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# Developing a methodology for ecosystem assessment of Tam Giang-Cau Hai lagoon and estuaries of Thua Thien Hue and Quang Tri Provinces, Central Vietnam


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# Academic thesis: Declaration of Authorship

I, Nguyen Vu Bao Chi, declare that this thesis and the work presented in it are my own and has been generated by me as the result of my own original research.

The title of the thesis is: "Developing a methodology for ecosystem assessment of Tam Giang-Cau Hai lagoon and estuaries of Thua Thien Hue and Quang Tri Provinces, Central Vietnam"

I confirm that:

- This work was done wholly or mainly while in candidature for a research degree at this University;
- Where any part of this thesis has previously been submitted for a degree or any other qualification at this University or any other institution, this has been clearly stated;
- Where I have consulted the published work of others, this is always clearly attributed;
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work;
- I have acknowledged all main sources of help;
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself;
- Either none of this work has been published before submission.

Signed: Nguyen Vu Bao Chi

Date: September 17th, 2019

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# List of Acronyms

| | |
|---|---|
| BOD | Biological Oxygen Demand |
| DANIDA | Danish International Development Agency |
| DO | Dissolved Oxygen |
| ES | Ecosystem Services |
| FAO | Food and Agricultural Organization |
| FOBIMO | Foraminiferal Biomonitoring |
| GoV | Government of Vietnam |
| GPS | Global Positioning System |
| ICZM | Integrated Coastal Zone Management |
| ISQG | Interim Sediment Quality Guidelines |
| IUCN | International Union for the Conservation of Nature |
| IUU | Illegal, Unregulated and Unreported |
| IWRM | Integrated Water Resources Management |
| MEA | Millennium Ecosystem Assessment |
| MSC | Monitoring, Surveillance and Control |
| NGO | Non-Governmental Organizations |
| OC | Organic Compound |
| PEL | Permissible Exposure Limit |
| TCVN | Technical Committee of Vietnam |
| TEEB | The Economics of Ecosystems and Biodiversity |
| TN | Total Nitrogen |
| TP | Total Phosphorus |
| US EPA | United States Environmental Protection Agency |
| UN | United Nations |
| WORMS | World Register of Marine Species |

# Abstract

The objective of this thesis is to systematize the environmental datasets acquired during a period of nearly two decades at set locations in Tam Giang-Cau Hai lagoon of Thua Thien Hue and Quang Tri Provinces, integrating existing secondary datasets with newly acquired primary information during 2006-2018.

In addition to physico-chemical parameters, biological proxy indicators of ecosystem integrity were incorporated in the database, in attempt to develop a tool-box methodology to reveal the degree of effectiveness of lagoon and wetland ecosystem functions being, long-term and seasonal variations and the degree of environmental stress caused by human activities.

Coastal plains and wetlands have been privileged sites for human civilizations for millennia. Their habitats and resources have been critical to the development and survival of humanity. Wetland ecosystems are part of our natural assets, providing services worth trillions of US dollars every year and making a vital contribution to life. With increasing demographic pressure and modern society craving for water and food resources, not counting threats posed by climate changes, the need to maximize these benefits has never been greater or more urgent.

A fundamental issue in developing countries is to harmonize environmental conservation and social progress. Human conditions are tightly linked to the state of the environmental where economic activities and social life are carried out. The Millennium Ecosystem Assessment stemmed from the assumption that a close relationship between welfare and prosperity of a community, its security and resilience is related in a multi-faceted way to the salubrity of the environment and its effectiveness in performing functions and providing services supportive to human life.

The following approach has been followed to set up a framework for the implementation of developmental projects or the drafting of ecosystem-based management policies and plans aiming at both environmental conservation and human well-being:

- Inventory of ecosystems and habitats in a specific locale
- Development of a set of objectively verifiable and quantifiable indicators to appraise the state of ecosystems, their effectiveness in performing functions and

delivering services.

- Establish a science-based framework for environmental monitoring and data acquisition for use of scientists and policy makers
- Establish a GIS-based environmental relational database to serve the purpose of planning, management and policy drafting.
- Develop thematic mapping for planning, tracking environmental changes, land use, soil consumption, illegality and abusive encroachment of urban settlements onto wetland.
- Use remote-sensing techniques to extrapolated point-source information to land and water surfaces

A methodology for each of these components is delivered as output of this thesis, then integrated into an operational tool-box for use of managers and decision makers.

The Tam Giang-Cau Hai lagoon with its 22,000 hectares of water surface and estuary wetlands, with associated deltas and forests, represent the largest lagoon system in Southeast Asia. It is a key area that, as a consequence of post-war rural repopulation, demographic increase, resource overuse, urbanization and industrialization, has undergone substantial changes in the past two decades.

As a consequence of human pressure and encroachment of the natural habitats, there is a perception that ecosystem functions and services have been impaired; however, a clear and science-grounded understanding to what extent the beneficial effects to the riparian communities has been compromised.

This doctoral thesis has been conceived with the objectives of developing a methodology for a science-based analysis of environmental effectiveness and ecosystem-service provision based on:

- available and routinely acquired data,
- standardization, spatialization and consistency assessment of available information,
- ecosystem and habitat identification,
- assessment of resource state and trends
- tool development for data dissemination

The environmental degradation of the Central Vietnam wetlands and increasing pressure on their aquatic resources, together with typhoons, floods and droughts that yearly strike the province concurred in creating a situation of particular vulnerability for people living on and around it. This situation of persistent threat and creeping decline has been a matter of concern in the past two decades: the application of the methods of science in support of environmental monitoring and control will contribute to a more effective management of the locale in the long term.

Original datasets were collected, in the years 2015-2018, according to a protocol, laboratory procedures and sampling grid compatible with previous campaigns implemented in 2006-2013 whose data are available from the local literature and internal Provincial reports.

A substantial component of the study was dedicated to benthic foraminifera, specific taxonomic category considered of importance as indicators of environmental quality and stress.

In order to assess water quality, the following list of parameters were measured, both directly in the field during sample collection and in the laboratory.

- Water depth of station,
- Turbidity,
- Temperature,
- Flow velocity during tidal flood and ebb,
- Compositional and textural parnameters of bottom sediments,
- Total solid and suspended solid present in the water,
- pH,
- Saliniity,
- Dissolved oxygen,
- Nitrites and nitrates,
- Ammonia,
- Alkalinity,
- Total phosphorous,
- Total nitrogen,
- Chlorophyll A
- Zoobenthos biomass
- Phytoplankton

- Microalgae and toxic algae
- Total coliforms, E. coli and Vibrio cells

The focus of the thesis is hinged on the assumption/observation that benthic foraminiferal assemblages display an overly sensitivity to environmental changes. The rationale of the investigation is therefore based on a threefold approach:

- Comparative analyses of historical time series of environmental data over the period of a decade.
- Relationships between environment parameter changes and shifts in the composition of foraminiferal assemblages.
- Calibration of foraminifera assemblages as a predictive tool for upcoming environmental changes.

Findings of this dissertation are:

- The Tam Giang-Cau Hai and wetlads of Central Vietnam maintain their rather pristine state compared to other lagoon and deltaic settings of the world, despite the high population density, the strong demand for food resources and on going vigorous development. Historical events of the second half of the past century slowed down the process of industrialization and urbanization, maintaining agriculture and fishery into artisanal conditions and the aesthetic of the natural environment into its untouched beauty.
- Aquaculture has been another major element of perturbation of the natural system: the attempt to promote shrimp production in the nineties generated in cascade negative impacts whose repercussions are still felt today: widespread organic pollution, wiping out of endemic mangrove ecosystem, eliminating inter-subtidal spawning and nursery platform, loss of productivity, break of reproductive cycle of numerous species, loss of biodiversity, hindrance of circulation etc.

Critical issues relating to the quality of wetland habitats of Central Vietnam

- Parameters and variables of water quality, sediments, benthic associations in Tam Giang-Cau Hai lagoon and estuaries of Central Vietnam portray a rather stable situation and a persistent acceptable standard for aquaculture; however, high organic-matter input to open waters relating to  biological excretion and excessive feed may create eutrophication and anoxia lethal for life.

- High-impact shrimp monoculture is unsustainable on the long term: alternative methods (e.g. clam farming) need to be studied and piloted to mitigate negative effects of effluents and aquaculture waste waters.
- Livelihood shift is necessary, having short-term impact on household welfare and economy, but unquestionably beneficial on the long term.
- Need of a viable community-based solid-waste collection and treatment plan, including the creation of a community-based collection network at commune level.
- Appropriateness of the future implementation of a wetland ecosystem carrying capacity exercise, in support of future planning and zoning for conservation and exclusion
- Need of a water-quality monitoring system for early warning of upcoming critical conditions and implementation of protection measures.

Biodiversity is an asset of Central Vietnam wetlands. In terms of species richness, these far outnumber any other lagoon in Vietnam and in the world. Count totals approximately 1000 species, most of them systematically identified: phytoplankton records the highest in number of representative species (287), fish's species are 215-230; birds, 73; zooplankton, 72; zoobenthos, 193 species, seaweeds 46, higher plant, 31; water grass 18 (of which 7 species of sea grass).

High biodiversity depends on physiographic complexities, diversity of habitats, and seasonal changes of the aquatic environment: salinity fluctuations between the dry and rainy season affect the composition of biota and species predominance.

# Riassunto

L'obiettivo di questa tesi è stato quello di creare e sistematizzare set di dati ambientali acquisiti durante quasi due decenni in siti costieri del Vietnam Centrale, (laguna di Tam Giang-Cau Hai) nelle Provincie di Thua Thien Hue e Quang Tri.

Oltre ai parametri fisico-chimici, nel database sono stati inclusi indicatori biologici di integrità dell'ecosistema, nel tentativo di sviluppare un prontuario e linee guida per rivelare il grado di efficacia delle funzioni e dei servizi ecosistemici offerti dagli ambienti lagunari e zone umide

Le pianure costiere e le zone umide offrono habitat e risorse naturali fondamentali per lo sviluppo e la sopravvivenza dell'umanità. Gli ecosistemi delle zone umide costiere offrono all' uomo risorse naturali e servizi per un valore di trilioni di dollari ogni anno e apportando un contributo fondamentale alla prosperità delle comunità rivierasche. Con l'aumento della pressione demografica e la società moderna che brama acqua e risorse alimentari, la necessità di massimizzare questi benefici non è mai stata così grande o urgente.

Nei paesi in via di sviluppo è fondamentale l'armonizzazione della conservazione ambientale e del progresso sociale. Le valutazioni del Millennium Ecosystem Assessment sono basate sul presupposto che esista una stretta relazione tra benessere e prosperità di una comunità e la sua sicurezza e resilienza: queste due condizioni sono strettamente legate alla salubrità dell'ambiente, alla sua efficacia nello svolgimento di funzioni indispensabili all'uomo e alla fornitura di servizi di supporto alla vita.

Il seguente approccio è stato seguito per istituire un protocollo di analisi ambientale

• Inventario degli ecosistemi e degli habitat.

• Sviluppo di indicatori oggettivamente verificabili e quantificabili per valutare lo stato di salute degli ecosistemi,

• Costruzione di un database relazionale ambientale a base GIS per scopi di pianificazione e gestione.

• Sviluppo di mappe tematiche utilizzando il telerilevamento.

# Introduction

Despite awareness and concern on environmental integrity has increased over the recent decades, wetlands are largely considered in both developing and developed countries as wasteland, unusable territory to be preferably drained and converted for development and other land uses.

Over the past century more than half the acreage of coastal wetlands and lagoons have been lost through reclamation and converted into arable land and/or urban areas. A fraction of natural wetland have undergone degradation because of human encroachment aiming to resource utilization and land occupation, such that ecosystems relying on freshwater availability are in major decline. Demographic increase and demand for water and food causes additional pressure on wetland ecosystems and as wetlands are degraded, communities struggle for subsistence, insecurity and poverty.

Since the early years of this century, Vietnam has undergone a vigorous process of economic development accompanied by aggressive land occupation and soil consumption, to accommodate infrastructures, urban expansion and industrialization. Given the geography of the country, whose population primarily concentrates on a narrow coastal stripe, embayments, coastal lagoons, wetlands and archipelagos were all to a various extent affected.

The Tam Giang-Cau Hai lagoon of Central Vietnam is a paradigm of such process of degradation, fueled by economic development, demographic increase after countryside re-population, resources overuse, deforestation and water-surface occupation by aquaculture.

Concern over the sustainability of resource use of the Tam Giang-Cau Hai lagoon raised in the late nineties when signs of depletion of fishery and loss of biodiversity became evident as a consequence of negative impact of wetland forest eradication, aquaculture development and population increase. In those years, a number of international agencies (FAO, DANIDA, World Bank, Asian Development Bank, IUCN) and a number of National cooperation agencies bilaterally intervened in support of sustainable resource use and food security in this area and elsewhere in the country.

In the years between the 2001 and 2005, the Millennium Ecosystem Assessment program was launched to appraise the consequences of the changes in the ecosystem's structure and modifications of natural habitats affecting human well-being and to establish sound approaches and scientific methodologies for initiatives required to promote environmental conservation, sustainable use of resources and maintain the integrity of those functions that ecosystems perform ultimately and intimately contributing to societal welfare.

In the early 2000' IUCN supported the concept of Integrated Water Resource Management in the Huong River basin, whose the Tam Giang-Cau Hai lagoon is the seaward termination, in the attempt to balance 'environmental flows' in the whole catchment area subjected to diverse and contrasting needs (hydro-power, sand mining, water transportation, urbanization, agriculture, fishery and aquaculture in its downstream side. The concept of 'environmental flows' implies the application of appropriate policies and management measures to ensure that water resources are equitably shared in a catchment, in an appropriate way to maintain downstream ecosystems and services unaltered. Creating an environmental flow regime is an important foundation of Integrated Water Resources Management (IWRM).

Understanding the complexities of coastal marine and wetland ecosystems, in 2005, an FAO rural development project entered on duty in the Tam Giang-Cau Hai lagoon, applying the concept of integrated coastal zone management (ICZM) not just to water but to all resources being utilized by the riparian communities (fishery, forestry, agriculture), in the attempt to regulate their use and ensure a sustainable food supply in the long term. For the first time, the concept of ecosystem management was applied and a cross-sectorial, holistic approach was used to delineate a management system of the largest lagoon system in Southeast Asia, compatible to the multi-faceted needs of the communities of resource users.

In compliance with the spirit of Millennium Ecosystem Assessment, the development of scientific basis to evaluate the integrity of Tam Giang-Cau Hai lagoon ecosystems was piloted by the FAO project in the years 2005-2102, in the attempt to develop a relational database of environmental standardized parameters usable as a baseline by the Provincial technical departments for support to decision making.

# Objective of this thesis

The FAO-supported project carried out extensive monitoring in the Tam Giang-Cau Hai lagoon during the years 2006-2012. The scope of data collection and storage related to the concept of linking the ability of an ecosystem to effectively maintain its functions unaltered (and therefore to ensure services to the human communities living on it) to a set of objectively detectable and verifiable parameters, as reference values to be used in monitoring.

Given the socio-economic focus of the FAO-supported project, the science-based approach to ecosystem management remained at a piloting stage, yet providing substantial data series to be elaborated further and contributing to an assessment of ecosystem functionality.

The objective of this thesis is to systematize the environmental datasets acquired during a period of nearly two decades at set locations in Tam Giang-Cau Hai lagoon of Thua Thien Hue and Quang Tri Provinces, integrating existing secondary datasets with newly acquired primary information during 2006-2018.

In addition to physico-chemical parameters, biological proxy indicators of ecosystem integrity were incorporated in the database, in attempt to develop a tool-box methodology to reveal the degree of effectiveness of lagoon and wetland ecosystem functions being, long-term and seasonal variations and the degree of environmental stress caused by human activities.

GIS-data spatialization will specifically locate sites/zones requiring attention, supporting a proactive approach to remediation, enhanced resilience, sustainable utilization of environmental resources and balanced development in a climate of aggressive urbanization and industrialization of the country.

### Why wetlands matter

Coastal plains and wetlands have been privileged sites for human civilizations for millennia. Their habitats and resources have been critical to the development and survival of humanity. Our progress in science and technological may support the misconception that nature can be ultimately controlled, but recurrent catastrophes rooted in an unsustainable use of land and water suggest that human society still depend on properly functioning ecosystems.

Wetland ecosystems are part of our natural assets, providing services worth trillions of US dollars every year and making a vital contribution to life. With increasing demographic pressure and modern society craving for water and food resources, not counting threats posed by climate changes, the need to maximize these benefits has never been greater or more urgent.

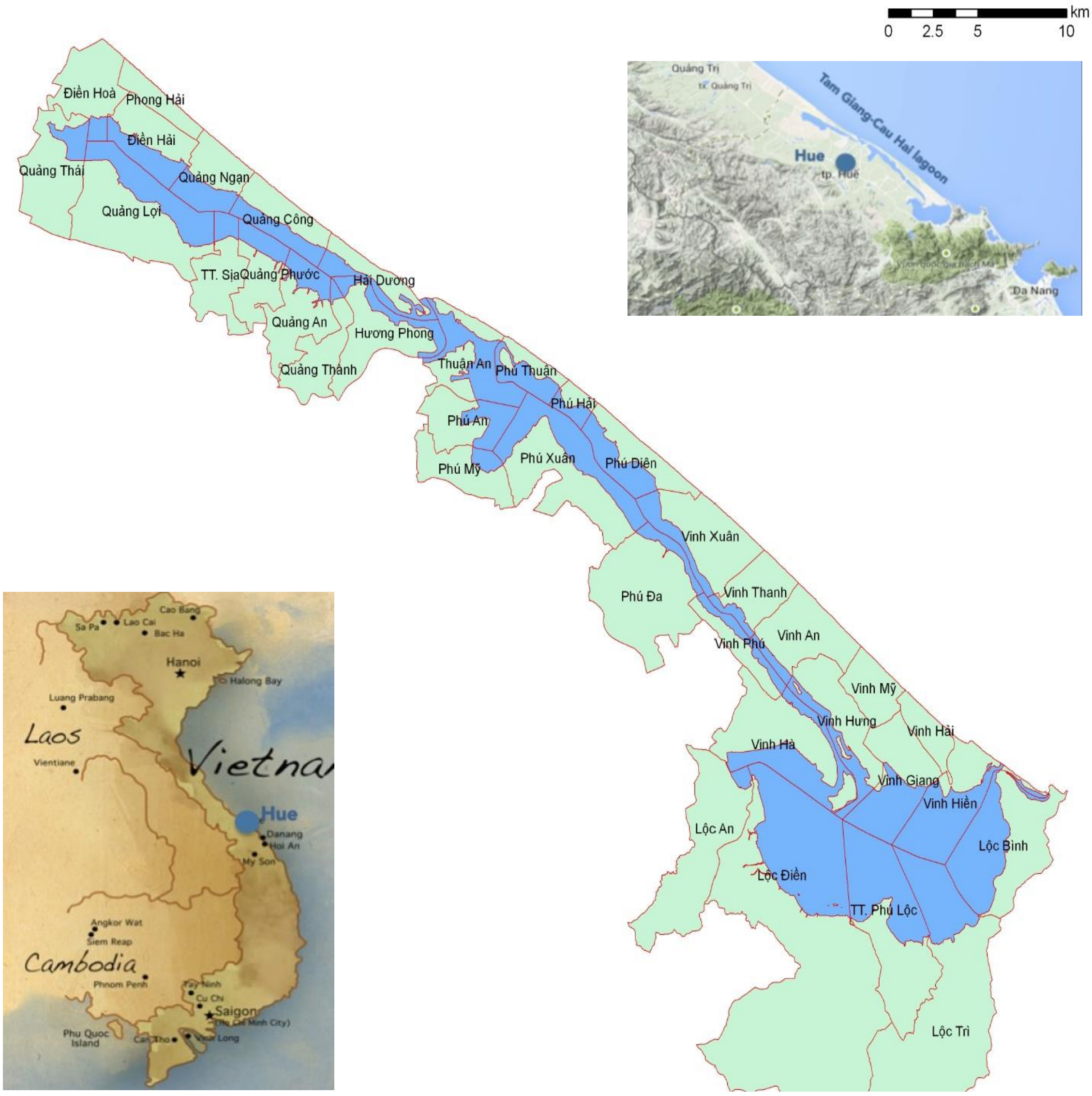


**Figure 1 – Geography and political boundaries (communes) of the Tam Giang-Cau Hai lagoon and its surrounding territory. The whole Tam Giang-Cau Hai lagoon belongs to the Thua Thien Hue Province; the 33 riparian communes belong to five districts. In the insert, the location of the Province and the Tam Giang-Cau Hai lagoon in the National context.**

Wetlands exist where superficial waters encroach over land; there mangroves forests, peatlands, salt marshes, streams, ponds and lakes, but also deltaic expanses, floodplains and flooded forests develop. Coastal wetlands occur where rivers meet the sea, water flow slows and expands into lagoons, embayments and shallow waters. Agriculture is practiced extensively in coastal wetlands, such as rice paddy fields and orchards, to a various extent altering the natural landscape.

Rivers convey fertile sediments to the sea, building-up floodplains that support agriculture. Rivers and estuaries are waterways facilitating maritime commerce and transportation; rivers are source of energy and drinking water for vast regions on Earth. River-related wetlands provide critical habitat for fishes and other aquatic animals vital for humans as food and proteins.

Deltaic swamps, lagoons and estuaries control and regulate water supply and quality to the most densely populated areas of the planet. Water risks to society, including scarcity, droughts and floods, are mitigated at wetlands, whose conservation and restoration is a cost-effective investment towards water security.

Wetland (mangrove) forests thrive in tropical and sub-tropical wetlands. These complex ecosystems develop under saline conditions unsuitable to most forest formations. Besides being nursery to a vast range of aquatic creatures, providing nutrients to nourish plankton, algae and fishes, mangrove forests offer physical protection against climatic extremes such as typhoons, storm winds and related floods. Dense mangrove forests may absorb and abate the destructive force of storm surge being an effective mitigation measure against weather deterioration due to climate changes. Moreover, mangroves are among the most effective carbon storage systems on Earth.

**Background**

A fundamental issue in developing countries is to harmonize environmental conservation and social progress. Human conditions are tightly linked to the state of the environmental where economic activities and social life are carried out. The Millennium Ecosystem Assessment stemmed from the assumption that a close relationship between welfare and prosperity of a community, its security and resilience is related in a multi-faceted way to the salubrity of the environment and its effectiveness in performing functions and providing services supportive to human life.

Since the early 2000’, the concept of ecosystem-based management was reflected into policy papers, management regulations and plans, in such a way that the focus was shifted from human actions and economic activities solely, to broader spectrums of initiatives promoting conservation and rehabilitation of ecosystems as a whole.

The concept of ecosystem management pioneered by the FAO developmental project in Tam Giang-Cau Hai lagoon designed its implementation strategy to achieve both ecological and social progress, by blending environmental science, monitoring and community development, without detracting from its primary objective that was food security and poverty alleviation.

An analysis of World Bank projects with objectives of alleviating poverty and protecting biodiversity revealed that only 16% made major progress on both objectives.

The approach developed in this thesis relates to the delivery of a framework in which a detailed exploration of science data and social economic achievements in a specific area are conducive to balance biodiversity conservation and social progress as a result of how people manage their ecosystem services.

Scientific advances around ecosystem functions and ecosystem service production and the design of appropriate monitoring programs are pivotal for the implementation of conservation and developmental objectives that will successfully advance both environmental and social goals.

In the early days, the Millennium Ecosystem Assessment endeavor exposed huge gaps in what later became known as science of ecosystem services. Yet, many development projects of those days embodied both aspects, recognized as intimately related by both conservationists and developmental agencies, of stewardship of nature, biodiversity conservation and economic development.

The results were a series of developmental initiatives, especially in the Tam Giang-Cau Hai lagoon, with integrated conservation and development purpose, all justified by the assumption that nature provides human communities with benefits and poverty and environment degradation and the “two sides of the same coin”.

Understanding the constraints that influence the outcomes of projects with dual conservation and economic development goals is crucial. One possible approach is to elaborate an investigation framework to be applied for assessing the connections between ecosystem services and economic development, by adopting indicators and metrics that could increase the likelihood of concurrent positive outcomes (win-win) in both interconnected aspects of natural and social life.

**A framework linking environmental science to human welfare.**

There are two possible approaches by which the science of ecosystem services can contribute to biodiversity and environmental integrity as well as to social welfare, economic progress and poverty alleviation.

One strategy is to promote economic viability of activities deriving from the effectiveness of services delivered by a specific ecosystem, in such a way that these activities may generate additional income and, in the best case, promote investments whose profits could be utilized to compensate eventual loss of economic opportunities suffered by communities engaged in environmental conservation.

In this case, the full accounting of ecosystem services available and a better insight on how and rater at which theses services are delivered, and economic value attached to them, might be an incentive to pay for nature conservation.

The second approach relates to the internalization of benefits deriving from the ecosystem management, by fostering a community-based economy through promotion of rural industries and access to the market of those goods (e.g. organic produce) and resources (e.g. touristic offer) whose availability is enhanced by the adoption of better environmental conservation practices.

When the economic value of natural ecosystems and resources are explicitly quantified, benefits are more valued both by the people who directly interact with the ecosystems and/or (government) agencies that would have to financially contribute from substitute sources, should ecosystems become impaired.

Whichever strategy is adopted, the following investigation steps should be undertaken to set up a framework for the implementation of developmental projects or the drafting of ecosystem-based management policies and plans aiming at both environmental conservation and human well-being:

- Inventory of ecosystems and habitats in a specific locale

- Development of a set of objectively verifiable and quantifiable indicators to appraise the state of ecosystems, their effectiveness in performing functions and delivering services.
- Establish a science-based framework for environmental monitoring and data acquisition for use of scientists and policy makers
- Establish a GIS-based environmental relational database to serve the purpose of planning, management and policy drafting.
- Develop thematic mapping for planning, tracking environmental changes, land use, soil consumption, illegality and abusive encroachment of urban settlements onto wetland.
- Use remote-sensing techniques to extrapolated point-source information to land and water surfaces

A methodology for each of these components is delivered as output of this thesis, then integrated into an operational tool-box for use of managers and decision makers.

Practical applications of the methodology and use of the toolbox is to adopt a scientific approach based on objectively verifiable indicators to ecosystem assessments and effectiveness of ecosystem functions and services supporting human life and community's well-being.

**Ecosystem functions and services**

Ecosystem functions are natural process that take place in animal and plant communities of the different biomes through exchanges of energy and nutrients in the food chain which are vital to the sustenance of plant and animal life on the planet.

Ecosystem services are ecosystem functions that are directly beneficial to humans.

These concepts evolved from the vast literature flourished on the subject, dating back since the sixties and seventies (King, 1966; Neef, 1966; Van Der Maarel and Dauvillier, 1978) and exponentially grown in the nineties (De Groot, 2002) detailing with increasing precision the roles natural ecosystems have in supporting human life and improving capacity to cope with adverse (natural, economic, societal) events (i.e. "resilience" in modern terms).

The “ecosystem service” concept has evolved though time to attain its modern significance of a multi-layered approach at the interface between ecosystems and human well-being.

Daily (1997) defines ecosystem services as “the conditions and processes through which natural ecosystems, and the species that make them up sustain and fulfill human life”. Costanza et al., 1997 and Millennium Ecosystem Assessment (2005) provide further predications as “**benefits** human populations derives, directly or indirectly from ecosystem functions.

Boyd and Banzhaf (2007) put emphasis of “consumption or utilization” of ecological components (*i.e.* resources, tangible or intangible such as landscape) for the purpose of achieving ever increasing human well-being. TEEB (2009) and Fisher *et al.,* (2009) follow the same line of reasoning, whilst U.S. EPA (2008) focuses on the concept of sustainability defining ES as “products of ecological functions or processes that directly or indirectly contribute to human well-being, or have the potential to do so in the future”.

Ecosystem services are susceptible to human abuse when natural processes are impaired or excessive resources are withdrawn to sustain a growing population. Therefore, the nature of these ecosystem services and how these are sustained should be understood.

**Classification of ecosystem functions and services**

The Millennium Ecosystem Assessment (MEA) document provides a framework for understanding and assessing the benefits that ecosystems deliver to communities. According to it, services are grouped into four categories:

- Supporting services. These include basic functions, such as nutrient recycling, primary production or soil formation, not directly beneficial to humans but indispensable to support ecosystem effectiveness and capacity to deliver the services of the other categories. TEEB replaced "supporting services" of the MEA document with "habitat services" defined as "ecosystem functions … a subset of the interactions between ecosystem structure and processes that underpin the capacity of an ecosystem to provide goods and services"
- Provisioning services relate to the production of commodities usable by humans as food, raw materials (e.g. lumber, fuel, etc.), genetic resources, water and energy, but

also biogenic minerals, medicinal and ornamental resources.

- Regulating services relate to the role ecosystems play in altering/regulating natural and biological processes, or even planetary cycles such as climate, carbon cycle etc. Pollination is a basic regulating service, but also carbon sequestration, crucial in climate regulation, flood control, waste decomposition and detoxification, purification of water and air, pest and disease control.
- Cultural services pertain to the spheres of aesthetics, spiritual life, history, support to education (school excursions) and recreational activities, such as ecotourism and sports).

**The pilot study area and project justification.**

The Tam Giang-Cau Hai lagoon with its 22,000 hectares of water surface and associated wetlands, deltas and forests, is the largest lagoon system in Southeast Asia. It is a key area that, as a consequence of post-war rural repopulation, demographic increase, resource overuse, urbanization and industrialization, has undergone substantial changes in the past two decades.

As a consequence of human pressure and encroachment of the natural habitats, there is a perception that ecosystem functions and services have been impaired; however, a clear and science-grounded understanding to what extent the beneficial effects to the riparian communities has been compromised.

Initiatives by international organizations (FAO, IUCN), NGOs, bilateral donors and the GoV have been promoted with the objectives of reverting trends of environmental degradation, primarily with a focus to poverty eradication, social and economic development but without a strategy and scientific information on how to restoring ecosystem functionality and protect ecosystem-service delivery to humans.

Environmental data have been collected extensively by governmental agencies and academic/research institutions, but databases hardly used for developing appropriate policies and undertaking management measured in support of environmental defense and resource conservation.

**Objectives of the study**

This doctoral thesis has been conceived with the objectives of developing a methodology for a science-based analysis of environmental effectiveness and ecosystem-service provision based on:

- available and routinely acquired data,
- standardization, spatialization and consistency assessment of available information,
- ecosystem and habitat identification,
- assessment of resource state and trends
- tool development for data dissemination

**Regional background and critical issues**

The coastal zone of the Thua Thien Hue Province makes up 34% of its total area and about 81% of its population; it is where most economic activities are concentrated.

The Tam Giang-Cau Hai lagoon, with its 68 km in length and 22,000 hectares of water surface is the largest lagoon in South East Asia. A community of over 300,000 people, mainly farmers and fishers, live on the resources of the water basin and its surrounding land. Administratively, thirty-three communes face the waters of the lagoon, grouped into five lagoon coastal districts, all under the Provincial authority of Thua Thien Hue.

North of Thua Thien Hue lays Quang Tri Province, the natural continuation of this Central Vietnam wetland, lagoon and estuary complex spanning from Phu Yen to Quang Binh.

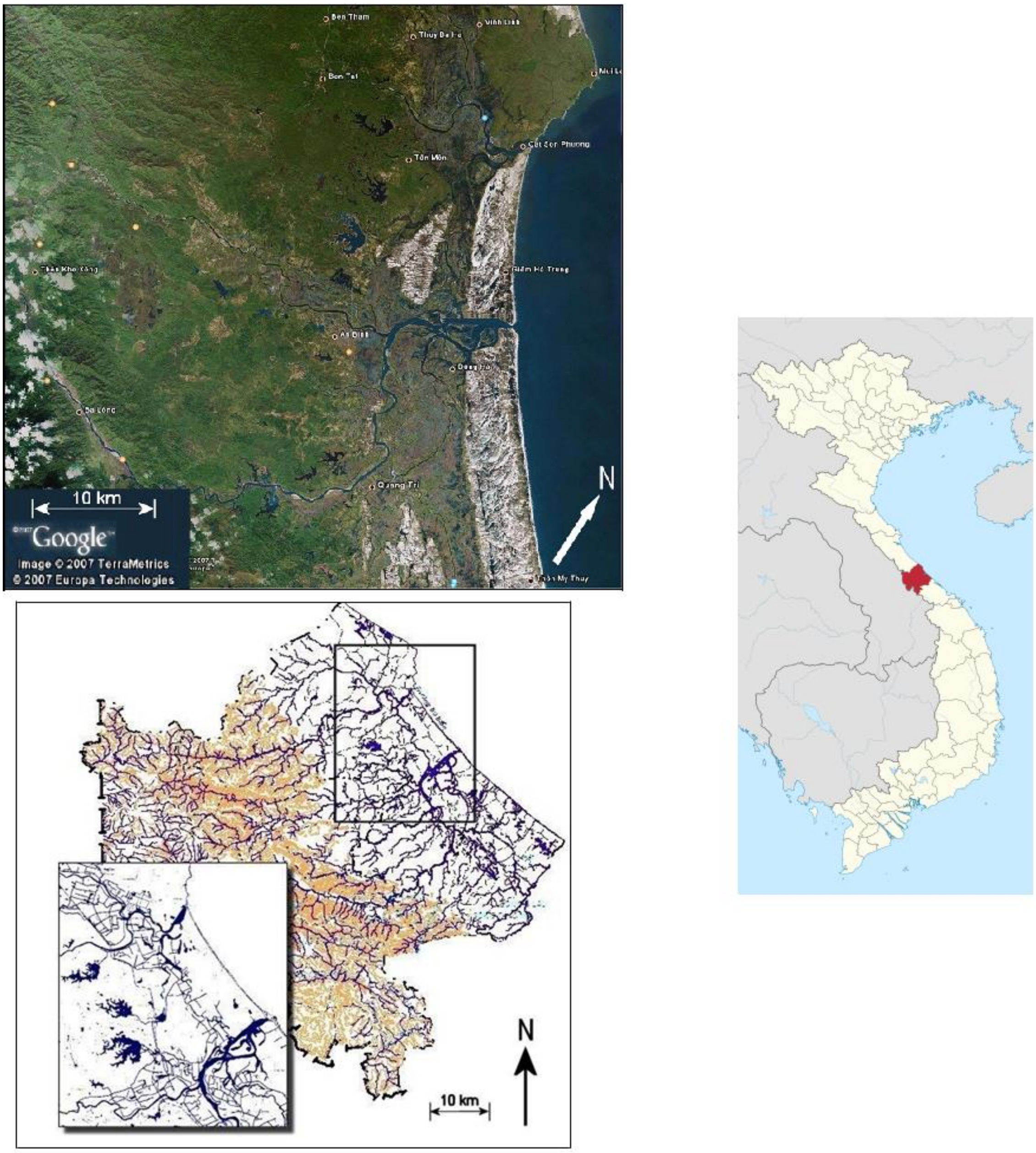


**Figure 2: Location of Quang Tri Province and related river network**

The Quang Tri province is located in a strategic area for transport and communication, at the junctions among the National Route 1A, the Ho Chi Minh Highway and the East-West Economic Corridor. Also the North-South Expressway and Coastal Highway. Located at the border-gate of Vietnam, Quang Tri is the focal node of the Indian Ocean and South China commercial traffic, terminal of the East-West Economic Corridor and the Mekong sub-region.

Quang Tri province has a total area of 4,592 km$^2$ and a large river network that provides a suitable setting for aquaculture. The Quảng Trị province also has 55% area of the mountainous territory and a 75-km-long coastline with a number of touristic destinations (Cửa Tùng, Cửa Việt, and Mỹ Thủy).

There are two major rivers: the Ben Hai river to north and the Thach Han river to the south, flowing into their own estuaries in Cua Tung and Cua Viet. The estuarine system in Quang Tri is complex because of the large number of tributaries draining the hinterland. In the estuaries, the salt water from the sea can invade up to 24 km inland creating a broad brackish zone of embayments, ox-bow lakes and wetlands.

The coastal belt is occupied by coastal dwellers; associated waterways and wetlands are being used for shrimp and fish farming (Trinh Q.T., 2010). Many local farmers shifted to shrimp culture because of high economic income from some successful models, but unplanned development of this industry brought up excessive pollution from untreated effluents, environmental deterioration and the prospect of unsustainable resource use.

There is a clear need of environmental management for this extensive wetland and lagoon system and a latent need for management of the coastal and inshore marine fisheries as a whole. According to existing data and feedback from fishers, commune leaders and local knowledge, the main reasons for the need to manage the coastal zone in an integrated manner are:

- The persisting degradation of the lagoon environment and ecosystems, because of overfishing, fish farming and deforestation.
- A significant decrease in stock abundance and diversity caused by illegal, unregulated and unreported (IUU) fishing and lack of monitoring, surveillance and control (MSC).
- A natural tendency to inlet siltation because of insufficient tidal draft.
- The need to include communities in management.
- The need to harmonize processes of urban expansion, water-surface and agricultural land tenure, industrialization and rural development.

The objective of this study is to provide decision makers scientific tools to revert the negative trends of the past decades that turned the lagoon into a livestock-depleted freshwater lake, polluted by untreated effluents, with most of its wetland habitats and wildlife endangered or vanished.

Two pilot area were selected in this stretch of Central Vietnam coastal zone: the Quang Tri estuaries and the Thua Thien Hue Tam Giang-Cau Hai lagoon Giang-Cau lagoon.

The environmental degradation of the Tam Giang-Cau Hai lagoon and increasing pressure on its aquatic resources, together with typhoons, floods and droughts that yearly strike the province concurred in creating a situation of particular vulnerability for people living on and around it. This situation of persistent threat and creeping decline has been a matter of concern in the past two decades: the application of the methods of science in support of environmental monitoring and control will contribute to a more effective management of the locale in the long term.

## Presentation of data

Original datasets were collected, in the years 2015-2018, according to a protocol, laboratory procedures and sampling grid compatible with previous campaigns implemented in 2006-2013 whose data are available from the local literature and internal Provincial reports.

Only selected datasets are discussed in the text, but the whole archive of information considered in this synthesis is given as Annex 1.

A substantial component of the study was dedicated to benthic foraminifera, specific taxonomic category considered of importance as indicators of environmental quality and stress.

### Materials and methods

Methods of water and sediment samples collection

Water samples were collected using a bathometer at 3 depths: surface, mid-water and bottom layer. Sediment samples were collected using a Van Veen grab, wrapped in zinc foil. The water and sediment samples were stored at < $4^0$C in the laboratory, before being analyzed.

Methods of phytoplankton sample collection

Phytoplankton samples were collected using a phytoplankton net with a 15 cm diameter and 45 cm length, and a mesh with a dimension of 20 µm, in an area of 15-m radius at each station. Upon collection, phytoplankton samples were fixed with formol 4%, transported to the laboratory and preserved at < 4$^0$C. Laboratory identification relied on morphological comparison method. Samples were analyzed with Olympus CH40 microscope with contrast phase.

<u>Methods of sediment sample collection for foraminiferal studies</u>

Samples were collected from the Tam Giang – Cau Hai lagoon in Thua Thien Hue Province and Cua Tung, Cua Viet estuaries in Quang Tri Province. Sediment and water sampling were collected using a Van Veen grab and Van Dorn sampler, respectively.

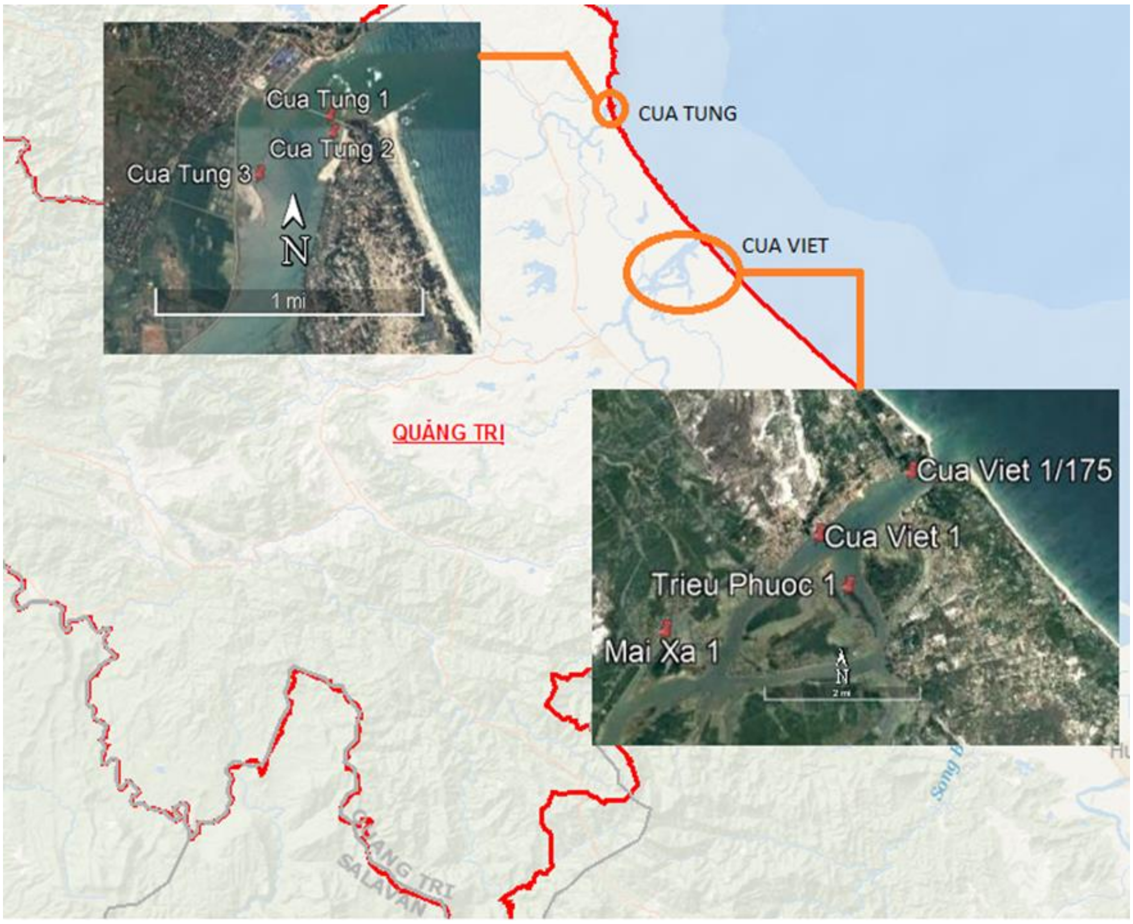


**Figure 3 - Sampling stations in Quang Tri Province, April 2017.**


**Figure 4 - Van Veen grab (left), Van Dorn sampler (center) and 50-mL-capacity Falcon conical tubes (right).**

Sediment and water samples from each location were stored together in 50-mL-capacity BD Falcon Conical Tubes and transferred to the laboratory at the end of the day for storage in refrigerated chambers.

The positions of the sampling stations were determined and recorded as WGS84 latitude and longitude, using the Global Position System.

<u>Water quality analyses</u>

In order to assess water quality, the following list of parameters were measured, both directly in the field during sample collection and in the laboratory.

- Water depth of station,
- Turbidity,
- Temperature,
- Flow velocity during tidal flood and ebb,
- Compositional and textural parnameters of bottom sediments,
- Total solid and suspended solid present in the water,
- pH,
- Saliniity,
- Dissolved oxygen,
- Nitrites and nitrates,
- Ammonia,
- Alkalinity,
- Total phosphorous,

- Total nitrogen,
- Chlorophyll A
- Zoobenthos biomass
- Phytoplankton
- Microalgae and toxic algae
- Total coliforms, E. coli and Vibrio cells
- Measuring methods are listed in the following Table 1.
-

| Type of analysis | Measuring method |
|---|---|
| Sediment | Visual description and grain size analysis |
| Depth | Measuring stick and ruler |
| Turbidity | Sechi disk |
| Temperature | Digital thermometer |
| Dissolved Oxygen (DO) | Sera test kit |
| pH | Sera test ki |
| kH | Sera test kit |
| $NH_4^+/NH_3$ | Sera test kit |
| $NO_3$ | Sera test kit |
| $NO_2$ | Sera test kit |
| Salinity | Optical salinometer |
| Total Solid (TS) | Mass balance method (dried at 103–105°C) |
| Suspended solids (SS) | Mass balance method (dried at 105°C). |
| Chlorophyll-a | Spectrophotometric determination method (SMEWW 10200 H) |
| Detection of E. coli and | TCVN 6187-1996 (Standard method ISO 9308 – 1 – 1990) – filter membrane method. |

**Table 1 – Parameter measuring and detection methods**

Grain-size analyses

Grain-size analyses were performed using the principle of diffraction. Three grain-size fractions were considered according to Wentworth, C (1922): silts (<63 µm), very fine sands (63 to 125 µm) and sands (>125 µm). After being dried at 40°C, the sediment samples were weighed on a high-precision scale, then sieved through 125-µm-mesh and 63-µm-mesh sieves and weighed again separately.

Microalgae and phytoplankton analyses

Qualitative algae determinations were based on morphology following classification by Ngoc An Truong (1993), Larsen and Ngoc Lam Nguyen (2004), and Tomas (1997) used in light microscopy. Quantitative counts were made using Sedgewick Rafter chamber (volume 1ml) under a microscope with a magnification of 100x.

Foraminifera analyses

Samples were analyzed for foraminiferal content following the technique described by Walton, W.R., (1952) and Lutze, G.F., and Altenbach, A., (1991). After sampling, sediments were preserved in the laboratory adding 10% concentrated formalin solution buffered with sodium borate along with Rose Bengal stain (1g/L) for a minimum time of 14 days for discriminating living specimens and dead tests, following the FOBIMO protocol (Schönfeld, J., *et al.*, 2012).

Samples were washed through sieves 63-µm-mesh sieves, then dried at 40°C, weighed on high-precision scale and sieved again with 125-µm-mesh and 63-µm-mesh sieves, corresponding to the coarser and finer grain-size limits of fine sand. Each residual sample was then weighed separately and the results expressed as percentage of each size fraction against the total weight of the sample.

The counted living (stained) benthic foraminifera were hand-picked by dry picking and stored in micropaleontological slides.

For species identification, the World Register of Marine Species (WORMS, http://www.marinespecies.org/) classification was used.

Species evenness, richness, and diversity indexes as the Shannon-Weiner (Shannon C. E., and Weaver, W., 1949) and Simpson Index (Simpson, 1949) were used to evaluate foraminiferal species diversity, in order to compare these data to the environmental standards of estuaries and coastal wetlands.

**Results of analyses**

The results of analysis of sediment and water samples collected during surveys in both Tam Giang-Cau Hai lagoon, Cua Tung and Cua Viet estuaries are herewith presented followed by a discussion and conclusions on ecosystem identification and mapping.

The focus of the thesis is hinged on the assumption/observation that benthic foraminiferal assemblages display an overly sensitivity to environmental changes. The rationale of the investigation is therefore based on a threefold approach:

- Comparative analyses of historical time series of environmental data over the period of a decade.
- Relationships between environment parameter changes and shifts in the composition of foraminiferal assemblages.
- Calibration of foraminifera assemblages as a predictive tool for upcoming environmental changes.

Foraminifera biology and ecology: proxies for environmental health

Foraminifera are single celled protozoans that consist of successive chambers and widely distributed in marine environment from the intertidal zone to the deep ocean floor, range from the polar region to the Equator, in marginal to deep basin. In the fifth century B.C., Herodotus reported that large benthic foraminifera of the genus *Nummulites* are abundant in the limestone used to build the Egyptian pyramids at Gizah.

In the 16$^{th}$ and 17$^{th}$ centuries, smaller foraminifera were for the first time described, illustrated, and variously classified. The French naturalist Alcide d'Orbigny (1826) revolutionized the foraminifers' taxonomy describing them as tiny cephalopods. Felix Dujardin (1835) first determined their true protozoan nature and promoted their recognition as a separate Class (d'Orbigny, 1839).

The famous world cruise of H.M.S Challenger in 1880's collected many samples and Henry Bowman Brady (1884) illustrated the foraminifera dredged from the sea floor.

Throughout the 20$^{th}$ century, there were several prominent scientists working on in foraminiferal studies. Joseph Augustine Cushman and his team published 556 papers and particularly the first journal on Contributions from the Cushman Laboratory for foraminiferal research (Cushman, 1927) and one of the most influential texts in the field is: "Foraminifera: Their Classification and Economic Use" (Cushman J.A.,1928). Oil industry, after World War I, drove an impulse on the development of benthic foraminiferal biostratigraphy. In the decade prior to World War II, the Paleogene zonation was developed for the Caucasus Mountains of the southwest Soviet Union (Subbotina, 1953) and the Caribbean (Bolli, H., 1957a, 1957b, 1957c, 1966).

Furthermore, the postwar search for petroleum in Trinidad in the southernmost Caribbean region led to a revolution in biostratigraphy. The standard provided by Hans Bolli, who published Cretaceous and Tertiary zonation (Bolli, H. M., 1957a, 1957b, 1957c, 1966), was applied and expanded in the later biostratigraphic research (Blow, W.H., 1969, 1979; Berggren, W. A., 1969; Stainforth, R. M., *et al.* 1975).

Beside the development of foraminiferal biostratigraphy, the micropaleontological techniques expanded, to be applied to the ocean and deep-sea cores (Schott, D. W., 1935; Cushman, J. A., & Henbest, L.G., 1940; Emiliani, C., & Edwards, G., 1953; Ericson, D. B., & Wollin, G., 1956). The Deep Sea Drilling Project (1968 - 1983) contributed successfully to the expansion of the micropalaeontological investigations on deep-sea. Further studies on living foraminifera have contributed to the understanding of their fossil counterparts (Reiss, Z., & Hottinger, L., 1984, Hemleben, C. *et al.* 1989) and through foraminiferal ecology, this groups has become a tool for environmental analysis, providing bio-indicators for environmental stress and impacts from natural and anthropic hazards (Jorissen, F. J., 1988; Hottinger, L., & Pecheux, J. F., 1991).

According to the World Register of Marine Species (2018), at present there are 8,983 recognized recent species and 34,766 recognized fossil species recorded.

The classifications of foraminifera are based on the characteristics of the shell or test, including morphology, apertural structure, shell components, and types of chamber arrangements.

The tests of foraminiferal skeleton is secreted or agglutinated shell and consists of one or more chambers. The chambers are separated by septa, but with a continuous connection through a foramen in each subsequent septum. Through the opening on the last chamber, the protoplasm extends outside the test and the pseudopodia extrude to capture prey and aid in movement. The chambers may arrange as a single row (uniserial), a double row (biserial), or a triple row (triserial). Some tests coil in a single plane (planispiral) or coil up in a spire like the shell of a snail (trochospiral). The emergent part in center of the spire is called umbo and the indentation part in the other side is called umbilicus. If the earlier chambers enveloped by the later ones, the test is called involute; if they are visible, the test is termed evolute. The external line of junction between the chambers is known as suture.

The organelles and the cytoplasm of foraminifera include: the Golgi bodied, ribosomes, vacuoles, microbodies, microtubules, xanthosomes and endoplasmic reticulum. The protoplasm consists of small amounts of organic pigments, iron compounds, brown and red deposits of fatty material, brown excremental particles and green splotches (Boersma, A., 1998).

Foraminifera are roughly divided into two major groups: planktonic and benthic. The planktonic species float passively, moved only by currents but capable of vertical migration. Their assemblages provide information about the conditions in surface water where they live. The benthic species live on the sea floor, either at the surface or buried in the sediment, or are attached to plant stems, rocks or particles. Benthic foraminifers constitute the most diverse group, small compared to the other shelled micro-organisms in modern seas (Gupta, S., 1999) and play an important role in the economy and balance of the biosphere (Cimerman, F. and Langer, M.R., 1991).

From the 1960s, benthic foraminifera were used to describe the state of the environments in which they live or lived (Resig, J.M., 1960, Watkins, J.G. 1961 and Boltovskoy, E., 1965) and the methodology has increasingly developed until the most recent decades. Because of their short life cycles (Boltovskoy, E., 1965, and Murray, J.W., 1991 and 2006), high biodiversity and specific ecological requirements, benthic foraminifera are particular sensitive to respond with environmental changes and can be successfully used as bio-indicators of environmental status in a wide range of marine and marginal marine environments (Alve, E., 1991 and 1995; Hayward, B.W., 1993; Frontalini, F., *et al.*, 2009; Romano, E., *et al.*, 2015). In coastal and estuarine environments, under natural conditions, foraminifera tend to reveal the relative inflow of salt water with fresh water, which affects salinity (Nichols, M. M., 1974 and Odum, H.T., 1974) and other variables.

The foraminiferal life cycle is termed heterophasic, which is characterized by the alternation of sexual and asexual generations (Fig. 5). The asexual phase, *schizogony*, produce the gamonts have a larger initial chamber, the *proloculus*, and a smaller test size termed the macrospheric generation. Meanwhile, the sexually-produced, *gamogony*, a gamont, which is characterized by a smaller proloculus and an overall larger test size, called the microspheric generation (Goldstein, S. T., 1999). Repetitive asexual reproduction, also accomplished through schizogony (Fig. 5), seems to be the main reproductive mechanism for benthic species (Alve, E., and Goldstein, S. T., 2003).

Benthic foraminifera are generally taxonomically classified on the basis of morphological parameters and primarily discerned on the basis of test chemistry. The most important groups include species with calcareous perforate tests, the Miliolids which have a calcareous imperforate test, agglutinated species and organic-walled (or soft-walled) ones. This distinction is particularly important also for the study of biological processes and their linkage to bio-mineralization, because the involved processes change on the basis of the test structure.

The most studied models for bio-mineralization relate to the calcareous perforate species, generally from the order Rotaliida. The calcite test consists of a series of chambers that are constructed sequentially. In life, the protoplasm of the cell pervades the chambers and extrudes to the exterior of the test, functioning in excretion, food capture, and chamber construction. Assembly of a new chamber wall begins with the protoplasm extending outward to define an

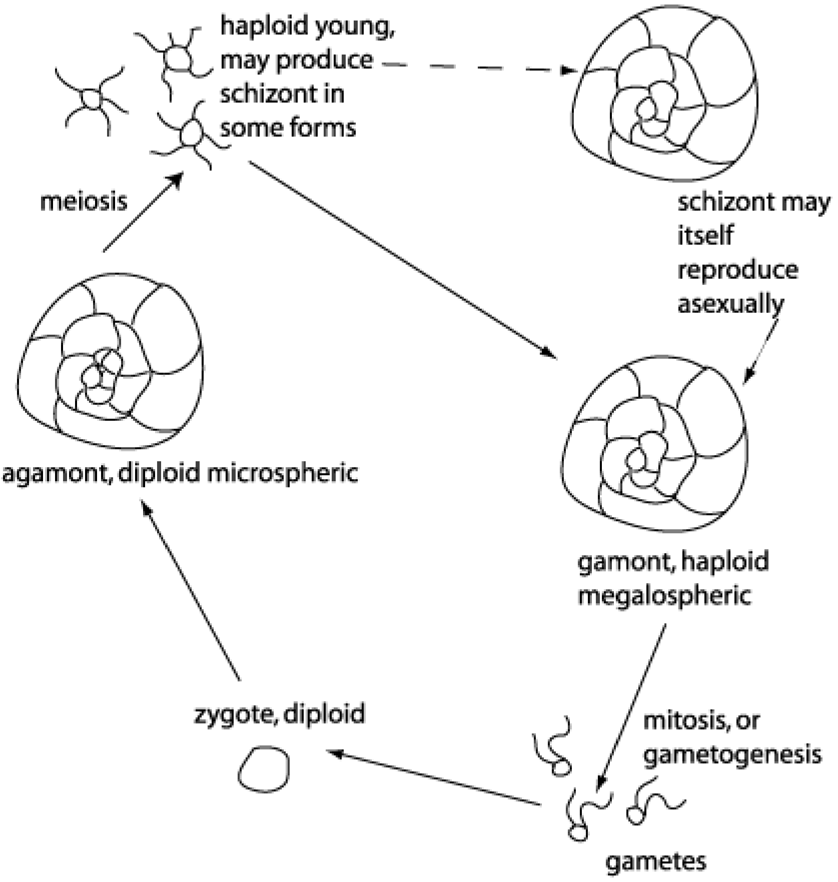


**Figure 5 – Diagram showing a generalized foraminfer life cycle. Note the alternation between a haploid megalospheric form and a diploid microspheric form (redrawn after Goldstein, S.T., 1999).**

outline that extends beyond the future positioning of the chamber being constructed (Cusak, M., and Freer, A., 2008). Calcification then takes place within this defined space with the formation of an organic layer or membrane that forms the shape of the new chamber. Nucleation occurs on both sides of this organic template, forming a new layer of primary calcite in the form of a new chamber wall that is then overlain by another layer of (secondary) calcite that extends over the entire test (Figure 3). Thus, the perforate calcite tests become increasingly laminated (Cusak, M., and Freer, A., 2008).

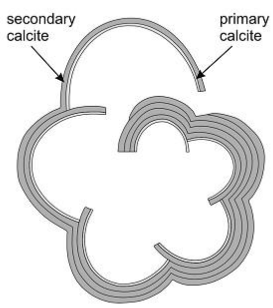


**Figure 6 - Formation of new chamber and laminate structure in perforate foraminifera. (Erez, J., 2003, reprinted by Cusak, M., and Freer, A., 2008).**

The mechanism of bio-mineralization of Miliolids and thus the final structure of the test, is different. In this case calcite needles and associated organic matter are preformed within the cytoplasm and transported to the forming chamber. Then, calcification occurs as cytoplasm is being extruded from the last complete chamber, proceeding from the base of the new chamber to the aperture; that is, the extruded cytoplasm does not first form the shape of new chamber and then the wall as in the previous case (Goldstein, S.T, 1999). Therefore, Miliolid tests do not have an inner organic layer as for lamellar tests of the calcareous perforated specimens.

Bio-mineralization is the ability to precipitate minerals from soft tissue, calcite in the case of foraminifera: some recent studies have deepened the understanding of mechanisms at the basis of these processes. $CaCO_3$ precipitation, both in calcareous species and Miliolids, occurs after the incorporation of seawater in the cytoplasmic vacuoles (as illustrated in Figure 4, after Bentov, S., *et al.*, 2009). In these vacuoles, precipitation is enhanced by local increasing of pH (up to >9), as described by de Nooijer, L.J., et al. 2008.

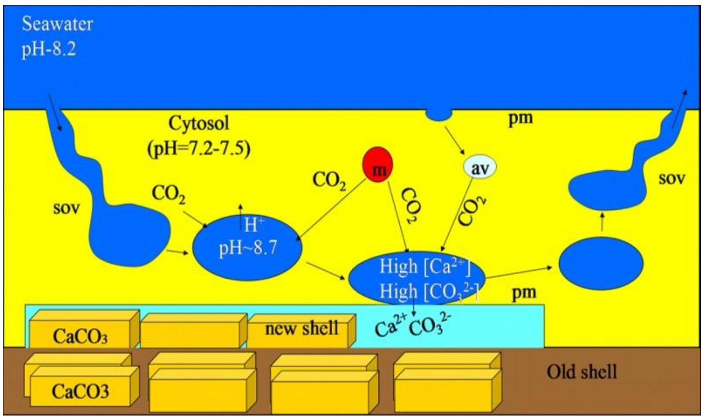


**Figure 7 - Model for temporal fusion of the seawater vacuoles (SWV) with the plasma membrane (pm) near the active calcification site. Seawater enters the cell through deep invaginations or semi-open vacuoles (sov). A vacuole is pinched off and undergoes alkalization by one of the cellular proton transport mechanisms. This SWV concentrates inorganic carbon by diffusion of $CO_2$ (aq) from the acidic cytosol into the alkaline SWV. This process is enhanced by adjacent mitochondria (m) and by the acidic vesicles (av) that release $CO_2$. The $[Ca^{2+}]$ and $[CO_3^{2-}]$-enriched vacuoles fuse with the cell membrane and supply the ions for calcification. The vacuoles are then resealed and release their content apically, away from the growing crystals (after Bentov, S., *et al*. 2009).**

Concerning agglutinated species, the mechanism of test formation is totally different. In fact, generally these foraminifera gather sediment grains into a mound near their aperture. Once cavity is formed within this mound of sediment, the foraminifer begins constructing a chamber by coating grains with a thin organic envelope, and then cementing them together with a small amount of organic cement. Some agglutinated species (*e.g. Textularia* species) are also able to precipitate a calcitic cement, that further binds the agglutinated materials together (Goldstein, S.T., 1999).

| Species/Stations | QT1 | QT2 | QT3 | QT4 | QT5 | QT6 | QT7 |
|---|---|---|---|---|---|---|---|
| ***Ammonia sp.*** | 0 | 0 | 0 | 0 | 2 | 6 | 5 |
| ***Dentalina sp.*** | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| ***Elphidium sp.*** | 0 | 0 | 0 | 0 | 8 | 20 | 0 |
| ***Fissurina sp.*** | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| ***Nonionella sp.*** | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| ***Planulina sp.*** | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| ***Reussella sp.*** | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| ***Sigmoilina sp.*** | 0 | 0 | 0 | 0 | 0 | 4 | 0 |
| ***Miliammina sp.*** | 7 | 32 | 2 | 3 | 0 | 0 | 0 |
| ***Miliolinella sp.*** | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| ***Quinqueloculina sp.*** | 0 | 0 | 0 | 0 | 28 | 15 | 0 |
| ***Spiroloculina sp.*** | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| ***Triloculina sp.*** | 0 | 0 | 0 | 0 | 5 | 2 | 0 |
| ***Ammobaculites sp.*** | 18 | 215 | 62 | 31 | 0 | 0 | 0 |
| ***Haplophragmoides sp.*** | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| ***Psammophaga sp.*** | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| ***Psammosphaera sp.*** | 0 | 0 | 9 | 1 | 0 | 0 | 0 |
| ***Trochammina sp.*** | 5 | 0 | 10 | 8 | 0 | 0 | 0 |
| **Total** | **30** | **255** | **86** | **43** | **45** | **56** | **5** |

**Table 2 - Foraminifera species abundance each station in Cua Viet, Cua Tung estuaries, Quang Tri Province - Survey April 2017**

At last, soft-shelled foraminifera have generally an organic wall, without calcite. This group includes simple organic shelled species and micro-agglutinated species that are able to weakly incorporate fine sediment particles in the organic matrix (Gooday, A.J., 2002).

Analyses of foraminiferal assemblages from Cua Tung and Cua Viet estuaries, April 2017

Table 2 show that different locations have different foraminiferal assemblages. QT2 has the highest foraminiferal abundance with 255 individuals; QT6 is the station that has the highest species diversity. In QT7, only *Ammonia tepida*, a species which normally is found in brackish water, occurs in the studied sediment sample.

The assemblages are dominated by *Ammobaculites* sp. in Cua Viet area (QT1, QT2, QT3, and QT4) and by *Elphidium* sp. and *Ammonia* sp. in Cua Tung area (QT5, QT6, and QT7) (Figure 7). Subordinary species include *Dentalina* sp., *Fissurina* sp., *Miliolinella* sp., and *Spiroloculina* sp. with only 1 individual for each specie (Table 1). From inlet along to river branches in Cua Viet estuary, the percentage of *Ammobaculites* sp. increase compare to the total taxa composition in each station.

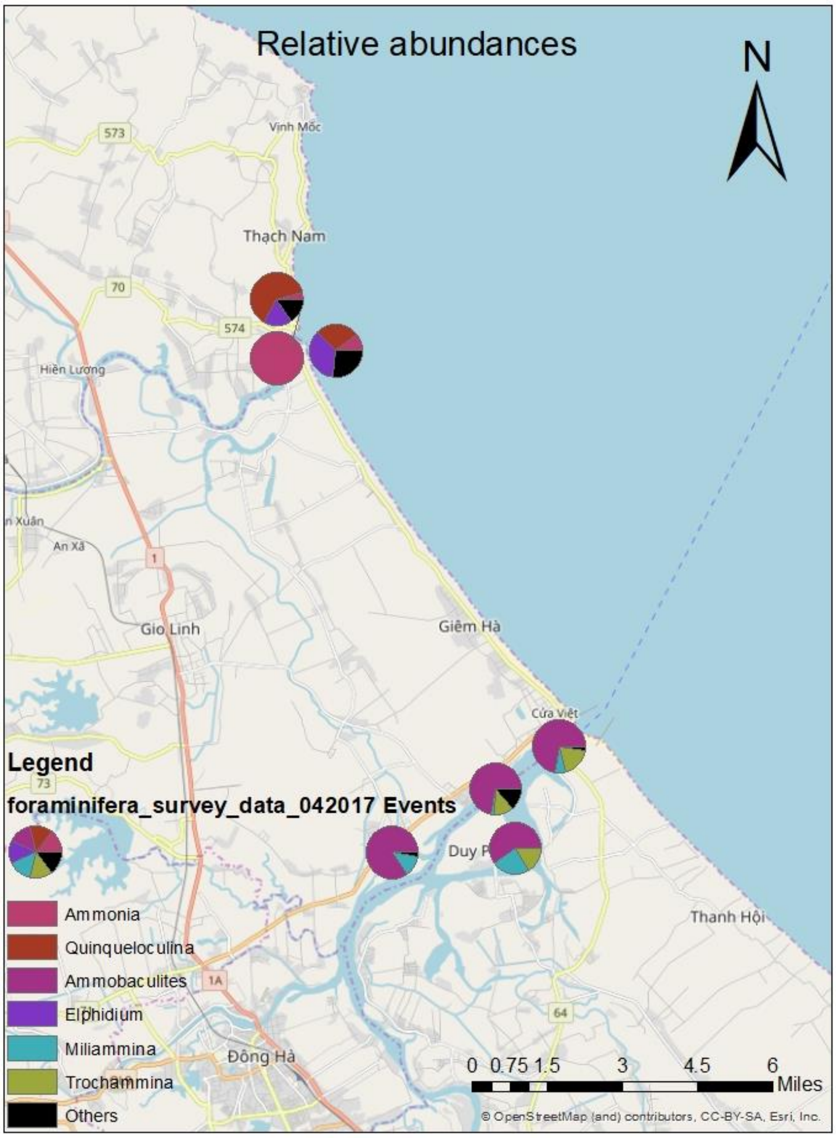


**Figure 8 - Relative abundances of the main living benthic foraminifera genus in Cua Tung and Cua Viet estuaries, Quang Tri Province, April 2017**

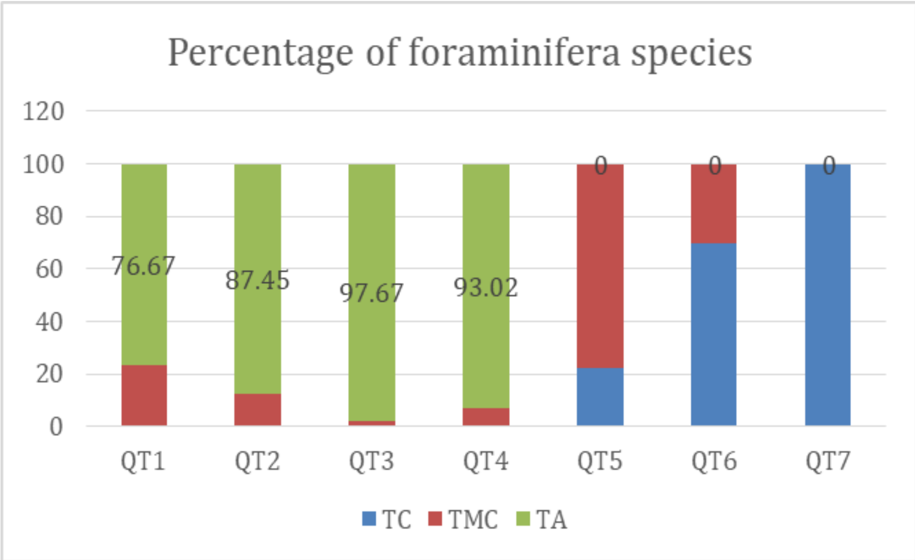


**Figure 9 - Percentage of foraminifera species in Cua Tung (QT5, QT6, QT7) and Cua Viet (QT1, QT2, QT3, QT4) estuaries, Quang Tri Province. Survey April 2017. TC, total calcareous; TMC, total Miliolids calcareous; TA, total agglutinated**

Taxa composition, as percentage of each foraminiferal group (calcareous perforated, miliolids calcareous, agglutinated) is shown in Figure 8. Comparison among samples from Cua Tung and Cua Viet estuaries, shows that agglutinated foraminifera are absent from samples of the former site (QT5, QT6, QT7) whilst calcareous foraminifera are absent from the latter (QT1, QT2, QT3, QT4), where salinity ranges vary from 10‰ ~ 12‰.

The abundance and diversity of living benthic foraminifera give clues about the environmental status of the estuaries in Quang Tri. Table 2 suggests that the diversity of foraminiferal species reflects salinity of water. Shannon-Weiner index value obtained for foraminifera was estimated to be 0 (lowest) at QT7 with lowest salinity is 1‰ and 2.011 (highest) at QT6 with highest salinity is 25‰. Similar to Simpson index, value was estimated lowest to be 1.000 at QT7 and highest to be 5.124 at QT6. Diverse of QT5 and QT6 increasing to 6 and 10 species meanwhile diverse of QT1 is 3, QT2 is 3, QT3 is 5, QT4 is 4 and QT7 is only 1.

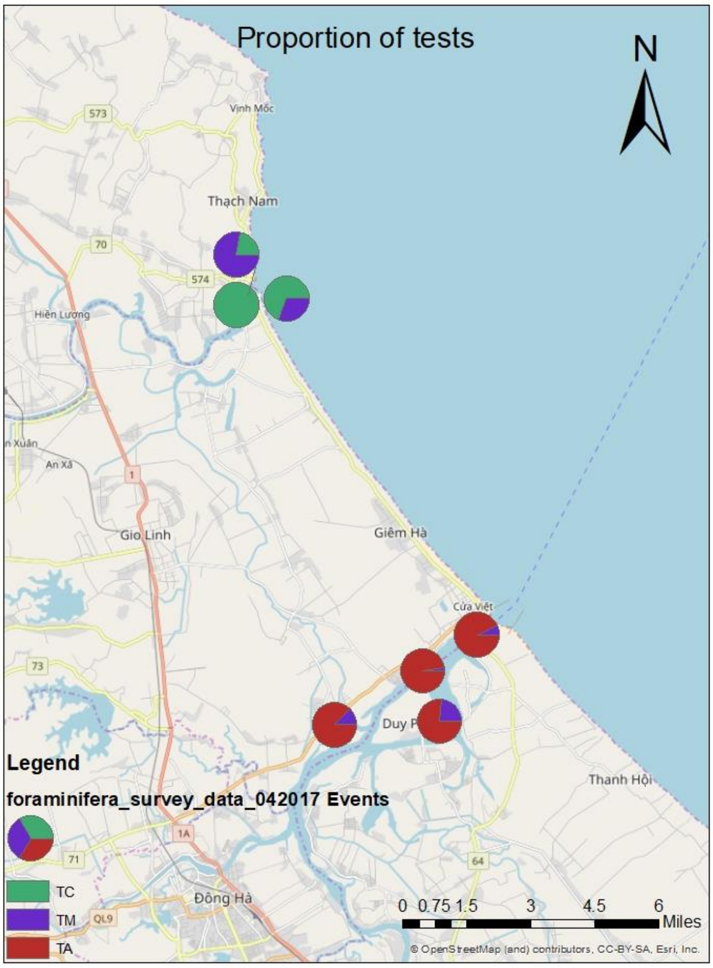


**Figure 10 - Proportion of tests of living benthic foraminifera in Cua Tung and Cua Viet estuaries, Quang Tri Province, April 2017**

| Station | Abundance | Species | H' | D | Salinity(‰) |
|---|---|---|---|---|---|
| **QT1** | 30 | 3 | 0.945 | 2.261 | 12 |
| **QT2** | 255 | 3 | 0.513 | 1.374 | 10 |
| **QT3** | 86 | 5 | 0.927 | 1.832 | 11 |
| **QT4** | 43 | 4 | 0.822 | 1.786 | 12 |
| **QT5** | 45 | 6 | 1.21 | 2.325 | 25 |
| **QT6** | 56 | 10 | 2.011 | 5.124 | 25 |
| **QT7** | 5 | 1 | 0 | 1 | 1 |

**Table 3 - Diversity of foraminiferal species from samples of Cua Tung and Cua Viet estuaries, Quang Tri Province, survey April 2017. H', Shannon-Weiner Diversity Index; D, Simpson Diversity Index**

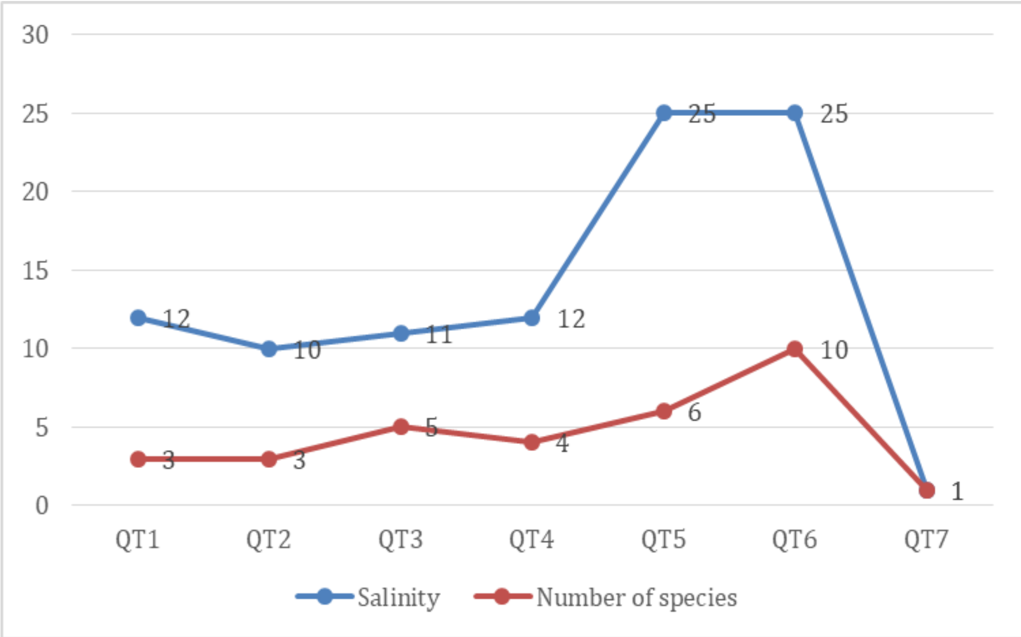


**Figure 11 - Correlation between salinity and benthic foraminiferal diversity (richness) in samples from Cua Viet and Cua Tung estuaries, Quang Tri Province, Survey April 2017**

<u>Analyses of samples from Cua Tung and Cua Viet estuaries, September 2017</u>

*Sediment characteristics*

Sand is the most abundant fraction in the stations of Cua Viet estuary (77.75% of total Cua Viet sediment samples) and it contributes 26.10% to 99.96% of sediment samples in Cua Viet estuary with the highest percentage is 99.96% in CV2. In this area, very fine sand is the second abundant fraction with 19.54%. The highest contents of very fine sand are found in CV1A (64.27%). Silt is rarely found in this area and contributes average on 2.93%

In Cau Hai lagoon sampling area, sand and very fine sand are dominant fractions of sediment samples with 44.09% and 39.56%, meanwhile, silt contributes 16.35% in total sediment samples.

| Station | <63µm | 63µm < sediment < 125µm | >125µm |
|---|---|---|---|
| CV1A | 1.77 | 11.82 | 4.8 |
| CV1B | 0.14 | 3.76 | 20.16 |
| CV2 | 0.02 | 0.04 | 19.59 |
| CV3 | 0.26 | 0.15 | 18.2 |
| CH0 | 0.26 | 9.87 | 10.09 |
| CH1 | 0.03 | 0.29 | 23.04 |
| CH2 | 3.27 | 9.03 | 3.03 |
| CH3 | 4.89 | 14.06 | 1.44 |
| CH4 | 6.38 | 2.62 | 2.38 |
| TG1 | 4.97 | 3.07 | 2.38 |
| TG2 | 2.57 | 5.12 | 1.08 |
| TG3 | 3.34 | 3.38 | 1.75 |
| RC1 | 3.21 | 1.47 | 2.08 |
| RC2 | 5.38 | 5.11 | 2.66 |
| RC3 | 3.64 | 0.81 | 1.76 |

**Table 4 - Grain-size fraction compositions**

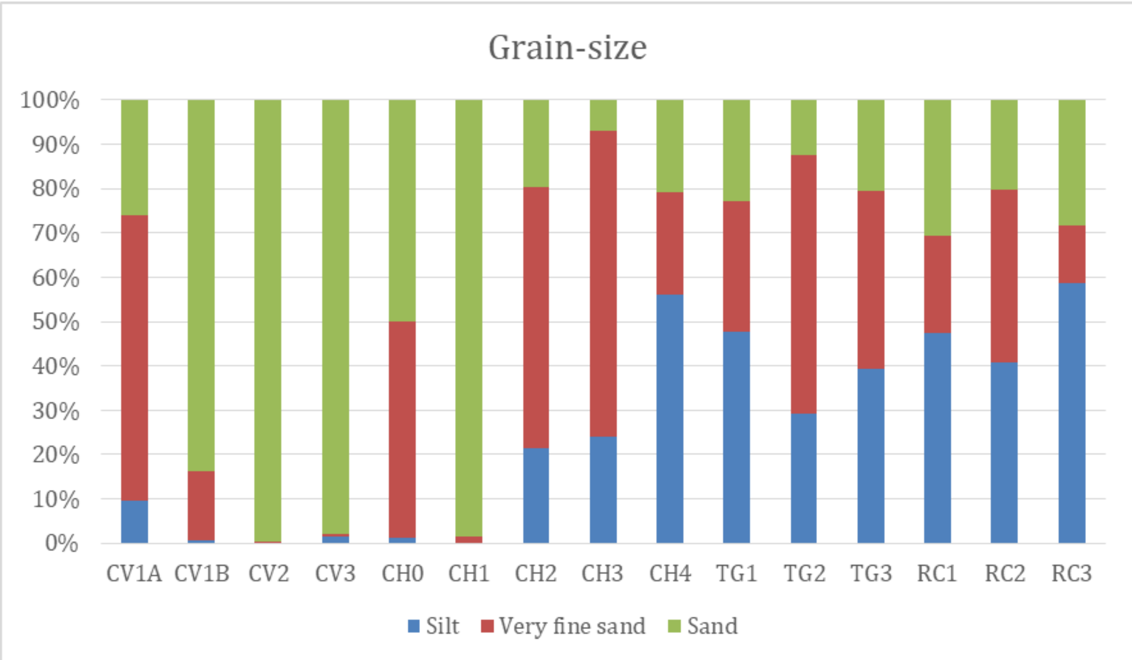


**Figure 12 - Sediment grain-size variations in 15 stations within 4 sampling areas**

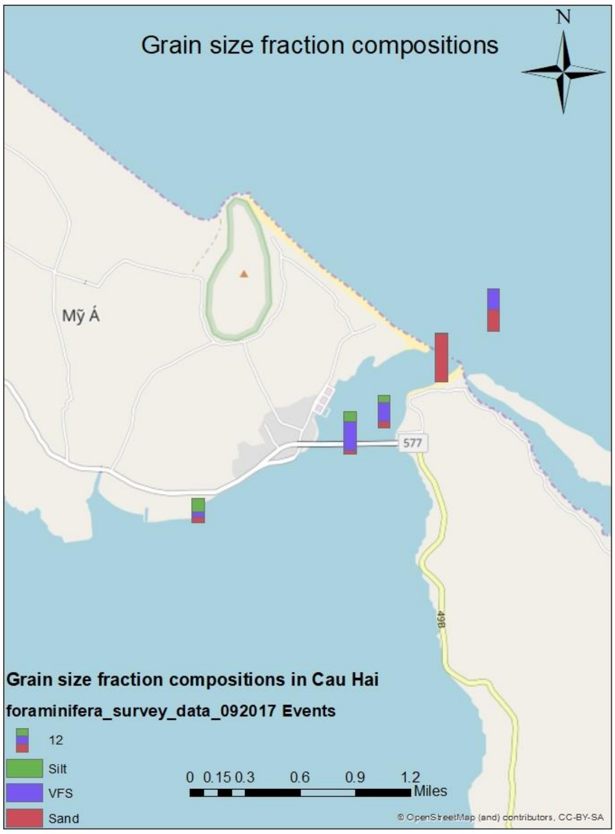


**Figure 13 - Grain size fraction compositions in samples from the Cau Hai inlet (Thua Thien Hue Province)**

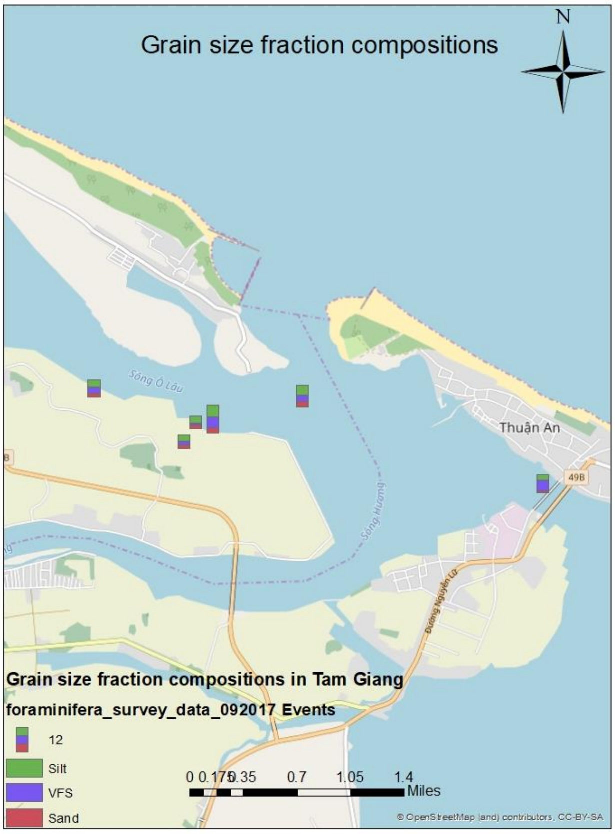


**Figure 14 - Grain size fraction compositions in Tam Giang**

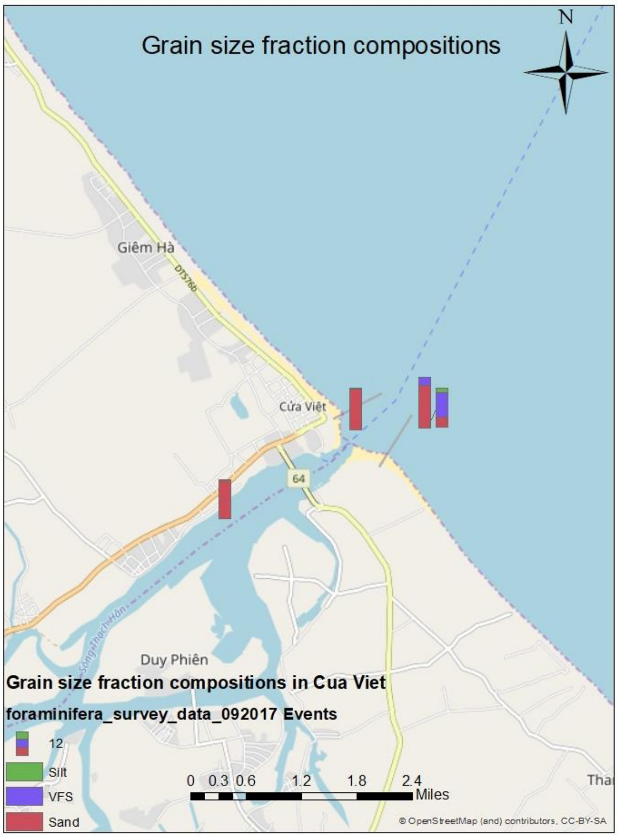


**Figure 15 - Grain size fraction compositions in Cua Viet**

*Foraminifera assemblages*

Taking into account sample grain size distributions, foraminifera assemblages have been analyzed and statistically evaluated, for each of the sampled stations, and compared against physico-chemical water parameters, in order to draw conclusions on impacts affecting urbanized and industrialized sites.

Table 4 shows the diversity and abundances of the foraminifera genus in Tam Giang – Cau Hai lagoon. *Ammonia* sp., *Elphidium* sp., *Miliammina* sp., *Haplophragmoides* sp., *Trochammina* sp., *Textularia* sp., *Ammobaculites* sp., *Ammoscalaria* sp. occur frequently in the sampling area (>50% stations). The most abundant genus is *Ammobaculites* sp. with 513 specimens distribute in almost every station except RC3 and CH0. Its abundance varies significantly among the sampling areas and the highest density is in RC2 with 133 specimens. *Ammonia* sp. is the second most abundant specimens (271 specimens), which occurs in TG2, RC2, and all the stations in Cau Hai lagoon. Its abundance varies as well significantly among the sampling areas and highest abundances are found in CH2 station.

| Table 4A | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Station/Species names** | **CV1A** | **CV1B** | **CV2** | **CV3** | **CH0** | **CH1** | **CH2** | **CH3** | **CH4** |
| *Ammonia* sp. | 192 | 16 | 3 | 27 | 7 | 3 | 131 | 52 | 26 |
| *Nonion* sp. | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| *Nonionella* sp. | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| *Eggerella* sp. | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Reussella* sp. | 12 | 1 | 0 | 0 | 2 | 1 | 6 | 2 | 0 |
| *Fijiella* sp. | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Neocassidulina* sp. | 4 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Hanzawaia* sp. | 5 | 21 | 1 | 0 | 27 | 0 | 7 | 0 | 0 |
| *Cibicides* sp. | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Elphidium* sp. | 7 | 50 | 3 | 2 | 18 | 11 | 12 | 13 | 2 |
| *Bolivina* sp. | 9 | 0 | 0 | 0 | 4 | 0 | 2 | 0 | 0 |
| *Bolivinellina* sp. | 0 | 5 | 1 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pararotalia* sp. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Asterigerinata* sp. | 0 | 3 | 0 | 0 | 4 | 0 | 0 | 0 | 0 |
| *Guttulina* sp. | 0 | 2 | 0 | 0 | 1 | 1 | 0 | 0 | 0 |
| *Calcarina* sp. | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *Hyalinea* sp. | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| *Rosalina* sp. | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 3 | 0 |
| *Glandulina* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *Quinqueloculina* sp. | 6 | 21 | 2 | 0 | 17 | 4 | 7 | 1 | 0 |
| *Triloculina* sp. | 2 | 4 | 0 | 0 | 6 | 4 | 0 | 0 | 0 |
| *Miliammina* sp. | 12 | 15 | 1 | 0 | 12 | 9 | 3 | 2 | 0 |
| *Pyrgo* sp. | 1 | 4 | 0 | 0 | 4 | 9 | 0 | 0 | 0 |
| *Articulina* sp. | 4 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | 0 |
| *Spiroloculina* sp. | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 |
| *Planispirinella* sp. | 0 | 8 | 0 | 0 | 3 | 0 | 0 | 1 | 0 |
| *Massilina* sp. | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Edentostomina* sp. | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Miliolinella* sp. | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| *Haplophragmoides* sp. | 34 | 0 | 0 | 2 | 0 | 0 | 4 | 0 | 5 |
| *Trochammina* sp. | 4 | 3 | 0 | 0 | 0 | 0 | 12 | 3 | 17 |
| *Textularia* sp. | 26 | 1 | 0 | 0 | 1 | 1 | 55 | 23 | 19 |
| *Ammobaculites* sp. | 70 | 9 | 0 | 4 | 0 | 1 | 82 | 31 | 33 |
| *Ammoscalaria* | 4 | 0 | 0 | 0 | 0 | 0 | 21 | 0 | 14 |
| *Nouria* sp. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Reophax* sp. | 1 | 0 | 0 | 0 | 0 | 0 | 28 | 19 | 21 |
| *Sahulia* sp. | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Technitella* sp. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Ammotium* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eratidus* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Psammosphaera* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Arenoparrella* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Jadammina* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Saccamminid* sp. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Total** | **409** | **178** | **11** | **35** | **119** | **51** | **372** | **150** | **138** |

| Table 4B | | | | | | |
|---|---|---|---|---|---|---|
| **Station/Species names** | **TG1** | **TG2** | **TG3** | **RC1** | **RC2** | **RC3** |
| *Ammonia* sp. | 0 | 46 | 0 | 0 | 6 | 0 |
| *Nonion* sp. | 0 | 1 | 0 | 0 | 0 | 0 |
| *Nonionella* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Eggerella* sp. | 0 | 0 | 0 | 1 | 0 | 0 |
| *Reussella* sp. | 0 | 2 | 0 | 0 | 0 | 0 |
| *Fijiella* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Neocassidulina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Hanzawaia* sp. | 0 | 1 | 0 | 0 | 0 | 0 |
| *Cibicides* sp. | 0 | 1 | 0 | 0 | 0 | 0 |
| *Elphidium* sp. | 0 | 1 | 0 | 0 | 0 | 0 |
| *Bolivina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Bolivinellina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Pararotalia* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Asterigerinata* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Guttulina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Calcarina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Hyalinea* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Rosalina* sp. | 0 | 1 | 0 | 0 | 0 | 0 |
| *Glandulina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Quinqueloculina* sp. | 0 | 1 | 0 | 0 | 0 | 0 |
| *Triloculina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Miliammina* sp. | 21 | 1 | 41 | 3 | 56 | 1 |
| *Pyrgo* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Articulina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Spiroloculina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Planispirinella* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Massilina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Edentostomina* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Miliolinella* sp. | 0 | 0 | 0 | 0 | 0 | 0 |

| | | | | | | |
|---|---|---|---|---|---|---|
| *Haplophragmoides* sp. | 35 | 3 | 24 | 0 | 2 | 0 |
| *Trochammina* sp. | 6 | 0 | 23 | 3 | 3 | 0 |
| *Textularia* sp. | 3 | 21 | 3 | 0 | 0 | 0 |
| *Ammobaculites* sp. | 98 | 23 | 98 | 14 | 133 | 0 |
| *Ammoscalaria* | 12 | 17 | 11 | 0 | 17 | 0 |
| *Nouria* sp. | 0 | 0 | 0 | 0 | 4 | 0 |
| *Reophax* sp. | 47 | 0 | 5 | 0 | 0 | 0 |
| *Sahulia* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Technitella* sp. | 0 | 0 | 0 | 0 | 0 | 0 |
| *Ammotium* sp. | 1 | 0 | 0 | 0 | 4 | 1 |
| *Eratidus* sp. | 54 | 0 | 18 | 0 | 11 | 0 |
| *Psammosphaera* sp. | 0 | 1 | 0 | 0 | 0 | 0 |
| *Arenoparrella* sp. | 0 | 0 | 0 | 0 | 0 | 3 |
| *Jadammina* sp. | 0 | 0 | 0 | 0 | 1 | 0 |
| *Saccamminid* sp. | 0 | 0 | 0 | 0 | 58 | 0 |
| **Total** | **277** | **120** | **223** | **21** | **295** | **5** |

**Table 5 - Foraminifera species abundance from samples from Cua Tung and Cua Viet estuaries of Quang Tri Province, Tam Giang-Cau Hai lagoon, Thua Thien Hue Province**

CH0 is the station with the highest diversity, with 17 genera existing at the sampling time. The second diversity station is CH2 with 15 genera present, then TG2 and CH1 station with 14 genera occur. Although that, CH2 is the most abundant station with 372 foraminifera specimens. The second abundant station is RC2 (295 specimens) with 11 genera exist in sediment sample.

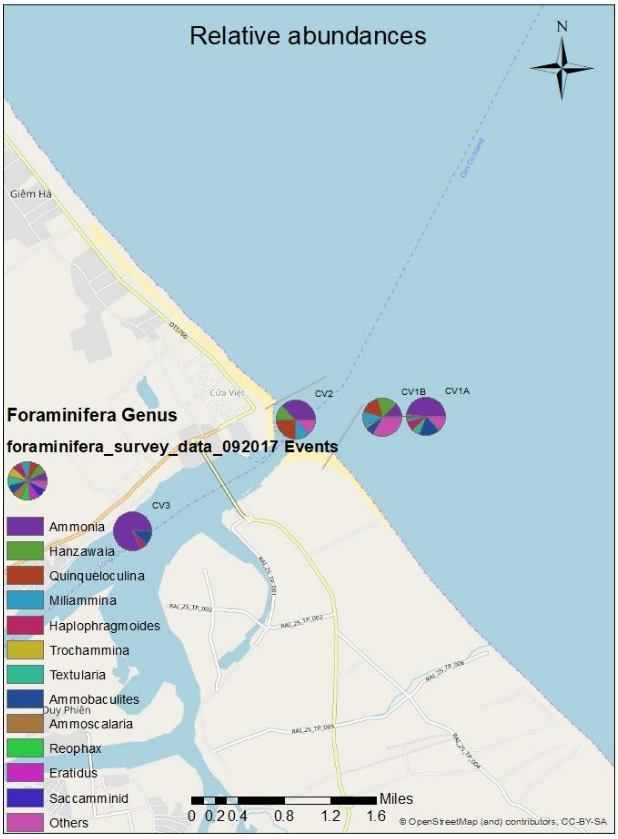


**Figure 16 – Relative abundances of the main living benthic foraminifera genus in Cua Viet estuary, Quang Tri Province, September 2017**

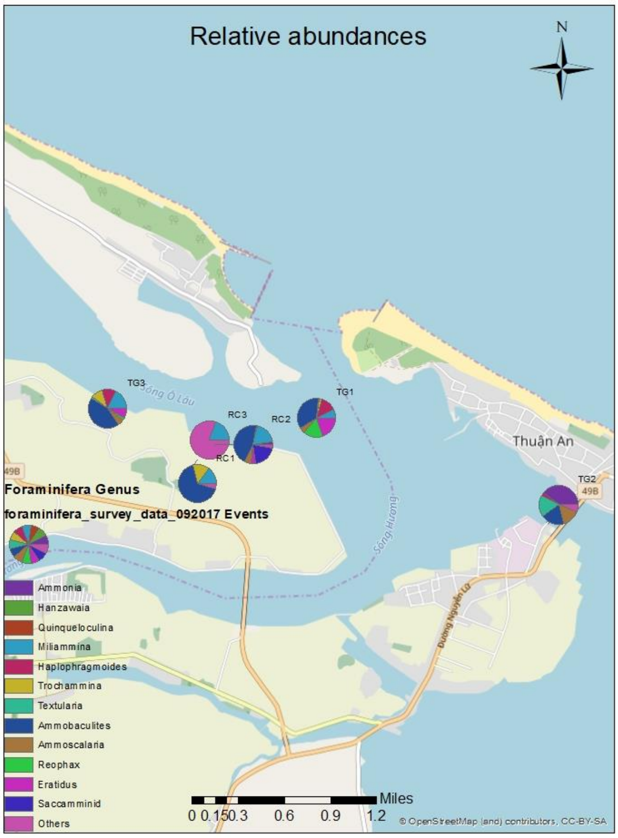


**Figure 17 – Relative abundances of the main living benthic foraminifera genus in Tam Giang lagoon, Thua Thien Hue Province, September 2017**

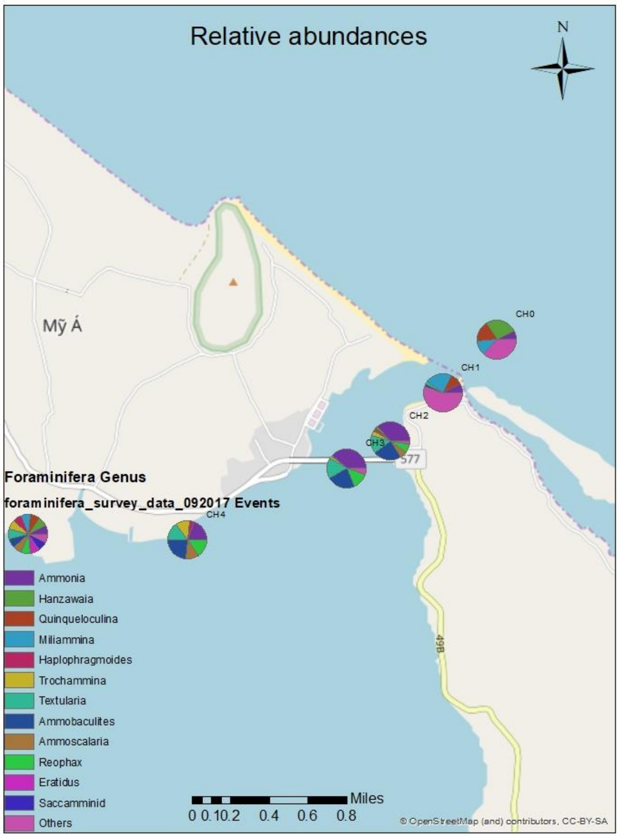


**Figure 18 - Relative abundances of the main living benthic foraminifera genus in Cau Hai lagoon, Thua Thien Hue Province, September 2017**

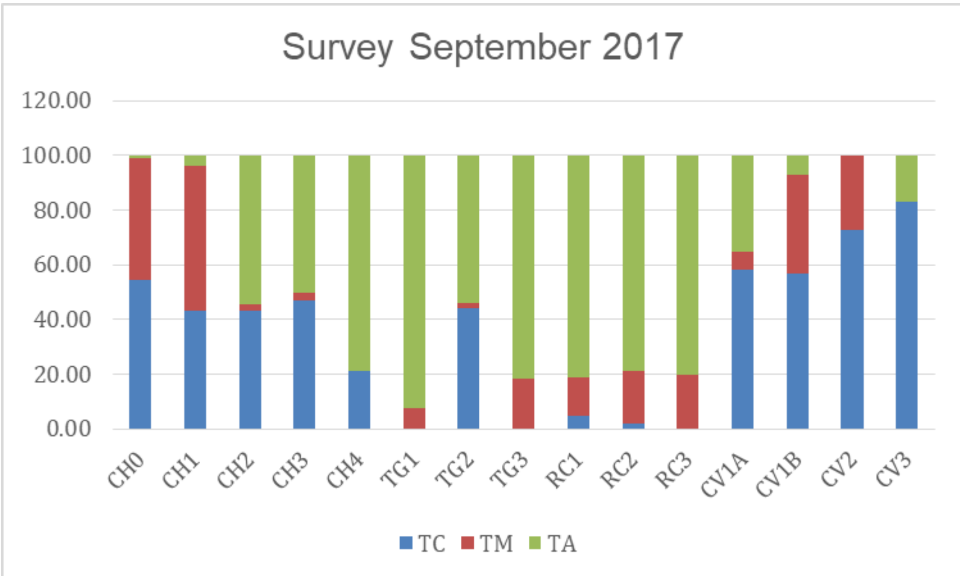


**Figure 19 - Percentage of foraminifera species from samples from Cua Tung and Cua Viet estuaries of Quang Tri Province, Tam Giang-Cau Hai lagoon, Thua Thien Hue Province. TC, Total Calcareous; TMC, Total Miliolids Calcareous; TA, Total Agglutinated.**

Figure 19 shows that, in different locations, the abundance of foraminifera group by shell component are different. Agglutinated species are rarely existing in station CH0, CH1, CV1A (0.84%, 3.92% and 7.30%) and absent in CV2 but occupy majority the living foraminifera assemblage in the other stations (>50%). The percentage of total calcareous species are high in stations CH0, CH1, CH3, TG2, all of Cua Viet estuary stations (> 43%) but low in stations CH4, RC1, RC2 (<22%) and absent in TG1, TG3 and RC3. Meanwhile, the percentage of total miliolids calcareous species are high in stations CH0, CH1, CV1B and CV2 (>35%), low in stations TG1, TG3, RC1, RC2, RC3 and CV1A (6%~27%), very low in stations CH2, CH3, TG2 (1% ~ 3%) and absent in station CH4 and CV3.


**Figure 20 – Proportion of tests of living benthic foraminifera in Cua Viet estuary, Quang Tri Province, September 2017**

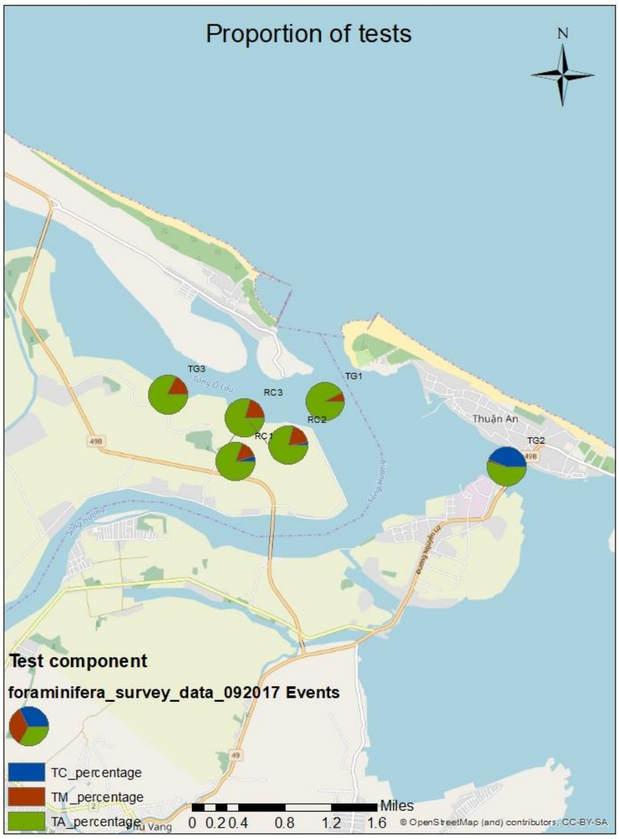


**Figure 21 – Proportion of tests of living benthic foraminifera in Tam Giang lagoon, Thua Thien Hue Province, September 2017**


**Figure 22 - Proportion of tests of living benthic foraminifera in Cau Hai lagoon, Thua Thien Hue Province, September 2017**

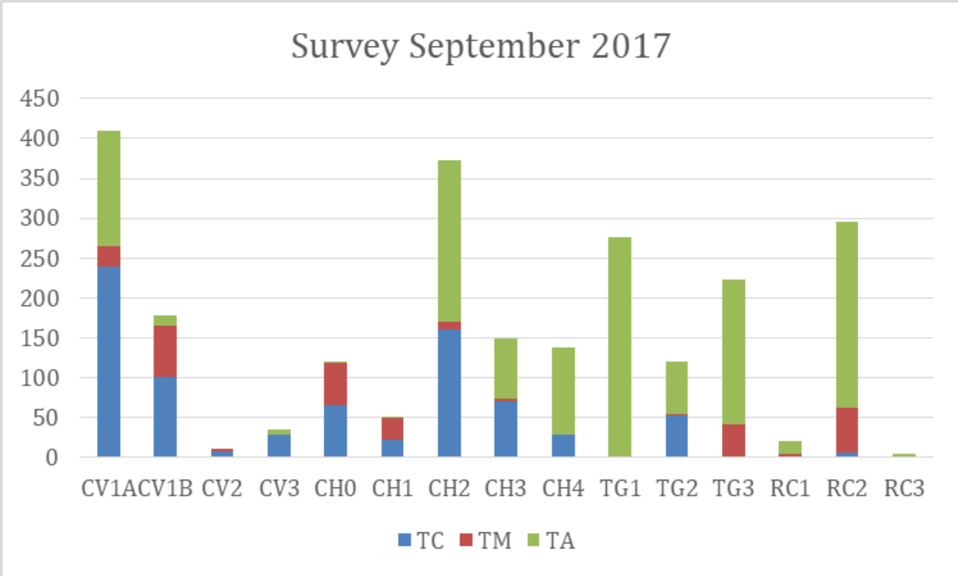


**Figure 23 - Percentage of foraminifera species from samples from Cua Tung and Cua Viet estuaries of Quang Tri Province, Tam Giang-Cau Hai lagoon, Thua Thien Hue Province. TC, Total Calcareous; TMC, Total Miliolids Calcareous; TA, Total Agglutinated.**

| Station | Abundance | Salinity | H | D | Number of species |
|---|---|---|---|---|---|
| **CV1A** | 409 | 30 | 1.955428 | 3.785923 | 25 |
| **CV1B** | 178 | 28 | 2.400856 | 7.554261 | 21 |
| **CV2** | 11 | 18 | 1.672625 | 4.780845 | 6 |
| **CV3** | 35 | 18 | 0.775195 | 1.626826 | 4 |
| **CH0** | 119 | 25 | 2.387369 | 8.286132 | 17 |
| **CH1** | 51 | 18 | 2.265253 | 7.58309 | 14 |
| **CH2** | 372 | 13 | 1.925614 | 4.840632 | 15 |
| **CH3** | 150 | 12 | 1.820673 | 4.797181 | 12 |
| **CH4** | 138 | 10 | 1.923489 | 6.179104 | 9 |
| **TG1** | 277 | 10 | 1.732587 | 4.626409 | 9 |
| **TG2** | 120 | 12 | 1.745695 | 6.805293 | 14 |
| **TG3** | 223 | 6 | 1.641614 | 3.864247 | 8 |
| **RC1** | 21 | 15 | 0.971262 | 2.051163 | 4 |
| **RC2** | 295 | 20 | 1.577123 | 3.525992 | 11 |
| **RC3** | 5 | 16 | 0.950271 | 2.272727 | 3 |

**Table 6 - Diversity of foraminiferal species of Cua Tung and Cua Viet estuaries of Quang Tri Province, Tam Giang-Cau Hai lagoon, Thua Thien Hue Province. H', Shannon-Weiner Diversity Index; D, Simpson Diversity Index**

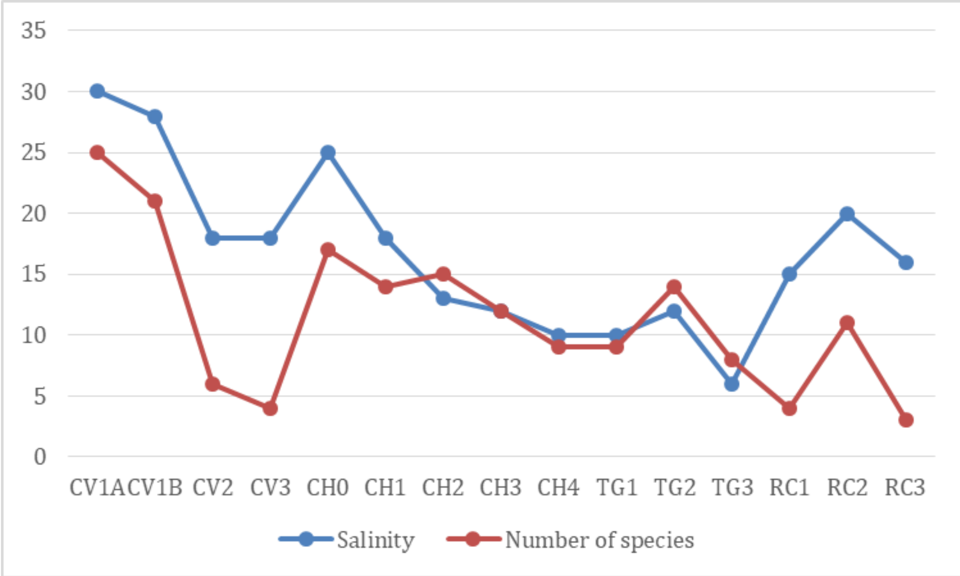


**Figure 24 - Correlation between in salinity and benthic foraminiferal diversity (richness) of Cua Tung and Cua Viet estuaries of Quang Tri Province and of Tam Giang-Cau Hai lagoon, Thua Thien Hue Province.**

Analysis of environmental data 2006-2018

Parameters indicating water quality such as bacteria counts and chlorophyll-a, both in the water and in the sediment in the period 2006-2012 showed values within the ranges of acceptability set up by the Government; that meaning that pollution from sea into lagoon through the inlets (closed to maritime port facilities) and from aquaculture is still modest. In particular, through the estuary of Tu Hien organic matter and toxic substances as $NO_3$ and $NH_3$ are reduced at times of enhanced water exchange with the sea. These observations are in harmony with findings of Le Cong Tuan (2008) who noted in his paper that also for the Sam Chuon lagoon (yet distant from the Thuan An inlet and hydrologically rather restricted) more than 70% of toxic substances were washed out after one days of water exchanges between sea and lagoon.

Most of water quality parameters of the Tam Giang-Cau Hai lagoon such as temperature, pH, DO, BOD5, ammonia, toxic metals (Cu, Pb, Zn and Cd) and OCs (DDTs and HCHs) met the requirement of Vietnam standard TCVN 2006 applied to the coastal water used for aquaculture. Although $PO_4$ and $NO_3$ concentration in the lagoon water was low ($N\text{-}NO_3 < 0.26$ mg/L and $P\text{-}PO_4 < 0.10$ mg/l), total N (TN) concentrations were higher 1 mg/l higher than standards at several sites. The TN concentrations are one of the potential causes of eutrophication, especially in the dry season. The results of chlorophyll-a in the lagoon water (higher than 5 μg/L at most sites in the dry season) were concurrent evidence of eutrophication, whilst $^{45}P$, based on the ratio TN/TP in water column, was identified as a main limiting factor.

In Thuy Tu and Cau Hai area, water quality parameters such as temperature, pH and especially salinity are quite suitable for black tiger shrimp culture, therefore widely practiced and cause of constant pollution hazards in the dry season. Uncontrolled aquaculture caused marked environmental disadvantages to the lagoon environment such as increase in organic matter content, high bacterial counts and persistent eutrophication. In this study, the organic matter content in estuaries and lagoon sediments were considered for their effects on benthic foraminiferal assemblages and use of this taxonomic group as an indicator of abnormal trophic states.

Both proxies of primary production and the measurement of the detrital fractions of sediment organic matter allows to characterize eutrophic and even hypertrophic habitats.

Although the concentration of toxic chemicals (OCs and toxic metals) in water of most of the lagoon habitats remote from urban settlements is fairly low, HCHs level in the sediment is rather high at several sites (*e.g.* near Thuan An industrial hub), causing adverse effects on lagoon aquatic organism.

Toxic-metal concentration in lagoon sediments was in general lower than the levels of ISQG and PEL applied to the marine sediment. However, Cd and Cu content at several sites was higher than the ISQG set standards.

Most of the water quality parameters in the canals adjacent to the aquaculture ponds met the requirement of the Vietnam Standard TCVN 2006 applied to coastal waters used for aquaculture and 28 TCVN 171/2001 applied to intensive culture of black tiger shrimp. However, aquaculture activities need to be somehow regulated in order to mitigate risk of habitat deterioration.

**Discussion on characteristics of lagoon and estuarine environments of Central Vietnam**

Climate of Central Vietnam

Central Vietnam seasonality relates to regional climate which is transitional between the monsoonal regime prevailing in the south of the country, with rainy summers and dry winters, and the tropical four-season regime characteristic of the north.

Located at the southern end of the North Vietnam's continental climate regime and protected by the Hai Van Pass, the Thua Thien Hue and Quang Tri provinces suffer the a worst and most harsh weather regime than other areas in the country.

Central Vietnam is affected by the monsoon: their direction is from northeast, in winter, and southwest, in summer. Due to its proximity to the area of maximum rainfall in absolute values (Bach Ma range, with average rainfall in excess of 3,000 mm/year), the lagoon belongs to the most intense precipitations area, whose annual average is approximately 2,744 mm/year, higher than the average country rainfall of 1,900 mm/year.

Typical climatic characteristic of this region is that the rainy season often comes late compared to other monsoon-dominate areas, usually beginning in September until December, with a total rainfall of 2,000 mm approximately (72.8%). Rainfall is highest in October (740 mm, 26.96%), persisting through November. Rainfall of the remaining months is less important.

Highest rainfall concentrated during the few fall months easily lead to floods. On the other hand, spring and early summers are definitely dryer because of limited precipitations.

Storms annually batter the coast, with 0 to 4 storms yearly with wind speed from 20 to 40 m/sec. During the last century, there were 0 to 8 storm/year. Storms are accompanied by heavy rains, persisting from 2-3 to 5-6 days, resulting in generalized inundation of the whole coastal lowland. The storm season is from June to November, most frequently from July to October.

Sunlight radiation, air temperature, evaporation, and drought. The annual total days of sunlight is high, from 1,900 to 2,000 hours, resulting in rather high annual average temperature (25.2 °C). In spring and summer, hours of sunlight concentrate from May to

August, which correlate with highest recorded temperatures (as much as 39-40 °C). These will lead to excess evaporation, causing drought. In winter, conversely, sunlight is less intense (100-110 hours/month): the lowest sunlight radiation occurs in December, coincident with lowest average and minimum temperatures (11.4 °C and 8.8°C, respectively). In the winter months, water evaporation is about 37-74 mm/month, far exceeded by intense rainfall (2,000mm).

Considerations on foraminiferal ecology

The living benthic foraminifera of Cua Tung and Cua Viet estuaries and of Tam Giang – Cau Hai lagoon are abundant and moderately diversified, but their abundance is closely related to salinity. General trends with increasing salinity include: decreasing abundance of agglutinated species, increasing abundance of porcellanaceous species, calcareous perforate species and increasing diversity. This preliminary research has shown that benthic foraminiferal abundance correlates to the environmental status and encourage exploiting their use as bio-indicators also in relationship with a eutrophic gradient in the estuary.

Tam Giang-Cau Hai lagoon physiography and ecosystems.

The Tam Giang-Cau Hai lagoon is a complex physiographic wetland system, consisting of a number of interconnected, yet hydrologically independent sub-basins, each one having its own morphological features, hydro-chemical characteristics and ecology.

The physiographical complexity of the lagoon system relates on the processes that shaped the landscape in the Holocene, following the post-glacial rise of the sea level, and on the interplay of fluvial and marine processes.

The ecological complexities depend on i) the compartmented nature of the lagoon sub-basins, ii) their hydrology (i.e. the circulation of the water masses within the lagoon and exchange with the sea; iii) the chemical state of the waters, including pollutant load from aquaculture, agriculture and urban sources and iv) the climate and its seasonality.

The Tam Giang-Cau Hai lagoon sub-basins morphology originated from the inundation of a relic morphology consisting of beach ridges, deltas and incised valleys, following the Holocene rise in sea level.

The Tam Giang Cau Hai sub-basins and active river system


**Figure 25 - The Tam Giang-Cau Hai lagoon sub-basins and their tributary river network. From northwest, the O Lau river discharging into the Tam Giang-Cau Hai lagoon; the Bo and Huong rivers, directly discharging into the Eastern Sea though the Thuan An inlet and the Truoi river, discharging into the Cau Hai sub-basin.**

Figure 25 shows the location and nomenclature of the main Tam Giang-Cau Hai lagoon sub-basins.

The upper Tam Giang is an elongated broad basin, natural extension of the often-submerged O' Lau river mouth, flanked on both side by a agricultural land.

The lower Tam Giang lagoon is a narrow corridor flanked by multiple rows of earthen aquaculture ponds encroaching the water surface, on the shores of the communes of Quang Cong, Hai Duong (to the east), Quang An, Quang Phuoc and Quang Dien (to the west).

The Huong river active delta extends from the Thuan An strait to the Huong Phong coastline of Ru Cha, comprising the Huong river mouth and sub-deltaic lobes of the Bo river

The Sam Chuon lagoon is an embayment that opens up between the corner of Thuy Dien and Thuan An, with three tributaries and one relic delta (An Truyen) nowadays all inactive (part of the sub-modern Huong River delta system),

The Thuy Tu channel is a waterway confined between modern and sub-modern beach-ridges, extending from the Thuan An strait to Cau Hai and building an inner flood-tidal delta lobe (Ba Con) at its debouch into this basin.

The Cau Hai sub-basin, semi-circular in shape, is surrounded by forested steep slopes, subject to intense runoff during the rainy season, with three main tributaries: Dai Giang, Thieu-Hoa and Truoi rivers. The Thuy Tu channel ends in Cau Hai and a tidal inlet (Tu Hien) opens towards the East Sea (Bien Dong).

Tam Giang-Cau Hai lagoon hydrology.

The lagoon physiography has influence on the overall circulation and the exchange of water masses with the sea, restricted by the longshore transport of sediments silting the inlets and the micro-tidal regime that hinders the penetration inland of marine waters during the flood-ebb cycle. Lacking tidal forcing, the lagoon circulation is driven by riverine flow except than in proximity of the inlets, with a local effect by wind fetch.

These hydrologic conditions have negative consequences on inlet stability, lagoon siltation, ventilation and flushing out of pollutants.

The hydrology of the lagoon has different characteristics in the different sub-basins: that of a normal river outflow in the northern Tam Giang; dominated by the interplay of the Huong river discharge and tides, in the central sector of Huong Tra and Thuan An; restricted in the whole southern basins, because of adverse conditions created by nature and man. The Cau Hai basin is an enclosed pond with intermittent sea connection and seasonal runoff that make salinity low and to fluctuate erratically. The central Thuy Tu is a relic depression between successive beach-ridge systems, nowadays hydrologically inactive because of human interventions (aquaculture and river diversion). Sam Chuon is a restricted embayment, enclosed within the southern pre-modern Huong River delta. Moreover, localized hinterland uplift (Phu Bai) contributed to disrupt the river pattern with consequences on the whole hydrological balance of the coast.

Hydrology and water masses exchange is a critical factor in Tam Giang-Cau Hai, as these control ventilation, oxygen distribution or depletion, pollutant and nutrient dispersal, sedimentation; not to mention the role on biological life cycle, productivity, biota and vegetation that contribute to characterize ecosystems. Human interventions, particularly the construction of aquaculture ponds and deployment fishing implements (bottom nets, stake traps and net enclosures) aggravated the situation, contributing to anoxia, eutrophication and posing additional stress onto an impoverished biological stock.

The longshore-current sediment transport at the inlets and estuaries of Central Vietnam show patterns related to the winter monsoonal regime, when dominant winds are from north and north-west.

The general pattern of sediment transport is longshore, along the beaches laying on both sides seaward of the inlets. Waves, on the other hand, transport the sediment landward, from the ebb tidal delta and offshore bars towards the lagoon interior contributing to the inlet siltation.

Due to the shallow inlet channel, coarse sediments transported longshore sediments enter the narrow passages and estuaries facilitated by the entering tidal-flood waters.

Due to prevailing north-easterly winds, inlets and estuaries are sheltered from any south-easterly transport.

The Tu Hien inlet, in particular, is protected by the Cape of Chan May Tay. Due to the lack of sediment supply from its southern coast, sediments entering the Tu Hien inlet mainly follow the northern marginal flood currents and part of it is flushed out by the ebb currents. The seasonal monsoon regime has a strong influence on the wave climate and sediment transport pattern in the inlet areas. The seasonal variation of sediment transport induced by waves are extracted from results of hydrological modelling (Fig. 26 Matticchio and Stefanon, 2011).

Tam Giang-Cau Hai lagoon water chemistry

Hydro-chemical parameter and their variation through time offer indirect clues to water circulation, pollution levels and a method to characterize lagoon ecosystems and habitats.

Salinity is an indicator of water flows and exchange of water masses between rivers, lagoon and the sea and function of climate (evaporation over precipitations). It is one of the parameters to defines ecosystems. Salinity and its fluctuations also affect the aquaculture.

Salinity fluctuates seasonally: on average, salinity builds up in the lagoon during the spring and early summer; it is generally high up to normal marine values close to two inlets (Thuan An in the center and Tu Hien, in the south) during the summer (May), when excess evaporation and limited river discharge drives marine waters inland.

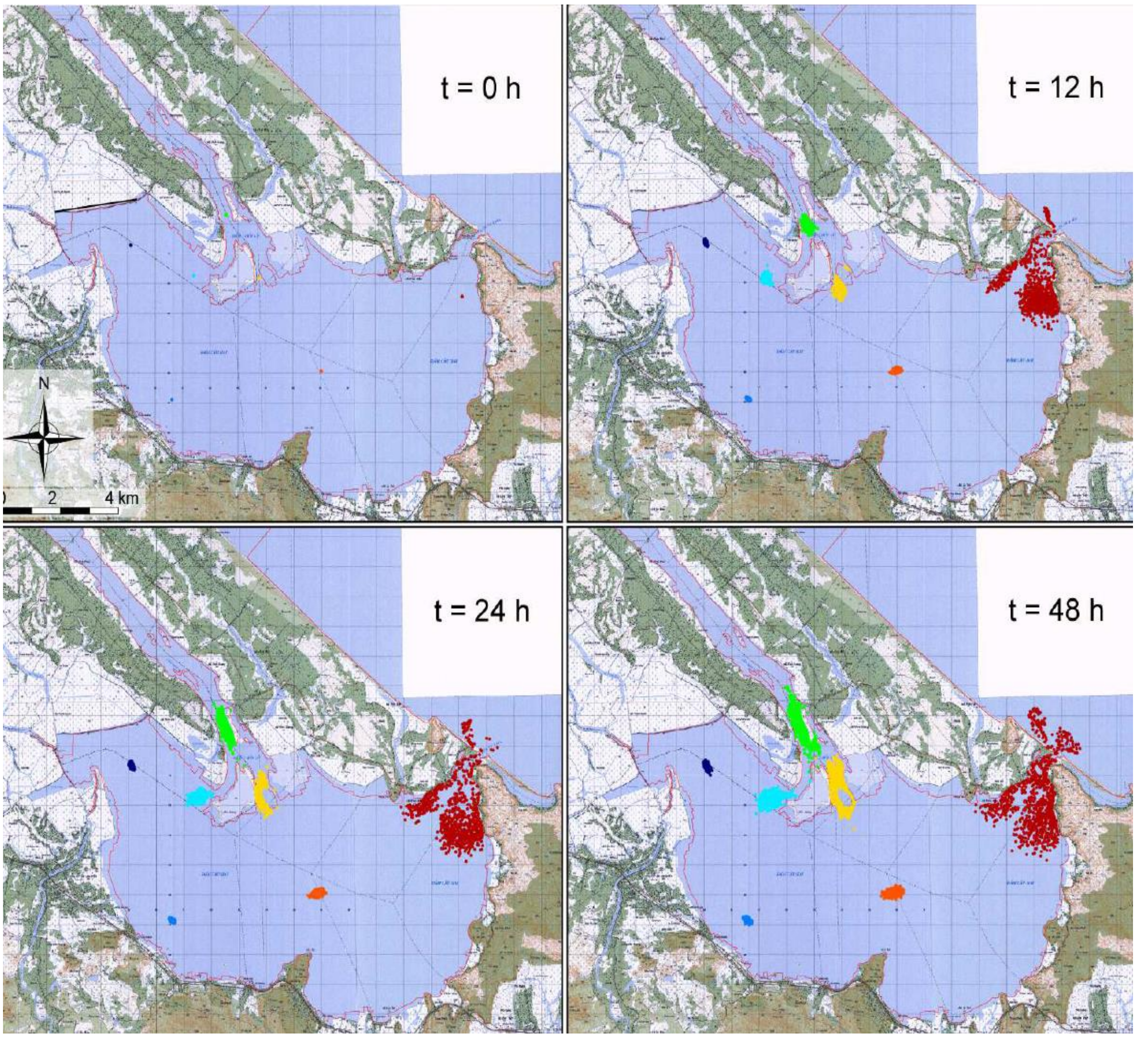


**Figure 26 – Diffusion and dispersion of the spots during the first 48 hours of simulation,forced by the astronomical tide of April 2011.**

Conversely, salinity is on average low in the northern lagoon of Tam Giang because of the steady outflow of the O' Lau river, causing a regular gradient from nearly fresh to saline waters along the channel, from the river mouth to the tidal inlet (e.g. Fig. 27, blue arrow on the map for May).

Salinity begins to decrease from August, with marked drops in the event of exceptional precipitations. During these times, for example in Cau Hai, fresh water drained from the Dai Giang-Thieu-Hoa river plain and the Truoi river is evacuated through the Tu Hien inlet and partly channeled into the Thuy Tu, whenever excess outflow through the inlet is hindered (Fig. 27, blue arrows in the August map).

BOD (Biological Oxygen Demand)[1] and COD (Chemical Oxygen Demand)[2] are laboratory tests used to infer the level of organic pollutants present in riverine and lake waters and an indicator of water quality. Data from Tam Giang-Cau Hai display a situation which remains within the limits of standards set up by governments for water quality throughout the year, with an overall increase during the spring and summer months in coincidence with the aquaculture season. The correlation between fish farming and the dispersal of organic pollutants is evident: in the area comprised between the Thuan An narrow and the northern Thuy Tu for example, BOD and COD values reach maxima in the summer as a result of organics build-up, in the lack of efficient flushing. Elsewhere, the overall level of organic pollution is moderate and drops in the winter months, as a consequence of typhoons and rains.

The pH maintains within the normal range throughout the year and in virtually all lagoon sectors, except for the northern Tam Giang lagoon at the mouth of the O' Lau river. There, the influx of river waters seems to promote a marked shift towards extreme acidic values during summer, when agricultural activity is at its climax. The most likely reason for this pH excursion could be sought in the discharge of agricultural wastewaters in the lagoon, but other mechanisms such as decomposition of organic matter in the presence of dissolved oxygen (*e.g.* by oxygen reduction) or erosion of tropical coastal soils containing iron-sulphides (release of acid sulphate) could be possible.

The total phosphorous is on average low, in most lagoon sectors and in all seasons. The highest values are recorded in the Sam Chuon basin and in the northern Tam Giang-O' Lau river mouth, most evident during an episode of increased runoff (August 2006), associated to a drop in pH – a sign of contribution from agricultural effluents. Nitrogen does not strictly echo the pattern of phosphorous, but equally suggest a more diffused dispersal in the aquatic environment, possibly from undigested fish feed or manure from agricultural activities around the lagoon, with episodes of build-up in the less ventilated parts of the basin (Sam Chuon). N and P bespeak of a pronounced tendency of the

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[1] BOD test indicates how fast biological organisms use up oxygen in a body of water. It is used in water quality management and assessment, ecology and environmental science to crudely indicate the quality of a water source.

[2] COD test is commonly used to indirectly measure the amount of organic compounds pollutants in water (e.g. lakes and rivers) and represent a useful measure of water quality.

lagoon to eutrophication, eventually promoting algal blooms (see peak of chlorophyll in Sam Chuon) and anomalous fluctuation in the dissolved oxygen.

Coliform bacterial load in the lagoon waters is generally high, with peaks at places (*e.g.* Tu Hien inlet, in August) three orders of magnitude higher than the national standard for aquatic cultivation areas (1,000 NPM/100ml). Despite the lack of large urban area along the lagoon shores, fecal-coliforms component indicates relevant human and/or animal livestock contributions, hence a diffuse release of wastewaters from communities.

The presence of pesticides and organochlorine compounds[3] used as agricultural insecticides in the sediment of the lagoon is noteworthy, although they do not represent an immediate hazard as they are stored in the sediment. These chemicals are largely banned in most countries nowadays, but the use in Vietnam is still continued and is a potential hazard in those few areas of enhanced riverine discharge. However, high water turbidity because of suspended clay particles causes chemical absorption of POPs and thus their rapid removal by burial.

Overall, the contaminant load of the lagoon (phosphorous, nitrogen, ammonia) and indicators of eutrophication (chlorophyll) are not severe, if one considers the critical of some of the basins. The dissolved oxygen level never falls below reference minimum standard for Vietnam, that means that oxygen depletion never develops to an extent to become harmful to aquatic animal life.

The lagoon system has a pronounced seasonality, with progressive water-quality deterioration during spring and summer, in coincidence with the farming activities, and return to more normal conditions during autumnal typhoons, when toxic waste and contaminants are flushed out.

Hydro-chemical characterization of the water masses and lagoon seasonality

In order to define ecologic zones, a statistical cluster analysis was applied to datasets acquired from the monitoring stations of 2006, using the four fundamental variables

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[3] An organochloride, organochlorine, chlorocarbon, or chlorinated solvent is an organic compound containing at least one covalently bonded chlorine atom. Their wide structural variety and divergent chemical properties lead to a broad range of uses. These chemicals are typically nonaqueous and are usually denser than water due to the presence of heavy chlorine atoms. Many pesticides widely used in agriculture are organochlorides. These include DDT, dicofol, heptachlor, endosulfan, chlordane, mirex, and pentachlorophenol. These can be either hydrophilic or hydrophobic depending on their molecular structure.

characterizing the water body: temperature, salinity, dissolved oxygen concentration and pH[4]. Based on these parameters, the stations were grouped into clusters with at least 5% dissimilarity, thus displaying water masses affinities, seasonality and to some extent exchange among basins. Water-mass affinities, in particular, provided hints on lagoon circulation in different seasons, an aspect often overlooked and insufficiently investigated.

*O'Lao river mouth and Tam Giang basin.*

In northern Tam Giang basin, including the O' Lau river mouth and upstream from the Huong Phong narrows, water masses display, in the month of April, a gradient form riverine type (see 1 in the legend of Fig. 27) to brackish (type 2), partially restricted (type 3). In May, a month of limited continental runoff, the fresh fluvial water of the O' Lau river remained confined in the vicinities of the mouth, while the lower Tam Giang stagnant water (type 2) expanded to the whole basin.

August 2006 was a month with enhanced precipitation (approximately 500 mm, three times the average of the month) and in that month fluvial waters (type 1) prevailed throughout the basin, with pockets of relic waters trapped locally. In November instead, three times dryer than average, signs of circulation restriction (type 3 waters) and reduced ventilation developed upstream from the Huong Phong narrows.

*Huong river mouth and Thuan An inlet.*

This area shows high variability of water characteristics, as it should be expected from mixing of riverine and marine flows. Marine saline waters (type 6 and 7) are detected in the vicinity of the inlet in the fair-weather months of April and May, diverted north towards Tam Giang, while riverine waters (type 1) predominate in the delta and expand, in the rainy season.

[4] Cluster analysis is an exploratory data analysis tool for solving classification problems. Its object is to sort cases (people, things, events, etc) into groups, or clusters, so that the degree of association is strong between members of the same cluster and weak between members of different clusters.

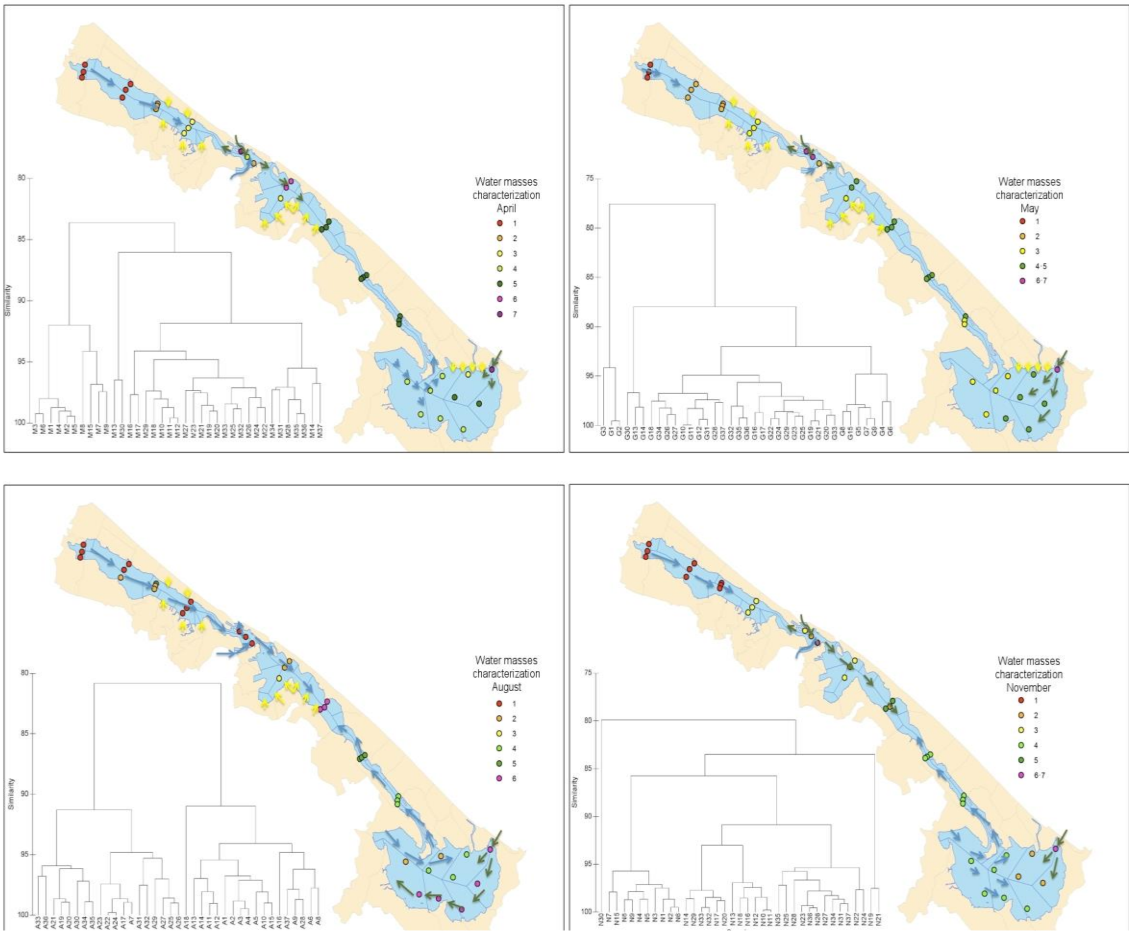


**Figure 27 - Results of cluster analysis of environmental parameter (dissolved oxygen, pH, salinity and temperature) for the four surveyed seasons of 2006 (April, spring; May, dry season; August, beginning of rainy season; November, rainy season but unusually dry in 2006). Cluster description is: 1, fresh water characterized by very low salinity (1 psu), lowest pH (except November), highest DO in early spring and fall and lowest, in summer (May and August); 2, low-salinity (average 7.8 psu) inner-lagoon water, as low as 3.5 psu during rainy months of April and August and as much as 13 psu in dry months of May and November; pH fluctuates between 7.5 during rainy months and 8.1 during dry month; 3, low-salinity brackish water, with intermediate salinity values ranging from 10 and 19 psu, lowest dissolved oxygen concentration and pH higher than 8; 4, low-salinity brackish waters, with stable salinity of 14 psu, temperature above 30 degree, pH average around 8 and concentration of dissolved oxygen systematically higher than cluster 3 (in excess of 7 mg/l). During the driest month of May, these intermediate waters are indistinguishable from those of cluster 5; 5, typical brackish water with salinity ranging between 16 and 18 psu, temperature normally higher than 30 degrees and average pH around 8. The concentration of dissolved oxygen is higher than 7 mg/l and salinity raised over 22 psu during driest month of May; 6, cooler marine waters (average 26.5 °C in April; lower than cluster 6); 7, marine waters, with salinity higher than 20 psu, as much as 30 psu during the dry months of May and November; temperature between 28,5 and 30,5 °C. Lowest concentration of dissolved oxygen in November, similarly to cluster 3.**

*Thuy Tu channel and Cau Hai.*

These two sub-basins have somehow affine water characteristics through all seasons, indicating limited mixing with southward-flowing waters from the north. The influence of marine waters from Thuan An (type 6), in April and of riverine waters from the Huong river (type 2), in August and November, is recognizable in the Thuy Tu channel as far south as the Phu Xuan-Vinh Xuan narrows. Characteristic Cau Hai restricted waters (type 4 and 5) prevail and may expand upstream through the southern Thuy Tu, eventually trapping relic saline waters (type 6) in the mid-section of the basin (*e.g.* August).

Seasonality of the Cau Hai basin shows a localized marine influence in the vicinity of the Tu Hien inlet during the spring months of April and May (type 5-7) and the development of restricted-circulation water masses elsewhere in the sub-basin, during the same dry months (type 3-5). In August, eastward outflow of fresh waters from the Dai Giang, Thieu-Hoa and Truoi rivers towards Tu Hien drags marine waters from the inlet across the southern Cau Hai into a clockwise gyre that brings brackish waters and ventilation to the easternmost restricted sector. Circulation restriction tends to prevail during fair weather (November 2006).

*Sam Chuon lagoon.*

The Sam Chuon basin is an embayment within the Huong river delta system, artificially cut off from riverine influx. All south-flowing Huong river branches are presently dammed off; marine waters from Thuan An hardly penetrate into the Thuy Tu channel, without being diverted into the sub-basin, thus making the marine influence negligible. For these reasons and because of the intense development of aquaculture, the Sam Chuon waters show little seasonality and marked affinities (type 2) with those typical of other low dynamic, scarcely ventilated and highly cultured basins (*e.g.* vicinities of Vinh Hien, Hai Duong and lower Tam Giang).

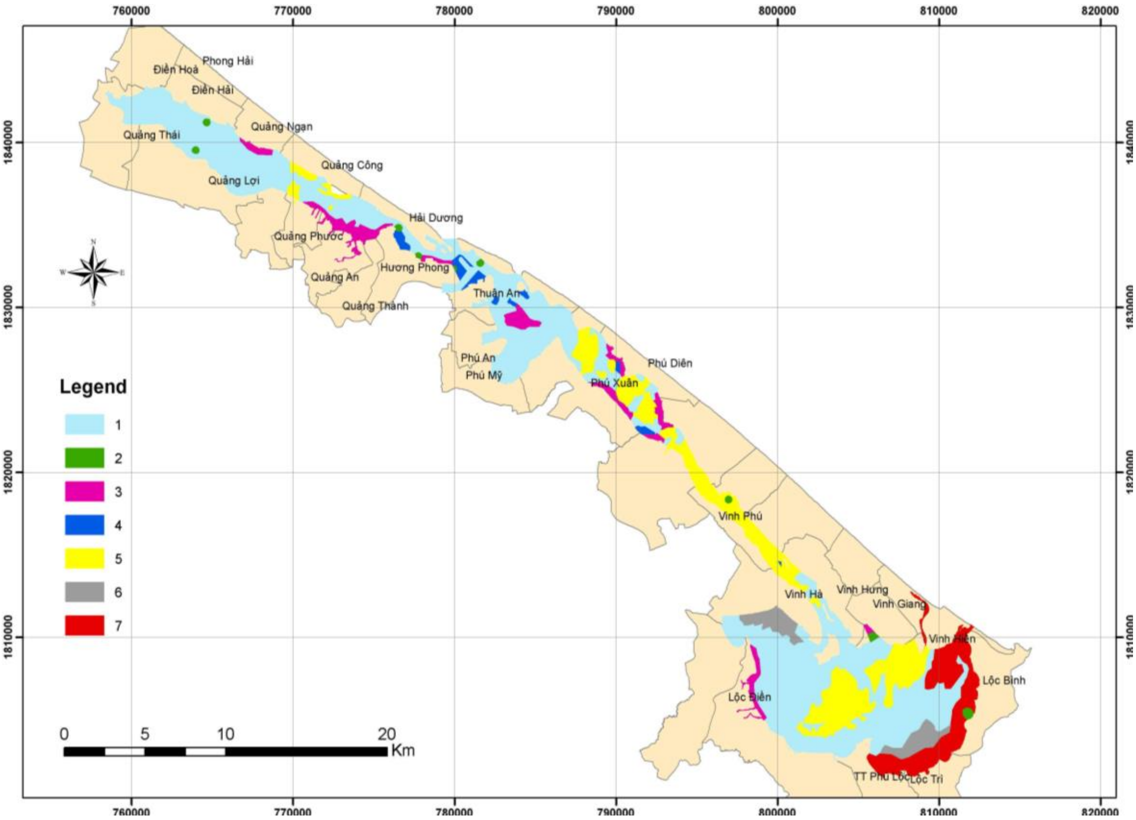


**Figure 28 - Natural and anthropic habitat distribution of Tam Giang-Cau Hai. Legend: 1, hydrophytes prairies; 2, sea grass fields; 3, aquaculture ponds; 4, tidal flats; 5, sandy-mud lagoon floor; 6. muddy lagoon floor; 7, meadows flooded in the rainy season.**

<u>Tam Giang-Cau Hai lagoon biocenotic mapping and distribution of main commercial species</u>

The distribution of lagoon biocenosis[5] is mainly driven by the salinity and its seasonal fluctuations. Figures 14 and 15 show the distribution of a suite of main *habitats* and commercial species in the lagoon, which reflects the physico-chemical characteristics of the water body and can thus are complementary elements of ecosystem definition.

Sea-bottom morphology, sediment composition, biota, macro-phytobenthos and macro-zoobenthos and vegetation coverage are parameters used in the zoning. The ecosystem of the Tam Giang-Cau Hai lagoon will be defined under the FAO code of ecosystem classification for further reference.

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[5] A group of interacting living animals and/or plants that form a particular ecosystem.

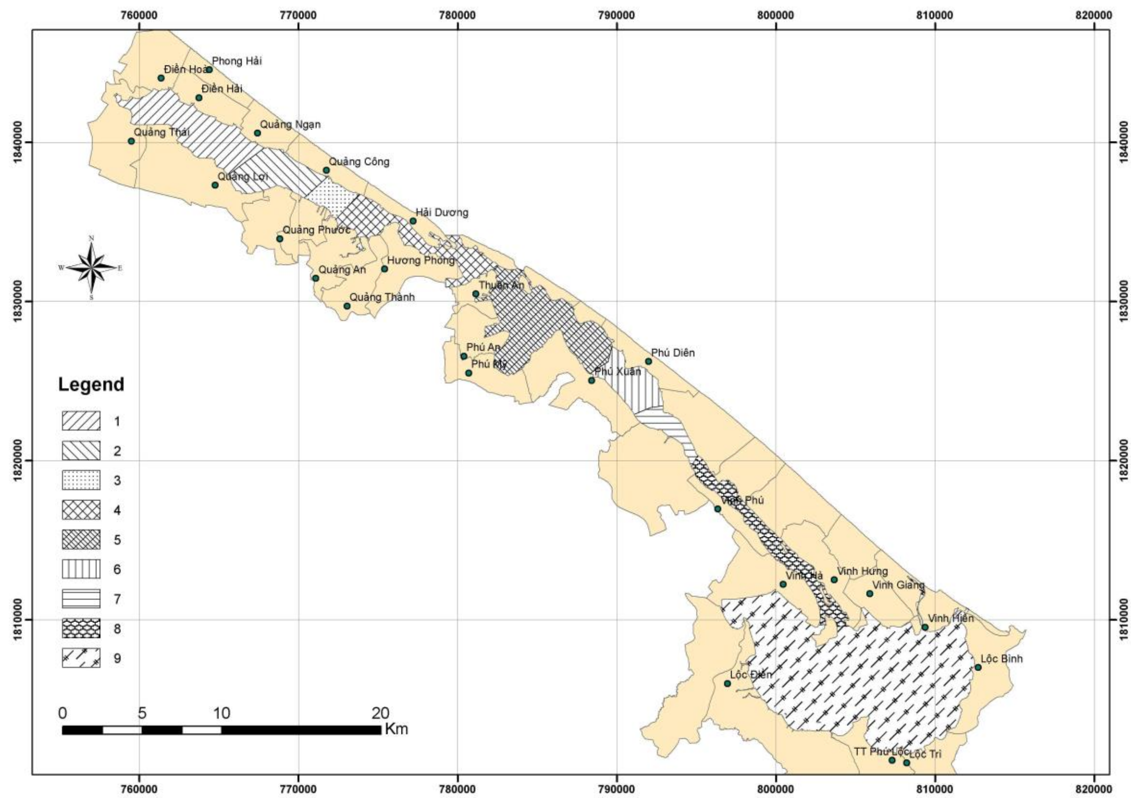


**Figure 29 - Distribution map of characteristic Tam Giang-Cau Hai biota and selected commercial species (natural fish population, macrophytobenthos, macrozoobenthos). Legend: 1, *Meretrix sp.* (*Trìa*), fresh-water shrimps, fresh-water weeds; 2, *Meretrix sp.* (*Trìa*), sea crab, thorned black crab (*ram*), *Potunus sp*. (blue crab or *ghe*); 3, *Saccostrea sp.*, *Meretrix sp.* , Cerithidea; 4, *Meretrix sp., Potunus sp.* (blue crab or *ghe*), fresh-water *Tilapia*, *Siganus*, sea fishes; 5, Meretrix sp., Potunus sp. (blue crab or *ghe*), seagrass, Veneridae and others bivalves, *Corbicula*, *Siganus*, *Metapenaeus ensis*, shrimps (*tôm go mo*); 6, Cerithidae (*ôc*), seaweeds; 7, Cerithidae (*ôc*), *Corbicula*, seaweeds; 8, *Solen sp., Metapenaeus sp.*, Cerithidae; 9, *Corbicula*, *Portunus* (blue crab or *ghe*), *Pteria*, *Saccostrea*, Penaeidae.**

<u>Tam Giang-Cau Hai lagoon ecosystem zoning.</u>

A stack of the seasonal cluster maps integrated with information from biota distribution, lagoon-bottom features and sediment types provide a basis to ecosystem characterization and zoning.

*O'Lau ecozone*. Riverine freshwater body from O' Lao predominates in the upper Tam Giang (O' Lau eco-zone). The boundary of this area fluctuates seasonally, but freshwater generally predominates far south as the Quang Loi-Quan Ngan transect. Hydrophytes beds and fresh-water weeds characterize the lagoon bottom in this compartment, hosting a faunal association featuring fresh-water shrimps and the clam *Meretrix sp*. as the predominant species.

*Distal O' Lau ecozone.*

The quadrangle comprising the coastline of the Sia territory, of Quang Loi and Quang Ngan communes is characterized by transitional brackish waters (distal O' Lao ecozone). The bottom is persistently colonized by patchy schyzohaline hydrophytes prairies hosting *Meretrix sp.* clams, but a more prominently brackish assemblage characterized by a variety of crustaceans (sea crab, blue crab and black-thorned crab) replacing freshwater shrimps.

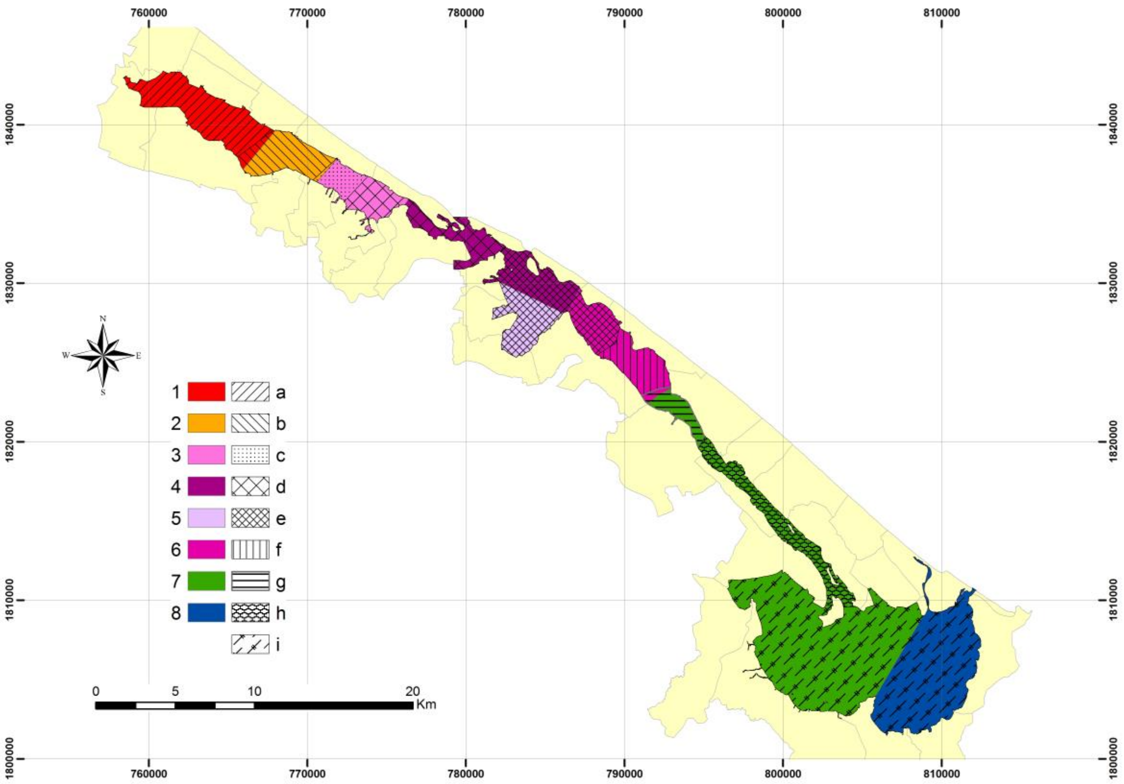


**Figure 30 - Integrated ecosystem zoning map derived from the distribution of water body characteristics (cluster analysis), lagoon-bottom features, sediment types and selected biota compositions (legend for fields a-I, see Fig. 29). Ecosystem legend: 1, Upper Tam Giang, O' Lau eco-zone; 2, Central Tam Giang, distal O' Lau eco-zone; 3, Lower Tam Giang eco-zone; 4, Huong river inner delta eco-zone; 5, Sam Chuon eco-zone; 6, Upper Thuy Tu marine relic waters; 7, Lower Thuy Tu channel and western Cau Hay continental domain; 8, Eastern Cau Hai marine and submarine domain, including mixing zone. The lower Tam Giang, the Sam Chuon and eastern Cau Hai show affinities in the way of having low-dynamic, stagnant water masses, largely of continental origin**

*Lower Tam Giang ecozone.*

The lower Tam Giang is still characterized by riverine predominance, with stronger seasonal marine influence and restricted circulation hindered by narrow passageways (*e.g.* Huong Phong). The influences of water masses alternatively flowing in opposite directions and the overwhelming pollutant load by aquaculture are characterizing features of the locale. Hydrophytes prairies host in this sector macro-benthic assemblages adapted to sandy bottoms and brackish-water conditions (*e.g. Meretrix sp*. associated with Cerithidea and oysters of the genus *Saccostrea*; fields 3 and 4 in Fig. 30).

*Huong river delta ecozone.*

The Huong river delta zone is unique in the sense that it is a lagoon compartment where marine and riverine water masses mix. Currents are enhanced by the complexities of the deltaic physiography, so that the prevalence of fluviatile or marine regimes depends on seasonality and precipitations. Macrophyto- and macrozoo-benthos are characteristic of schyzohaline (fluctuating salinity) environment: sea fishes such as *Siganus* (rabbit fish) and sea crab such as *Potunus*, but also *Tilapia* are reported in this area, together with *Metapenaeus ensis* and other marine shrimp specimens.

The deltaic schyzohaline ecozone may seasonally extend southward into the upper Thuy Tu (Huong river sub-deltaic ecozone), still characterized by marine assemblages of the kind described above, together with the occurrence of other typical estuarine mollusks (*e.g. Corbicula* and Veneridae).

*Sam Chuon ecozone.*

The Sam Chuon embayment physically belongs to the Huong river delta complex, but hydrologically is a stand-alone compartment, isolated from both riverine and marine influx. Moreover, water masses are severely affected aquaculture effluents from the southern shores. The embayment, by biota and water characteristics, shows affinities with the lower Tam Giang.

*Upper Thuy Tu ecozone.*

The upper Thuy Tu is a hydrologic divide. The characteristics of this section are sandy bottoms, due to the sorting effect of currents, marine water seasonally filtering from Thuan An and interfering with episodic northerly counter flows from Cau Hai and a peculiar marine biota consisting of sea weeds and Cerithidea mollusks. The effect of water masses converging towards this sector of Thuy Tu determines the encapsulation of pockets of modified marine relic waters, with anomalous concentration of organic pollutants from aquaculture effluents.

*Lower Thuy Tu ecozone.*

The lower Thuy Tu waters show similarities with those of western Cau Hai and an overall aquatic environment, set aside the morphology, comparable with that of the sub-basin. Both western Cau Hai and lower Thuy Tu waters have continental riverine affinity, suggesting seasonal penetration from Cau Hai into the channel, with some mixing with the modified marine waters of the upper Thuy Tu, somewhere in the mid-section at the height of Vinh Thanh-Vinh Phu and Vinh Xuan-Phu Da. The sandy-mud lagoon floor of the lower Thuy Tu is characterized by mollusks of Cerithidea family, specimens of the genus *Solen* and *Metapenaeus ensis*.

*Cau Hai ecozone.*

The Cau Hai sub-basin is divided in two parts: the low-energy, fluvial-dominated environment of the western and northern sector, with largely muddy bottoms, and the marine-dominated eastern and southern sector, with a transitional zone corresponding to the transect between Phu Loc town-Loc Tri and Vinh Hien communes. In the marine and transitional zones, sandy bottom prevails in the vicinities of the inlet (Tu Hien flood tidal delta) and in the Thuy Tu inner delta debouching into Cau Hai. The benthos characteristics are undifferentiated in the sub-basin (*Corbicula*, the oyster *Saccostrea* and the bivalve *Pteria*, along with sea crabs and Penaeidae).

<u>Non-living resources (soil, groundwater, mineral resources)</u>

*Land use and land cover.*

To assist in management of Tam Giang-Cau Hai lagoon and its pertinences, a land use and land cover map 1:25,000 scale of the coastal Thua Thien Hue Province, covering 125,000 hectares and 34 coastal communes, was produced in 2006, stacking remote-sensing data from 1989, 2000 and 2006 imagery (Fig. 31).

An *ad hoc* legend was created by modifying and adapting to local characteristics, the CORINE[6] land cover legend.

In the detailed study and related map, the land use/land cover categories are grouped into four levels, with 5, 11, 23 and 8 headings each (Fig. 31).

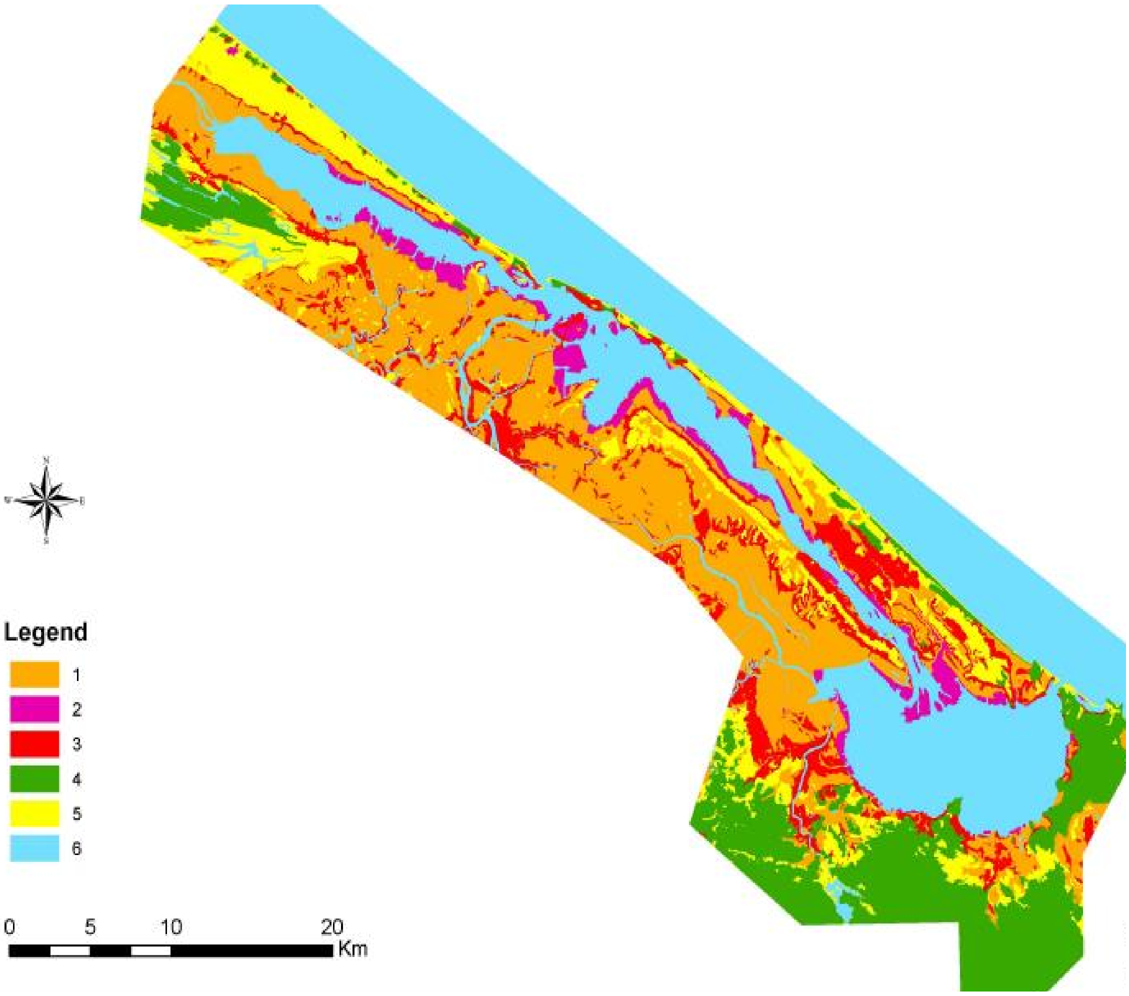


**Figure 31 - Simplified land-use map of the territory surrounding the Tam Giang-Cau Hai lagoon. Legend: 1, agricultural areas (rice paddies and cultivated fields) in alluvial plain lowland; 2, aquaculture areas, potential sites of effluent waste-water discharge and sources of organic pollutants (fish feeds, fish metabolism residues etc.); 3, urban (and industrial) areas; 4, semi-natural tropical and subtropical moist broadleaf forests; 5, semi-natural sandy area, with irregular and discontinuous bush coverage; 6, inland waters and sea.**

[6] CORINE, "Coordination of Information on the Environment". In 1985 the Corine programme was initiated in the European Union; it was a prototype project working on many different environmental issues. The Corine databases and several of its programmes have been taken over by the EEA. One of these is an inventory of land cover in 44 classes, and presented as a cartographic product, at a scale of 1:100 000. This database is operationally available for most areas of Europe (http://www.eea.europa.eu/publications/COR0-landcover)

| | | | |
|---|---|---|---|
| 1 Artificial Surfaces | 11 Urban Fabric | 111 Continuous urban fabric | |
| | | 112 Discontinuous urban fabric | |
| | 12 Industrial, Commercial and Transport Units | 121 Industrial areas | |
| | | 122 Ports and airports | |
| | | 123 Aquaculture ponds | 1231 Inland aquaculture ponds |
| | | | 1232 Lagoon aquaculture ponds |
| | 13 Mines and construction sites | 131 Mineral extraction sites | |
| | | 132 Construction sites | |
| | 14 Graves or cemeteries, monumental areas | 141 Graves or cemeteries | |
| 2 Agricultural areas | 21 Arable land | 211 Rice fields | |
| | | 212 Complex cultivation | |
| | 22 Agro-forestry areas | 221 Agro-forestry areas | |
| 3 Forests and semi-natural areas | 31 Forests | 311 Broad-leaved forest | 3111 Broad-leaved sparse forest |
| | | | 3112 Broad-leaved dense forest |
| | | 312 Coniferous forest | 3121 Coniferous sparse forest |
| | | | 3122 Coniferous dense forest |
| | | 313 Mixed forest | 3131 Mixed sparse forest |
| | | | 3132 Mixed dense forest |
| | | 314 Mangrove forest | |
| | 32 Open spaces with little or no vegetation | 321 Shrub, bushes and/or herbaceous vegetation | |
| | | 322 Sandy inner areas | |
| | | 323 Sandy coastal areas | |
| 4 Wetlands | 41 Inland wetlands | 411 Inland wetlands | |
| 5 Water bodies | 51 Inland waters | 511 Water courses | |
| | | 512 Lakes or inner basins | |
| | 52 Marine waters | 521 Coastal Lagoon | |
| | | 522 Sea and Ocean | |

**Figure 32 - Land use/land cover categories and nomenclature defined for coastal Thua Thien Hue Province, modified after CORINE land types classifications.**

*Mineral resources and building materials.*

Exploitation of mineral resources in the floodplain/coastal zone relate to:

- Sand mining from inlets and active beaches, for construction (artisanal, manually operated)
- Sand mining from active river bed for construction and infrastructure building (artisanal and semi-industrial, manually and machine-operated)
- Laterite-soil quarrying from slopes (semi-industrial).
- Limestone rock mining for handycraft (artisanal) and cement processing (industrial).
- Sand is actively mined from inlet and beaches. Excess sediment in these areas of natural natural deposition is not harmful but rather beneficial to the hydraulic system which suffers excessive siltation and clogging.

Sand withdrawal from active rivers is intense, semi-industrially operated and continuous through the years, except during floods and storms. This activity driven by strong and likely higher future demand as a result of urbanization, industrialization and infrastructure building is harmful to the sediment budget along the coast and will likely result in enhanced coastal erosion, already severe at places.

Laterite-soil quarrying from mountainous slope is an inportant source of low-quality material for roads substrates, earthfill and basement for country and urban houses. This practice has been widespread in recent years along the slopes surrounding Cau Hai, next to the road for immediate and convenient supply. Laterite is abundant as a tropical soil wherever outctop of crystalline basement rock is outcropping. Quarrying surveying and technology is rather primitive: deforeastation is followed by bulldozing of soft argillaceous soil to meet the immediate demand, until the rocky substrate or unsuitable material are encountered. Transportation is by small trucks or dumpers, according to the needs of the contractor. When finished, the mining site is abandoned, vulnerable to slope instability, creep, landsliding and dispersal of contaminant laterite sludge in the logoon.

Limestone rock, wherever of suitable mineralogical composition and purity, is mined for processing in cement industry, more often inland rather then in coastal areas. Decorative limestone is also small-scalle quarried and marketed across Vietnam for household handicraft, decorations, column pedestals and tombstones. While the former is highly impacting the environment and landscape integrity, this latter is rather a popular artesanal activity in Thua Thien Hue as weel as in other areas of Vietnam, more of a cultural value and should be subject of tutelage.

*Groundwater.*

Coastal Thua Thien Hue Province possesses extensive superficial aquifers[7] that, once managed, can provide adequate freshwater supply for agriculture, aquaculture and urban services of rural communities. Ground water serves the great majority of people who live in rural areas; the reason is that, among the various sources of supply, ground water is by far the most practical and safe in nature.

7 Water-bearing rock or sediment formations

Unlike surface waters, the advantages of groundwater are:

- it is likely to be free of pathogenic bacteria;
- generally, it may be used without further treatment;
- in many instances it can be found in the close vicinity of rural communities;
- it is often most practical and economical to obtain and distribute;
- the water-bearing aquifer from which it is drawn usually provides a natural storage at the point of intake[8].

There are some disadvantages relating to its high mineral content and to the investment needed to survey, engineer and capture water from aquifers, but advantages far outnumber the few inconveniences that exist over surface, more erratic supply.

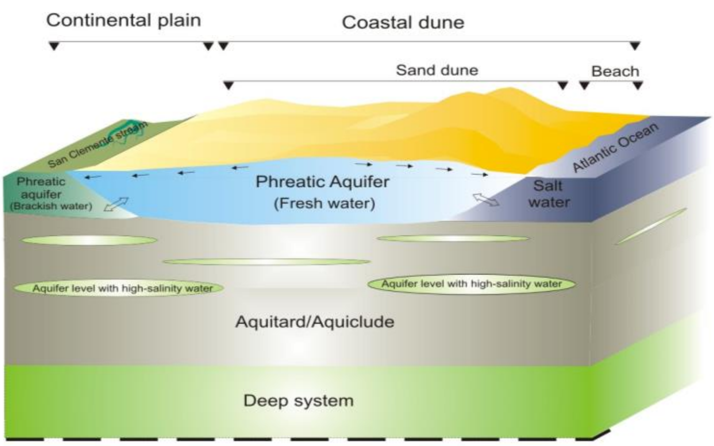


**Figure 33 - Cartoon showing a typical example of coastal phreatic aquifer from sand dunes.**

In coastal Thua Thien Hue, groundwater resides near-surface (the free-water zone of Tollman) in the modern coastal-dunes aquifers (the backshore from Phong Dien to Hai Duong and from Thuan An to the extreme south) and sub-recent dune fields of Quang Dien, Phong Dien and Phu Vang (Fig. 1 and 31).

Aquifers are easily recharged by the abundant precipitation of the province (over 3,000 mm/year) and freshwater is there available, in most instances, in the close vicinity of sites of utilization and in amounts sufficient to the community requirements.

The resource has not yet been seriously considered for potential, quality and vulnerability. Pollution is currently a severe hazard for the resource, from urban waste and industrial aquaculture recently developed on sand fields. Once polluted, aquifers are difficult to treat or remedy.

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[8] World Health Organization Monograph 42, Chapter 3

# Summary and conclusions

## Assessment of status of coastal environment

Status of quality of coastal environment

The Tam Giang-Cau Hai and vicinities maintain its rather pristine state compared to other lagoon and deltaic settings of the world, despite the high population density, the strong demand for food resources and on going vigorous development. Historical events of the second half of the past century slowed down the process of industrialization and urbanization, maintaining agriculture and fishery into artisanal conditions and the aesthetic of the natural environment into its untouched beauty.

Infrastructure development (road, bridges, expansion of cities) generated impacts: on landscape, on resources and, easing communications among villages and to the city, on the social structure itself. Some traditional occupations like local ferries, handicraft making etc. have vanished and pressure has been transferred from the aquatic environment on land, from the peripheral centers to cities. Traditional nomadic boat-dwellers, once present in dense and bursting floating villages in both the remote lagoon expanses and in the cities have been, in the turn of a quinquennium, relocated on land, with doubtful improvements in their lifestyles, livelihoods and aquatic environment but with an undoubted loss of cultural and traditional value.

Aquaculture has been another major element of perturbation of the natural system: the attempt to promote shrimp production in the nineties generated in cascade negative impacts whose repercussions are still felt today: widespread organic pollution, wiping out of endemic mangrove ecosystem, eliminating inter-subtidal spawning and nursery platform, loss of productivity, break of reproductive cycle of numerous species, loss of biodiversity, hindrance of circulation etc.

Construction and uncontrolled mining of building materials altered the harmony of the landscape by producing large red scars in the deep green of the forest: laterite mining in near the coastline deteriorated the quality of the aquatic environment by promoting the flushing of red sludge in the lagoon and increase the amount of suspended matter; uncontrolled quarrying is promoting soil erosion, land sliding and slope instability. The uncontrolled dumping of construction material or roadwork debris (e.g. construction residues of the Tu Hien bridge) also deteriorated the integrity of the coastline and lagoon floor, to the detriment of fishery and living creatures.

River diversion, damming and construction of salinization-prevention dikes, besides resolving some of the impending emergencies for agriculture altered the natural waterways network and hydraulics, generating changes in the lagoon biological cycles.

Damming in the upper catchment, by reducing the discharge of rivers and sediment-laden water will further promote saline intrusion from the sea and sand mining for construction from the all active riverbeds will increase coastal erosion, which already became severe at places in the past few years (*e.g.* Thuan An and Hai Duong). The construction of shoreline groins and piers, neither resolve the problem nor mitigate the process (e.g. Cua Viet and Cua Tung, Quang Tri).

Despite rapid and recent changes, the environment maintains its charm and beauty, its unique character in the whole Vietnam and this is a cultural asset that should be maintained for its recreational value and use for the benefit of the forthcoming development of the touristic industry in the country.

<u>The sources of environmental hazards, pollution and degradation in the coastal area</u>

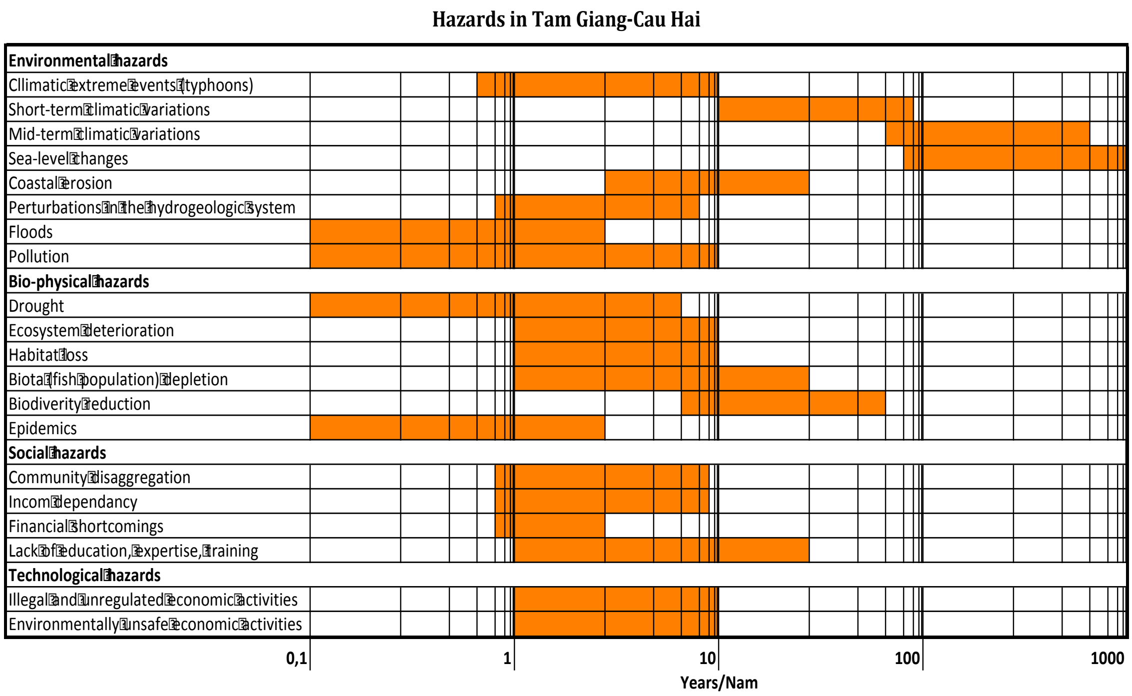


**Figure 34 - Hazards classification for the Tam Giang-Cau Hai and the coastal province of Thua Thien Hue. The time scale indicates the time frame and frequency at which hazard may turn into an emergency.**

Hazards[9] for the lagoon environment listed in Figure 20 have a natural, climatic and social origin. These can be classified as environmental, when they relate to the physical environment; bio-physical, when they affect the biota and living creatures in general; social, when hazard may impact the socio-economy of the human community at large and technological, when relate to technologically assisted human activities.

The timing and the frequency (return period[10]) at which a hazard may turn into an emergency may assist decision makers in designing interventions and setting priorities. Prevalent natural hazards in Tam Giang-Cau Hai lagoon and the costal area of Thua Thien Hue include pollutant dispersal from agriculture, aquaculture, industry and urban settlements; climatic hazards relate to seasonal fluctuation of river discharge (flash-floods) and the recurrence of autumnal typhoons that, if in-phase with the flash floods, can enhance the level of risk. The simplified land-use map of Fig. 31 shows the potential sources of risks.

In terms of susceptibility towards hazards and vulnerability, three levels of risk can be identified for the different zones of Tam Giang-Cau Hai: *high risk*, whenever incumbent hazards are persistent in populated areas or production sites, emergencies are frequent and/or multiple emergencies can develop simultaneously (*e.g.* flood and typhoon), with effects that manifest in the immediate or short term; *moderate risk*, whenever emergencies, once they manifest, are localized or controllable, affect lesser-densely populated areas and *low risk*, whenever emergencies are mild and their effects are likely to be naturally mitigated in the short term. High-risk zones require immediate attention and hazard mitigation interventions. Moderate risk zones require monitoring and rehabilitation measures. Low-risk zones require low-level of attention. With respect to these three levels of risks, the Tam Giang-Cau Hai system can be categorized has follows.

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[9] Hazard/emergency ranking: establishing priorities. A hazard is a situation that poses a level of threat to life, health, property or environment. Most hazards are dormant or potential: the likelihood a hazard turns into an emergency and the seriousness of the emergency whenever it manifests express the level of risk. Emergencies are episodic, cyclic, or persistent. The time frame into which the emergency develops bears consequences on establishing priorities of intervention.

[10] A return period also known as a recurrence interval is an estimate of the likelihood of an event, such as an earthquake, flood or a river discharge flow to occur. It is a statistical measurement typically based on historic data denoting the average recurrence interval over an extended period of time, and is usually used for risk analysis (e.g. to decide whether a project should be allowed to go forward in a zone of a certain risk, or to design structures to withstand an event with a certain return period. The following analysis assumes that the probability of the event occurring does not vary over time and is independent of past events.

Critical issues relating to the quality of wetland habitats of Central Vietnam

- Parameters and variables of water quality, sediments, benthic associations in Tam Giang-Cau Hai lagoon and estuaries of Central Vietnam portray a rather stable situation and a persistent acceptable standard for aquaculture; however, high organic-matter input to open waters relating to biological excretion and excessive feed may create eutrophication and anoxia lethal for life.
- High-impact shrimp monoculture is unsustainable on the long term: alternative methods (e.g. clam farming) need to be studied and piloted to mitigate negative effects of effluents and aquaculture waste waters.
- Livelihood shift is necessary, having short-term impact on household welfare and economy, but unquestionably beneficial on the long term.
- Need of a viable community-based solid-waste collection and treatment plan, including the creation of a community-based collection network at commune level.
- Appropriateness of the future implementation of a wetland ecosystem carrying capacity exercise, in support of future planning and zoning for conservation and exclusion
- Need of a water-quality monitoring system for early warning of upcoming critical conditions and implementation of protection measures.

Vulnerable ecosystems in Tam Giang-Cau Hai lagoon and coastal areas and risk assessment maps.

The sub-basins of Lower Tam Giang, Sam Chuon-upper Thuy Tu, and western Cau Hai, because of physiographic complexities and hydrological hindrance, are at present considered as high-risk zones. The intense development of aquaculture and related threats of pollution, disease outbreaks, loss of crop, income instability, etc. represent the main hazards and source of social hardship: people, their livelihoods and the environment are affected.

Concerning climatic hazards, the landward side of the lower Tam Giang coastal plain (Huong Tra and Quang Dien) is subject to poor drainage and subject to persistent floods yearly. Organic pollution is severe due to enormous development of ponds and lack of flushing. The central region from the lower Tam Giang (Hai Duong Commune) to the upper Thuy Tu (Thuan An, Phu Hai) appears to be under potential threat of coastal erosion: these zones should be reclassified as extremely sensitive, according to the definition adopted in the Decision No. 3677 of the Thua Thien Hue People's Committee (Fig. 35). Thuy Tu is currently highly polluted and priority should be given to effluent control from aquaculture. Western Cau Hai should be eligible of high sensitiveness given its water exchange limitations

The eastern Cau Hai, the lower and middle Thuy Tu and the upper Tam Giang are classified as moderate-risk zones (sensitive zones in the terminology of the Decision No. 3677 of the Thua Thien Hue People's Committee) implying that better fishery-management practices and rehabilitation should suffice to mitigate the current state of degradation. The Tu Hien inlet is a critical zone for sea-lagoon interaction.

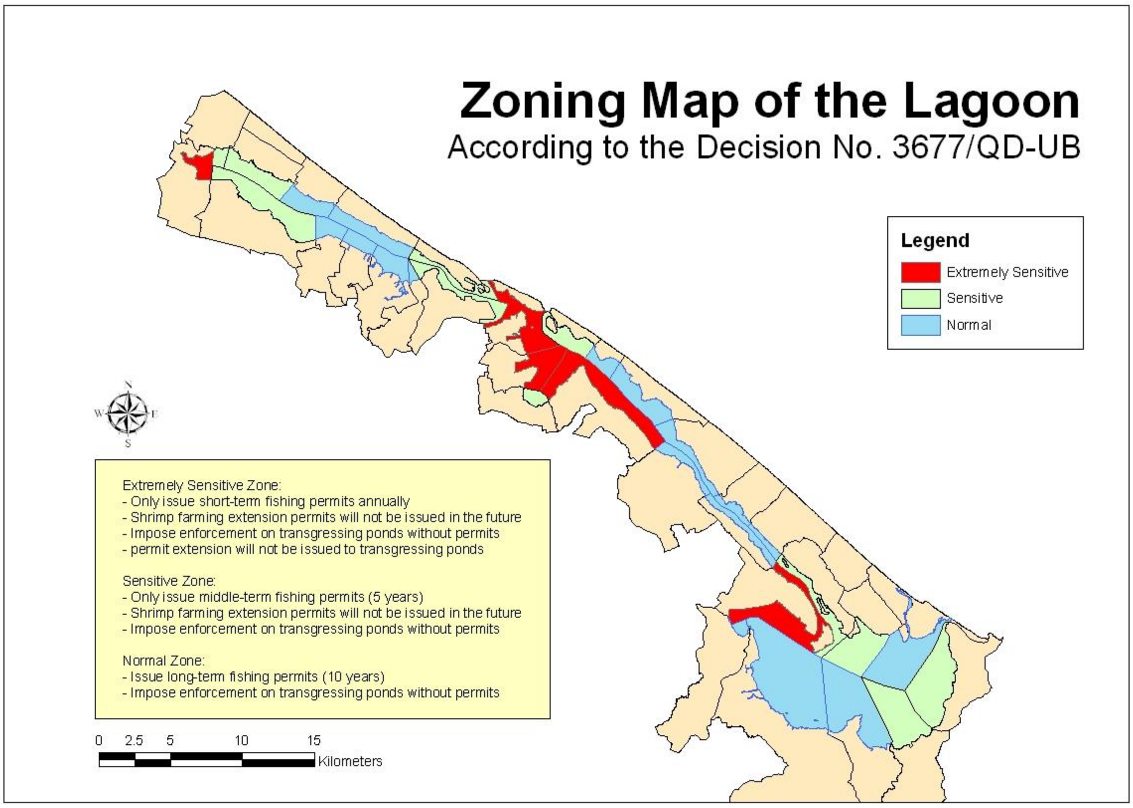


**Figure 35 - Zoning map of the Tam Giang-Cau Hai lagoon based on risk-level towards fishery activities, as assessed in 2004, and range of proposed interventions in support of the sector (as per Decision No. 3677/QD-UB of 2004 of the Thua Thien Hue Provincial People's Committee).**

No zones may be classified at present as low-risk, even though the Huong river delta and the upper Tam Giang (O'Lau river mouth), because of ecosystem integrity may be re-proposed for conservation and tourism. Chemical pollutants from agriculture are seasonally severe, so that better control on effluents and ban of POPs use should be emplaced.

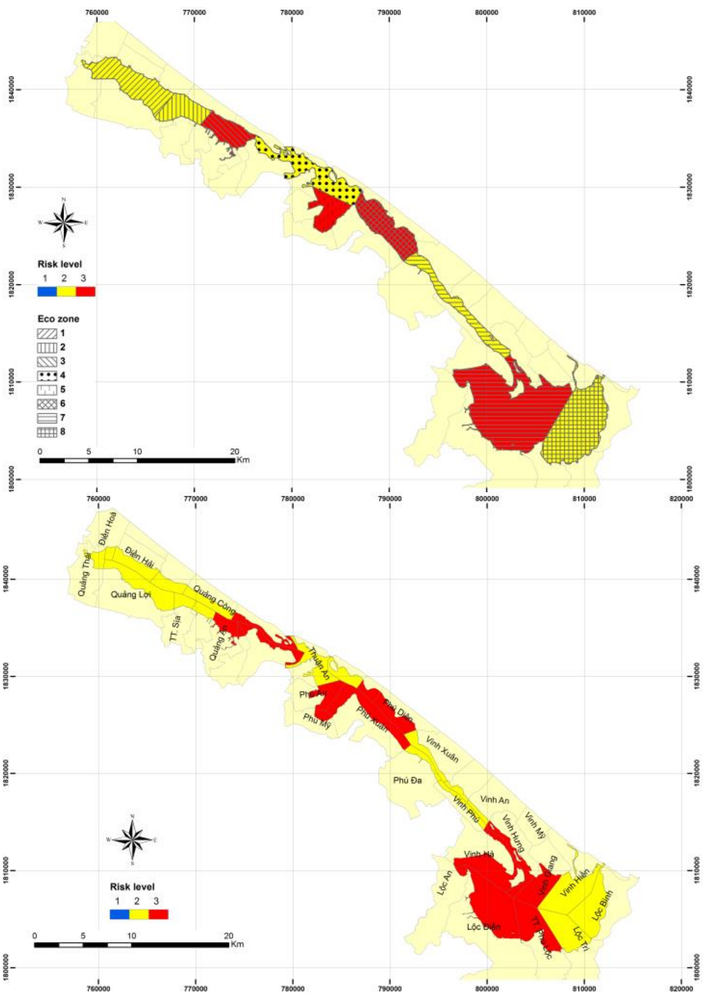


**Figure 36 - Risk maps of the Tam Giang-Cau Hai lagoon representing the risk level evaluated for each of the identified ecosystems (above) and communes (below). Risk levels have been ranked according to three categories: 1, *low*, whenever emergencies are mild and their effects are likely to be naturally mitigated or nullified in the short term; 2, *moderate*, whenever emergencies, once they manifest, are circumscribed or controllable and 3, *high*, whenever emergencies are persistent and/or multiple emergencies can manifest simultaneously.**

Based on latest assessments, the 2004 commune risk-level (sensitiveness) map of Tam Giang-Cau Hai should be revised according to the representation of Fig. 36

<u>Assessment of status of coastal biological resources</u>

Biodiversity is an asset of Tam Giang-Cau Hai. In terms of species richness, the lagoon and wetlands of Thua Thien Hue far outnumber any other lagoon in Vietnam. Count totals approximately 1000 species, most of them systematically identified: phytoplankton records the highest in number of representative species (287), fish's species are 215-230; birds, 73; zooplankton, 72; zoobenthos, 193 species, seaweeds 46, higher plant, 31; water grass 18 (of which 7 species of sea grass). Percent of specie distribution is shown in Fig. 37.

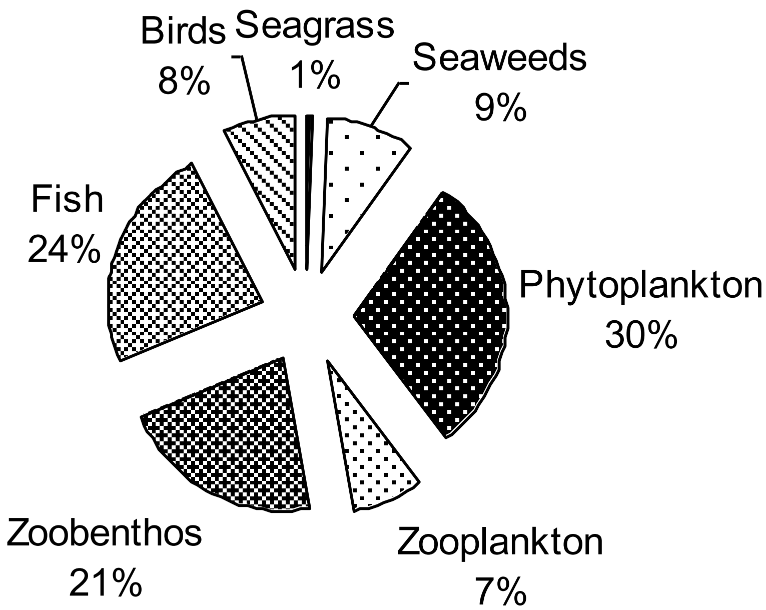


**Figure 37 - Percent of species distribution in Tam Giang-Cau Hai lagoon identified during the assessments 2006-2018.**

High biodiversity depends on complexities of lagoon physiography and habitats, and seasonal changes of the aquatic environment: salinity fluctuations between the dry and rainy season affect the composition of biota and species predominance. For example, in rainy season, the freshwater grass *Valisneria spiralis* is predominant, associated to the freshwater prawn *Macrobrachium sp.,* the freshwater shrimp *Palaemonetes sp.* and the clam *Corbicula*. In contrast, in the dry season, brackish species predominate, such as squids *Loligo sp.* and *Sepia sp.*, the shrimp *Penaeus sp.*, the crab *Portunus sp.*, and the fish *Siganus sp.*

A characteristic of the Tam Giang-Cau Hai lagoon is the growth of underwater and coastal prairies, ideal habitat of migrant waterfowls, including approximately thirty protected species among which the purple heron (*Ardaea purpurea),* the osprey *(Pandlion haliaetus)*, the common kestrel *(Falco tinnunculus)* and one species, the asian dowitcher (*Limnodromus semipalmatus), which* is recorded in the Vietnam Red Book of endangered species.

There are over a hundred aquatic species of economic interest in Tam Giang-Cau Hai lagoon. From crude estimates, local fishers in the five lagoon districts produce approximately 2,500 metric tons of aquatic products (excluding seaweeds of low economic value), primarily for the local market. Among these, there were 23 marketable fish species and 34 other categories including benthic edible organisms that are considered a valuable commodity for processing of local food such as sour shrimp sauce (*tom chua*) and clam rice (*com hen*).

Among the 73 species of aquatic bird, there are five migrant types seasonally resident in the lagoon: the Eurasian coot (*Fulica atra*), the spot-billed duck (*Anas poecilorhyncha*), the graylag goose (*Anser anser*), the spotted redshank (*Tringa erythropus*), the garganey (*Anas querquedula*), with estimated several ten thousands of individuals of commercial interest.

Seagrass and seaweeds are harvested for manure and animal feed, to increase the income for local households. Surveys revealed that there are about 1021 hectares a seagrass fields in Tam Giang-Cau Hai, mostly concentrated in Con Noi, Con Dai and Ba Con (Cau Hai).

Subaqueous prairies develop at depth of 0.7 to 1.4 m, displaying different species composition depending seasons and salinity [11], with massive growth of invasive freshwater plants during the rainy season and increased runoff; with increased salinity during the summer months, seagrass replaces freshwater plants and the decay of dead tissue contributes to water pollution an alkalinity.

The growth of invasive freshwater plants is a serious, yet common problem of coastal lagoons subject to fluvial water predominance and limited seawater circulation. Freshwater plants are often classified as pest plants, highly noxious to environment and difficult to eradicate. *Hydrilla* for example, forms dense mats of vegetation that interferes with recreation and destroys fish and wildlife habitats.

Despite Tam Giang-Cau Hai has a long history of scientific investigations, quantitative studies on biological resources are still non exhaustive. The biological stock of tropical, multi-species systems is a laborious elaboration of catch monitoring data: under time and budget limitation, the IMOLA project attempted a crude estimate of biomass based on bulk catch in areas where bottom morphology and navigation conditions allowed trawling. The standing stock size was expeditiously obtained applying the Pauly (1983) formula[12].

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[11] Five species belonging to Hydrocharitacae, Cymodoceaceae, Zosteraceae and Ruppiaceae, with predominant *Zostera japonica*, *Halophila beccarii* and *Halodule pinifolia*. Species of oligohaline waters (0.5-4‰) are *Hydrilla verticillata* (a salinity resistant, potentially invasive freshwater plant), *Vallisneria spiralis* (eel grass, proliferates on organic-rich substrates, invasive pest plant), *Myriophyllum spicatum* (watermilfoil, potentially invasive, noxious weed), *Potamogeton crispus* (noxious weed of inland waters and lakes). Euryhaline species (tolerant to wide range of salinity) are *Zostera japonica* and *Halodule pinifolia*. Mixohaline species (0,5-30‰) are *Halophila beccarii* and *Ruppia maritima*. A predominany euhaline species (normal marine) is *Halophila ovalis.*

[12] Pauly, D., 1983, Some simple methods for the assessment of tropical fish stock, FAO Fishery Technical Paper 234

Thirteen trawling transects using push net in O Lau, Hai Duong-Thuan An, Sam Chuon, Thuy Tu and Cau Hai. Based on captured frequency, taxonomic categories were subdivided into:

- High-frequency group. 42 species of economic interest, 7 of which rather ubiquitous, with frequency of 78-100% of total catch sessions. These include flathead grey mullet (*Mugil cephalus*), whipfin silver biddy (*Gerres filamentosus*), *Triacanthus brevirostris*, *Hemirhamphus sinensis*, freckled hawkfish (*Ambassis kopsii*), orange-spotted and white-spotted rabbitfish (*Siganus guttatus* and *Siganus oramin*), and shrimp *Metapenaeus ensis*.
- Medium-frequency group: 10 species, with frequency from 46 - 70% of total catch sessions. These include crabs (*Varuna litterata*), catfish (*Leiocassis hanamensis*), *Sparus latus*, crescent bass (*Terapon jarbua*), bartail flathead (*Platychephalus indicus*), shortnose ponyfish (*Leiognathus brevirostris*), gobids (*Oxyurichthys tentacularis*), glass eel (*Pisodonophis boro*), Commerson's anchovie (*Stolephorus commersonii*).
- Low-frequency group: 11 species with appearance frequency of 25-40% of total catch sessions. These include blue swimmer crab (*Portunus pelagicus*), clams (*Corbicula sp.*), whitefin wolf-herring (*Chirocentrus nudus*), *Tetraodon ocellatus*, trumpeter whiting (*Sillago maculatus*), white goby (*Aboma lactipes*), *Clupanodon punctatus*, Mauritius sardinella (*Sardinella jussieu*), prawns (*Penaeus merguiensis* and *Penaeus monodon*).
- Very low frequency group: 14 species recorded on only 1-2 catch sessions. These species have restricted distribution: for example the freshwater prawn *Macrobrachium sp* is an indicator of freshwater habitats of O Lau and adjacent areas whilst *Squilla sp*. is only found in saline waters close to inlets; around the lagoon mouths; The flat-head goby is a rare species only found in Sam Chuon and Huong Tra.

The highest recorded diversity were in the marine-influenced lagoon tract comprised between Quang Cong to Phu Hai (Tam Giang and Sam Chuon), with number of species ranging from 30 and 32. The lowest number of species was recorded in the freshwater-dominated section of O Lau (20 species), followed by Thuy Tu (23 species) and Cau Hai (26 species) (Fig. 38). Similarly, the highest bulk biomass, as calculated from catch, was recorded in the Sam Chuon-Thuy Tu transect and the lowest value in absolute terms was in O Lau. Based on production during the catch sessions, the bulk spot biomass value was assessed for each location, applying the Pauly (1983) relationship (Table 7).

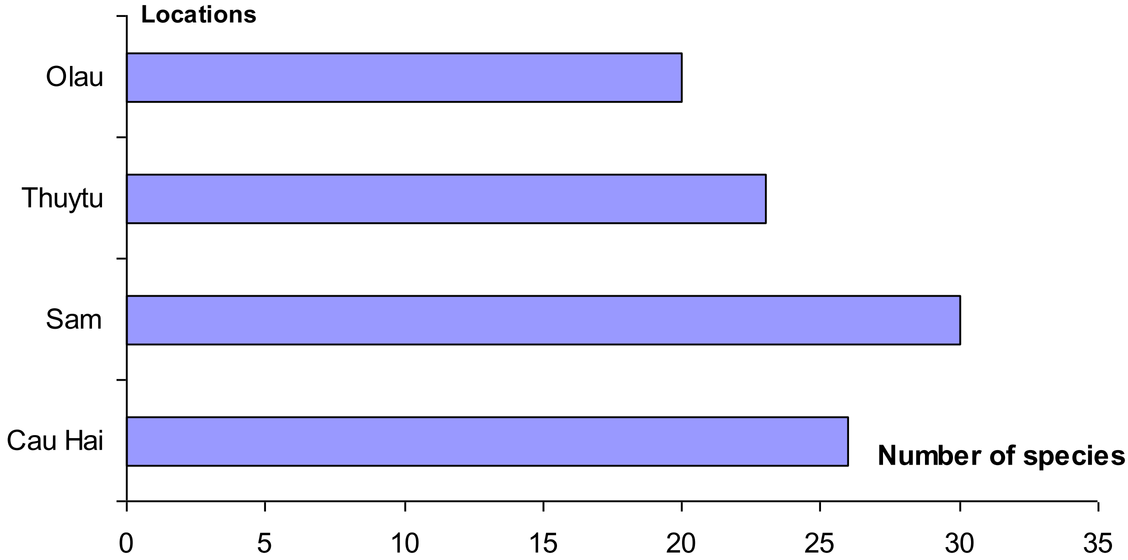


**Figure 38 - Distribution of number of aquatic species in the Tam Giang-Cau Hai lagoon sub-basins.**

| Location | Production per catch session (tons/hectare) | Extrapolated bulk biomass (tons) |
|---|---|---|
| O Lau | 3.293 | 13.172 |
| South Thuan An | 17.562 | 70.248 |
| East Thuan An | 5.193 | 20.772 |
| West Thuan An | 8.849 | 35.396 |
| West Sam Chuon | 4.837 | 19.348 |
| North Sam Chuon | 190.200 | 760.800 |
| East Sam Chuon | 36.997 | 147.988 |
| Huong Tra | 71.862 | 287.448 |
| Thuy Tu | 47.104 | 188.416 |
| South Cau Hai | 16.300 | 65.200 |
| East Cau Hai | 22.103 | 88.412 |
| North Cau Hai | 16.907 | 67.628 |
| West Cau Hai | 8.526 | 34.104 |

**Table 7 - Production per catch session (in tons per hectare) and extrapolated bulk biomass (in tons), May 2006.**

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# Annexes

## Annex 1 – Comprehensive datasets of surveys 2006-2013, secondary data considered in this synthesis

**Survey Institute of Marine Resources and Environament, April 2006**

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) Tide (Flood) | Tide (Ebb) | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³= µg/l) | Zoobenthos biomass unit/m² | Zoobenthos biomass g/m³ | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T | | | | | | | | | | | | <0.01 | 0,24 | 0,04 | | 0,05 | 1,17 | 0,9 | 826 | 343831 | | | | 1700 | | |
| | 1 | M | | 0,5 | 27,8 | | | | | | 6,65 | 1,0 | 7,23 | | | | | | | | | | | | | | | |
| | | B | 0,5 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,17 | 0,05 | | 0,05 | 1,51 | 1,2 | 140 | 84720 | | | | 1100 | | |
| A | 2 | M | | 1,0 | 28,3 | | | | | | 7,11 | 1,0 | 7,01 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,23 | 0,05 | | 0,11 | 0,62 | 0,5 | 406 | 280200 | | | | 1100 | | |
| | 3 | M | | 0,7 | 28,9 | | | | | | 7,61 | 1,0 | 7,26 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud Clay Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,26 | 0,06 | | 0,05 | 1,03 | 0,6 | 246 | 211386 | | | | 1100 | | |
| | 4 | M | | 0,9 | 27,9 | | | | | | 7,47 | 1,0 | 7,10 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,25 | 0,08 | | 0,07 | 0,59 | 0,8 | 286 | 7853 | | | | 750 | | |
| B | 5 | M | | 1,1 | 28,4 | | | | | | 7,29 | 1,0 | 7,19 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,13 | 0,07 | | 0,03 | 0,89 | 0,5 | 113 | 224673 | | | | 0 | | |
| | 6 | M | | 0,4 | 28,9 | | | | | | 8,26 | 1,0 | 7,28 | | | | | | | | | | | | | | | |
| | | B | 0,4 | | | | | Mud Clay Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,09 | 0,03 | | 0,09 | 1,15 | 0,5 | 133 | 5500 | | | | 540 | | |
| | 7 | M | | 1,2 | 26,1 | | | | | | 7,34 | 5,0 | 6,63 | | | | | | | | | | | | | | | |
| | | B | 2,7 | | | | | Mud Clay | | | | | | | 0,15 | | | 0,09 | 0,94 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,14 | 0,05 | | 0,06 | 1,07 | 0,7 | 240 | 21533 | | | | 450 | | |
| C | 8 | M | | 1,3 | 23,1 | | | | | | 7,37 | 4,0 | 6,22 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,07 | | 0,07 | 0,53 | 0,9 | 266 | 17553 | | | | 450 | | |
| | 9 | M | | 0,7 | 26,7 | | | | | | 7,58 | 4,0 | 6,18 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,05 | 0,02 | | 0,09 | 0,96 | 2,1 | 440 | 80406 | | | | 2400 | | |
| | 10 | M | | 1,0 | 26,9 | | | | | | 7,76 | 15,0 | 6,10 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,09 | 0,03 | | 0,06 | 0,18 | 1,5 | 540 | 57833 | | | | 1700 | | |
| D | 11 | M | | 1,8 | 27,4 | | | | | | 7,76 | 15,5 | 6,71 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud Sand | | | | | | | 0,04 | | | 0,04 | 1,15 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,06 | 0,02 | | 0,07 | 0,15 | 1,1 | 540 | 60700 | | | | 150 | | |
| | 12 | M | | 1,4 | 27,3 | | | | | | 7,67 | 15,5 | 6,40 | | | | | | | | | | | | | | | |
| | | B | 1,4 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,05 | <0.02 | | 0,06 | 0,55 | 0,9 | 93 | 27480 | | | | 0 | | |
| | 13 | M | | 2,5 | 27,0 | | | | | | 8,07 | 27,5 | 7,03 | | | | | | | | | | | | | | | |
| | | B | 11,0 | | | | | Mud Sand | | | | | | | 0,08 | | | 0,03 | 0,09 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,13 | 0,04 | | 0,07 | 1,26 | 0,4 | 180 | 14766 | | | | 5400 | | |
| E | 14 | M | | 1,0 | 27,8 | | | | | | 7,52 | 8,0 | 6,68 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,12 | 0,05 | | 0,07 | 0,77 | 0,5 | 380 | 98546 | | | | 750 | | |
| | 15 | M | | 0,8 | 28,2 | | | | | | 7,65 | 5,0 | 6,78 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | <0.02 | | 0,05 | 1,07 | 2,2 | 746 | 642600 | | | | 0 | | |
| | 16 | M | | 1,0 | 26,4 | | | | | | 8,09 | 19,0 | 6,81 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,05 | | 0,05 | 0,72 | 2,3 | 226 | 17880 | | | | 11000 | | |
| F | 17 | M | | 1,8 | 27,1 | | | | | | 8,18 | 21,0 | 6,86 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud | | | | | | | 0,15 | | | 0,05 | 0,79 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,05 | 0,12 | | 0,07 | 0,65 | 1,1 | 806 | 334100 | | | | 7500 | | |
| | 18 | M | | 0,9 | 27,9 | | | | | | 8,50 | 15,5 | 7,08 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud Clay Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,04 | | 0,03 | 1,89 | 3,2 | 1226 | 48533 | | | | 5400 | | |
| | 19 | M | | 1,3 | 29,7 | | | | | | 8,19 | 17,5 | 6,89 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,06 | 0,05 | | 0,04 | 2,88 | 2,7 | 333 | 72240 | | | | 4500 | | |
| G | 20 | M | | 1,9 | 29,3 | | | | | | 8,13 | 17,0 | 7,14 | | | | | | | | | | | | | | | |
| | | B | 2,7 | | | | | Mud Sand | | | | | | | 0,13 | | | <0.01 | 0,32 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,07 | | 0,06 | 1,27 | 3,3 | 1266 | 1038867 | | | | 0 | | |
| | 21 | M | | 0,3 | 29,2 | | | | | | 8,20 | 18,0 | 6,33 | | | | | | | | | | | | | | | |
| | | B | 0,3 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | <0.02 | | 0,06 | 1,16 | 3,5 | 340 | 52900 | | | | 7500 | | |
| | 22 | M | | 1,4 | 29,5 | | | | | | 8,24 | 16,0 | 7,65 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | <0.02 | | 0,07 | 1,60 | 1,7 | 360 | 10166 | | | | 2100 | | |
| H | 23 | M | | 2,5 | 29,7 | | | | | | 8,25 | 15,5 | 7,86 | | | | | | | | | | | | | | | |
| | | B | 3,7 | | | | | Mud Sand | | | | | | | 0,05 | | | <0.01 | 0,36 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,03 | | 0,06 | 0,85 | 0,9 | 573 | 47493 | | | | 11000 | | |
| | 24 | M | | 2,5 | 30,2 | | | | | | 8,25 | 16,5 | 7,62 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud Clay | | | | | | | 0,05 | | | 0,02 | 0,79 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | <0.02 | | 0,07 | 1,65 | 0,9 | 553 | 306546 | | | | 2300 | | |
| | 25 | M | | 1,2 | 30,6 | | | | | | 8,37 | 13,5 | 7,13 | | | | | | | | | | | | | | | |
| | | B | 2,0 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | <0.02 | | 0,09 | 0,78 | 1,1 | 193 | 6566 | | | | 0 | | |
| I | 26 | M | | 2,7 | 31,2 | | | | | | 8,58 | 16,0 | 7,22 | | | | | | | | | | | | | | | |
| | | B | 3,3 | | | | | Mud Clay | | | | | | | 0,06 | | | <0.01 | 0,82 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,02 | | 0,05 | 0,69 | 1,5 | 273 | 23320 | | | | 3100 | | |
| | 27 | M | | 2,6 | 31,0 | | | | | | 8,44 | 18,5 | 7,27 | | | | | | | | | | | | | | | |
| | | B | 3,1 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,08 | | 0,06 | 1,48 | 0,9 | 593 | 63300 | | | | 3100 | | |
| | 28 | M | | 0,8 | 31,3 | | | | | | 8,25 | 12,0 | 6,35 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Mud | | | | | | | <0.05 | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,06 | | 0,05 | 0,75 | 1,3 | 586 | 315806 | | | | 7500 | | |
| J | 29 | M | | 1,0 | 29,2 | | | | | | 8,38 | 15,0 | 6,26 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,12 | | 0,05 | 0,71 | 1,1 | 120 | 14400 | | | | 150 | | |
| | 30 | M | | 2,5 | 24,8 | | | | | | 8,13 | 29,5 | 6,34 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud | | | | | | | | | | <0.01 | 0,84 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,05 | | 0,03 | 0,85 | 2,5 | | | | | | 11000 | | |
| | 31 | M | | 1,2 | 29,8 | | | | | | 8,84 | 10,0 | 6,91 | | | | | | | | | | | | | | | |
| | | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,08 | | 0,06 | 0,97 | 0,9 | 213 | 78220 | | | | 11000 | | |
| K | 32 | M | | 1,8 | 31,0 | | | | | | 8,10 | 14,0 | 6,92 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud Clay | | | | | | | <0.05 | | | 0,05 | 0,90 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,05 | 0,10 | | 0,03 | 1,18 | 2,6 | 226 | 52600 | | | | 2400 | | |
| | 33 | M | | 1,3 | 30,5 | | | | | | 8,10 | 15,0 | 6,81 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | 0,05 | 0,13 | | 0,03 | 0,88 | 2,2 | 3793 | 31113 | | | | 4500 | | |
| | 37 | M | | 1,6 | 30,3 | | | | | | 8,36 | 7,0 | 6,09 | | | | | | | | | | | | | | | |
| | | B | 1,6 | | | | | Mud Clay | | | | | | | <0.05 | | | <0.01 | 0,82 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,08 | | 0,04 | 0,64 | 3,1 | 160 | 36700 | | | | 2400 | | |
| | 34 | M | | 2,1 | 29,5 | | | | | | 8,26 | 20,0 | 6,88 | | | | | | | | | | | | | | | |
| L | | B | 2,1 | | | | | Mud Sand | | | | | | | <0.05 | | | | | | | | | | | | | |
| | | T | | | | | | | | | 8,51 | | | <0.01 | <0.05 | 0,14 | | 0,02 | 0,58 | 2,4 | 140 | 80620 | | | | 1100 | | |
| | 35 | M | | 1,9 | 31,0 | | | | | | | 11,0 | 7,03 | | | | | | | | | | | | | | | |
| | | B | 1,9 | | | | | Clay Sand | | | | | | | | | | <0.01 | 0,80 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.01 | <0.05 | 0,11 | | 0,03 | 0,79 | 1,3 | 273 | 65953 | | | | 2500 | | |
| | 36 | M | | 1,3 | 31,4 | | | | | | 8,80 | 11,0 | 7,23 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud Sand | | | | | | | 0,05 | | | <0.01 | 0,14 | | | | | | | | | |

## Survey Institute of Marine Resources and Environament, April 2006 Phytoplankton Species

**STATION A1**

| No | Sampling date: 03/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 14 | 280 |
| 2 | *Leptocylindrus danicus* | 30 | 600 |
| 3 | *Navicula lyra* | 1 | 20 |
| 4 | *Cymbella sp.* | 1 | 20 |
| 5 | *Pleurosigma sp* | 3 | 60 |
| 6 | *Nitzschia lorenziana* | 2 | 40 |
| 7 | *Pseudonitzschia sp.2* | 2 | 40 |
| 8 | *Surirella tenera v. nervosa* | 4 | 80 |
| 9 | *Scenedesmus spp.* | 4 | 80 |
| 10 | *Euglena sp1.* | 3 | 60 |
| 11 | *Gloeotila pelagica* | 13 | 260 |
| | | 77 | 1540 |

**STATION A2**

| No | Sampling date: 03/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 37 | 740 |
| 2 | *Leptocylindrus danicus* | 9 | 180 |
| 3 | *Chaetoceros socialis* | 8 | 160 |
| 4 | *Synedra gaillonii* | 2 | 40 |
| 5 | *Diploneis smithii* | 1 | 20 |
| 6 | *Nitzschia lorenziana* | 3 | 60 |
| 7 | *Nitzschia longissima v. reversa* | 2 | 40 |
| 8 | *Nitzschia sigma* | 3 | 60 |
| 9 | *Surirella tenera v. nervosa* | 2 | 40 |
| 10 | *Pediastrum sp.* | 1 | 20 |
| 11 | *Euglena sp1.* | 13 | 260 |
| 12 | *Phacus sp1.* | 4 | 80 |
| 13 | *Gloeotila pelagicum* | 73 | 1460 |
| | | | **3160** |

**STATION A3**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Synedra gaillonii* | 2 | 40 |
| 2 | *Nitzschia lorenziana* | 2 | 40 |
| 3 | *Nitzschia sigma* | 2 | 40 |
| 4 | *Nitzschia sp.* | 4 | 80 |
| 5 | *Surirella tenera v. nervosa* | 1 | 20 |
| 6 | *Euglena sp1.* | 2 | 40 |
| 7 | *Gloeotila pelagicum* | 6 | 120 |
| | | | **380** |

**STATION B4**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Diploneis smithii* | 7 | 70 |
| 2 | *Nitzschia lorenziana* | 31 | 310 |
| 3 | *Nitzschia longissima* | 18 | 180 |
| 4 | *Nitzschia longissima v. reversa* | 128 | 1280 |
| 5 | *Nitzschia sp.* | 16 | 160 |
| 6 | *Bacillaria paxillifera* | 54 | 540 |
| 7 | *Pediastrum sp.* | 1 | 10 |
| | | **255** | **2550** |

**STATION B5**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 12 | 240 |
| 2 | *Diploneis smithii* | 4 | 80 |
| 3 | *Nitzschia lorenziana* | 11 | 220 |
| 4 | *Nitzschia longissima* | 21 | 420 |
| 5 | *Nitzschia longissima v. reversa* | 140 | 2800 |
| 6 | *Nitzschia sigma* | 6 | 120 |
| 7 | *Nitzschia sp.* | 40 | 800 |
| 8 | *Bacillaria paxillifera* | 16 | 320 |
| 9 | *Gloeotila pelagicum* | 5 | 100 |
| | | **255** | **5100** |

**STATION B6**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |

**STATION G19**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 2 | 20 |
| 2 | *Chaetoceros spp.* | 4 | 40 |
| 3 | *Thalassionema nitzschioides* | 2 | 20 |
| 4 | *Synedra sp.* | 14 | 140 |
| 5 | *Grammatophora marina* | 55 | 550 |
| 6 | *Cocconeis scutellum* | 6 | 60 |
| 7 | *Trachyneis aspera* | 2 | 20 |
| 8 | *Diploneis bombus* | 1 | 10 |
| 9 | *Gyrosigma sp.* | 2 | 20 |
| 10 | *Pleurosigma angulatum* | 1 | 10 |
| 11 | *Pleurosigma elongatum* | 1 | 10 |
| 12 | *Pleurosigma pelagicum* | 1 | 10 |
| 13 | *Nitzschia longissima v. reversa* | 3 | 30 |
| 14 | *Nitzschia sigma v. intercedens* | 2 | 20 |
| 15 | *Nitzschia sp.1* | 4 | 40 |
| 16 | *Nitzschia sp.* | 2 | 20 |
| 17 | *Surirella ovalis* | 1 | 10 |
| 18 | *Dinophysis caudata* | 9 | 90 |
| 19 | *Dinophysis tripos* | 2 | 20 |
| 20 | *Ceratium furca* | 1 | 10 |
| 21 | *Gonyaulax polygramma* | 2 | 20 |
| 22 | *Gonyaulax spinifera* | 1 | 10 |
| 23 | *Gonyaulax verior* | 1 | 10 |
| 24 | *Alexandrium spp.* | 1 | 10 |
| 25 | *Oscillatoria sp1* | 249 | 2490 |
| 26 | *Oscillatoria sp2* | 4 | 40 |
| | | **373** | **3730** |

**STATION G20**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 10 | 200 |
| 2 | *Chaetoceros spp.* | 168 | 3360 |
| 3 | *Thalassionema nitzschioides* | 21 | 420 |
| 4 | *Thalassiothrix frauenfeldii* | 34 | 680 |
| 5 | *Synedra sp.* | 113 | 2260 |
| 6 | *Grammatophora marina* | 4 | 80 |
| 7 | *Cocconeis scutellum* | 5 | 100 |
| 8 | *Trachyneis aspera* | 3 | 60 |
| 9 | *Pleurosigma pelagicum* | 3,5 | 70 |
| 10 | *Nitzschia lorenziana* | 2 | 40 |
| 11 | *Nitzschia sigma* | 8 | 160 |
| 12 | *Pseudonitzschia spp.* | 1 | 20 |
| 13 | *Surirella ovalis* | 0,5 | 10 |
| 14 | *Prorocentrum gracile* | 1 | 20 |
| 15 | *Dinophysis caudata* | 4 | 80 |
| 16 | *Dinophysis tripos* | 1 | 20 |
| 17 | *Dinophysis sp.* | 1 | 20 |
| 18 | *Ceratium breve* | 0,5 | 10 |
| 19 | *Ceratium deflexum* | 1 | 20 |
| 20 | *Ceratium furca* | 1 | 20 |
| 21 | *Gonyaulax sp* | 1 | 20 |
| 22 | *Protoperidinium conicum* | 0,5 | 10 |
| 23 | *Protoperidinium depressum* | 1 | 20 |
| 24 | *Protoperidinium sp.2* | 8 | 160 |
| 25 | *Alexandrium spp.* | 12 | 240 |
| 26 | *Oscillatoria sp1* | 1 | 20 |
| | | **406** | **8120** |

**STATION G21**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus cf. subtilis* | 1 | 10 |
| 2 | *Thalassiosira spp.* | 18 | 180 |
| 3 | *Guinardia flaccida* | 1 | 10 |
| 4 | *Guinardia striata* | 2 | 20 |
| 5 | *Chaetoceros spp.* | 84 | 840 |
| 6 | *Cerataulina bergonii* | 2 | 20 |
| 7 | *Thalassionema nitzschioides* | 54 | 540 |
| 8 | *Thalassiothrix frauenfeldii* | 16 | 160 |
| 9 | *Synedra sp.* | 116 | 1160 |

| | | | |
|---|---|---|---|
| 1 | *Melosira sp.* | 2 | 20 |
| 2 | *Navicula palpebralis* | 5 | 50 |
| 3 | *Diploneis smithii* | 1 | 10 |
| 4 | *Nitzschia lorenziana* | 5 | 50 |
| 5 | *Nitzschia longissima* | 1 | 10 |
| 6 | *Nitzschia longissima v. reversa* | 1 | 10 |
| 7 | *Nitzschia sigma* | 9 | 90 |
| 8 | *Nitzschia sp.* | 5 | 50 |
| 9 | *Bacillaria paxillifera* | 3 | 30 |
| 10 | *Surirella tenera v. nervosa* | 1 | 10 |
| 11 | *Campylodiscus undulatus* | 1 | 10 |
| | | **34** | **340** |

**STATION C7**

| No | Sampling date: 03/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 1 | 20 |
| 2 | *Thalassiothrix frauenfeldii* | 1 | 20 |
| 3 | *Navicula palpebralis* | 1 | 20 |
| 4 | *Navicula elegans* | 3 | 60 |
| 5 | *Trachyneis aspera* | 6 | 120 |
| 6 | *Diploneis smithii* | 8 | 160 |
| 7 | *Nitzschia lorenziana* | 13 | 260 |
| 8 | *Nitzschia longissima* | 2 | 40 |
| 9 | *Nitzschia longissima v. reversa* | 36 | 720 |
| 10 | *Nitzschia sigma* | 86 | 1720 |
| 11 | *Nitzschia sigma v. intercedens* | 6 | 120 |
| 12 | *Pseudonitzschia spp.* | 8 | 160 |
| 13 | *Surirella tenera v. nervosa* | 1 | 20 |
| | | **172** | **3440** |

**STATION C8**

| No | Sampling date: 03/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Synedra pulchella* | 3 | 60 |
| 2 | *Grammatophora marina* | 2 | 40 |
| 3 | *Navicula elegans* | 2 | 40 |
| 4 | *Diploneis smithii* | 3 | 60 |
| 5 | *Pleurosigma sp* | 4 | 80 |
| 6 | *Amphiprora alata* | 1 | 20 |
| 7 | *Nitzschia lorenziana* | 14 | 280 |
| 8 | *Nitzschia longissima* | 11 | 220 |
| 9 | *Nitzschia longissima v. reversa* | 80 | 1600 |
| 10 | *Nitzschia sigma* | 2 | 40 |
| 11 | *Nitzschia sp.* | 19 | 380 |
| 12 | *Bacillaria paxillifera* | 8 | 160 |
| 13 | *Surirella gemma* | 3 | 60 |
| 14 | *Surirella tenera v. nervosa* | 1 | 20 |
| 15 | *Campylodiscus biangulatum* | 1 | 20 |
| 16 | *Prorocentrum micans* | 1 | 20 |
| | | **155** | **3100** |

**STATION C9**

| No | Sampling date: 03/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | Cyclotella sp. | 2 | 40 |
| 2 | Synedra gaillonii | 1 | 20 |
| 3 | Grammatophora marina | 1 | 20 |
| 4 | Navicula cancellata | 1 | 20 |
| 5 | Navicula elegans | 0,5 | 10 |
| 6 | Trachyneis aspera | 1 | 20 |
| 7 | Diploneis smithii | 2 | 40 |
| 8 | Pleurosigma elongatum | 1 | 20 |
| 9 | Nitzschia lorenziana | 16 | 320 |
| 10 | Nitzschia longissima | 3 | 60 |
| 11 | Nitzschia longissima v. reversa | 166 | 3320 |
| 12 | Nitzschia sigma | 2 | 40 |
| 13 | Nitzschia sp. | 53 | 1060 |
| 14 | Bacillaria paxillifera | 262 | 5240 |
| 15 | Pseudonitzschia spp. | 29 | 580 |
| 16 | Surirella tenera v. nervosa | 1 | 20 |
| | | **541,5** | **10830** |

**STATION D10**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus cf. subtilis* | 1 | 10 |
| 2 | *Thalassiosira spp.* | 27 | 270 |

| | | | |
|---|---|---|---|
| 10 | *Cocconeis scutellum* | 1 | 10 |
| 11 | *Navicula palpebralis* | 1 | 10 |
| 12 | *Nitzschia sigma* | 2 | 20 |
| 13 | *Nitzschia sigma v. intercedens* | 2 | 20 |
| 14 | *Bacillaria paxillifera* | 5 | 50 |
| 15 | *Pseudonitzschia spp.* | 8 | 80 |
| 16 | *Dinophysis caudata* | 1 | 10 |
| 17 | *Gonyaulax sp* | 8 | 80 |
| 18 | *Gonyaulax verior* | 1 | 10 |
| 19 | *Protoperidinium steinii* | 12 | 120 |
| 20 | *Protoperidinium conicum* | 3 | 30 |
| 21 | *Protoperidinium sp.2* | 1 | 10 |
| 22 | *Protoperidinium spp.* | 4 | 40 |
| 23 | *Alexandrium spp.* | 22 | 220 |
| | | **365** | **3650** |

**STATION H22**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 10 | 200 |
| 2 | *Guinardia flaccida* | 2 | 40 |
| 3 | *Chaetoceros spp.* | 26 | 520 |
| 4 | *Thalassionema nitzschioides* | 8 | 160 |
| 5 | *Thalassiothrix frauenfeldii* | 12 | 240 |
| 6 | *Synedra sp.* | 24 | 480 |
| 7 | *Grammatophora marina* | 1 | 20 |
| 8 | *Cocconeis scutellum* | 9 | 180 |
| 9 | *Navicula palpebralis* | 1 | 20 |
| 10 | *Navicula lyra* | 1 | 20 |
| 11 | *Pleurosigma affine* | 1 | 20 |
| 12 | *Pleurosigma angulatum* | 1 | 20 |
| 13 | *Amphiprora alata* | 1 | 20 |
| 14 | *Nitzschia lorenziana* | 2 | 40 |
| 15 | *Nitzschia longissima v. reversa* | 1 | 20 |
| 16 | *Nitzschia sigma* | 5 | 100 |
| 17 | *Prorocentrum mexicanum* | 2 | 40 |
| 18 | *Prorocentrum gracile* | 0,5 | 10 |
| 19 | *Dinophysis caudata* | 2 | 40 |
| 20 | *Polykrikos schwartzii* | 0,5 | 10 |
| 21 | *Ceratium furca* | 33 | 660 |
| 22 | *Ceratium trichoceros* | 0,5 | 10 |
| 23 | *Ceratium macroceros* | 1 | 20 |
| 24 | *Gonyaulax sp* | 3 | 60 |
| 25 | *Protoperidinium steinii* | 8 | 160 |
| 26 | *Protoperidinium divergens* | 3 | 60 |
| 27 | *Protoperidinium depressum* | 2 | 40 |
| 28 | *Protoperidinium pellucidum* | 3 | 60 |
| 29 | *Protoperidinium latissimum* | 1 | 20 |
| 30 | *Protoperidinium spp.* | 5 | 100 |
| 31 | *Alexandrium spp.* | 2 | 40 |
| | | **171,5** | **3430** |

**STATION H23**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Asteromphalus cleveanus* | 1 | 10 |
| 2 | *Thalassiosira spp.* | 9 | 90 |
| 3 | *Chaetoceros spp.* | Nhieu | Nhieu |
| 4 | *Thalassionema nitzschioides* | 3 | 30 |
| 5 | *Thalassiothrix frauenfeldii* | 13 | 130 |
| 6 | *Synedra sp.* | 12 | 120 |
| 7 | *Grammatophora marina* | 7 | 70 |
| 8 | *Cocconeis scutellum* | 20 | 200 |
| 9 | *Navicula palpebralis* | 2 | 20 |
| 10 | *Navicula elegans* | 4 | 40 |
| 11 | *Trachyneis aspera* | 2 | 20 |
| 12 | *Diploneis smithii* | 2 | 20 |
| 13 | *Pleurosigma pelagicum* | 1 | 10 |
| 14 | *Nitzschia sigma* | 4 | 40 |
| 15 | *Pseudonitzschia spp.* | 1 | 10 |
| 16 | *Campylodiscus biangulatum* | 2 | 20 |
| 17 | *Prorocentrum mexicanum* | 6 | 60 |
| 18 | *Gymnodinium sanguineum* | 2 | 20 |
| 19 | *Polykrikos schwartzii* | 4 | 40 |
| 20 | *Ceratium furca* | 10 | 100 |
| 21 | *Gonyaulax sp* | 1 | 10 |
| 22 | *Gonyaulax spinifera* | 4 | 40 |
| 23 | *Gonyaulax rotundata* | 2 | 20 |
| 24 | *Protoperidinium steinii* | 9 | 90 |
| 25 | *Protoperidinium conicum* | 1 | 10 |

| No | SPECIES | QUANTITY | CELLS/L |
|---|---|---|---|
| 3 | *Skeletonema costatum* | 18 | 180 |
| 4 | *Leptocylindrus danicus* | 3 | 30 |
| 5 | *Biddulphia sp.* | 1 | 10 |
| 6 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 7 | *Synedra gaillonii* | 1 | 10 |
| 8 | *Navicula membranacea* | 7 | 70 |
| 9 | *Pleurosigma angulatum* | 1 | 10 |
| 10 | *Nitzschia sigma* | 24 | 240 |
| 11 | *Nitzschia sp.* | 2 | 20 |
| 12 | *Surirella ovalis* | 3 | 30 |
| 13 | *Protoperidinium sp.* | 2 | 20 |
| | | **92** | **920** |

**STATION D11**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 10 | 100 |
| 2 | *Coscinodiscus cf. subtilis* | 1 | 10 |
| 3 | *Thalassiosira spp.* | 40 | 400 |
| 4 | *Skeletonema costatum* | 12 | 120 |
| 5 | *Chaetoceros curvisetus* | 16 | 160 |
| 6 | *Chaetoceros spp.* | 8 | 80 |
| 7 | *Thalassionema nitzschioides* | 1 | 10 |
| 8 | *Thalassiothrix frauenfeldii* | 3 | 30 |
| 9 | *Nitzschia longissima* | 4 | 40 |
| 10 | *Nitzschia sigma* | 25 | 250 |
| 11 | *Pseudonitzschia sp.1* | 1 | 10 |
| 12 | *Surirella ovalis* | 6 | 60 |
| 13 | *Ceratium breve* | 1 | 10 |
| 14 | *Gonyaulax sp* | 17 | 170 |
| 15 | *Protoperidinium pellucidum* | 1 | 10 |
| 16 | *Protoperidinium sp.2* | 7 | 70 |
| 17 | *Alexandrium spp.* | 4 | 40 |
| 18 | *Oscillatoria sp2* | 2 | 20 |
| | | **159** | **1590** |

**STATION D12**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus jonesianus* | 1 | 10 |
| 2 | *Thalassiosira spp.* | 20 | 200 |
| 3 | *Chaetoceros spp.* | 24 | 240 |
| 4 | *Thalassionema nitzschioides* | 2 | 20 |
| 5 | *Thalassiothrix frauenfeldii* | 6 | 60 |
| 6 | *Pleurosigma angulatum* | 1 | 10 |
| 7 | *Nitzschia longissima* | 3 | 30 |
| 8 | *Nitzschia sigma* | 11 | 110 |
| 9 | *Nitzschia sigma v. intercedens* | 2 | 20 |
| 10 | *Pseudonitzschia sp.1* | 4 | 40 |
| 11 | *Surirella ovalis* | 1 | 10 |
| 12 | *Gonyaulax sp* | 5 | 50 |
| 13 | *Protoperidinium spp.* | 21 | 210 |
| | | **101** | **1010** |

**STATION E13**

| No | Sampling date: 04/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 3 | 60 |
| 2 | *Cyclotella striata* | 1 | 20 |
| 3 | *Cyclotella comta* | 1 | 20 |
| 4 | *Cyclotella sp.* | 1 | 20 |
| 5 | *Coscinodiscus asteromphalus* | 1 | 20 |
| 6 | *Coscinodiscus jonesianus* | 1 | 20 |
| 7 | *Coscinodiscus cf. subtilis* | 1 | 20 |
| 8 | *Coscinodiscus sp.* | 1 | 20 |
| 9 | *Thalassiosira spp.* | 16 | 320 |
| 10 | *Leptocylindrus danicus* | 4 | 80 |
| 11 | *Chaetoceros spp.* | 27 | 540 |
| 12 | *Biddulphia longicruris* | 0,5 | 10 |
| 13 | *Thalassionema nitzschioides* | 2 | 40 |
| 14 | *Thalassiothrix frauenfeldii* | 5 | 100 |
| 15 | *Navicula palpebralis* | 3 | 60 |
| 16 | *Navicula elegans* | 1 | 20 |
| 17 | *Amphiprora alata* | 1 | 20 |
| 18 | *Nitzschia lorenziana* | 1 | 20 |
| 19 | *Nitzschia longissima* | 5 | 100 |
| 20 | *Nitzschia sigma* | 4 | 80 |
| 21 | *Nitzschia sigma v. intercedens* | 0,5 | 10 |
| 22 | *Nitzschia sp.* | 1 | 20 |

| No | SPECIES | QUANTITY | CELLS/L |
|---|---|---|---|
| 26 | *Protoperidinium divergens* | 9 | 90 |
| 27 | *Protoperidinium depressum* | 1 | 10 |
| 28 | *Protoperidinium pellucidum* | 1 | 10 |
| 29 | *Protoperidinium spp.* | 4 | 40 |
| 30 | *Alexandrium spp.* | 1 | 10 |
| | | **128** | **1280** |

**STATION H24**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 5 | 50 |
| 2 | *Thalassionema nitzschioides* | 1 | 10 |
| 3 | *Thalassiothrix frauenfeldii* | 7 | 70 |
| 4 | *Synedra sp.* | 15 | 150 |
| 5 | *Grammatophora marina* | 3 | 30 |
| 6 | *Cocconeis scutellum* | 7 | 70 |
| 7 | *Trachyneis aspera* | 2 | 20 |
| 8 | *Nitzschia lorenziana* | 1 | 10 |
| 9 | *Nitzschia sigma* | 3 | 30 |
| 10 | *Pseudonitzschia spp.* | 2 | 20 |
| 11 | *Campylodiscus echeneis* | 1 | 10 |
| 12 | *Campylodiscus biangulatum* | 1 | 10 |
| 13 | *Prorocentrum mexicanum* | 9 | 90 |
| 14 | *Dinophysis caudata* | 1 | 10 |
| 15 | *Gymnodinium sp* | 2 | 20 |
| 16 | *Ceratium furca* | 3 | 30 |
| 17 | *Gonyaulax spinifera* | 6 | 60 |
| 18 | *Gonyaulax verior* | 1 | 10 |
| 19 | *Protoperidinium steinii* | 3 | 30 |
| 20 | *Protoperidinium conicum* | 1 | 10 |
| 21 | *Protoperidinium divergens* | 4 | 40 |
| 22 | *Protoperidinium pellucidum* | 1 | 10 |
| 23 | *Protoperidinium spp.* | 18 | 180 |
| | | **97** | **970** |

**STATION 25**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira nummuloides* | 2 | 20 |
| 2 | *Chaetoceros spp.* | 80 | 800 |
| 3 | *Thalassiothrix frauenfeldii* | 1 | 10 |
| 4 | *Synedra sp.* | 5 | 50 |
| 5 | *Grammatophora marina* | 5 | 50 |
| 6 | *Navicula elegans* | 1 | 10 |
| 7 | *Diploneis smithii* | 1 | 10 |
| 8 | *Pleurosigma angulatum* | 1 | 10 |
| 9 | *Nitzschia lorenziana* | 2 | 20 |
| 10 | *Nitzschia sigma* | 6 | 60 |
| 11 | *Pseudonitzschia spp.* | 5 | 50 |
| 12 | *Prorocentrum sp.* | 1 | 10 |
| 13 | *Gymnodinium sanguineum* | 1 | 10 |
| 14 | *Gyrodinium spirale* | 2 | 20 |
| 15 | *Ceratium furca* | 10 | 100 |
| 16 | *Gonyaulax sp* | 2 | 20 |
| 17 | *Gonyaulax spinifera* | 4 | 40 |
| 18 | *Protoperidinium conicum* | 3 | 30 |
| 19 | *Protoperidinium spp.* | 16 | 160 |
| 20 | *Alexandrium spp.* | 1 | 10 |
| | | **149** | **1490** |

**STATION 26**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 2 | 20 |
| 2 | *Thalassionema nitzschioides* | 1 | 10 |
| 3 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 4 | *Synedra sp.* | 4 | 40 |
| 5 | *Grammatophora marina* | 7 | 70 |
| 6 | *Navicula elegans* | 1 | 10 |
| 7 | *Trachyneis aspera* | 2 | 20 |
| 8 | *Pleurosigma naviculaceum* | 1 | 10 |
| 9 | *Nitzschia lorenziana* | 5 | 50 |
| 10 | *Nitzschia longissima* | 3 | 30 |
| 11 | *Pseudonitzschia spp.* | 1 | 10 |
| 12 | *Campylodiscus echeneis* | 1 | 10 |
| 13 | *Prorocentrum mexicanum* | 4 | 40 |
| 14 | *Dinophysis caudata* | 1 | 10 |
| 15 | *Gymnodinium sp* | 1 | 10 |
| 16 | *Gyrodinium spirale* | 1 | 10 |

| | | | |
|---|---|---|---|
| 23 | *Pseudonitzschia sp.1* | 3 | 60 |
| 24 | *Dinophysis caudata* | 5 | 100 |
| 25 | *Dinophysis cf. fortii* | 1 | 20 |
| 26 | *Closterium sp* | 3,5 | 70 |
| | | **93,5** | **1870** |

**STATION E14**

| No | Sampling date: 04/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Leptocylindrus danicus* | 3 | 60 |
| 2 | *Chaetoceros spp.* | 11 | 220 |
| 3 | *Synedra pulchella* | 8 | 160 |
| 4 | *Navicula lyra* | 0,5 | 10 |
| 5 | *Diploneis bombus* | 1 | 20 |
| 6 | *Pleurosigma angulatum* | 3 | 60 |
| 7 | *Amphiprora alata* | 5 | 100 |
| 8 | *Nitzschia lorenziana* | 7 | 140 |
| 9 | *Nitzschia longissima* | 16 | 320 |
| 10 | *Nitzschia sigma* | 4 | 80 |
| 11 | *Nitzschia sp.* | 20 | 400 |
| 12 | *Bacillaria paxillifera* | 20 | 400 |
| 13 | *Prorocentrum gracile* | 0,5 | 10 |
| 14 | *Pediastrum sp.* | 1 | 20 |
| 15 | *Scenedesmus spp.* | 30 | 600 |
| 16 | *Closterium sp* | 4 | 80 |
| 17 | *Gloeotila pelagica* | 23 | 460 |
| | | **157** | **3140** |

**STATION E15**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira nummuloides* | 8 | 160 |
| 2 | *Skeletonema costatum* | 6 | 120 |
| 3 | *Chaetoceros curvisetus* | 40 | 800 |
| 4 | *Chaetoceros spp.* | 189 | 3780 |
| 5 | *Synedra pulchella* | 9 | 180 |
| 6 | *Navicula palpebralis* | 1 | 20 |
| 7 | *Pleurosigma angulatum* | 3 | 60 |
| 8 | *Nitzschia longissima* | 9 | 180 |
| 9 | *Nitzschia longissima v. reversa* | 2 | 40 |
| 10 | *Nitzschia sigma* | 1 | 20 |
| 11 | *Nitzschia sigma v. intercedens* | 0,5 | 10 |
| 12 | *Nitzschia sp.* | 18 | 360 |
| 13 | *Surirella tenera v. nervosa* | 0,5 | 10 |
| 14 | *Protoperidinium spp.* | 1 | 20 |
| 15 | *Peridinium quinquecorne* | 2 | 40 |
| 16 | *Pediastrum sp.* | 2 | 40 |
| 17 | *Scenedesmus spp.* | 26 | 520 |
| 18 | *Staurastrum sp.* | 3 | 60 |
| 19 | *Closterium sp* | 4 | 80 |
| | | **325** | **6500** |

**STATION F16**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cyclotella sp.* | 1 | 20 |
| 2 | *Coscinodiscus asteromphalus* | 1 | 20 |
| 3 | *Coscinodiscus jonesianus* | 3 | 60 |
| 4 | *Coscinodiscus jonesianus v. commutata* | 1 | 20 |
| 5 | *Coscinodiscus nodulifer* | 1 | 20 |
| 6 | *Thalassiosira spp.* | 7 | 140 |
| 7 | *Skeletonema costatum* | 8 | 160 |
| 8 | *Chaetoceros spp.* | 78 | 1560 |
| 9 | *Thalassionema nitzschioides* | 8 | 160 |
| 10 | *Thalassiothrix frauenfeldii* | 19 | 380 |
| 11 | *Pleurosigma affine* | 1 | 20 |
| 12 | *Nitzschia lorenziana* | 1 | 20 |
| 13 | *Nitzschia longissima* | 2 | 40 |
| 14 | *Nitzschia longissima v. reversa* | 2 | 40 |
| 15 | *Pseudonitzschia spp.* | 5 | 100 |
| 16 | *Dinophysis caudata* | 6 | 120 |
| 17 | *Dinophysis cf. fortii* | 1 | 20 |
| 18 | *Dinophysis sp.* | 1 | 20 |
| 19 | *Gyrodinium spirale* | 1 | 20 |
| 20 | *Ceratium trichoceros* | 1 | 20 |
| 21 | *Protoperidinium spp.* | 4 | 80 |
| 22 | *Peridinium quinquecorne* | 4 | 80 |
| | | **156** | **3120** |

| | | | |
|---|---|---|---|
| 17 | *Ceratium furca* | 12 | 120 |
| 18 | *Ceratium tripos* | 1 | 10 |
| 19 | *Gonyaulax spinifera* | 3 | 30 |
| 20 | *Protoperidinium depressum* | 2 | 20 |
| 21 | *Protoperidinium pellucidum* | 1 | 10 |
| 22 | *Protoperidinium leonis* | 1 | 10 |
| 23 | *Protoperidinium spp.* | 14 | 140 |
| | | **71** | **710** |

**STATION 27**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 2 | 20 |
| 2 | *Chaetoceros spp.* | 68 | 680 |
| 3 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 4 | *Synedra sp.* | 5 | 50 |
| 5 | *Cocconeis scutellum* | 6 | 60 |
| 6 | *Pleurosigma pelagicum* | 1 | 10 |
| 7 | *Nitzschia lorenziana* | 3 | 30 |
| 8 | *Nitzschia longissima* | 1 | 10 |
| 9 | *Nitzschia sigma* | 10 | 100 |
| 10 | *Prorocentrum mexicanum* | 3 | 30 |
| 11 | *Ceratium furca* | 1 | 10 |
| 12 | *Ceratium macroceros* | 1 | 10 |
| 13 | *Gonyaulax verior* | 1 | 10 |
| 14 | *Protoperidinium conicum* | 1 | 10 |
| 15 | *Protoperidinium divergens* | 1 | 10 |
| 16 | *Protoperidinium spp.* | 15 | 150 |
| | | **121** | **1210** |

**STATION 28**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 10 | 100 |
| 2 | *Rhizosolenia hyalina* | 1 | 10 |
| 3 | *Chaetoceros spp.* | 1 | 10 |
| 4 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 5 | *Cocconeis scutellum* | 10 | 100 |
| 6 | *Pleurosigma sp* | 1 | 10 |
| 7 | *Nitzschia longissima* | 1 | 10 |
| 8 | *Nitzschia sigma* | 4 | 40 |
| 9 | *Ceratium furca* | 9 | 90 |
| 10 | *Gonyaulax verior* | 1 | 10 |
| 11 | *Protoperidinium steinii* | 6 | 60 |
| 12 | *Alexandrium sp* | 1 | 10 |
| | | **47** | **470** |

**STATION 29**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cyclotella comta* | 1 | 10 |
| 2 | *Thalassionema nitzschioides* | 1 | 10 |
| 3 | *Thalassiothrix frauenfeldii* | 1 | 10 |
| 4 | *Synedra sp.* | 7 | 70 |
| 5 | *Nitzschia lorenziana* | 2 | 20 |
| 6 | *Nitzschia longissima* | 3 | 30 |
| 7 | *Bacillaria paxillifera* | 1 | 10 |
| 8 | *Pseudonitzschia sp.1* | 4 | 40 |
| 9 | *Gloeotila pelagica* | 4 | 40 |
| | | **24** | **240** |

**STATION 30**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus jonesianus* | 1 | 20 |
| 2 | *Lauderia borealis* | 1 | 20 |
| 3 | *Leptocylindrus danicus* | 2 | 40 |
| 4 | *Guinardia flaccida* | 7 | 140 |
| 5 | *Guinardia striata* | 10 | 200 |
| 6 | *Rhizosolenia hyalina* | 0,5 | 10 |
| 7 | *Chaetoceros spp.* | 11 | 220 |
| 8 | *Eucampia cornuta* | 1,5 | 30 |
| 9 | *Thalassionema nitzschioides* | 8 | 160 |
| 10 | *Thalassiothrix frauenfeldii* | 121 | 2420 |
| 11 | *Synedra gaillonii* | 2 | 40 |
| 12 | *Navicula palpebralis* | 1 | 20 |
| 13 | *Navicula membranacea* | 14 | 280 |
| 14 | *Navicula elegans* | 1 | 20 |

**STATION F17**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus asteromphalus* | 2 | 40 |
| 2 | *Coscinodiscus cf. subtilis* | 1 | 20 |
| 3 | *Thalassiosira spp.* | 14 | 280 |
| 4 | *Skeletonema costatum* | 1 | 20 |
| 5 | *Chaetoceros spp.* | 62 | 1240 |
| 6 | *Thalassionema nitzschioides* | 9 | 180 |
| 7 | *Thalassiothrix frauenfeldii* | 9 | 180 |
| 8 | *Synedra gaillonii* | 0,5 | 10 |
| 9 | *Pleurosigma affine* | 0,5 | 10 |
| 10 | *Pleurosigma angulatum* | 0,5 | 10 |
| 11 | *Pleurosigma pelagicum* | 1 | 20 |
| 12 | *Nitzschia lorenziana* | 3 | 60 |
| 13 | *Nitzschia longissima* | 1 | 20 |
| 14 | *Nitzschia longissima v. reversa* | 4 | 80 |
| 15 | *Nitzschia sigma v. intercedens* | 1 | 20 |
| 16 | *Bacillaria paxillifera* | 3 | 60 |
| 17 | *Pseudonitzschia spp.* | 6 | 120 |
| 18 | *Dinophysis caudata* | 5 | 100 |
| 19 | *Dinophysis cf. fortii* | 2 | 40 |
| 20 | *Dinophysis mitra* | 1 | 20 |
| 21 | *Protoperidinium divergens* | 2 | 40 |
| 22 | *Protoperidinium oceanicum* | 1 | 20 |
| 23 | *Protoperidinium spp.* | 5 | 100 |
| 24 | *Gloeotila pelagica* | 4 | 80 |
| | | **138,5** | **2770** |

**STATION F18**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus cf. subtilis* | 1 | 10 |
| 2 | *Thalassiosira spp.* | 9 | 90 |
| 3 | *Skeletonema costatum* | 8 | 80 |
| 4 | *Chaetoceros spp.* | 36 | 360 |
| 5 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 6 | *Synedra sp.* | 2 | 20 |
| 7 | *Navicula elegans* | 1 | 10 |
| 8 | *Gyrosigma sp.* | 1 | 10 |
| 9 | *Pleurosigma cf. fasciola* | 1 | 10 |
| 10 | *Nitzschia lorenziana* | 6 | 60 |
| 11 | *Nitzschia longissima* | 4 | 40 |
| 12 | *Nitzschia longissima v. reversa* | 3 | 30 |
| 13 | *Nitzschia sigma* | 1 | 10 |
| 14 | *Pseudonitzschia spp.* | 4 | 40 |
| 15 | *Dinophysis cf. fortii* | 1 | 10 |
| 16 | *Pediastrum sp.* | 1 | 10 |
| | | **81** | **810** |

| | | | |
|---|---|---|---|
| 15 | *Trachyneis aspera* | 1 | 20 |
| 16 | *Pleurosigma affine* | 1 | 20 |
| 17 | *Pleurosigma angulatum* | 3 | 60 |
| 18 | *Pleurosigma naviculaceum* | 10 | 200 |
| 19 | *Nitzschia lorenziana* | 1 | 20 |
| 20 | *Nitzschia longissima* | 2 | 40 |
| 21 | *Nitzschia sigma* | 9 | 180 |
| 22 | *Pseudonitzschia sp.1* | 1 | 20 |
| 23 | *Campylodiscus echeneis* | 0,5 | 10 |
| 24 | *Prorocentrum micans* | 1 | 20 |
| 25 | *Dinophysis caudata* | 8 | 160 |
| 26 | *Dinophysis sp.* | 0,5 | 10 |
| 27 | *Ceratium breve* | 0,5 | 10 |
| 28 | *Ceratium deflexum* | 0,5 | 10 |
| 29 | *Ceratium furca* | 3 | 60 |
| 30 | *Ceratium fusus* | 3 | 60 |
| 31 | *Ceratium kofoidii* | 1 | 20 |
| 32 | *Ceratium trichoceros* | 1 | 20 |
| 33 | *Protoperidinium steinii* | 1 | 20 |
| 34 | *Protoperidinium conicum* | 0,5 | 10 |
| 35 | *Protoperidinium divergens* | 3 | 60 |
| 36 | *Goniodoma polyedra* | 1 | 20 |
| 37 | *Dictyocha speculum* | 0,5 | 10 |
| 38 | *Oscillatoria sp2* | 6 | 120 |
| | | **240** | **4800** |

**STATION K32**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiothrix frauenfeldii* | 4 | 40 |
| 2 | *Synedra sp.* | 2 | 20 |
| 3 | *Navicula lyra* | 1 | 10 |
| 4 | *Gyrosigma strigile* | 1 | 10 |
| 5 | *Nitzschia longissima* | 5 | 50 |
| 6 | *Nitzschia longissima v. reversa* | 2 | 20 |
| 7 | *Nitzschia sigma v. intercedens* | 3 | 30 |
| 8 | *Nitzschia sp.* | 8 | 80 |
| 9 | *Pseudonitzschia sp.1* | 2 | 20 |
| 10 | *Ceratium furca* | 1 | 10 |
| 11 | *Gonyaulax verior* | 1 | 10 |
| 12 | *Gonyaulax rotundata* | 2 | 20 |
| 13 | *Protoperidinium steinii* | 4 | 40 |
| 14 | *Protoperidinium sp.* | 1 | 10 |
| 15 | *Alexandrium sp* | 2 | 20 |
| | | **39** | **390** |

**STATION K33**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiothrix frauenfeldii* | 3 | 30 |
| 2 | *Nitzschia lorenziana* | 1 | 10 |
| 3 | *Nitzschia longissima v. reversa* | 1 | 10 |
| 4 | *Pseudonitzschia sp.1* | 2 | 20 |
| 5 | *Campylodiscus biangulatum* | 1 | 10 |
| 6 | *Ceratium furca* | 1 | 10 |
| 7 | *Protoperidinium steinii* | 1 | 10 |
| 8 | *Alexandrium sp* | 20 | 200 |
| 9 | *Oscillatoria sp2* | 1 | 10 |
| | | **31** | **310** |

**STATION K37**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 2 | *Synedra sp.* | 1 | 10 |
| 3 | *Diploneis smithii* | 1 | 10 |
| 4 | *Nitzschia longissima* | 2 | 20 |
| 5 | *Nitzschia sigma* | 1 | 10 |
| 6 | *Pseudonitzschia spp.* | 1 | 10 |
| 7 | *Alexandrium spp.* | 16 | 160 |
| | | **24** | **240** |

**STATION 134**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Chaetoceros spp.* | 64 | 640 |
| 2 | *Thalassiothrix frauenfeldii* | 1 | 10 |
| 3 | *Synedra sp.* | 1 | 10 |
| 4 | *Grammatophora marina* | 4 | 40 |

| | | | |
|---|---|---|---|
| 5 | *Nitzschia longissima* | 1 | 10 |
| 6 | *Nitzschia sigma* | 5 | 50 |
| 7 | *Nitzschia sp.* | 2 | 20 |
| 8 | *Pseudonitzschia spp.* | 3 | 30 |
| 9 | *Alexandrium spp.* | 268 | 2680 |
| | | **349** | **3490** |

**STATION 135**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Chaetoceros sp.* | 4 | 40 |
| 2 | *Thalassiothrix frauenfeldii* | 1 | 10 |
| 3 | *Nitzschia lorenziana* | 4 | 40 |
| 4 | *Nitzschia longissima* | 2 | 20 |
| 5 | *Nitzschia longissima v. reversa* | 1 | 10 |
| 6 | *Nitzschia sigma* | 3 | 30 |
| 7 | *Gonyaulax sp* | 1 | 10 |
| 8 | *Alexandrium pseudogonyaulax* | 586 | 5860 |
| | | **602** | **6020** |

**STATION 136**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassionema nitzschioides* | 2 | 20 |
| 2 | *Cocconeis scutellum* | 2 | 20 |
| 3 | *Gyrosigma strigile* | 1 | 10 |
| 4 | *Nitzschia longissima* | 2 | 20 |
| 5 | *Nitzschia sigma* | 7 | 70 |
| 6 | *Pseudonitzschia sp.1* | 2 | 20 |
| 7 | *Alexandrium spp.* | 1234 | 12340 |
| | | **1250** | **12500** |

## Survey Institute of Marine Resources and Environment, April 2006 Zooplankton Species

**STATION A1**

| No | Sampling date: 03/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Penilia schmackeri* | 1 | 50 |
| 2 | *Paracalanus parvus* | 14 | 700 |
| 3 | *Schmackeria dubia* | 1 | 50 |
| 4 | *Alldiaptomus sp.* | 1 | 50 |
| 5 | *Oithona similis* | 2 | 100 |
| 6 | *Thermocyclops hyalinus* | 34 | 1700 |
| 7 | *Corycaeus dahli* | 1 | 50 |
| 8 | *Oikopleura dioica* | 1 | 50 |
| 9 | *AT T«m* | 1 | 50 |
| 10 | *Acartiella sinensis* | 1 | 50 |
| | ***Total*** | **57** | **2850** |

**STATION A2**

| No | Sampling date: 03/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 2 | 20 |
| 2 | *Acartia clausi* | 8 | 80 |
| 3 | *Oithona similis* | 2 | 20 |
| 4 | *Thermocyclops hyalinus* | 1 | 10 |
| 5 | *Cypridina noctiluca* | 2 | 20 |
| | ***Total*** | **15** | **150** |

**STATION A3**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 11 | 550 |
| 2 | *Pseudodiaptomus insisus* | 1 | 50 |
| 3 | *Acartia pacifica* | 3 | 150 |
| 4 | *Oithona similis* | 6 | 300 |
| 5 | *Oithona brevicornis* | 12 | 600 |
| 6 | *Thermocyclops hyalinus* | 6 | 300 |
| 7 | *Euterpina acutifront* | 1 | 50 |
| 8 | *Harparticoda* | 4 | 200 |
| 9 | *Acarbella sinemis* | 7 | 350 |
| | | **51** | **2550** |

**STATION B4**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Acartiella sinensis* | 66 | 3300 |
| | ***Total*** | **66** | **3300** |

**STATION B5**

| No | Sampling date: 04/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Acartiella sinensis* | 202 | 40400 |
| | ***Total*** | **202** | **40400** |

**STATION B6**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Piaphanosoma sarsi* | 1 | 50 |
| 2 | *Acartia clausi* | 50 | 2500 |
| 3 | *Harparticoda* | 1 | 50 |
| 4 | *Acarbella sinemis* | 234 | 11700 |
| | | **286** | **14300** |

**STATION C7**

| No | Sampling date: 08/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Schmackeria bulbosa* | 2 | 100 |
| 2 | *Acartia pacifica* | 7 | 350 |
| 3 | *Thermocyclops hyalinus* | 18 | 900 |

**STATION G20**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Sagitta crassa* | 1 | 50 |
| 2 | *Pseudodiaptomus insisus* | 2 | 100 |
| 3 | *Temora turbinata Dana* | 1 | 50 |
| 4 | *Labidocera minuta* | 2 | 100 |
| 5 | *Acartia clausi* | 4 | 200 |
| 6 | *Euterpina acutifront* | 1 | 50 |
| 7 | *Oikopleura dioica* | 2 | 100 |
| 8 | *C¸ ton* | 2 | 100 |
| | | **15** | **750** |

**STATION G21**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Pseudodiaptomus insisus* | 2 | 100 |
| 2 | *Acartia clausi* | 1 | 50 |
| 3 | *Oithona nana* | 4 | 200 |
| 4 | *Oithona similis* | 1 | 50 |
| 5 | *Oncaea venusta* | 6 | 300 |
| 6 | *Microcyclop varican* | 4 | 200 |
| 7 | *Clytemnestra scutellata* | 1 | 50 |
| 8 | *Amphipoda* | 1 | 50 |
| 9 | *Oikopleura dioica* | 3 | 150 |
| 10 | *Copepoda* | 10 | 500 |
| | ***Total*** | **33** | **1650** |

**STATION H22**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 15 | 1500 |
| 2 | *Centropages orsini* | 1 | 100 |
| 3 | *Oithona similis* | 10 | 1000 |
| 4 | *Oncaea venusta* | 1 | 100 |
| 5 | *Oikopleura dioica* | 3 | 300 |
| 6 | *AT Balanus* | 11 | 1100 |
| 7 | *Cypridina noctiluca* | 8 | 800 |
| | ***Total*** | **49** | **4900** |

**STATION H23**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 3 | 150 |
| 2 | *Centropages orsini* | 5 | 250 |
| 3 | *Temora turbinata Dana* | 1 | 50 |
| 4 | *Labidocera minuta* | 1 | 50 |
| 5 | *Acartia clausi* | 1 | 50 |
| 6 | *Oithona similis* | 1 | 50 |
| 7 | *Thermocyclops hyalinus* | 3 | 150 |
| 8 | *Oikopleura dioica* | 7 | 350 |
| 9 | *AT Gastropoda* | 12 | 600 |
| 10 | *AT Balanus* | 2 | 100 |
| 11 | *Cypridina noctiluca* | 2 | 100 |
| | ***Total*** | **38** | **1900** |

**STATION H24**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 1 | 50 |
| 2 | *Centropages orsini* | 1 | 50 |
| 3 | *Labidocera minuta* | 3 | 150 |
| 4 | *Acartia clausi* | 1 | 50 |
| 5 | *Oithona similis* | 1 | 50 |
| 6 | *Euterpina acutifront* | 1 | 50 |
| 7 | *Oikopleura dioica* | 8 | 400 |

| | | | |
|---|---|---|---|
| 4 | *AT Brachyura* | 2 | 100 |
| 5 | *C¸ ton* | 1 | 50 |
| 6 | *AT «m* | 40 | 2000 |
| 7 | *Cypridina noctiluca* | 1 | 50 |
| 8 | *Acartiella sinensis* | 3 | 150 |
| | ***Total*** | **74** | **3700** |

**STATION C8**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 1 | 50 |
| 2 | *Oncaea conifera* | 1 | 50 |
| 3 | *AT Bivalvia* | 1 | 50 |
| 4 | *Acartiella sinensis* | 8 | 400 |
| | ***Total*** | **11** | **550** |

**STATION C9**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 6 | 60 |
| 2 | *Oithona nana* | 1 | 10 |
| 3 | *Acarbella sinemis* | 10 | 100 |
| | | **17** | **170** |

**STATION D10**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | Acartia clausi | 1 | 10 |
| 2 | Amphipoda | 1 | 10 |
| | ***Total*** | **2** | **20** |

**STATION D11**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 19 | 190 |
| 2 | *Centropages orsini* | 2 | 20 |
| 3 | *Acartia clausi* | 51 | 510 |
| 4 | *Oithona similis* | 1 | 10 |
| 5 | *Euterpina acutifront* | 2 | 20 |
| 6 | *Hyalocylis striata* | 1 | 10 |
| 7 | *Oikopleura dioica* | 19 | 190 |
| 8 | *AT Bivalvia* | 5 | 50 |
| 9 | *AT Actinotrocha* | 2 | 20 |
| | ***Total*** | **102** | **1020** |

**STATION D12**

| No | Sampling date: 05/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Oikopleura dioica* | 1 | 50 |
| 2 | *Cypridina noctiluca* | 1 | 50 |
| 3 | *Acartiella sinensis* | 31 | 1550 |
| | ***Total*** | **33** | **1650** |

**STATION E13**

| No | Sampling date: 03/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Podon schmackeri* | 1 | 10 |
| 2 | *Paracalanus parvus* | 28 | 280 |
| 3 | *Oithona similis* | 2 | 20 |
| 4 | *Oikopleura dioica* | 2 | 20 |
| | ***Total*** | **33** | **330** |

**STATION E15**

| No | Sampling date:04/ 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 2 | 20 |
| 2 | *Acartia clausi* | 1 | 10 |
| 3 | *Euterpina acutifront* | 1 | 10 |

| | | | |
|---|---|---|---|
| 8 | *AT Bivalvia* | 1 | 50 |
| 9 | *AT Gastropoda* | 1 | 50 |
| 10 | *C¸ ton* | 1 | 50 |
| 11 | *Cypridina noctiluca* | 1 | 50 |
| | ***Total*** | **20** | **1000** |

**STATION 25**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 6 | 300 |
| 2 | *Labidocera minuta* | 3 | 150 |
| 3 | *Acartia clausi* | 1 | 50 |
| 4 | *Corycaeus andrewsi* | 1 | 50 |
| 5 | *Corycaeus dalhi* | 1 | 50 |
| 6 | *Oikopleura dioica* | 1 | 50 |
| 7 | *AT Gastropoda* | 3 | 150 |
| 8 | *Cypridina noctiluca* | 1 | 50 |
| | ***Total*** | **17** | **850** |

**STATION 26**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 6 | 60 |
| 2 | *Acartia clausi* | 6 | 60 |
| 3 | *Oithona similis* | 9 | 90 |
| 4 | *Oikopleura dioica* | 3 | 30 |
| 5 | *Copepoda* | 12 | 120 |
| 6 | *Cypridina noctiluca* | 24 | 240 |
| | ***Total*** | **60** | **600** |

**STATION 27**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 8 | 400 |
| 2 | *Pseudodiaptomus insisus* | 2 | 100 |
| 3 | *Acartia clausi* | 1 | 50 |
| 4 | *Oithona similis* | 23 | 1150 |
| 5 | *Corycaeus andrewsi* | 1 | 50 |
| 6 | *Corycaeus dalhi* | 1 | 50 |
| 7 | *Euterpina acutifront* | 2 | 100 |
| 8 | *Amphipoda* | 1 | 50 |
| 9 | *C¸ ton* | 1 | 50 |
| 10 | *Cypridina noctiluca* | 1 | 50 |
| 11 | *Acarbella sinemis* | 1 | 50 |
| | ***Total*** | **42** | **2100** |

**STATION 28**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 8 | 400 |
| 2 | *Acartia clausi* | 2 | 100 |
| 3 | *Oithona brevicornis* | 27 | 1350 |
| 4 | *Corycaeus dalhi* | 3 | 150 |
| 5 | *AT Actinotrocha* | 1 | 50 |
| 6 | *C¸ ton* | 2 | 100 |
| 7 | *Cypridina noctiluca* | 1 | 50 |
| | ***Total*** | **44** | **2200** |

**STATION 29**

| No | Sampling date: 07/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 1 | 50 |
| 2 | *Acartia clausi* | 1 | 50 |
| 3 | *AT Brachyura* | 1 | 50 |
| | ***Total*** | **3** | **150** |

**STATION 30**

| No | Sampling date: 07/04/2006 |
|---|---|

| No | SPECIES | QUANTITY | INDS/M3 |
|---|---|---|---|
| 4 | *Cypridina noctiluca* | 1 | 10 |
| | ***Total*** | **5** | **50** |

**STATION F16**

| No | Sampling date: 04/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 32 | 320 |
| 2 | *Centropages orsini* | 1 | 10 |
| 3 | *Acartia clausi* | 3 | 30 |
| 4 | *Oithona similis* | 2 | 20 |
| 5 | *Oikopleura dioica* | 5 | 50 |
| | ***Total*** | **43** | **430** |

**STATION F17**

| No | Sampling date: 04/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Thermocyclops hyalinus* | 1 | 50 |
| 2 | *Corycaeus dalhi* | 6 | 300 |
| 3 | *Oikopleura dioica* | 12 | 600 |
| | ***Total*** | **19** | **950** |

**STATION F18**

| No | Sampling date: 04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 3 | 30 |
| 2 | *Acartia clausi* | 1 | 10 |
| 3 | *Oithona similis* | 4 | 40 |
| 4 | *Euterpina acutifront* | 3 | 30 |
| 5 | *Acarbella sinemis* | 3 | 30 |
| | | **14** | **140** |

| No | SPECIES | QUANTITY | INDS/M3 |
|---|---|---|---|
| 1 | *Sagitta enflata* | 6 | 60 |
| 2 | *Sagitta sp.* | 1 | 10 |
| 3 | *Penilia schmackeri* | 1 | 10 |
| 4 | *Canthocalanus pauper* | 1 | 10 |
| 5 | *Acrocalanus gilber* | 1 | 10 |
| 6 | *Paracalanus parvus* | 22 | 220 |
| 7 | *Centropages orsini* | 1 | 10 |
| 8 | *Temora turbinata Dana* | 5 | 50 |
| 9 | *Acartia clausi* | 3 | 30 |
| 10 | *Pontellina plumata* | 3 | 30 |
| 11 | *Oithona nana* | 2 | 20 |
| 12 | *Oithona similis* | 6 | 60 |
| 13 | *Corycaeus andrewsi* | 1 | 10 |
| 14 | *Corycaeus dalhi* | 1 | 10 |
| 15 | *Euterpina acutifront* | 10 | 100 |
| 16 | *Oikopleura dioica* | 6 | 60 |
| 17 | *Acarbella sinemis* | 4 | 40 |
| | | **74** | **740** |

**STATION K32**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 1 | 10 |
| 2 | *Temora turbinata Dana* | 1 | 10 |
| 3 | *Labidocera minuta* | 2 | 20 |
| 4 | *Acartia clausi* | 8 | 80 |
| 5 | *Oithona similis* | 1 | 10 |
| 6 | *Cypridina noctiluca* | 1 | 10 |
| | ***Total*** | **14** | **140** |

**STATION K33**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 1 | 10 |
| 2 | *Acartia clausi* | 12 | 120 |
| 3 | *Oikopleura dioica* | 1 | 10 |
| | ***Total*** | **14** | **140** |

**STATION K37**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 3 | 30 |
| 2 | *Acartia clausi* | 1 | 10 |
| 3 | *Oithona similis* | 1 | 10 |
| 4 | *AT gastropoda* | 1 | 10 |
| 5 | *Cypridina noctiluca* | 4 | 40 |
| 6 | *Acartiella sinensis* | 9 | 90 |
| | | **19** | **190** |

**STATION L34**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 9 | 450 |
| 2 | *Temora turbinata Dana* | 2 | 100 |
| 3 | *Oithona similis* | 3 | 150 |
| 4 | *Cypridina noctiluca* | 3 | 150 |
| | ***Total*** | **17** | **850** |

**STATION L35**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Labidocera minuta* | 2 | 20 |
| 2 | *Acartia clausi* | 4 | 40 |
| 3 | *Oithona similis* | 5 | 50 |
| 4 | *Cypridina noctiluca* | 6 | 60 |
| | ***Total*** | **17** | **170** |

**STATION L36**

| No | Sampling date: 06/04/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 4 | 40 |
| | **Total** | **4** | **40** |

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| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/m² | g/m³ | | | | | | |
| | | T | | | | | | | | | | | | 0,003 | <0.05 | 0,06 | | 0,02 | <0.05 | 1,9 | | | | | | 2800 | | |
| | 1 | M | | 0,6 | 28,5 | | | | | | 6,45 | 1,0 | 5,20 | | | | | | | | | | | | | | | |
| | | B | 0,5 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,005 | <0.05 | <0.02 | | 0,04 | <0.05 | 1,4 | | | | | | 46000 | | |
| A | 2 | M | | 0,5 | 28,4 | | | | | | 6,23 | 1,0 | 5,20 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | <0.05 | 0,04 | | 0,03 | 0,06 | 0,5 | | | | | | 2700 | | |
| | 3 | M | | 1,0 | 31,3 | | | | | | 6,45 | 1,0 | 7,30 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud Clay Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,07 | 0,03 | | 0,03 | 1,51 | 2,6 | | | | | | 46000 | | |
| | 4 | M | | 1,0 | 31,5 | | | | | | 7,87 | 10,0 | 7,70 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,004 | 0,05 | 0,04 | | 0,07 | 0,79 | 8,2 | | | | | | >240000 | | |
| B | 5 | M | | 1,2 | 29,9 | | | | | | 8,15 | 14,5 | 7,50 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud Clay | | | | | | | 0,06 | | | 0,09 | 0,81 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,05 | 0,02 | | 0,02 | 0,75 | 0,6 | | | | | | 1500 | | |
| | 6 | M | | 1,0 | 31,6 | | | | | | 8,96 | 10,0 | 8,30 | | | | | | | | | | | | | | | |
| | | B | 0,4 | | | | | Mud Clay Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,06 | 0,02 | | 0,04 | 0,99 | 3,5 | | | | | | 21000 | | |
| | 7 | M | | 1,8 | 31,7 | | | | | | 8,21 | 14,5 | 7,50 | | | | | | | | | | | | | | | |
| | | B | 2,7 | | | | | Mud Clay | | | | | | | 0,13 | | | 0,04 | 0,64 | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,002 | 0,06 | 0,02 | | 0,04 | 0,83 | 3,3 | | | | | | 15000 | | |
| C | 8 | M | | 1,0 | 31,5 | | | | | | 8,65 | 13,0 | 7,40 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,003 | 0,06 | 0,05 | | 0,04 | 1,07 | 2,6 | | | | | | 1100 | | |
| | 9 | M | | 0,7 | 32,4 | | | | | | 8,26 | 14,5 | 7,60 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,07 | <0.02 | | 0,06 | 1,31 | 4,2 | | | | | | 2000 | | |
| | 10 | M | | 1,0 | 30,5 | | | | | | 7,99 | 18,0 | 6,10 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,06 | 0,06 | | 0,05 | 1,88 | 4,3 | | | | | | 2000 | | |
| D | 11 | M | | 1,2 | 30,5 | | | | | | 8,10 | 18,0 | 6,10 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,06 | 0,04 | | 0,04 | 1,74 | 5,9 | | | | | | 2800 | | |
| | 12 | M | | 1,0 | 31,2 | | | | | | 8,10 | 17,0 | 6,20 | | | | | | | | | | | | | | | |
| | | B | 1,4 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,07 | 0,02 | | 0,04 | 1,08 | 1,1 | | | | | | 1100 | | |
| | 13 | M | | 2,0 | 29,0 | | | | | | 8,21 | 30,0 | 7,10 | | | | | | | | | | | | | | | |
| | | B | 11,0 | | | | | Mud Sand | | | | | | | 0,09 | | | 0,03 | 1,03 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,07 | 0,02 | | 0,03 | 1,64 | 1,0 | | | | | | >240000 | | |
| E | 14 | M | | 1,5 | 28,1 | | | | | | 8,23 | 31,5 | 7,50 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,007 | 0,21 | 0,02 | | 0,04 | 0,92 | 0,2 | | | | | | 2800 | | |
| | 15 | M | | 1,1 | 31,0 | | | | | | 8,14 | 13,5 | 7,50 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Mud | | | | | | | 0,17 | | | 0,03 | 0,53 | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,004 | 0,08 | 0,05 | | 0,05 | 0,54 | 3,2 | | | | | | 2100 | | |
| | 16 | M | | 0,9 | 30,0 | | | | | | 8,03 | 23,0 | 6,15 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,003 | 0,06 | 0,05 | | 0,02 | 0,90 | 3,6 | | | | | | 110000 | | |
| F | 17 | M | | 1,0 | 30,1 | | | | | | 8,07 | 24,0 | 6,80 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud | | | | | | | 0,09 | | | 0,04 | 0,69 | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,002 | 0,07 | 0,04 | | 0,03 | 1,72 | 1,5 | | | | | | 2300 | | |
| | 18 | M | | 1,0 | 30,5 | | | | | | 7,96 | 21,0 | 6,00 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud Clay Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,002 | 0,08 | 0,05 | | 0,04 | 1,47 | 3,2 | | | | | | 4300 | | |
| | 19 | M | | 1,4 | 31,8 | | | | | | 8,34 | 25,0 | 7,90 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,004 | 0,07 | 0,04 | | 0,04 | 1,32 | 4,3 | | | | | | 24000 | | |
| G | 20 | M | | 1,1 | 31,6 | | | | | | 8,09 | 24,0 | 6,90 | | | | | | | | | | | | | | | |
| | | B | 2,7 | | | | | Mud Sand | | | | | | | 0,06 | | | 0,07 | 2,09 | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,002 | 0,05 | 0,05 | | 0,03 | 1,63 | 2,8 | | | | | | 4300 | | |
| | 21 | M | | 0,6 | 32,3 | | | | | | 8,21 | 25,0 | 7,80 | | | | | | | | | | | | | | | |
| | | B | 0,3 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,004 | 0,10 | 0,08 | | 0,04 | 0,95 | 6,1 | | | | | | 15000 | | |
| | 22 | M | | 0,9 | 32,0 | | | | | | 8,35 | 23,0 | 7,80 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,004 | 0,08 | 0,04 | | 0,04 | 0,94 | 1,7 | | | | | | >240000 | | |
| H | 23 | M | | 1,0 | 31,1 | | | | | | 8,15 | 22,5 | 7,40 | | | | | | | | | | | | | | | |
| | | B | 3,7 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,004 | 0,06 | 0,04 | | 0,04 | 1,02 | 4,5 | | | | | | 2800 | | |
| | 24 | M | | 1,0 | 32,1 | | | | | | 8,20 | 22,5 | 7,60 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,003 | 0,06 | 0,04 | | 0,06 | 1,81 | 4,7 | | | | | | 4300 | | |
| | 25 | M | | 1,2 | 31,0 | | | | | | 8,22 | 21,5 | 7,60 | | | | | | | | | | | | | | | |
| | | B | 2,0 | | | | | Mud Sand | | | | | | | 0,05 | | | 0,04 | 0,98 | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,004 | 0,07 | 0,05 | | 0,04 | 1,34 | 6,7 | | | | | | 7500 | | |
| I | 26 | M | | 1,5 | 31,0 | | | | | | 8,17 | 20,0 | 7,10 | | | | | | | | | | | | | | | |
| | | B | 3,3 | | | | | Mud Clay | | | | | | | 0,05 | | | 0,09 | 2,68 | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,004 | 0,06 | 0,05 | | 0,04 | 1,22 | 2,9 | | | | | | 24000 | | |
| | 27 | M | | 1,3 | 31,4 | | | | | | 8,21 | 19,0 | 7,20 | | | | | | | | | | | | | | | |
| | | B | 3,1 | | | | | Mud Clay | | | | | | | 0,05 | | | 0,09 | 0,76 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,07 | <0.02 | | 0,05 | 2,10 | 0,3 | | | | | | 24000 | | |
| | 28 | M | | 0,8 | 31,7 | | | | | | 8,50 | 17,5 | 7,50 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Mud | | | | | | | 0,05 | | | 0,03 | 3,35 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,07 | 0,06 | | 0,02 | 1,08 | 4,9 | | | | | | 2100 | | |
| J | 29 | M | | 1,0 | 31,5 | | | | | | 8,48 | 22,0 | 8,10 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,06 | 0,04 | | 0,02 | 1,81 | 3,8 | | | | | | 15000 | | |
| | 30 | M | | 2,0 | 28,0 | | | | | | 8,03 | 34,0 | 8,40 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,002 | 0,06 | <0.02 | | 0,02 | 3,46 | 3,1 | | | | | | 3500 | | |
| | 31 | M | | 1,1 | 31,2 | | | | | | 8,33 | 17,0 | 5,60 | | | | | | | | | | | | | | | |
| | | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,06 | 0,02 | | 0,02 | 0,83 | 1,7 | | | | | | 7500 | | |
| K | 32 | M | | 1,4 | 32,6 | | | | | | 8,40 | 20,5 | 7,20 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | 0,002 | 0,06 | 0,02 | | 0,02 | 0,81 | 1,5 | | | | | | 110000 | | |
| | 33 | M | | 1,1 | 32,4 | | | | | | 8,06 | 24,5 | 6,70 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,07 | 0,02 | | 0,02 | 0,81 | 2,5 | | | | | | 110000 | | |
| | 37 | M | | 1,4 | 32,0 | | | | | | 8,18 | 16,0 | 6,60 | | | | | | | | | | | | | | | |
| | | B | 1,6 | | | | | Mud Clay | | | | | | | <0.05 | | | 0,07 | 1,31 | | | | | | | | | |
| | | T | | | | | | | | | | | | <0.002 | 0,07 | 0,02 | | 0,02 | 1,06 | 1,2 | | | | | | 3500 | | |
| | 34 | M | | 1,5 | 31,5 | | | | | | 8,40 | 20,0 | 5,80 | | | | | | | | | | | | | | | |
| L | | B | 2,1 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |
| | 35 | T | | | | | | | | | | | | <0.002 | 0,07 | 0,04 | | 0,02 | 0,55 | 0,7 | | | | | | 15000 | | |
| | | M | | 1,5 | 33,2 | | | | | | 8,62 | 20,0 | 8,55 | | | | | | | | | | | | | | | |
| | | B | 1,9 | | | | | Clay Sand | | | | | | | | | | | | | | | | | | | | |
| | 36 | T | | | | | | | | | | | | <0.002 | 0,07 | 0,05 | | 0,05 | 0,76 | 1,3 | | | | | | 110000 | | |
| | | M | | 1,3 | 33,3 | | | | | | 8,63 | 20,5 | 9,10 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud Sand | | | | | | | | | | | | | | | | | | | | |

# Survey Institute of Marine Resources and Environment, May 2006 Phytoplankton Species

**STATION A1**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 6 | 120 |
| 2 | *Melosira granulata v. angustissima* | 1090 | 21800 |
| 3 | *Asterionella sp.* | 1145 | 22900 |
| 4 | *Nitzschia lorenziana* | 2 | 40 |
| 5 | *Dinophysis sp.* | 1 | 20 |
| 6 | *Alexandrium sp* | 3 | 60 |
| 7 | *Pediastrum sp.* | 10 | 200 |
| 8 | *Scenedesmus quadricauda* | 15 | 300 |
| 9 | *Spirogyra sp* | 1 | 20 |
| 10 | *Staurastrum sp.* | 90 | 1800 |
| 11 | *Phacus cf. longicauda* | 1 | 20 |
| 12 | *Dinoflagellate group* | 1 | 20 |
| | | **2365** | **47300** |

**STATION A2**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata v. angustissima* | 610 | 6100 |
| 2 | *Thalassiothrix frauenfeldii* | 5 | 50 |
| 3 | *Asterionella sp.* | 300 | 3000 |
| 4 | *Gyrosigma sp.* | 1 | 10 |
| 5 | *Surirella tenera v. nervosa* | 1 | 10 |
| 6 | *Protoperidinium sp.* | 1 | 10 |
| 7 | *Peridinium sp.* | 50 | 500 |
| 8 | *Alexandrium sp* | 6 | 60 |
| 9 | *Dictyocha fibula* | 1 | 10 |
| 10 | *Pediastrum sp.* | 5 | 50 |
| 11 | *Scenedesmus quadricauda* | 4 | 40 |
| 12 | *Staurastrum sp.* | 161 | 1610 |
| 13 | *Euglena sp2.* | 1 | 10 |
| | | **1146** | **11460** |

**STATION A3**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Thalassiosira sp.* | 1 | 20 |
| 2 | *Chaetoceros spp.* | 8 | 160 |
| 3 | *Synedra gaillonii* | 1 | 20 |
| 4 | *Amphiprora alata* | 1 | 20 |
| 5 | *Nitzschia longissima v. reversa* | 1 | 20 |
| 6 | *Nitzschia sigma* | 2 | 40 |
| 7 | *Surirella ovalis* | 2 | 40 |
| 8 | *Surirella tenera v. nervosa* | 2 | 40 |
| 9 | *Gymnodinium sanguineum* | 1 | 20 |
| 10 | *Oscillatoria sp2* | 4 | 80 |
| 11 | *Pediastrum sp.* | 2 | 40 |
| 12 | *Scenedesmus sp.* | 19 | 380 |
| 13 | *Gloeotila pelagicum* | 6 | 120 |
| 14 | *Dinoflagellates group* | 489 | 9780 |
| | | **539** | **10780** |

**STATION B4**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 6 | 60 |
| 2 | *Asterionella sp.* | 195 | 1950 |
| 3 | *Diploneis smithii* | 3 | 30 |
| 4 | *Pleurosigma sp* | 1 | 10 |
| 5 | *Nitzschia lorenziana* | 1 | 10 |
| 6 | *Nitzschia longissima v. reversa* | 7 | 70 |
| 7 | *Nitzschia palpebralis* | 1 | 10 |
| 8 | *Ceratium sp.* | 1 | 10 |
| 9 | *Peridinium sp.* | 173 | 1730 |
| 10 | *Alexandrium sp* | 1 | 10 |
| 11 | *Anabaena sp* | 8 | 80 |
| 12 | *Pediastrum simplex* | 1 | 10 |
| 13 | *Staurastrum sp.* | 4 | 40 |
| 14 | *Phacus sp1.* | 2 | 20 |
| 15 | *Dinoflagellate group* | 4 | 40 |
| | | **408** | 4080 |

**STATION B5**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Cyclotella sp.* | 1 | 10 |
| 2 | *Thalassiosira spp.* | 7 | 70 |
| 3 | *Navicula elegans* | 2 | 20 |

**STATION G20**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Coscinodiscus cf. subtilis* | 1 | 10 |
| 2 | *Thalassiosira spp.* | 11 | 110 |
| 3 | *Trachyneis aspera* | 1 | 10 |
| 4 | *Pleurosigma angulatum* | 1 | 10 |
| 5 | *Pleurosigma naviculaceum* | 2 | 20 |
| 6 | *Nitzschia lorenziana* | 1 | 10 |
| 7 | *Nitzschia longissima v. reversa* | 2 | 20 |
| 8 | *Nitzschia sigma* | 14 | 140 |
| 9 | *Prorocentrum micans* | 5 | 50 |
| 10 | *Metadinophysis sinensis* | 1 | 10 |
| 11 | *Gymnodinium sanguineum* | 1 | 10 |
| 12 | *Ceratium furca* | 2 | 20 |
| 13 | *Gonyaulax polygramma* | 3 | 30 |
| 14 | *Gonyaulax spinifera* | 3 | 30 |
| 15 | *Protoperidinium steinii* | 5 | 50 |
| 16 | *Protoperidinium pellucidum* | 18 | 180 |
| 17 | *Protoperidinium sp.* | 44 | 440 |
| 18 | *Peridinium quinquecorne* | 6 | 60 |
| 19 | *Alexandrium sp* | 2 | 20 |
| 20 | *Dinoflagellates group* | 5 | 50 |
| | | **128** | **1280** |

**STATION G21**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Coscinodiscus bipartitus* | 1 | 10 |
| 2 | *Actinoptychus splendens* | 1 | 10 |
| 3 | *Thalassiosira spp.* | 208 | 2080 |
| 4 | *Pleurosigma affine* | 2 | 20 |
| 5 | *Pleurosigma angulatum* | 1 | 10 |
| 6 | *Pleurosigma sp* | 1 | 10 |
| 7 | *Nitzschia sigma* | 7 | 70 |
| 8 | *Prorocentrum micans* | 2 | 20 |
| 9 | *Metadinophysis sinensis* | 1 | 10 |
| 10 | *Ceratium furca* | 2 | 20 |
| 11 | *Ceratium fusus* | 1 | 10 |
| 12 | *Gonyaulax sp* | 2 | 20 |
| 13 | *Protoperidinium pellucidum* | 13 | 130 |
| 14 | *Protoperidinium sp.* | 3 | 30 |
| 15 | *Peridinium quinquecorne* | 6 | 60 |
| 16 | *Scrippsiella sp.* | 2 | 20 |
| 17 | *Dictyocha fibula* | 1 | 10 |
| 18 | *Dictyocha speculum* | 1 | 10 |
| 19 | *Trichodesmim thythrocun* | 1 | 10 |
| 20 | *Dinoflagellate group* | 13 | 130 |
| 21 | *Diatom* | 2 | 20 |
| | | **271** | **2710** |

**STATION H22**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Thalassiosira spp.* | 7 | 70 |
| 2 | *Grammatophora marina* | 3 | 30 |
| 3 | *Cocconeis scutellum* | 131 | 1310 |
| 4 | *Gyrosigma spenceri* | 1 | 10 |
| 5 | *Pleurosigma affine* | 7 | 70 |
| 6 | *Pleurosigma angulatum* | 1 | 10 |
| 7 | *Pleurosigma sp* | 4 | 40 |
| 8 | *Amphiprora alata* | 1 | 10 |
| 9 | *Nitzschia longissima v. reversa* | 1 | 10 |
| 10 | *Nitzschia sigma* | 10 | 100 |
| 11 | *Nitzschia sigma v. intercedens* | 1 | 10 |
| 12 | *Gymnodinium sanguineum* | 2 | 20 |
| 13 | *Ceratium furca* | 3 | 30 |
| 14 | *Gonyaulax sp* | 15 | 150 |
| 15 | *Protoperidinium pellucidum* | 4 | 40 |
| 16 | *Protoperidinium pentagonum* | 1 | 10 |
| 17 | *Protoperidinium sp.2* | 2 | 20 |
| 18 | *Protoperidinium sp.* | 13 | 130 |
| 19 | *Peridinium sp.* | 11 | 110 |
| 20 | *Alexandrium sp* | 1 | 10 |
| 21 | *Alexandrium pseudogonyaulax* | 8 | 80 |
| 22 | *Anabaena sp* | 34 | 340 |
| 23 | *Dinoflagellate group* | 21 | 210 |
| 24 | *Diatom* | 2 | 20 |
| | | **284** | **2840** |

| | | | |
|---|---|---|---|
| 4 | *Trachyneis aspera* | 3 | 30 |
| 5 | *Diploneis smithii* | 4 | 40 |
| 6 | *Gyrosigma sp.* | 1 | 10 |
| 7 | *Pleurosigma pelagicum* | 1 | 10 |
| 8 | *Nitzschia longissima* | 2 | 20 |
| 9 | *Nitzschia sigma* | 18 | 180 |
| 10 | *Surirella ovalis* | 7 | 70 |
| 11 | *Prorocentrum mexicanum* | 1 | 10 |
| 12 | *Gonyaulax polygramma* | 2 | 20 |
| 13 | *Gonyaulax verior* | 1 | 10 |
| 14 | *Protoperidinium steinii* | 1 | 10 |
| 15 | *Protoperidinium sp.2* | 15 | 150 |
| 16 | *Peridinium sp.* | 1 | 10 |
| 17 | *Alexandrium sp* | 1 | 10 |
| 18 | *Oscillatoria sp2.* | 5 | 50 |
| 19 | *Dinoflagellate group* | 54 | 540 |
| | | **127** | **1270** |

**STATION B6**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Chaetoceros subtilis* | 4 | 40 |
| 2 | *Diploneis smithii* | 2 | 20 |
| 3 | *Pleurosigma sp* | 2 | 20 |
| 4 | *Nitzschia sigma* | 1 | 10 |
| 5 | *Protoperidinium sp.2* | 3 | 30 |
| 6 | *Peridinium quinquecorne* | 1 | 10 |
| 7 | *Peridinium sp.* | 104 | 1040 |
| 8 | *Alexandrium sp* | 54 | 540 |
| 9 | *Oscillatoria sp1* | 13 | 130 |
| 10 | *Anabaena sp* | 1 | 10 |
| 11 | *Spirogyra ionia* | 5 | 50 |
| 12 | *Dinoflagellate group* | 3 | 30 |
| 13 | *Diatom* | 1 | 10 |
| | | **194** | **1940** |

**STATION C7**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus asteromphalus* | 1 | 10 |
| 2 | *Thalassiosira sp.* | 3 | 30 |
| 3 | *Navicula palpebralis* | 2 | 20 |
| 4 | *Navicula cancellata* | 2 | 20 |
| 5 | *Diploneis smithii* | 2 | 20 |
| 6 | *Gyrosigma sp.* | 1 | 10 |
| 7 | *Pleurosigma sp* | 4 | 40 |
| 8 | *Nitzschia lorenziana* | 3 | 30 |
| 9 | *Nitzschia longissima* | 1 | 10 |
| 10 | *Nitzschia sigma* | 11 | 110 |
| 11 | *Nitzschia sp.* | 1 | 10 |
| 12 | *Surirella tenera* | 3 | 30 |
| 13 | *Surirella sp.* | 2 | 20 |
| 14 | *Campylodiscus sp.* | 4 | 40 |
| 15 | *Prorocentrum emarginatum* | 2 | 20 |
| 16 | *Gyrodinium spirale* | 1 | 10 |
| 17 | *Gonyaulax sp* | 4 | 40 |
| 18 | *Protoperidinium sp.* | 2 | 20 |
| 19 | *Peridinium sp.* | 36 | 360 |
| 20 | *Scenedesmus sp.* | 8 | 80 |
| 21 | *Dinoflagellate group* | 4 | 40 |
| | | **97** | **970** |

**STATION C8**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cyclotella sp.* | 1 | 10 |
| 2 | *Thalassiosira sp.* | 2 | 20 |
| 3 | *Odontella sinensis* | 1 | 10 |
| 4 | *Thalassiothrix frauenfeldii* | 1 | 10 |
| 5 | *Grammatophora marina* | 1 | 10 |
| 6 | *Navicula cancellata* | 3 | 30 |
| 7 | *Trachyneis aspera* | 10 | 100 |
| 8 | *Diploneis smithii* | 1 | 10 |
| 9 | *Diploneis crabro* | 1 | 10 |
| 10 | *Gyrosigma sp.* | 1 | 10 |
| 11 | *Pleurosigma pelagicum* | 1 | 10 |
| 12 | *Amphora lineata* | 2 | 20 |
| 13 | *Nitzschia lorenziana* | 4 | 40 |
| 14 | *Nitzschia longissima* | 3 | 30 |
| 15 | *Nitzschia sigma* | 7 | 70 |
| 16 | *Nitzschia sp.* | 4 | 40 |
| 17 | *Surirella ovalis* | 1 | 10 |
| 18 | *Campylodiscus undulatus* | 1 | 10 |

**STATION H23**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cocconeis scutellum* | 10 | 100 |
| 2 | *Pleurosigma affine* | 4 | 40 |
| 3 | *Pleurosigma sp* | 3 | 30 |
| 4 | *Nitzschia sigma* | 6 | 60 |
| 5 | *Surirella gemma* | 1 | 10 |
| 6 | *Prorocentrum micans* | 4 | 40 |
| 7 | *Metadinophysis sinensis* | 2 | 20 |
| 8 | *Gymnodinium sanguineum* | 16 | 160 |
| 9 | *Gonyaulax sp* | 3 | 30 |
| 10 | *Gonyaulax verior* | 1 | 10 |
| 11 | *Gonyaulax rotundata* | 1 | 10 |
| 12 | *Protoperidinium pellucidum* | 5 | 50 |
| 13 | *Protoperidinium pentagonum* | 1 | 10 |
| 14 | *Protoperidinium sp.2* | 7 | 70 |
| 15 | *Protoperidinium sp.* | 7 | 70 |
| 16 | *Scrippsiella sp.* | 7 | 70 |
| 17 | *Alexandrium sp* | 5 | 50 |
| 18 | *Alexandrium pseudogonyaulax* | 5 | 50 |
| 19 | *Dinoflagellate group* | 51 | 510 |
| | | **139** | **1390** |

**STATION H24**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 4 | 40 |
| 2 | *Cocconeis scutellum* | 16 | 160 |
| 3 | *Trachyneis aspera* | 5 | 50 |
| 4 | *Gyrosigma balticum* | 1 | 10 |
| 5 | *Pleurosigma angulatum* | 8 | 80 |
| 6 | *Pleurosigma naviculaceum* | 3 | 30 |
| 7 | *Pleurosigma pelagicum* | 4 | 40 |
| 8 | *Amphora lineata* | 1 | 10 |
| 9 | *Amphora hyalina* | 1 | 10 |
| 10 | *Amphora quadrata* | 1 | 10 |
| 11 | *Nitzschia longissima* | 1 | 10 |
| 12 | *Nitzschia sigma* | 2 | 20 |
| 13 | *Surirella ovalis* | 1 | 10 |
| 14 | *Campylodiscus undulatus* | 1 | 10 |
| 15 | *Prorocentrum micans* | 3 | 30 |
| 16 | *Prorocentrum mexicanum* | 1 | 10 |
| 17 | *Gymnodinium sanguineum* | 1 | 10 |
| 18 | *Gonyaulax sp* | 2 | 20 |
| 19 | *Gonyaulax polygramma* | 9 | 90 |
| 20 | *Protoperidinium steinii* | 5 | 50 |
| 21 | *Protoperidinium conicum* | 3 | 30 |
| 22 | *Protoperidinium depressum* | 1 | 10 |
| 23 | *Protoperidinium pellucidum* | 10 | 100 |
| 24 | *Protoperidinium sp.* | 18 | 180 |
| 25 | *Alexandrium sp* | 5 | 50 |
| 26 | *Oscillatoria sp2* | 3 | 30 |
| 27 | *Dinoflagellates group* | 18 | 180 |
| | | **128** | **1280** |

**STATION I25**

| No | Sampling date: 30/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Synedra pulchella* | 1 | 10 |
| 2 | *Cocconeis scutellum* | 2 | 20 |
| 3 | *Trachyneis aspera* | 1 | 10 |
| 4 | *Pleurosigma angulatum* | 1 | 10 |
| 5 | *Prorocentrum micans* | 1 | 10 |
| 6 | *Gonyaulax polygramma* | 6 | 60 |
| 7 | *Protoperidinium steinii* | 2 | 20 |
| 8 | *Protoperidinium pellucidum* | 1 | 10 |
| 9 | *Protoperidinium sp.* | 12 | 120 |
| 10 | *Protoperidinium spp.* | 18 | 180 |
| 11 | *Scrippsiella spinifera* | 1 | 10 |
| 12 | *Oscillatoria sp2* | 1 | 10 |
| | | **47** | **470** |

**STATION I26**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira sp.* | 1 | 10 |
| 2 | *Cocconeis scutellum* | 4 | 40 |
| 3 | *Pleurosigma affine* | 2 | 20 |
| 4 | *Pleurosigma sp* | 2 | 20 |
| 5 | *Nitzschia sigma* | 4 | 40 |
| 6 | *Nitzschia sp.* | 1 | 10 |
| 7 | *Gymnodinium sanguineum* | 2 | 20 |

| | | | |
|---|---|---|---|
| 19 | *Campylodiscus biangulatum* | 5 | 50 |
| 20 | *Gyrodinium spirale* | 1 | 10 |
| 21 | *Gonyaulax verior* | 1 | 10 |
| 22 | *Pediastrum sp.* | 1 | 10 |
| 23 | *Dinoflagellates group* | 70 | 700 |
| | | | **1230** |

**STATION C9**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata v. angustissima* | 12 | 120 |
| 2 | *Cyclotella sp.* | 1 | 10 |
| 3 | *Coscinodiscus sp.* | 1 | 10 |
| 4 | *Actinoptychus splendens* | 1 | 10 |
| 5 | *Thalassiosira sp.* | 1 | 10 |
| 6 | *Navicula sp* | 1 | 10 |
| 7 | *Navicula palpebralis* | 1 | 10 |
| 8 | *Navicula cancellata* | 50 | 500 |
| 9 | *Diploneis smithii* | 2 | 20 |
| 10 | *Gyrosigma balticum* | 15 | 150 |
| 11 | *Gyrosigma spenceri* | 9 | 90 |
| 12 | *Gyrosigma sp.* | 1 | 10 |
| 13 | *Pleurosigma sp* | 10 | 100 |
| 14 | *Nitzschia longissima v. reversa* | 1 | 10 |
| 15 | *Nitzschia sp.1* | 3 | 30 |
| 16 | *Nitzschia sp.* | 7 | 70 |
| 17 | *Campylodiscus echeneis* | 5 | 50 |
| 18 | *Campylodiscus sp.* | 9 | 90 |
| 19 | *Prorocentrum sp.* | 1 | 10 |
| 20 | *Ceratium furca* | 1 | 10 |
| 21 | *Gonyaulax verior* | 1 | 10 |
| 22 | *Peridinium sp.* | 36 | 360 |
| 23 | *Dinoflagellate group* | 1 | 10 |
| 24 | *Diatom* | 4 | 40 |
| | | **174** | **1740** |

**STATION D10**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus jonesianus v. commutata* | 1 | 10 |
| 2 | *Thalassiosira sp.* | 5 | 50 |
| 3 | *Nitzschia lorenziana* | 3 | 30 |
| 4 | *Nitzschia longissima* | 1 | 10 |
| 5 | *Nitzschia sigma* | 9 | 90 |
| 6 | *Dinophysis caudata* | 1 | 10 |
| 7 | *Gyrodinium spirale* | 1 | 10 |
| 8 | *Gonyaulax sp* | 7 | 70 |
| 9 | *Protoperidinium pellucidum* | 4 | 40 |
| 10 | *Protoperidinium punctulatum* | 2 | 20 |
| 11 | *Peridinium quinquecorne* | 1 | 10 |
| 12 | *Peridinium sp.* | 12 | 120 |
| 13 | *Scrippsiella sp.* | 1 | 10 |
| 14 | *Dinoflagellate group* | 22 | 220 |
| | | **70** | **700** |

**STATION D11**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira sp.* | 8 | 80 |
| 2 | *Cyclotella sp.* | 2 | 20 |
| 3 | *Coscinodiscus sp.* | 2 | 20 |
| 4 | *Thalassiosira sp.* | 8 | 80 |
| 5 | *Biddulphia longicruris* | 1 | 10 |
| 6 | *Odontella mobiliensis* | 1 | 10 |
| 7 | *Odontella sinensis* | 0 | 0 |
| 8 | *Thalassiothrix frauenfeldii* | 3 | 30 |
| 9 | *Grammatophora marina* | 3 | 30 |
| 10 | *Navicula cancellata* | 3 | 30 |
| 11 | *Mastogloia sp.* | 1 | 10 |
| 12 | *Pleurosigma sp* | 4 | 40 |
| 13 | *Amphora quadrata* | 1 | 10 |
| 14 | *Nitzschia lorenziana* | 10 | 100 |
| 15 | *Nitzschia longissima* | 2 | 20 |
| 16 | *Nitzschia sigma* | 12 | 120 |
| 17 | *Surirella gemma* | 2 | 20 |
| 18 | *Surirella sp.* | 6 | 60 |
| 19 | *Prorocentrum minimum* | 3 | 30 |
| 20 | *Metadinophysis sinensis* | 1 | 10 |
| 21 | *Gonyaulax verior* | 1 | 10 |
| 22 | *Peridinium quinquecorne* | 2 | 20 |
| 23 | *Peridinium sp.* | 31 | 310 |
| 24 | *Alexandrium sp* | 9 | 90 |
| 25 | *Alexandrium pseudogonyaulax* | 1 | 10 |
| 26 | *Dinoflagellate group* | 16 | 160 |

| | | | |
|---|---|---|---|
| 8 | *Gonyaulax sp* | 7 | 70 |
| 9 | *Protoperidinium sp.* | 7 | 70 |
| 10 | *Peridinium quinquecorne* | 1 | 10 |
| 11 | *Peridinium sp.* | 9 | 90 |
| 12 | *Alexandrium sp* | 2 | 20 |
| 13 | *Alexandrium pseudogonyaulax* | 1 | 10 |
| 14 | *Oscillatoria sp2* | 1 | 10 |
| 15 | *Dinoflagellate group* | 10 | 100 |
| | | **54** | **540** |

**STATION 27**

| No | Sampling date: 30/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cyclotella sp.* | 1 | 10 |
| 2 | *Thalassiosira sp.* | 5 | 50 |
| 3 | *Climacosphenia moniligera* | 1 | 10 |
| 4 | *Cocconeis scutellum* | 9 | 90 |
| 5 | *Pleurosigma affine* | 1 | 10 |
| 6 | *Nitzschia longissima* | 1 | 10 |
| 7 | *Nitzschia sigma* | 4 | 40 |
| 8 | *Dinophysis caudata* | 2 | 20 |
| 9 | *Gymnodinium sanguineum* | 4 | 40 |
| 10 | *Gonyaulax sp* | 2 | 20 |
| 11 | *Gonyaulax verior* | 1 | 10 |
| 12 | *Protoperidinium pellucidum* | 4 | 40 |
| 13 | *Protoperidinium sp.* | 2 | 20 |
| 14 | *Peridinium quinquecorne* | 3 | 30 |
| 15 | *Alexandrium sp* | 2 | 20 |
| 16 | *Alexandrium pseudogonyaulax* | 1 | 10 |
| 17 | *Pyrophacus sp* | 2 | 20 |
| 18 | *Dictyocha fibula* | 1 | 10 |
| 19 | *Trichodesmim hythrocun* | 1 | 10 |
| 20 | *Dinoflagellate group* | 37 | 370 |
| 21 | *Diatom* | 4 | 40 |
| | | **88** | **880** |

**STATION 28**

| No | Sampling date: 30/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 5 | 50 |
| 2 | *Thalassionema nitzschioides* | 2 | 20 |
| 3 | *Thalassiothrix frauenfeldii* | 1 | 10 |
| 4 | *Synedra gaillonii* | 2 | 20 |
| 5 | *Cocconeis scutellum* | 7 | 70 |
| 6 | *Navicula elegans* | 1 | 10 |
| 7 | *Trachyneis aspera* | 1 | 10 |
| 8 | *Pleurosigma affine* | 2 | 20 |
| 9 | *Amphora lineata* | 1 | 10 |
| 10 | *Nitzschia longissima* | 1 | 10 |
| 11 | *Nitzschia sigma* | 4 | 40 |
| 12 | *Gonyaulax sp* | 2 | 20 |
| 13 | *Gonyaulax verior* | 3 | 30 |
| 14 | *Protoperidinium pellucidum* | 2 | 20 |
| 15 | *Protoperidinium sp.* | 16 | 160 |
| | | **50** | **500** |

**STATION 29**

| No | Sampling date: 30/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Biddulphia reticulum* | 1 | 10 |
| 2 | *Synedra pulchella* | 1 | 10 |
| 3 | *Navicula sp* | 3 | 30 |
| 4 | *Trachyneis aspera* | 2 | 20 |
| 5 | *Gyrosigma sp.* | 1 | 10 |
| 6 | *Nitzschia sp.* | 1 | 10 |
| 7 | *Gymnodinium sp* | 1 | 10 |
| 8 | *Gonyaulax sp* | 2 | 20 |
| 9 | *Gonyaulax spinifera* | 1 | 10 |
| 10 | *Protoperidinium sp.* | 22 | 220 |
| 11 | *Protoperidinium spp.* | 1 | 10 |
| 12 | *Alexandrium sp* | 1 | 10 |
| 13 | *Dinoflagellates group* | 40 | 400 |
| | | **77** | **770** |

**STATION 30**

| No | Sampling date: 30/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | Coscinodiscus asteromphalus | 0,5 | 10 |
| 2 | Asteromphalus cleveanus | 1 | 20 |
| 3 | Thalassiosira spp. | 6 | 120 |
| 4 | Guinardia flaccida | 1 | 20 |
| 5 | Guinardia striata | 11 | 220 |
| 6 | Pseudosolenia calcar-avis | 5 | 100 |
| 7 | Thalassiothrix frauenfeldii | 6 | 120 |

| | | | |
|---|---|---|---|
| | | **133** | **1330** |

**STATION D12**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | Coscinodiscus jonesianus | 1 | 10 |
| 2 | Coscinodiscus sp. | 1 | 10 |
| 3 | Thalassiosira spp. | 6 | 60 |
| 4 | Pleurosigma pelagicum | 1 | 10 |
| 5 | Amphiprora alata | 1 | 10 |
| 6 | Nitzschia lorenziana | 1 | 10 |
| 7 | Nitzschia longissima | 1 | 10 |
| 8 | Nitzschia sigma | 4 | 40 |
| 9 | Surirella ovalis | 1 | 10 |
| 10 | Surirella tenera v. nervosa | 2 | 20 |
| 11 | Prorocentrum micans | 2 | 20 |
| 12 | Prorocentrum mexicanum | 1 | 10 |
| 13 | Dinophysis cf. fortii | 1 | 10 |
| 14 | Gymnodinium sanguineum | 1 | 10 |
| 15 | Ceratium furca | 1 | 10 |
| 16 | Gonyaulax polygramma | 3 | 30 |
| 17 | Protoperidinium steinii | 9 | 90 |
| 18 | Protoperidinium sp. | 13 | 130 |
| 19 | Peridinium quinquecorne | 9 | 90 |
| 20 | Alexandrium spp. | 2 | 20 |
| | | **61** | **610** |

**STATION E13**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Paralia sulcata* | 2 | 20 |
| 2 | *Melosira nummuloides* | 3 | 30 |
| 3 | *Coscinodiscus asteromphalus* | 1 | 10 |
| 4 | *Coscinodiscus oculus-iridis* | 1 | 10 |
| 5 | *Coscinodiscus jonesianus v. commutata* | 4 | 40 |
| 6 | *Coscinodiscus sp.* | 2 | 20 |
| 7 | *Thalassiosira sp.* | 17 | 170 |
| 8 | *Lauderia borealis* | 2 | 20 |
| 9 | *Guinardia flaccida* | 7 | 70 |
| 10 | *Guinardia striata* | 1 | 10 |
| 11 | *Pseudosolenia calcar-avis* | 1 | 10 |
| 12 | *Cerataulina bergonii* | 6 | 60 |
| 13 | *Ditylum brightwellii* | 2 | 20 |
| 14 | *Thalassionema nitzschioides* | 7 | 70 |
| 15 | *Thalassiothrix frauenfeldii* | 95 | 950 |
| 16 | *Cocconeis scutellum* | 4 | 40 |
| 17 | *Navicula membranacea* | 3 | 30 |
| 18 | *Pleurosigma sp* | 4 | 40 |
| 19 | *Campylodiscus echeneis* | 1 | 10 |
| 20 | *Prorocentrum micans* | 2 | 20 |
| 21 | *Dinophysis caudata* | 7 | 70 |
| 22 | *Dinophysis cf. rotundata* | 1 | 10 |
| 23 | *Gymnodinium sanguineum* | 1 | 10 |
| 24 | *Gyrodinium spirale* | 2 | 20 |
| 25 | *Polykrikos schwartzii* | 1 | 10 |
| 26 | *Ceratium furca* | 7 | 70 |
| 27 | *Ceratium kofoidii* | 1 | 10 |
| 28 | *Ceratium cf. lunula* | 1 | 10 |
| 29 | *Protoperidinium divergens* | 2 | 20 |
| 30 | *Protoperidinium pellucidum* | 6 | 60 |
| 31 | *Protoperidinium sp.2* | 6 | 60 |
| 32 | *Scrippsiella sp.* | 1 | 10 |
| 33 | *Alexandrium sp* | 2 | 20 |
| 34 | *Goniodoma polyedra* | 1 | 10 |
| 35 | *Zygabikodinium sp.* | 1 | 10 |
| 36 | *Dictyocha fibula* | 1 | 10 |
| 37 | *Anabaena sp* | 1 | 10 |
| 38 | *Dinoflagellate group* | 6 | 60 |
| 39 | *Diatom* | 2 | 20 |
| | | **215** | **2150** |

**STATION E14**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | Coscinodiscus jonesianus | 1 | 20 |
| 2 | Coscinodiscus sp. | 2 | 40 |
| 3 | Asteromphalus cleveanus | 0,5 | 10 |
| 4 | Thalassiosira sp. | 21 | 420 |
| 5 | Lauderia borealis | 6 | 120 |
| 6 | Guinardia flaccida | 0,5 | 10 |
| 7 | Guinardia striata | 2 | 40 |
| 8 | Rhizosolenia crassispina | 1 | 20 |
| 9 | Biddulphia regia | 1 | 20 |
| 8 | Navicula membranacea | 7 | 140 |
| 9 | Trachyneis aspera | 2 | 40 |
| 10 | Pleurosigma affine | 1 | 20 |
| 11 | Pleurosigma pelagicum | 4 | 80 |
| 12 | Nitzschia longissima | 3 | 60 |
| 13 | Nitzschia sigma | 2 | 40 |
| 14 | Metadinophysis sinensis | 1 | 20 |
| 15 | Dinophysis caudata | 2 | 40 |
| 16 | Dinophysis cf. fortii | 0,5 | 10 |
| 17 | Noctiluca scintillans | 0,5 | 10 |
| 18 | Ceratium furca | 6 | 120 |
| 19 | Ceratium fusus | 1 | 20 |
| 20 | Ceratium kofoidii | 2 | 40 |
| 21 | Gonyaulax sp | 1 | 20 |
| 22 | Protoperidinium conicum | 1 | 20 |
| 23 | Protoperidinium pellucidum | 1 | 20 |
| 24 | Protoperidinium subinerme | 1 | 20 |
| 25 | Protoperidinium sp. | 1 | 20 |
| 26 | Protoperidinium spp. | 5 | 100 |
| 27 | Alexandrium spp. | 1 | 20 |
| 28 | Lingulodinium sp. | 1 | 20 |
| 29 | Podolampas palmipes | 1 | 20 |
| | | **75,5** | **1510** |

**STATION K32**

| No | Sampling date: 29/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 2 | 20 |
| 2 | *Nitzschia sigma* | 1 | 10 |
| 3 | *Gonyaulax sp* | 11 | 110 |
| 4 | *Protoperidinium sp.* | 2 | 20 |
| 5 | *Protoperidinium spp.* | 11 | 110 |
| 6 | *Alexandrium sp* | 1 | 10 |
| 7 | *Alexandrium pseudogonyaulax* | 5 | 50 |
| 8 | *Pyrophacus sp* | 1 | 10 |
| 9 | *Closterium setaceum* | 4 | 40 |
| 10 | *Dinoflagellate group* | 11 | 110 |
| | | **49** | **490** |

**STATION K33**

| No | Sampling date: 05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cyclotella sp.* | 1 | 10 |
| 2 | *Thalassiosira spp.* | 3 | 30 |
| 3 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 4 | *Pleurosigma pelagicum* | 6 | 60 |
| 5 | *Gonyaulax spinifera* | 5 | 50 |
| 6 | *Protoperidinium sp.* | 82 | 820 |
| 7 | *Protoperidinium spp.* | 3 | 30 |
| 8 | *Alexandrium sp* | 1 | 10 |
| | | **103** | **1030** |

**STATION K37**

| No | Sampling date: 29/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 3 | 30 |
| 2 | *Thalassiothrix frauenfeldii* | 3 | 30 |
| 3 | *Amphora lineata* | 2 | 20 |
| 4 | *Nitzschia longissima v. reversa* | 1 | 10 |
| 5 | *Gonyaulax sp* | 1 | 10 |
| 6 | *Protoperidinium conicum* | 1 | 10 |
| 7 | *Protoperidinium pellucidum* | 2 | 20 |
| 8 | *Protoperidinium sp.* | 7 | 70 |
| 9 | *Alexandrium spp.* | 6 | 60 |
| 10 | *Dinoflagellates group* | 26 | 260 |
| | | **52** | **520** |

**STATION L34**

| No | Sampling date: 29/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cyclotella comta* | 1 | 20 |
| 2 | *Cyclotella sp.* | 1 | 20 |
| 3 | *Thalassiosira sp.* | 3 | 60 |
| 4 | *Grammatophora marina* | 1 | 20 |
| 5 | *Trachyneis aspera* | 1 | 20 |
| 6 | *Pleurosigma pelagicum* | 1 | 20 |
| 7 | *Amphiprora alata* | 1 | 20 |
| 8 | *Nitzschia lorenziana* | 2 | 40 |
| 9 | *Nitzschia longissima* | 1 | 20 |
| 10 | *Nitzschia longissima v. reversa* | 1 | 20 |
| 11 | *Nitzschia sigma* | 6 | 120 |
| 12 | *Gonyaulax sp* | 3 | 60 |
| 13 | *Protoperidinium steinii* | 1 | 20 |

| | | | |
|---|---|---|---|
| 10 | Ditylum sol | 1 | 20 |
| 11 | Thalassionema nitzschioides | 4 | 80 |
| 12 | Thalassiothrix frauenfeldii | 34 | 680 |
| 13 | Thalassiothrix longissima | 1 | 20 |
| 14 | Synedra gaillonii | 1 | 20 |
| 15 | Trachyneis aspera | 1 | 20 |
| 16 | Diploneis bombus | 1 | 20 |
| 17 | Pleurosigma affine | 2 | 40 |
| 18 | Pleurosigma naviculaceum | 1 | 20 |
| 19 | Amphora quadrata | 0,5 | 10 |
| 20 | Nitzschia lorenziana | 1 | 20 |
| 21 | Nitzschia longissima | 1 | 20 |
| 22 | Nitzschia sp. | 2 | 40 |
| 23 | Bacillaria paxillifera | 2 | 40 |
| 24 | Surirella gemma | 1 | 20 |
| 25 | Campylodiscus biangulatum | 1 | 20 |
| 26 | Prorocentrum micans | 6 | 120 |
| 27 | Dinophysis caudata | 2 | 40 |
| 28 | Dinophysis cf. fortii | 1 | 20 |
| 29 | Gymnodinium sanguineum | 1 | 20 |
| 30 | Ceratium furca | 0,5 | 10 |
| 31 | Ceratium kofoidii | 1 | 20 |
| 32 | Gonyaulax sp | 1 | 20 |
| 33 | Protoperidinium spp. | 35 | 700 |
| 34 | Peridinium quinquecorne | 3 | 60 |
| 35 | Lingulodinium polyedra | 1 | 20 |
| 36 | Dictyocha fibula | 1 | 20 |
| 37 | Dictyocha speculum | 1 | 20 |
| | | **143** | **2860** |

| **STATION E15** | | | |
|---|---|---|---|
| **No** | Sampling date: 27/05/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira nummuloides* | 2 | 20 |
| 2 | *Melosira sp.* | 4 | 40 |
| 3 | *Thalassiosira sp.* | 28 | 280 |
| 4 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 5 | *Synedra ulna* | 1 | 10 |
| 6 | *Cocconeis scutellum* | 4 | 40 |
| 7 | *Navicula sp* | 1 | 10 |
| 8 | *Diploneis sp.1* | 1 | 10 |
| 9 | *Gyrosigma sp.* | 2 | 20 |
| 10 | *Pleurosigma sp* | 5 | 50 |
| 11 | *Nitzschia longissima v. reversa* | 6 | 60 |
| 12 | *Nitzschia sigma* | 4 | 40 |
| 13 | *Peridinium sp.* | 25 | 250 |
| 14 | *Oscillatoria sp1* | 3 | 30 |
| 15 | *Spirulina sp* | 2 | 20 |
| 16 | *Dinoflagellate group* | 2 | 20 |
| 17 | *Diatom* | 4 | 40 |
| | | **96** | **960** |

| **STATION F16** | | | |
|---|---|---|---|
| **No** | Sampling date: 28/05/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus oculus-iridis* | 1 | 10 |
| 2 | *Coscinodiscus jonesianus v. commutata* | 4 | 40 |
| 3 | *Thalassiosira sp.* | 125 | 1250 |
| 4 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 5 | *Cocconeis scutellum* | 3 | 30 |
| 6 | *Pleurosigma affine* | 2 | 20 |
| 7 | *Pleurosigma sp* | 7 | 70 |
| 8 | *Amphora lineata* | 1 | 10 |
| 9 | *Nitzschia longissima* | 16 | 160 |
| 10 | *Nitzschia longissima v. reversa* | 13 | 130 |
| 11 | *Nitzschia sigma* | 9 | 90 |
| 12 | *Prorocentrum micans* | 2 | 20 |
| 13 | *Dinophysis caudata* | 1 | 10 |
| 14 | *Gymnodinium sanguineum* | 1 | 10 |
| 15 | *Ceratium furca* | 3 | 30 |
| 16 | *Gonyaulax sp* | 1 | 10 |
| 17 | *Protoperidinium pellucidum* | 1 | 10 |
| 18 | *Protoperidinium punctulatum* | 1 | 10 |
| 19 | *Peridinium quinquecorne* | 1 | 10 |
| 20 | *Dinoflagellate group* | 1 | 10 |
| | | **195** | **1950** |

| **STATION F17** | | | |
|---|---|---|---|
| **No** | Sampling date: 28/05/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Coscinodiscus oculus-iridis* | 1 | 10 |
| 2 | *Coscinodiscus jonesianus* | 3 | 30 |
| 3 | *Thalassiosira spp.* | 39 | 390 |

| | | | |
|---|---|---|---|
| 14 | *Protoperidinium sp.* | 2 | 40 |
| 15 | *Alexandrium sp* | 4 | 80 |
| | | **29** | **580** |

| **STATION L35** | | | |
|---|---|---|---|
| **No** | Sampling date: 29/05/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Diatoma elongatum* | 1 | 10 |
| 2 | *Thalassionema nitzschioides* | 1 | 10 |
| 3 | *Cocconeis scutellum* | 2 | 20 |
| 4 | *Pleurosigma affine* | 1 | 10 |
| 5 | *Nitzschia lorenziana* | 1 | 10 |
| 6 | *Nitzschia longissima* | 4 | 40 |
| 7 | *Nitzschia longissima v. reversa* | 3 | 30 |
| 8 | *Nitzschia sigma* | 1 | 10 |
| 9 | *Prorocentrum mexicanum* | 1 | 10 |
| 10 | *Prorocentrum gracile* | 1 | 10 |
| 11 | *Gymnodinium sanguineum* | 5 | 50 |
| 12 | *Gonyaulax polygramma* | 3 | 30 |
| 13 | *Protoperidinium steinii* | 1 | 10 |
| 14 | *Protoperidinium conicum* | 1 | 10 |
| 15 | *Protoperidinium depressum* | 1 | 10 |
| 16 | *Protoperidinium pellucidum* | 1 | 10 |
| 17 | *Protoperidinium sp.* | 22 | 220 |
| | | **50** | **500** |

| **STATION L36** | | | |
|---|---|---|---|
| **No** | Sampling date: 29/05/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Biddulphia reticulum* | 1 | 10 |
| 2 | *Cocconeis scutellum* | 9 | 90 |
| 3 | *Gyrosigma strigile* | 3 | 30 |
| 4 | *Pleurosigma affine* | 1 | 10 |
| 5 | *Amphiprora alata* | 1 | 10 |
| 6 | *Nitzschia lorenziana* | 1 | 10 |
| 7 | *Nitzschia longissima* | 3 | 30 |
| 8 | *Nitzschia sigma* | 9 | 90 |
| 9 | *Surirella gemma* | 1 | 10 |
| 10 | *Ceratium furca* | 1 | 10 |
| 11 | *Gonyaulax sp* | 1 | 10 |
| 12 | *Gonyaulax spinifera* | 1 | 10 |
| 13 | *Protoperidinium pellucidum* | 2 | 20 |
| 14 | *Protoperidinium sp.* | 9 | 90 |
| 15 | *Alexandrium sp* | 2 | 20 |
| | | **45** | **450** |

| | | | |
|---|---|---|---|
| 4 | *Guinardia flaccida* | 1 | 10 |
| 5 | *Thalassiothrix frauenfeldii* | 2 | 20 |
| 6 | *Pleurosigma angulatum* | 1 | 10 |
| 7 | *Amphiprora alata* | 1 | 10 |
| 8 | *Nitzschia longissima* | 2 | 20 |
| 9 | *Nitzschia longissima v. reversa* | 1 | 10 |
| 10 | *Nitzschia sigma* | 6 | 60 |
| 11 | *Bacillaria paxillifera* | 4 | 40 |
| 12 | *Surirella gemma* | 1 | 10 |
| 13 | *Prorocentrum micans* | 10 | 100 |
| 14 | *Gymnodinium sanguineum* | 10 | 100 |
| 15 | *Ceratium kofoidii* | 1 | 10 |
| 16 | *Gonyaulax sp* | 10 | 100 |
| 17 | *Gonyaulax spinifera* | 1 | 10 |
| 18 | *Protoperidinium steinii* | 1 | 10 |
| 19 | *Protoperidinium pellucidum* | 18 | 180 |
| 20 | *Peridinium quinquecorne* | 35 | 350 |
| 21 | *Alexandrium spp.* | 1 | 10 |
| 22 | *Dinoflagellates group* | 25 | 250 |
| | | **174** | **1740** |

**STATION F18**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 8 | 80 |
| 2 | *Cocconeis scutellum* | 19 | 190 |
| 3 | *Pleurosigma affine* | 9 | 90 |
| 4 | *Nitzschia sigma* | 4 | 40 |
| 5 | *Surirella gemma* | 2 | 20 |
| 6 | *Prorocentrum micans* | 1 | 10 |
| 7 | *Metadinophysis sinensis* | 2 | 20 |
| 8 | *Dinophysis caudata* | 1 | 10 |
| 9 | *Gymnodinium sanguineum* | 163 | 1630 |
| 10 | *Gonyaulax sp* | 18 | 180 |
| 11 | *Gonyaulax verior* | 2 | 20 |
| 12 | *Gonyaulax rotundata* | 2 | 20 |
| 13 | *Protoperidinium pellucidum* | 11 | 110 |
| 14 | *Protoperidinium sp.1 (to, dinh ngan)* | 29 | 290 |
| 15 | *Protoperidinium sp.* | 1 | 10 |
| 16 | *Peridinium quinquecorne* | 3 | 30 |
| 17 | *Scrippsiella sp.* | 15 | 150 |
| 18 | *Alexandrium spp.* | 14 | 140 |
| 19 | *Pyrophacus sp* | 2 | 20 |
| 20 | *Dinoflagellate group* | 6 | 60 |
| | | **312** | **3120** |

**STATION G19**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 6 | 60 |
| 2 | *Grammatophora marina* | 2 | 20 |
| 3 | *Cocconeis scutellum* | 3 | 30 |
| 4 | *Trachyneis aspera* | 2 | 20 |
| 5 | *Gyrosigma strigile* | 1 | 10 |
| 6 | *Pleurosigma naviculaceum* | 1 | 10 |
| 7 | *Pleurosigma pelagicum* | 4 | 40 |
| 8 | *Amphora hyalina* | 1 | 10 |
| 9 | *Nitzschia longissima v. reversa* | 5 | 50 |
| 10 | *Nitzschia sigma* | 5 | 50 |
| 11 | *Prorocentrum micans* | 3 | 30 |
| 12 | *Dinophysis caudata* | 2 | 20 |
| 13 | *Gymnodinium sanguineum* | 2 | 20 |
| 14 | *Ceratium furca* | 6 | 60 |
| 15 | *Gonyaulax polygramma* | 5 | 50 |
| 16 | *Gonyaulax spinifera* | 2 | 20 |
| 17 | *Protoperidinium steinii* | 11 | 110 |
| 18 | *Protoperidinium pellucidum* | 21 | 210 |
| 19 | *Protoperidinium sp.* | 11 | 110 |
| 20 | *Peridinium quinquecorne* | 10 | 100 |
| 21 | *Alexandrium minutum* | 2 | 20 |
| 22 | *Dinoflagellates group* | 35 | 350 |
| | | **140** | **1400** |

## Survey Institute of Marine Resources and Environament, May 2006  Zooplankton Species

**STATION A1**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Penilia schmackeri* | 2 | 200 |
| 2 | *Paracalanus parvus* | 3 | 300 |
| 3 | *Labidocera kroery* | 1 | 100 |
| 4 | *Oithona similis* | 9 | 900 |
| 5 | *Thermocyclops hyalinus* | 38 | 3800 |
| 6 | *Diaphanosoma sarsi* | 1 | 100 |
| 7 | *AT Bivalvia* | 1 | 100 |
| 8 | *AT T«m* | 1 | 100 |
| | **Total** | **56** | **5600** |

**STATION A2**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus crassirostris* | 15 | 750 |
| 2 | *Acartia erythraea* | 19 | 950 |
| 3 | *Oithona similis* | 6 | 300 |
| 4 | *Thermocyclops hyalinus* | 24 | 1200 |
| 5 | *Moinadaphnia macleyii* | 6 | 300 |
| 6 | *Diaphanosoma sarsi* | 18 | 900 |
| 7 | *Bosmiana longistris* | 18 | 900 |
| | **Total** | **106** | **5300** |

**STATION A3**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 1 | 10 |
| 2 | *Acartia clausi* | 5 | 50 |
| 3 | *Oithona similis* | 1 | 10 |
| 4 | *AT Bivalvia* | 1 | 10 |
| | **Total** | **8** | **80** |

**STATION B4**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Eucalanus subcrassus Giesb.* | 2 | 100 |
| 2 | *Larva of shrimp* | 1 | 50 |
| 3 | *Paracalanus crassirostris* | 36 | 1800 |
| 4 | *Temora turbinata Dana* | 1 | 50 |
| 5 | *Acartia clausi* | 7 | 350 |
| 6 | *Acartia erythraea* | 4 | 200 |
| 7 | *Oithona similis* | 5 | 250 |
| 8 | *Oithona brevicornis* | 2 | 100 |
| 9 | *Thermocyclops hyalinus* | 5 | 250 |
| 10 | *Clytemnestra scutellata* | 1 | 50 |
| 11 | *Diaphanosoma sarsi* | 1 | 50 |
| 12 | *Bosmina longistris* | 5 | 250 |
| | **Total** | **70** | **3500** |

**STATION B5**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | Eucalanus subcrassus Giesb. | 1 | 50 |
| 2 | Paracalanus parvus | 11 | 550 |
| 3 | Acartia clausi | 2 | 100 |
| | **Total** | **14** | **700** |

**STATION B6**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Acartia clausi* | 3 | 30 |
| 2 | *Oithona similis* | 1 | 10 |
| 3 | *AT Bivalvia* | 3 | 30 |
| | **Total** | **7** | **70** |

**STATION C7**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 3 | 150 |
| 2 | *Labidocera minuta* | 1 | 50 |
| 3 | *Acartia pacifica* | 4 | 200 |
| 4 | *Oithona similis* | 1 | 50 |
| 5 | *Microsetella norvegica* | 2 | 100 |
| | **Total** | **11** | **550** |

**STATION G19**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Penilia schmackeri* | 1 | 50 |
| 2 | *Paracalanus parvus* | 4 | 200 |
| 3 | *Acartia clausi* | 3 | 150 |
| 4 | *Acartia erythraea* | 1 | 50 |
| 5 | *Oithona similis* | 15 | 750 |
| 6 | *Oncaea venusta* | 1 | 50 |
| 7 | *Microsetella norvegica* | 1 | 50 |
| 8 | *Macrosetella gracilis* | 12 | 600 |
| 9 | *Copepoda* | 6 | 300 |
| | **Total** | **44** | **2200** |

**STATION G20**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Sagitta delicata* | 1 | 50 |
| 2 | *Canthocalanus pauper* | 2 | 100 |
| 3 | *Undinula vulgaris Dana* | 1 | 50 |
| 4 | *Paracalanus parvus* | 22 | 1100 |
| 5 | *Labidocera kroery* | 1 | 50 |
| 6 | *Acartia clausi* | 9 | 450 |
| 7 | *Oithona brevicornis* | 1 | 50 |
| 8 | *Oithona plumifera* | 1 | 50 |
| 9 | *Microsetella norvegica* | 11 | 550 |
| 10 | *C¸ con* | 1 | 50 |
| | **Total** | **50** | **2500** |

**STATION G21**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 33 | 1650 |
| 2 | *Acartia clausi* | 4 | 200 |
| 3 | *Oithona brevicornis* | 10 | 500 |
| 4 | *Microcetella norvegica* | 5 | 250 |
| 5 | *Euterpina acutifront* | 1 | 50 |
| 6 | *Lucifer typus* | 1 | 50 |
| 7 | *Oikopleura dioica* | 1 | 50 |
| 8 | *AT T«m* | 2 | 100 |
| | **Total** | **57** | **2850** |

**STATION H22**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus crassirostris* | 58 | 5800 |
| 2 | *Pseudodiaptomus marinus* | 1 | 100 |
| 3 | *Schmackeria gordioides* | 1 | 100 |
| 4 | *Labidocera minuta* | 1 | 100 |
| 5 | *Acartia clausi* | 33 | 3300 |
| 6 | *Oithona nana* | 21 | 2100 |
| 7 | *Oithona brevicornis* | 6 | 600 |
| 8 | *Oithona plumifera* | 1 | 100 |
| 9 | *Microcetella norvegica* | 1 | 100 |
| 10 | *Euterpina acutifront* | 3 | 300 |
| 11 | *Oikopleura dioica* | 1 | 100 |
| 12 | *Copepoda* | 1 | 100 |
| 13 | *AT T«m* | 1 | 100 |
| | **Total** | **129** | **12900** |

**STATION H23**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Sagitta delicata* | 1 | 100 |
| 2 | *Paracalanus parvus* | 197 | 19700 |
| 3 | *Centropages furcatus* | 1 | 100 |
| 4 | *Acartia clausi* | 6 | 600 |
| 5 | *Oithona similis* | 16 | 1600 |
| 6 | *Oithona brevicornis* | 1 | 100 |
| 7 | *Macrosetella gracilis* | 1 | 100 |
| | | **223** | **22300** |

**STATION H24**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 8 | 400 |

**STATION C8**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 9 | 90 |
| 2 | *Acartia clausi* | 6 | 60 |
| 3 | *Microsetella norvegica* | 1 | 10 |
| | **Total** | **16** | **160** |

**STATION C9**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 5 | 250 |
| 2 | *Acartia clausi* | 4 | 200 |
| 3 | *Oithona similis* | 1 | 50 |
| 4 | *Corycaeus dalhi* | 2 | 100 |
| 5 | *Microsetella norvegica* | 18 | 900 |
| 6 | *Macrosetella gracilis* | 12 | 600 |
| 7 | *Euterpina acutifront* | 2 | 100 |
| 8 | *AT T«m* | 1 | 50 |
| | **Total** | **45** | **2250** |

**STATION D10**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 5 | 500 |
| 2 | *Schmackeria dulbosa* | 1 | 100 |
| 3 | *Oithona similis* | 1 | 100 |
| 4 | *Oithona brevicornis* | 2 | 200 |
| 5 | *Oithona flumifera* | 8 | 800 |
| 6 | *Thermocyclops hyalinus* | 16 | 1600 |
| 7 | *Diaphanosoma sarsi* | 2 | 200 |
| 8 | *AT Bivalvia* | 1 | 100 |
| 9 | *Mesocylops sp.* | 1 | 100 |
| 10 | *Bosmiana longistris* | 1 | 100 |
| | **Total** | **38** | **3800** |

**STATION D11**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 2 | 100 |
| 2 | *Acartia clausi* | 2 | 100 |
| 3 | *Oithona similis* | 6 | 300 |
| 4 | *Corycaeus dalhi* | 1 | 50 |
| 5 | *Microsetella norvegica* | 1 | 50 |
| 6 | *Oikopleura dioica* | 1 | 50 |
| | **Total** | **13** | **650** |

**STATION D12**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Sagitta delicata* | 1 | 50 |
| 2 | *Eucalanus subcrassus Giesb.* | 1 | 50 |
| 3 | *Paracalanus parvus* | 4 | 200 |
| 4 | *Labidocera minuta* | 1 | 50 |
| 5 | *Acartia clausi* | 11 | 550 |
| 6 | *Oithona fallax* | 1 | 50 |
| 7 | *Oithona similis* | 1 | 50 |
| 8 | *Oncaea venusta* | 1 | 50 |
| | **Total** | **21** | **1050** |

**STATION E13**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 37 | 1850 |
| 2 | *Schmackeria sp.* | 1 | 50 |
| 3 | *Acartia clausi* | 4 | 200 |
| 4 | *Oithona similis* | 30 | 1500 |
| 5 | *Oithona brevicornis* | 39 | 1950 |
| 6 | *Corycaeus dahli* | 4 | 200 |
| 7 | *Microsetella norvegica* | 7 | 350 |
| | **Total** | **122** | **6100** |

**STATION E14**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Sagitta delicata* | 2 | 100 |
| 2 | *Paracalanus parvus* | 23 | 1150 |

| | | | |
|---|---|---|---|
| 2 | *Acartia pacifica* | 2 | 100 |
| 3 | *Oncaea venusta* | 2 | 100 |
| 4 | *AT Actinotrocha* | 1 | 50 |
| | **Total** | **13** | **650** |

**STATION I30**

| No | Sampling date: 30/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Sagitta crassa* | 1 | 50 |
| 2 | *Acrocalanus gilber* | 2 | 100 |
| 3 | *Paracalanus parvus* | 32 | 1600 |
| 4 | *Acartia clausi* | 2 | 100 |
| 5 | *Oithona similis* | 19 | 950 |
| 6 | *Oithona brevicornis* | 6 | 300 |
| 7 | *Euterpina acutifront* | 2 | 100 |
| 8 | *Oikopleura dioica* | 11 | 550 |
| 9 | *AT Gastropoda* | 1 | 50 |
| 10 | *Dyphyes sp.* | 1 | 50 |
| | **Total** | **77** | **3850** |

**STATION K32**

| No | Sampling date: 29/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Eucalanus subcrassus Giesb.* | 1 | 50 |
| 2 | *Paracalanus parvus* | 9 | 450 |
| 3 | *Centropages furcatus* | 1 | 50 |
| 4 | *Acartia clausi* | 1 | 50 |
| 5 | *Acartia erythraea* | 6 | 300 |
| 6 | *Oithona similis* | 14 | 700 |
| 7 | *Thermocyclops hyalinus* | 1 | 50 |
| 8 | *Moinadaphnia macleyii* | 1 | 50 |
| 9 | *Hyalocylis striata* | 1 | 50 |
| 10 | *Diaphanosoma sarsi* | 1 | 50 |
| 11 | *Creises sp.* | 1 | 50 |
| | **Total** | **37** | **1850** |

**STATION K33**

| No | Sampling date: 26/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 30 | 1500 |
| 2 | *Labidocera minuta* | 1 | 50 |
| 3 | *Acartia clausi* | 3 | 150 |
| 4 | *Oithona nana* | 1 | 50 |
| 5 | *Oithona similis* | 5 | 250 |
| | **Total** | **40** | **2000** |

**STATION K37**

| No | Sampling date: 29/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 20 | 200 |
| 2 | *AT Bivalvia* | 1 | 10 |
| 3 | *Copepoda* | 6 | 60 |
| | **Total** | **27** | **270** |

**STATION L34**

| No | Sampling date: 29/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Undinula vulgaris Dana* | 1 | 100 |
| 2 | *Eucalanus subcrassus Giesb.* | 1 | 100 |
| 3 | *Paracalanus parvus* | 75 | 7500 |
| 4 | *Oithona similis* | 1 | 100 |
| 5 | *Oithona brevicornis* | 8 | 800 |
| 6 | *Corycaeus dahli* | 2 | 200 |
| 7 | *Microsetella norvegica* | 1 | 100 |
| 8 | *AT Bivalvia* | 1 | 100 |
| | **Total** | **90** | **9000** |

**STATION L35**

| No | Sampling date: 29/05/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 46 | 2300 |
| 2 | *Acartia erythraea* | 1 | 50 |
| 3 | *Oithona similis* | 12 | 600 |
| 4 | *AT Bivalvia* | 1 | 50 |
| | **Total** | **60** | **3000** |

**STATION L36**

| No | Sampling date: 29/05/2006 |
|---|---|

| | | | |
|---|---|---|---|
| 3 | *Acartia pacifica* | 6 | 300 |
| 4 | *Oithona similis* | 19 | 950 |
| 5 | *Corycaeus dalhi* | 1 | 50 |
| 6 | *Microcetella norvegica* | 1 | 50 |
| 7 | *C¸ton* | 1 | 50 |
| | **Total** | **53** | **2650** |

| No | SPECIES | QUANTITY | INDS/M3 |
|---|---|---|---|
| 1 | *Paracalanus parvus* | 15 | 1500 |
| 2 | *Oithona similis* | 14 | 1400 |
| 3 | *Oithona brevicornis* | 11 | 1100 |
| 4 | *Copepoda* | 12 | 1200 |
| | **Total** | **52** | **5200** |

**STATION E15**

| No | Sampling date: 27/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 12 | 600 |
| 2 | *Oithona similis* | 4 | 200 |
| 3 | *Copepoda* | 1 | 50 |
| | **Total** | **17** | **850** |

**STATION F16**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 1 | 100 |
| 2 | *Labidocera minuta* | 1 | 100 |
| 3 | *Acartia clausi* | 3 | 300 |
| 4 | *Oithona nana* | 3 | 300 |
| 5 | *Corycaeus andrewsi* | 1 | 100 |
| 6 | *Corycaeus dahli* | 3 | 300 |
| 7 | *Microcetella norvegica* | 18 | 1800 |
| 8 | *Macrocetella gracilis* | 24 | 2400 |
| 9 | *Euterpina acutifront* | 1 | 100 |
| | **Total** | **55** | **5500** |

**STATION F17**

| No | Sampling date: 28/05/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 7 | 350 |
| 2 | *Labidocera minuta* | 3 | 150 |
| 3 | *Acartia clausi* | 3 | 150 |
| 4 | *Oithona similis* | 14 | 700 |
| 5 | *Corycaeus dahli* | 4 | 200 |
| 6 | *Microsetella norvegica* | 1 | 50 |
| 7 | *Oikopleura dioica* | 3 | 150 |
| 8 | *AT Gastropoda* | 1 | 50 |
| 9 | *Copepoda* | 6 | 300 |
| | **Total** | **42** | **2100** |

**Survey Institute of Marine Resources and Environament, August 2006**

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$(mg/l) | $NH_3$(mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| | | T | | | 30,1 | | | | | | 5,30 | <1 | 5,5 | | 0,09 | 0,08 | | 0,07 | 0,31 | 2,0 | | | | | | 9300 | | |
| | 1 | M | | – | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,5 | | 30,1 | | | Mud | | | 5,69 | <1 | 5,4 | | | | | | | | | | | | | | | |
| | | T | | | 31,2 | | | | | | 5,67 | <1 | 6,8 | | 0,15 | 0,07 | | 0,06 | 0,35 | 2,5 | | | | | | 2400 | | |
| A | 2 | M | | 0,8 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,0 | | 30,0 | | | Mud - Clay | | | 5,80 | <1 | 6,1 | | | | | | | | | | | | | | | |
| | | T | | | 31,5 | | | | | | 6,11 | <1 | 6,5 | | 0,12 | 0,06 | | 0,08 | 0,24 | 6,8 | | | | | | 900 | | |
| | 3 | M | | 1,1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,7 | | 31,3 | | | Mud - Clay - Sand | | | 6,08 | <1 | 6,1 | | | | | | | | | | | | | | | |
| | | T | | | 31,5 | | | | | | 6,39 | <1 | 6,7 | | 0,19 | 0,03 | | 0,12 | 0,40 | 5,1 | | | | | | 400 | | |
| | 4 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,9 | | 31,3 | | | Mud - Clay | | | 6,56 | <1 | 6,4 | | | | | | | | | | | | | | | |
| | | T | | | 29,1 | | | | | | 6,25 | <1 | 6,6 | | 0,20 | 0,10 | | 0,24 | 0,36 | 4,1 | | | | | | 110000 | | |
| B | 5 | M | | 0,8 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,5 | | 28,3 | | | Mud - Clay | | | 6,31 | <1 | 6,3 | | | | | | | | | | | | | | | |
| | | T | | | 32,0 | | | | | | 8,20 | <1 | 7,4 | | <0.05 | 0,02 | | 0,05 | 0,16 | 2,3 | | | | | | 400 | | |
| | 6 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,4 | | 32,0 | | | Mud - Clay - Sand | | | 8,27 | <1 | 7,2 | | | | | | | | | | | | | | | |
| | | T | | | 25,6 | | | | | | 6,40 | <1 | 6,3 | | 0,16 | 0,05 | | 0,08 | 0,32 | 7,0 | | | | | | 15000 | | |
| | 7 | M | | 0,7 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 2,7 | | 19,4 | | | Mud - Clay | | | 6,51 | <1 | 6,1 | | 0,20 | | | 0,10 | 0,25 | | | | | | | | | |
| | | T | | | 30,8 | | | | | | 7,47 | <1 | 7,0 | | 0,05 | 0,04 | | 0,04 | 0,13 | 2,2 | | | | | | 400 | | |
| C | 8 | M | | 0,8 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,3 | | 30,3 | | | Mud - Clay | | | 7,44 | <1 | 7,1 | | | | | | | | | | | | | | | |
| | | T | | | 32,4 | | | | | | 7,76 | 1,5 | 7,2 | | <0.05 | 0,05 | | 0,08 | 0,18 | 8,0 | | | | | | 2100 | | |
| | 9 | M | | 0,8 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,7 | | 31,3 | | | Mud - Sand | | | 7,74 | 1,0 | 7,2 | | | | | | | | | | | | | | | |
| | | T | | | 29,8 | | | | | | 6,96 | <1 | 6,5 | | 0,17 | 0,04 | | 0,12 | 0,44 | 9,2 | | | | | | 1500 | | |
| | 10 | M | | 0,8 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,0 | | 30,0 | | | Mud - Sand | | | 7,11 | 1,0 | 6,4 | | | | | | | | | | | | | | | |
| | | T | | | 29,2 | | | | | | 7,06 | 1,5 | 6,4 | | 0,09 | 0,06 | | 0,09 | 0,23 | 5,4 | | | | | | 1100 | | |
| D | 11 | M | | 0,9 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,8 | | 28,5 | | | Mud - Sand | | | 7,11 | 2,0 | 6,2 | | | | | | | | | | | | | | | |
| | | T | | | 29,9 | | | | | | 7,00 | 1,5 | 6,3 | | 0,08 | 0,04 | | 0,14 | 0,20 | 8,3 | | | | | | 4600 | | |
| | 12 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,4 | | 29,8 | | | Mud - Clay | | | 6,94 | 1,5 | 6,0 | | | | | | | | | | | | | | | |
| | | T | | | 30,3 | | | | | | 7,78 | 2,0 | 7,1 | | 0,10 | 0,04 | | 0,06 | 0,24 | 4,8 | | | | | | 15000 | | |
| | 13 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 11,0 | | 28,6 | | | Mud - Sand | | | 8,00 | 25,0 | 5,3 | | <0.05 | | | 0,05 | 2,69 | | | | | | | | | |
| | | T | | | 30,0 | | | | | | 6,49 | 2,0 | 6,0 | | 0,23 | 0,06 | | 0,04 | 0,37 | 2,6 | | | | | | 21000 | | |
| E | 14 | M | | 0,8 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,0 | | 29,1 | | | Sand | | | 6,65 | 3,0 | 6,0 | | | | | | | | | | | | | | | |
| | | T | | | 30,2 | | | | | | 6,67 | <1 | 6,3 | | 0,22 | 0,07 | | 0,04 | 0,35 | 5,6 | | | | | | 7500 | | |
| | 15 | M | | 7,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,8 | | 28,1 | | | Mud | | | 6,92 | <1 | 6,6 | | | | | | | | | | | | | | | |
| | | T | | | 31,6 | | | | | | 8,22 | 13,0 | 6,0 | | 0,13 | 0,05 | | 0,04 | 0,33 | 14,9 | | | | | | 110000 | | |
| | 16 | M | | 1,4 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,0 | | 29,5 | | | Mud - Sand | | | 8,20 | 18,0 | 5,8 | | | | | | | | | | | | | | | |
| | | T | | | 31,8 | | | | | | 8,15 | 12,5 | 6,6 | | 0,10 | 0,03 | | 0,08 | 0,43 | 12,4 | | | | | | 2800 | | |
| F | 17 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,8 | | 31,8 | | | Mud | | | 8,20 | 12,5 | 6,0 | | | | | | | | | | | | | | | |
| | | T | | | 32,5 | | | | | | 7,62 | 4,5 | 6,2 | | 0,07 | 0,03 | | 0,02 | 0,42 | 24,8 | | | | | | 700 | | |
| | 18 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,9 | | 31,0 | | | Mud - Clay - Sand | | | 7,44 | 16,0 | 6,4 | | | | | | | | | | | | | | | |
| | | T | | | 30,8 | | | | | | 7,95 | 22,0 | 5,7 | | 0,05 | 0,03 | | 0,04 | 0,47 | 7,0 | | | | | | 2000 | | |
| | 19 | M | | 1,3 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,3 | | 30,7 | | | Mud - Sand | | | 7,92 | 22,0 | 5,5 | | | | | | | | | | | | | | | |
| | | T | | | 30,5 | | | | | | 7,89 | 23,0 | 5,8 | | 0,06 | 0,02 | | 0,03 | 0,29 | 6,4 | | | | | | 1100 | | |
| G | 20 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 2,7 | | 29,6 | | | Mud - Sand | | | 8,89 | 22,5 | 5,7 | | <0.05 | | | 0,05 | 0,46 | | | | | | | | | |
| | | T | | | 30,5 | | | | | | 7,67 | 21,2 | 6,3 | | <0.05 | 0,03 | | 0,04 | 0,69 | 6,9 | | | | | | 2700 | | |
| | 21 | M | | 1,1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,5 | | 29,5 | | | Mud - Sand | | | 7,76 | 32,0 | 5,2 | | | | | | | | | | | | | | | |
| | | T | | | 31,4 | | | | | | 8,10 | 17,0 | 6,4 | | <0.05 | 0,04 | | 0,06 | 0,53 | 6,4 | | | | | | 15000 | | |
| | 22 | M | | 1,2 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,3 | | 31,4 | | | Mud - Sand | | | 8,05 | 17,0 | 6,3 | | | | | | | | | | | | | | | |
| | | T | | | 31,6 | | | | | | 8,05 | 19,0 | 6,3 | | 0,05 | 0,03 | | 0,05 | 0,42 | 7,2 | | | | | | 15000 | | |
| H | 23 | M | | 1,3 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 3,7 | | 30,5 | | | Mud - Sand | | | 7,85 | 21,5 | 5,6 | | 0,05 | | | 0,08 | 0,13 | | | | | | | | | |
| | | T | | | 31,3 | | | | | | 8,05 | 18,0 | 6,2 | | 0,06 | 0,02 | | 0,05 | 0,53 | 7,1 | | | | | | 2000 | | |
| | 24 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 2,5 | | 29,7 | | | Mud - Clay | | | 7,95 | 19,0 | 5,8 | | | | | | | | | | | | | | | |
| | | T | | | 32,0 | | | | | | 7,95 | 13,5 | 6,5 | | <0.05 | 0,05 | | 0,04 | 0,48 | 7,6 | | | | | | 400 | | |
| | 25 | M | | 1,5 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 2,0 | | 30,9 | | | Mud - Sand | | | 7,68 | 21,0 | 6,4 | | <0.05 | | | 0,07 | 0,30 | | | | | | | | | |
| | | T | | | 32,0 | | | | | | 7,87 | 13,5 | 6,7 | | 0,06 | 0,04 | | 0,02 | 0,36 | 6,5 | | | | | | 200 | | |
| I | 26 | M | | 1,7 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 3,3 | | 31,0 | | | Mud - Clay | | | 7,57 | 21,5 | 6,3 | | <0.05 | | | 0,04 | 0,27 | | | | | | | | | |
| | | T | | | 31,5 | | | | | | 7,67 | 11,0 | 6,7 | | <0.05 | 0,02 | | 0,04 | 0,77 | 12,0 | | | | | | 400 | | |
| | 27 | M | | 1,5 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 3,1 | | 30,6 | | | Mud - Clay | | | 7,69 | 18,0 | 6,1 | | <0.05 | | | 0,05 | 0,22 | | | | | | | | | |
| | | T | | | 32,9 | | | | | | 7,67 | 1,0 | 7,4 | | <0.05 | 0,10 | | 0,04 | 0,25 | 6,1 | | | | | | 15000 | | |
| | 28 | M | | 1,5 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 0,8 | | 32,9 | | | Mud | | | 7,81 | 6,0 | 7,1 | | | | | | | | | | | | | | | |
| | | T | | | 33,0 | | | | | | 7,01 | <1 | 7,4 | | 0,05 | 0,06 | | 0,06 | 0,26 | 8,2 | | | | | | 2000 | | |
| J | 29 | M | | 1,1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,0 | | 32,2 | | | Mud - Clay | | | 7,20 | 6,0 | 6,8 | | | | | | | | | | | | | | | |
| | | T | | | 32,9 | | | | | | 7,46 | <1 | 7,3 | | 0,05 | 0,08 | | 0,06 | 0,26 | 5,2 | | | | | | 750000 | | |
| | 30 | M | | 1,3 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 2,5 | | 32,4 | | | Mud | | | 7,42 | 2,0 | 6,4 | | | | | | | | | | | | | | | |
| | | T | | | 30,0 | | | | | | 7,55 | 16,0 | 6,9 | | <0.05 | 0,03 | | 0,04 | 0,42 | 2,6 | | | | | | 1500 | | |
| | 31 | M | | 1,7 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | | | 30,0 | | | | | | – | – | – | | | | | | | | | | | | | | | |
| | | T | | | 29,4 | | | | | | 7,79 | 15,0 | 5,7 | | <0.05 | 0,03 | | 0,05 | 0,31 | 5,4 | | | | | | 2000 | | |
| K | 32 | M | | 1,0 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,8 | | 29,4 | | | Mud - Clay | | | 7,77 | 15,0 | 5,7 | | | | | | | | | | | | | | | |
| | | T | | | 28,9 | | | | | | 7,87 | 24,0 | 4,9 | | <0.05 | 0,03 | | 0,03 | 0,49 | 3,6 | | | | | | 430000 | | |
| | 33 | M | | 1,1 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,3 | | 28,3 | | | Mud - Clay | | | 7,86 | 21,0 | 5,3 | | | | | | | | | | | | | | | |
| | | T | | | 32,8 | | | | | | 7,67 | 3,0 | 7,2 | | <0.05 | 0,08 | | 0,06 | 0,29 | 3,5 | | | | | | 2800 | | |
| | 37 | M | | 1,3 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,6 | | 32,0 | | | Mud - Clay | | | 7,66 | 24,0 | 6,3 | | | | | | | | | | | | | | | |
| | | T | | | 31,1 | | | | | | 7,10 | 25,0 | 5,3 | | <0.05 | 0,03 | | 0,03 | 0,48 | 2,7 | | | | | | 150000 | | |
| | 34 | M | | 0,7 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 2,1 | | 31,8 | | | Mud - Sand | | | 7,12 | 25,0 | 5,0 | | <0.05 | | | 0,04 | 0,34 | | | | | | | | | |
| L | | T | | | 30,9 | | | | | | 7,48 | 26,0 | 6,3 | | <0.05 | 0,05 | | 0,02 | 0,59 | 1,0 | | | | | | 3500 | | |
| | 35 | M | | 1,8 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,9 | | 30,3 | | | Clay - Sand | | | 7,49 | 28,0 | 6,0 | | | | | | | | | | | | | | | |
| | | T | | | 28,1 | | | | | | 7,80 | 3,0 | 6,4 | | <0.05 | 0,04 | | 0,04 | 0,55 | 3,7 | | | | | | 2000 | | |
| | 36 | M | | 0,5 | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,3 | | 27,3 | | | Mud - Sand | | | 7,83 | 24,0 | 6,0 | | | | | | | | | | | | | | | |

# Survey Institute of Marine Resources and Environament, August 2006 - Phytoplankton Species

**STATION A1**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 9120 | 182400 |
| 2 | *Thalassiosira spp.* | 3 | 60 |
| 3 | *Diploneis smithii* | 1 | 20 |
| 4 | *Pleurosigma cf. fasciola* | 1 | 20 |
| 5 | *Nitzschia sigma* | 26 | 520 |
| 6 | *Nitzschia sp.* | 2 | 40 |
| 7 | *Prorocentrum micans* | 1 | 20 |
| 8 | *Ceratium furca* | 2 | 40 |
| 9 | *Oscillatoria sp2* | 10 | 200 |
| 10 | *Pediastrum sp.* | 7 | 140 |
| 11 | *Phacus sp1.* | 4 | 80 |
| | | **9177** | **183540** |

**STATION A2**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 5856 | 117120 |
| 2 | *Thalassionema nitzschioides* | 2 | 40 |
| 3 | *Thalassiothrix frauenfeldii* | 1 | 20 |
| 4 | *Nitzschia sigma* | 4 | 80 |
| 5 | *Oscillatoria sp2* | 5 | 100 |
| 6 | *Anabaena sp* | 1 | 20 |
| 7 | *Pediastrum sp.* | 2 | 40 |
| 8 | *Scenedesmus spp.* | 8 | 160 |
| 9 | *Phacus sp1.* | 9 | 180 |
| | | **5888** | **117760** |

**STATION A3**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 3648 | 72960 |
| 2 | *Skeletonema costatum* | 10 | 200 |
| 3 | *Nitzschia longissima* | 4 | 80 |
| 4 | *Nitzschia sigma* | 20 | 400 |
| 5 | *Pseudonitzschia sp.1 (to)* | 3 | 60 |
| 6 | *Prorocentrum mexicanum* | 1 | 20 |
| 7 | *Oscillatoria sp1* | 2 | 40 |
| 8 | *Oscillatoria sp2* | 11 | 220 |
| 9 | *Pediastrum sp.* | 5 | 100 |
| 10 | *Scenedesmus spp.* | 184 | 3680 |
| 11 | *Phacus sp1.* | 3 | 60 |
| 12 | *T¶o lôc* | 85 | 1700 |
| | | **3976** | **79520** |

**STATION B4**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 8736 | 174720 |
| 2 | *Melosira sp.* | 30 | 600 |
| 3 | *Thalassiosira spp.* | 2 | 40 |
| 4 | *Navicula palpebralis* | 1 | 20 |
| 5 | *Trachyneis aspera* | 1 | 20 |
| 6 | *Pleurosigma pelagicum* | 1 | 20 |
| 7 | *Nitzschia lorenziana* | 9 | 180 |
| 8 | *Nitzschia longissima* | 7 | 140 |
| 9 | *Nitzschia sigma* | 13 | 260 |
| 10 | *Nitzschia sigma v. intercedens* | 2 | 40 |
| 11 | *Pseudonitzschia spp.* | 3 | 60 |
| 12 | *Oscillatoria sp2* | 130 | 2600 |
| 13 | *Pediastrum sp.* | 6 | 120 |
| 14 | *Scenedesmus spp.* | 148 | 2960 |
| | | **9089** | **181780** |

**STATION B5**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 11488 | 229760 |
| 2 | *Melosira juergensi* | 17 | 340 |
| 3 | *Melosira spp.* | 32 | 640 |
| 4 | *Trachyneis aspera* | 23 | 460 |
| 5 | *Pleurosigma sp* | 1 | 20 |
| 6 | *Nitzschia sigma* | 6 | 120 |
| 7 | *Surirella gemma* | 1 | 20 |
| 8 | *Oscillatoria sp2* | 35 | 700 |
| 9 | *Pediastrum sp.* | 5 | 100 |
| 10 | *Scenedesmus spp.* | 4 | 80 |
| 11 | *Closterium sp* | 2 | 40 |
| 12 | *Phacus sp1.* | 2 | 40 |
| | | **11616** | **232320** |

**STATION B6**

**STATION G19**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Thalassiosira spp.* | 6 | 240 |
| 2 | *Pleurosigma sp* | 1 | 40 |
| 3 | *Amphora quadrata* | 5 | 200 |
| 4 | *Nitzschia longissima v. reversa* | 8 | 320 |
| 5 | *Prorocentrum micans* | 79 | 3160 |
| 6 | *Prorocentrum sigmoides* | 2 | 80 |
| 7 | *Prorocentrum rhathynum* | 14 | 560 |
| 8 | *Dinophysis rudgei* | 14 | 560 |
| 9 | *Gymnodinium sp* | 5 | 200 |
| 10 | *Gymnodinium mikimotoi* | 17 | 680 |
| 11 | *Gyrodinium spirale* | 21 | 840 |
| 12 | *Ceratium furca* | 33 | 1320 |
| 13 | *Ceratium fusus* | 3 | 120 |
| 14 | *Gonyaulax sp* | 1 | 40 |
| 15 | *Protoperidinium steinii* | 12 | 480 |
| 16 | *Protoperidinium pellucidum* | 11 | 440 |
| 17 | *Protoperidinium leonis* | 24 | 960 |
| 18 | *Protoperidinium sp.* | 16 | 640 |
| 19 | *Peridinium quinquecorne* | 1 | 40 |
| 20 | *Peridinium sp.* | 369 | 14760 |
| 21 | *Alexandrium sp* | 4 | 160 |
| 22 | *Alexandrium pseudogonyaulax* | 18 | 720 |
| 23 | *Diplopsalis sp.* | 1 | 40 |
| | | **665** | **26600** |

**STATION G20**

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Asteromphalus cleveanus* | 1 | 40 |
| 2 | *Thalassiosira spp.* | 17 | 680 |
| 3 | *Odontella mobiliensis* | 0,5 | 20 |
| 4 | *Synedra pulchella* | 4 | 160 |
| 5 | *Pleurosigma angulatum* | 10 | 400 |
| 6 | *Pleurosigma naviculaceum* | 30 | 1200 |
| 7 | *Nitzschia longissima* | 2 | 80 |
| 8 | *Nitzschia sigma* | 8 | 320 |
| 9 | *Nitzschia sigma v. intercedens* | 4 | 160 |
| 10 | *Nitzschia sp.* | 6 | 240 |
| 11 | *Prorocentrum micans* | 12 | 480 |
| 12 | *Prorocentrum mexicanum* | 46 | 1840 |
| 13 | *Prorocentrum gracile* | 32 | 1280 |
| 14 | *Dinophysis cf. rotundata* | 2 | 80 |
| 15 | *Gonyaulax polygramma* | 1 | 40 |
| 16 | *Protoperidinium steinii* | 35 | 1400 |
| 17 | *Protoperidinium depressum* | 2 | 80 |
| 18 | *Protoperidinium pellucidum* | 11 | 440 |
| 19 | *Alexandrium spp.* | 17 | 680 |
| 20 | *Diplopsalis sp.* | 1 | 40 |
| | | **241,5** | **9660** |

**STATION G21**

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Thalassiosira spp.* | 1 | 20 |
| 2 | *Skeletonema costatum* | 26 | 520 |
| 3 | *Chaetoceros diversus* | 2 | 40 |
| 4 | *Navicula sp* | 1 | 20 |
| 5 | *Pleurosigma sp* | 62 | 1240 |
| 6 | *Nitzschia longissima* | 1 | 20 |
| 7 | *Nitzschia sp.* | 1 | 20 |
| 8 | *Prorocentrum micans* | 92 | 1840 |
| 9 | *Prorocentrum rhathynum* | 11 | 220 |
| 10 | *Dinophysis rudgei* | 1 | 20 |
| 11 | *Gymnodinium sp* | 5 | 100 |
| 12 | *Gyrodinium spirale* | 11 | 220 |
| 13 | *Polykrikos schwartzii* | 1 | 20 |
| 14 | *Ceratium furca* | 1 | 20 |
| 15 | *Protoperidinium steinii* | 41 | 820 |
| 16 | *Protoperidinium pellucidum* | 6 | 120 |
| 17 | *Protoperidinium sp.* | 13 | 260 |
| 18 | *Peridinium quinquecorne* | 1 | 20 |
| 19 | *Peridinium sp.* | 4 | 80 |
| 20 | *Scrippsiella sp.* | 1 | 20 |
| 21 | *Alexandrium spp.* | 6 | 120 |
| 22 | *Alexandrium pseudogonyaulax* | 15 | 300 |
| 23 | *Pyrophacus sp* | 25 | 500 |
| 24 | *Hermesium sp.* | 6 | 120 |
| | | **334** | **6680** |

**STATION H22**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 115 | 2300 |
| 2 | *Melosira juergensi* | 2 | 40 |
| 3 | *Skeletonema costatum* | 10 | 200 |
| 4 | *Navicula palpebralis* | 1 | 20 |
| 5 | *Diploneis smithii* | 1 | 20 |
| 6 | *Gyrosigma strigile* | 1 | 20 |
| 7 | *Amphiprora alata* | 1 | 20 |
| 8 | *Nitzschia longissima* | 3 | 60 |
| 9 | *Nitzschia sigma* | 27 | 540 |
| 10 | *Nitzschia sigma v. intercedens* | 2 | 40 |
| 11 | *Protoperidinium spp.* | 4 | 80 |
| 12 | *Oscillatoria sp2* | 7 | 140 |
| 13 | *Pediastrum sp.* | 2 | 40 |
| 14 | *Scenedesmus spp.* | 54 | 1080 |
| | | **230** | **4600** |

**STATION C7**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 8256 | 165120 |
| 2 | *Melosira juergensi* | 36 | 720 |
| 3 | *Thalassiosira spp.* | 2 | 40 |
| 4 | *Skeletonema costatum* | 6 | 120 |
| 5 | *Diatoma elongatum* | 4 | 80 |
| 6 | *Navicula palpebralis* | 10 | 200 |
| 7 | *Trachyneis aspera* | 9 | 180 |
| 8 | *Pleurosigma naviculaceum* | 2 | 40 |
| 9 | *Pleurosigma pelagicum* | 1 | 20 |
| 10 | *Nitzschia lorenziana* | 1 | 20 |
| 11 | *Nitzschia longissima* | 13 | 260 |
| 12 | *Nitzschia sigma* | 94 | 1880 |
| 13 | *Nitzschia sigma v. intercedens* | 10 | 200 |
| 14 | *Pseudonitzschia sp. 1 (to)* | 13 | 260 |
| 15 | *Oscillatoria sp2* | 29 | 580 |
| 16 | *Pediastrum sp.* | 2 | 40 |
| 17 | *Scenedesmus sp.* | 10 | 200 |
| 18 | *Scenedesmus spp.* | 32 | 640 |
| 19 | *Phacus sp1.* | 2 | 40 |
| | | **8532** | **170640** |

**STATION C8**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 1728 | 34560 |
| 2 | *Melosira juergensi* | 93 | 1860 |
| 3 | *Thalassiosira spp.* | 5 | 100 |
| 4 | *Navicula palpebralis* | 5 | 100 |
| 5 | *Pleurosigma spp.* | 3 | 60 |
| 6 | *Pleurosigma sp* | 2 | 40 |
| 7 | *Nitzschia lorenziana* | 1 | 20 |
| 8 | *Nitzschia longissima* | 6 | 120 |
| 9 | *Nitzschia sigma* | 15 | 300 |
| 10 | *Nitzschia sigma v. intercedens* | 3 | 60 |
| 11 | *Pseudonitzschia spp.* | 11 | 220 |
| 12 | *Protoperidinium sp.* | 1 | 20 |
| 13 | *Oscillatoria sp2* | 6 | 120 |
| 14 | *Pediastrum sp.* | 10 | 200 |
| 15 | *Scenedesmus spp.* | 90 | 1800 |
| 16 | *Tetrachlorella cumbricus var. apiculatus* | 24 | 480 |
| | | **2003** | **40060** |

**STATION C9**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 744 | 14880 |
| 2 | *Coscinodiscus cf. subtilis* | 1 | 20 |
| 3 | *Thalassiosira spp.* | 4 | 80 |
| 4 | *Diatoma elongatum* | 2 | 40 |
| 5 | *Grammatophora marina* | 2 | 40 |
| 6 | *Navicula palpebralis* | 3 | 60 |
| 7 | *Navicula lyra* | 1 | 20 |
| 8 | *Pleurosigma sp* | 4 | 80 |
| 9 | *Pleurosigma naviculaceum* | 1 | 20 |
| 10 | *Pleurosigma pelagicum* | 2 | 40 |
| 11 | *Amphora quadrata* | 3 | 60 |
| 12 | *Nitzschia sigma* | 11 | 220 |
| 13 | *Surirella tenera v. nervosa* | 1 | 20 |
| 14 | *Campylodiscus biangulatum* | 1 | 20 |
| 15 | *Protoperidinium spp.* | 6 | 120 |
| 16 | *Oscillatoria sp2* | 11 | 220 |
| 17 | *Pediastrum sp.* | 8 | 160 |
| 18 | *Scenedesmus spp.* | 120 | 2400 |
| 19 | *Closterium sp* | 2 | 40 |
| 20 | *Phacus sp1.* | 1 | 20 |
| | | **928** | **18560** |

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Thalassiosira spp.* | 1 | 40 |
| 2 | *Skeletonema costatum* | 10 | 400 |
| 3 | *Synedra sp.* | 2 | 80 |
| 4 | *Grammatophora marina* | 1 | 40 |
| 5 | *Navicula sp* | 1 | 40 |
| 6 | *Pleurosigma angulatum* | 4 | 160 |
| 7 | *Pleurosigma sp* | 15 | 600 |
| 8 | *Nitzschia lorenziana* | 2 | 80 |
| 9 | *Nitzschia longissima* | 5 | 200 |
| 10 | *Nitzschia longissima v. reversa* | 45 | 1800 |
| 11 | *Nitzschia sigma* | 19 | 760 |
| 12 | *Nitzschia closterium* | 1 | 40 |
| 13 | *Prorocentrum micans* | 2 | 80 |
| 14 | *Prorocentrum rhathynum* | 5 | 200 |
| 15 | *Gymnodinium sanguineum* | 3 | 120 |
| 16 | *Polykrikos schwartzii* | 0,5 | 20 |
| 17 | *Gonyaulax sp* | 7 | 280 |
| 18 | *Gonyaulax verior* | 1 | 40 |
| 19 | *Protoperidinium steinii* | 2 | 80 |
| 20 | *Protoperidinium pellucidum* | 3 | 120 |
| 21 | *Protoperidinium sp.* | 9 | 360 |
| 22 | *Peridinium sp.* | 3 | 120 |
| 23 | *Alexandrium sp* | 1 | 40 |
| 24 | *Alexandrium pseudogonyaulax* | 8 | 320 |
| 25 | *Oblea sp* | 8 | 320 |
| 26 | *Pyrophacus sp* | 5 | 200 |
| 27 | *Oscillatoria sp2* | 2 | 80 |
| 28 | *Anabaena sp* | 3 | 120 |
| 29 | *T¶o lam* | 112 | 4480 |
| | | **280,5** | **11220** |

**STATION H23**

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Thalassiosira sp.* | 2 | 40 |
| 2 | *Skeletonema costatum* | 73 | 1460 |
| 3 | *Chaetoceros sp.* | 4 | 80 |
| 4 | *Pleurosigma sp* | 12 | 240 |
| 5 | *Nitzschia longissima* | 1 | 20 |
| 6 | *Nitzschia longissima v. reversa* | 5 | 100 |
| 7 | *Nitzschia sigma* | 1 | 20 |
| 8 | *Prorocentrum micans* | 7 | 140 |
| 9 | *Prorocentrum rhathynum* | 21 | 420 |
| 10 | *Dinophysis rudgei* | 1 | 20 |
| 11 | *Gymnodinium sanguineum* | 4 | 80 |
| 12 | *Polykrikos schwartzii* | 1 | 20 |
| 13 | *Ceratium furca* | 1 | 20 |
| 14 | *Gonyaulax sp* | 16 | 320 |
| 15 | *Gonyaulax verior* | 2 | 40 |
| 16 | *Gonyaulax rotundata* | 1 | 20 |
| 17 | *Protoperidinium pellucidum* | 1 | 20 |
| 18 | *Protoperidinium sp.* | 29 | 580 |
| 19 | *Peridinium quinquecorne* | 1 | 20 |
| 20 | *Alexandrium pseudogonyaulax* | 9 | 180 |
| 21 | *Oblea sp* | 10 | 200 |
| 22 | *Pyrophacus sp* | 11 | 220 |
| 23 | *Hermesium sp.* | 2 | 40 |
| 24 | *Oscillatoria sp2* | 2 | 40 |
| 25 | *T¶o lam* | 235 | 4700 |
| | | **452** | **9040** |

**STATION H24**

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Skeletonema costatum* | 44 | 1760 |
| 2 | *Thalassiothrix frauenfeldii* | 1 | 40 |
| 3 | *Navicula sp* | 0,5 | 20 |
| 4 | *Diploneis sp.1* | 1 | 40 |
| 5 | *Pleurosigma sp* | 8 | 320 |
| 6 | *Nitzschia lorenziana* | 1 | 40 |
| 7 | *Nitzschia longissima* | 1 | 40 |
| 8 | *Nitzschia longissima v. reversa* | 8 | 320 |
| 9 | *Nitzschia sigma* | 1 | 40 |
| 10 | *Prorocentrum micans* | 2 | 80 |
| 11 | *Prorocentrum rhathynum* | 9 | 360 |
| 12 | *Dinophysis rudgei* | 1 | 40 |
| 13 | *Polykrikos schwartzii* | 2 | 80 |
| 14 | *Gonyaulax sp* | 12 | 480 |
| 15 | *Gonyaulax verior* | 1 | 40 |
| 16 | *Protoperidinium steinii* | 5 | 200 |
| 17 | *Protoperidinium pellucidum* | 1 | 40 |
| 18 | *Protoperidinium sp.* | 43 | 1720 |
| 19 | *Peridinium quinquecorne* | 4 | 160 |
| 20 | *Peridinium sp.* | 1 | 40 |
| 21 | *Alexandrium pseudogonyaulax* | 11 | 440 |
| 22 | *Fragillidium sp.* | 1 | 40 |

**STATION D10**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 6 | 120 |
| 2 | *Melosira granulata v. angustissima* | 121 | 2420 |
| 3 | *Thalassiosira spp.* | 16 | 320 |
| 4 | *Skeletonema costatum* | 27 | 540 |
| 5 | *Leptocylindrus danicus* | 7 | 140 |
| 6 | *Navicula palpebralis* | 5 | 100 |
| 7 | *Nitzschia longissima* | 261 | 5220 |
| 8 | *Nitzschia sigma* | 2160 | 43200 |
| 9 | *Nitzschia sigma v. intercedens* | 1 | 20 |
| 10 | *Pseudonitzschia spp.* | 14 | 280 |
| 11 | *Oscillatoria sp2* | 3 | 60 |
| 12 | *Pediastrum sp.* | 4 | 80 |
| 13 | *Scenedesmus spp.* | 66 | 1320 |
| 14 | *Phacus sp1.* | 1 | 20 |
| | | **2692** | **53840** |

**STATION D11**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 116 | 2320 |
| 2 | *Thalassiosira spp.* | 11 | 220 |
| 3 | *Skeletonema costatum* | 14 | 280 |
| 4 | *Diatoma elongatum* | 3 | 60 |
| 5 | *Nitzschia longissima* | 108 | 2160 |
| 6 | *Nitzschia sigma* | 688 | 13760 |
| 7 | *Pseudonitzschia spp.* | 17 | 340 |
| 8 | *Oscillatoria sp2* | 5 | 100 |
| 9 | *Pediastrum sp.* | 8 | 160 |
| 10 | *Scenedesmus spp.* | 108 | 2160 |
| 11 | *Phacus sp1.* | 1 | 20 |
| | | **1079** | **21580** |

**STATION D12**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 31 | 620 |
| 2 | *Thalassiosira spp.* | 12 | 240 |
| 3 | *Skeletonema costatum* | 4 | 80 |
| 4 | *Diatoma elongatum* | 5 | 100 |
| 5 | *Synedra pulchella* | 1 | 20 |
| 6 | *Synedra gaillonii* | 3 | 60 |
| 7 | *Nitzschia longissima* | 2 | 40 |
| 8 | *Nitzschia sigma* | 7 | 140 |
| 9 | *Pseudonitzschia spp.* | 11 | 220 |
| 10 | *Alexandrium sp* | 1 | 20 |
| 11 | *Oscillatoria sp2* | 4 | 80 |
| 12 | *Anabaena sp* | 3 | 60 |
| 13 | *Pediastrum sp.* | 8 | 160 |
| 14 | *Scenedesmus spp.* | 160 | 3200 |
| 15 | *Phacus sp1.* | 1 | 20 |
| 16 | *Gloeotila spp* | 57 | 1140 |
| | | **310** | **6200** |

**STATION E13**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 97 | 1940 |
| 2 | *Thalassiosira spp.* | 23 | 460 |
| 3 | *Skeletonema costatum* | 12 | 240 |
| 4 | *Diatoma elongatum* | 1 | 20 |
| 5 | *Nitzschia longissima* | 324 | 6480 |
| 6 | *Nitzschia sigma* | 196 | 3920 |
| 7 | *Pseudonitzschia spp.* | 1 | 20 |
| 8 | *Protoperidinium spp.* | 3 | 60 |
| 9 | *Alexandrium sp* | 1 | 20 |
| 10 | *Oscillatoria sp2* | 11 | 220 |
| 11 | *Anabaena sp* | 3 | 60 |
| 12 | *Scenedesmus spp.* | 60 | 1200 |
| | | **732** | **14640** |

**STATION E14**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Melosira granulata* | 158 | 3160 |
| 2 | *Thalassiosira spp.* | 7 | 140 |
| 3 | *Skeletonema costatum* | 8 | 160 |
| 4 | *Biddulphia pulchella* | 1 | 20 |
| 5 | *Diatoma elongatum* | 5 | 100 |
| 6 | *Thalassiothrix frauenfeldii* | 1 | 20 |
| 7 | *Synedra gaillonii* | 1 | 20 |
| 8 | *Trachyneis aspera* | 2 | 40 |
| 9 | *Pleurosigma normanii* | 1 | 20 |
| 10 | *Nitzschia longissima* | 1 | 20 |
| 11 | *Gymnodinium sanguineum* | 1 | 20 |

| | | | |
|---|---|---|---|
| 23 | *Oblea sp* | 25 | 1000 |
| 24 | *Pyrophacus sp* | 5 | 200 |
| 25 | *Hermesium sp.* | 2 | 80 |
| 26 | *T¶o am* | 54 | 2160 |
| | | **244,5** | **9780** |

**STATION 25**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Thalassiosira sp.* | 1 | 40 |
| 2 | *Skeletonema costatum* | 62 | 2480 |
| 3 | *Pleurosigma sp* | 2 | 80 |
| 4 | *Nitzschia longissima v. reversa* | 16 | 640 |
| 5 | *Prorocentrum micans* | 1 | 40 |
| 6 | *Prorocentrum minimum* | 1 | 40 |
| 7 | *Prorocentrum rhathynum* | 1 | 40 |
| 8 | *Gymnodinium sanguineum* | 2 | 80 |
| 9 | *Ceratium furca* | 0,5 | 20 |
| 10 | *Gonyaulax sp* | 2 | 80 |
| 11 | *Protoperidinium pellucidum* | 1 | 40 |
| 12 | *Protoperidinium sp.* | 7 | 280 |
| 13 | *Peridinium quinquecorne* | 1 | 40 |
| 14 | *Alexandrium sp* | 1 | 40 |
| 15 | *Alexandrium pseudogonyaulax* | 5 | 200 |
| 16 | *Oblea sp* | 6 | 240 |
| 17 | *Pyrophacus sp* | 21 | 840 |
| 18 | *Hermesium sp.* | 1 | 40 |
| 19 | *Anabaena sp* | 9 | 360 |
| 20 | *T¶o am* | 244 | 9760 |
| | | **384,5** | **15380** |

**STATION 26**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Skeletonema costatum* | 58 | 2320 |
| 2 | *Chaetoceros sp.* | 5 | 200 |
| 3 | *Synedra sp.* | 2 | 80 |
| 4 | *Pleurosigma sp* | 2 | 80 |
| 5 | *Nitzschia longissima v. reversa* | 4 | 160 |
| 6 | *Gonyaulax sp* | 1 | 40 |
| 7 | *Protoperidinium conicum* | 1 | 40 |
| 8 | *Protoperidinium sp.* | 4 | 160 |
| 9 | *Peridinium quinquecorne* | 6 | 240 |
| 10 | *Alexandrium pseudogonyaulax* | 5 | 200 |
| 11 | *Diplopsalis sp.* | 1 | 40 |
| 12 | *Oblea sp* | 3 | 120 |
| 13 | *Pyrophacus sp* | 4 | 160 |
| 14 | *Hermesium sp.* | 2 | 80 |
| 15 | *Anabaena sp* | 13 | 520 |
| 16 | *Pediastrum sp.* | 1 | 40 |
| 17 | *Scenedesmus sp.* | 12 | 480 |
| 18 | *T¶o am* | 214 | 8560 |
| | | **338** | **13520** |

**STATION 27**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Skeletonema costatum* | 39 | 1560 |
| 2 | *Chaetoceros sp.* | 4 | 160 |
| 3 | *Grammatophora marina* | 0,5 | 20 |
| 4 | *Pleurosigma sp* | 3 | 120 |
| 5 | *Nitzschia longissima* | 3 | 120 |
| 6 | *Nitzschia longissima v. reversa* | 1 | 40 |
| 7 | *Nitzschia sigma* | 1 | 40 |
| 8 | *Prorocentrum micans* | 3 | 120 |
| 9 | *Prorocentrum minimum* | 3 | 120 |
| 10 | *Prorocentrum rhathynum* | 2 | 80 |
| 11 | *Gonyaulax sp* | 4 | 160 |
| 12 | *Protoperidinium sp.* | 1 | 40 |
| 13 | *Peridinium sp.* | 0,5 | 20 |
| 14 | *Alexandrium sp* | 3 | 120 |
| 15 | *Fragillidium sp.* | 1 | 40 |
| 16 | *Oblea sp* | 7 | 280 |
| 17 | *Pyrophacus sp* | 6 | 240 |
| 18 | *Hermesium sp.* | 3 | 120 |
| 19 | *Oscillatoria sp1* | 3 | 120 |
| 20 | *Anabaena sp* | 17 | 680 |
| 21 | *T¶o am* | 261 | 10440 |
| | | **366** | **14640** |

**STATION 28**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | *Skeletonema costatum* | 95 | 1900 |
| 2 | *Synedra sp.* | 2 | 40 |
| 3 | *Pleurosigma sp* | 2 | 40 |
| 4 | *Pleurosigma naviculaceum* | 1 | 20 |

| No | SPECIES | QUANTITY | CELLS/L |
|---|---|---|---|
| 12 | *Protoperidinium spp.* | 3 | 60 |
| 13 | *Oscillatoria sp2* | 15 | 300 |
| 14 | *Spirulina sp* | 6 | 120 |
| 15 | *Anabaena sp* | 6 | 120 |
| 16 | *Pediastrum sp.* | 1 | 20 |
| 17 | *Scenedesmus spp.* | 30 | 600 |
| 18 | *Phacus sp1.* | 1 | 20 |
| | | **248** | **4960** |

| **STATION E15** | | | |
|---|---|---|---|
| **No** | Sampling date: 19/08/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 176 | 3520 |
| 2 | *Thalassiosira spp.* | 14 | 280 |
| 3 | *Diatoma elongatum* | 2 | 40 |
| 4 | *Nitzschia longissima* | 7 | 140 |
| 5 | *Nitzschia sigma* | 15 | 300 |
| 6 | *Nitzschia sp.* | 6 | 120 |
| 7 | *Oscillatoria sp2* | 14 | 280 |
| 8 | *Spirulina sp* | 5 | 100 |
| 9 | *Anabaena sp* | 9 | 180 |
| 10 | *Pediastrum sp.* | 8 | 160 |
| 11 | *Scenedesmus spp.* | 81 | 1620 |
| 12 | *Phacus sp1.* | 8 | 160 |
| | | **345** | **6900** |

| **STATION F16** | | | |
|---|---|---|---|
| **No** | Sampling date: 19/08/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 49 | 1960 |
| 2 | *Skeletonema costatum* | 8 | 320 |
| 3 | *Pleurosigma pelagicum* | 1 | 40 |
| 4 | *Nitzschia longissima* | 1 | 40 |
| 5 | *Nitzschia sigma* | 1 | 40 |
| 6 | *Prorocentrum micans* | 0,5 | 20 |
| 7 | *Prorocentrum rhathynum* | 34 | 1360 |
| 8 | *Prorocentrum gracile* | 1 | 40 |
| 9 | *Gymnodinium sp* | 3 | 120 |
| 10 | *Gymnodinium sanguineum* | 3 | 120 |
| 11 | *Protoperidinium pellucidum* | 4 | 160 |
| 12 | *Protoperidinium spp.* | 6 | 240 |
| 13 | *Alexandrium spp.* | 5 | 200 |
| 14 | *Oscillatoria sp2* | 30 | 1200 |
| 15 | *Spirulina sp* | 5 | 200 |
| 16 | *Anabaena sp* | 5 | 200 |
| 17 | *Nhãm Dino bĐ* | 103 | 4120 |
| | | **259,5** | **10380** |

| **STATION F17** | | | |
|---|---|---|---|
| **No** | Sampling date: 19/08/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 3 | 60 |
| 2 | *Thalassiosira spp.* | 67 | 1340 |
| 3 | *Skeletonema costatum* | 4 | 80 |
| 4 | *Nitzschia longissima* | 3 | 60 |
| 5 | *Nitzschia sigma* | 7 | 140 |
| 6 | *Pseudonitzschia spp.* | 3 | 60 |
| 7 | *Prorocentrum rhathynum* | 3 | 60 |
| 8 | *Alexandrium spp.* | 13 | 260 |
| 9 | *Oscillatoria sp2* | 99 | 1980 |
| 10 | *Spirulina sp* | 14 | 280 |
| 11 | *Anabaena sp* | 17 | 340 |
| 12 | *Scenedesmus spp.* | 8 | 160 |
| 13 | *Nhãm Dino bĐ* | 101 | 2020 |
| | | **342** | **6840** |

| **STATION F18** | | | |
|---|---|---|---|
| **No** | Sampling date: 19/08/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata v. angustissima* | 10 | 200 |
| 2 | *Skeletonema costatum* | 8 | 160 |
| 3 | *Synedra sp.* | 2 | 40 |
| 4 | *Pleurosigma sp* | 1 | 20 |
| 5 | *Nitzschia longissima v. reversa* | 4 | 80 |
| 6 | *Nitzschia sp.* | 4 | 80 |
| 7 | *Peridinium quinquecorne* | 1 | 20 |
| 8 | *Anabaena sp* | 780 | 15600 |
| 9 | *Microcystis sp* | 72 | 1440 |
| 10 | *Scenedesmus quadricauda* | 16 | 320 |
| 11 | *Scenedesmus armatus* | 400 | 8000 |
| 12 | *Scenedesmus acuminatus var. acuminatus* | 8 | 160 |
| 13 | *Phacus sp2.* | 1 | 20 |
| 14 | *Phacus sp1.* | 1 | 20 |
| | | **1308** | **26160** |

| No | SPECIES | QUANTITY | CELLS/L |
|---|---|---|---|
| 5 | *Nitzschia longissima* | 2 | 40 |
| 6 | *Nitzschia sigma v. intercedens* | 1 | 20 |
| 7 | *Prorocentrum rhathynum* | 1 | 20 |
| 8 | *Anabaenopsis raciborskii* | 2150 | 43000 |
| 9 | *Pediastrum sp.* | 2 | 40 |
| 10 | *Scenedesmus carinatus* | 8 | 160 |
| 11 | *Scenedesmus quadricauda* | 4 | 80 |
| 12 | *Scenedesmus acuminatus var. acuminatus* | 20 | 400 |
| 13 | *Staurastrum sp.* | 1 | 20 |
| 14 | *T¶o lam* | 15 | 300 |
| | | **2304** | **46080** |

| **STATION 29** | | | |
|---|---|---|---|
| **No** | Sampling date: 21/08/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata v. angustissima* | 294 | 5880 |
| 2 | *Skeletonema costatum* | 525 | 10500 |
| 3 | *Synedra sp.* | 2 | 40 |
| 4 | *Navicula sp* | 2 | 40 |
| 5 | *Nitzschia sigma* | 1 | 20 |
| 6 | *Nitzschia sp.* | 2 | 40 |
| 7 | *Peridinium sp.* | 2 | 40 |
| 8 | *Anabaena sp* | 8 | 160 |
| 9 | *Anabaenopsis sp.* | 510 | 10200 |
| 10 | *Pediastrum sp.* | 5 | 100 |
| 11 | *Scenedesmus sp.* | 8 | 160 |
| 12 | *Scenedesmus carinatus* | 7 | 140 |
| 13 | *Scenedesmus quadricauda* | 12 | 240 |
| 14 | *Scenedesmus acuminatus var. acuminatus* | 16 | 320 |
| 15 | *Staurastrum sp.* | 1 | 20 |
| | | **1395** | **27900** |

| **STATION 30** | | | |
|---|---|---|---|
| **No** | Sampling date: 21/08/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata v. angustissima* | 109 | 4360 |
| 2 | *Coscinodiscus sp.* | 0,5 | 20 |
| 3 | *Skeletonema costatum* | 18 | 720 |
| 4 | *Synedra sp.* | 4 | 160 |
| 5 | *Pleurosigma sp* | 1 | 40 |
| 6 | *Nitzschia sigma* | 2 | 80 |
| 7 | *Peridinium sp.* | 6 | 240 |
| 8 | *Oscillatoria sp1* | 1 | 40 |
| 9 | *Anabaenopsis raciborskii* | 547,5 | 21900 |
| 10 | *Microcystis sp* | 1 | 40 |
| 11 | *Pediastrum sp.* | 3 | 120 |
| 12 | *Scenedesmus carinatus* | 4 | 160 |
| 13 | *Scenedesmus quadricauda* | 8 | 320 |
| 14 | *Scenedesmus acuminatus var. acuminatus* | 8 | 320 |
| 15 | *Staurastrum sp.* | 4 | 160 |
| 16 | *T¶o lam* | 2 | 80 |
| | | **719** | **28760** |

| **STATION 31** | | | |
|---|---|---|---|
| **No** | Sampling date: 21/08/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Skeletonema costatum* | 141 | 2820 |
| 2 | *Thalassiothrix frauenfeldii* | 1 | 20 |
| 3 | *Pleurosigma sp* | 6 | 120 |
| 4 | *Nitzschia lorenziana* | 1 | 20 |
| 5 | *Nitzschia longissima v. reversa* | 6 | 120 |
| 6 | *Nitzschia sigma v. intercedens* | 2 | 40 |
| 7 | *Oscillatoria sp1* | 3 | 60 |
| 8 | *Anabaenopsis sp.* | 2001 | 40020 |
| | | **2161** | **43220** |

| **STATION K32** | | | |
|---|---|---|---|
| **No** | Sampling date: 22/08/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Skeletonema costatum* | 70 | 1400 |
| 2 | *Pleurosigma sp* | 23 | 460 |
| 3 | *Nitzschia longissima* | 1 | 20 |
| 4 | *Nitzschia longissima v. reversa* | 29 | 580 |
| 5 | *Nitzschia sigma* | 1 | 20 |
| 6 | *Prorocentrum micans* | 6 | 120 |
| 7 | *Prorocentrum rhathynum* | 2 | 40 |
| 8 | *Gonyaulax sp* | 1 | 20 |
| 9 | *Gonyaulax verior* | 1 | 20 |
| 10 | *Gonyaulax rotundata* | 2 | 40 |
| 11 | *Protoperidinium steinii* | 7 | 140 |
| 12 | *Protoperidinium pellucidum* | 3 | 60 |
| 13 | *Peridinium sp.* | 12 | 240 |
| 14 | *Alexandrium sp* | 7 | 140 |
| 15 | *Alexandrium spp.* | 1 | 20 |
| 16 | *Alexandrium pseudogonyaulax* | 1 | 20 |
| 17 | *Diplopsalis sp.* | 1 | 20 |
| 18 | *Oblea sp* | 2 | 40 |

| | | | |
|---|---|---|---|
| 19 | *Pyrophacus sp* | 28 | 560 |
| 20 | *Hermesium sp.* | 3 | 60 |
| 21 | *Oscillatoria sp1* | 1 | 20 |
| 22 | *Euglena sp1.* | 1 | 20 |
| 23 | *T¶o am* | 77 | 1540 |
| | | **280** | **5600** |

**STATION K33**

| No | Sampling date: 22/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Skeletonema costatum* | 50 | 1000 |
| 2 | *Chaetoceros sp.* | 7 | 140 |
| 3 | *Synedra sp.* | 1 | 20 |
| 4 | *Achnanthes longipes* | 1 | 20 |
| 5 | *Pleurosigma sp* | 17 | 340 |
| 6 | *Nitzschia longissima* | 8 | 160 |
| 7 | *Nitzschia longissima v. reversa* | 6 | 120 |
| 8 | *Nitzschia sigma* | 3 | 60 |
| 9 | *Protoperidinium sp.* | 4 | 80 |
| 10 | *Alexandrium pseudogonyaulax* | 2 | 40 |
| 11 | *Pyrophacus sp* | 5 | 100 |
| 12 | *Hermesium sp.* | 1 | 20 |
| 13 | *T¶o am* | 2 | 40 |
| | | **107** | **2140** |

**STATION L35**

| No | Sampling date: 22/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Skeletonema costatum* | 53 | 1060 |
| 2 | *Chaetoceros spp.* | 47 | 940 |
| 3 | *Synedra sp.* | 6 | 120 |
| 4 | *Grammatophora marina* | 13 | 260 |
| 5 | *Cocconeis scutellum* | 1 | 20 |
| 6 | *Pleurosigma affine* | 2 | 40 |
| 7 | *Nitzschia lorenziana* | 1 | 20 |
| 8 | *Nitzschia longissima* | 4 | 80 |
| 9 | *Nitzschia longissima v. reversa* | 34 | 680 |
| 10 | *Nitzschia sigma* | 7 | 140 |
| 11 | *Gymnodinium sanguineum* | 1 | 20 |
| 12 | *Ceratium furca* | 13 | 260 |
| 13 | *Gonyaulax sp* | 2 | 40 |
| 14 | *Gonyaulax rotundata* | 5 | 100 |
| 15 | *Protoperidinium claudicans* | 1 | 20 |
| 16 | *Protoperidinium pellucidum* | 4 | 80 |
| 17 | *Protoperidinium sp.* | 2 | 40 |
| 18 | *Peridinium quinquecorne* | 1 | 20 |
| 19 | *Peridinium sp.* | 18 | 360 |
| 20 | *Alexandrium sp* | 2 | 40 |
| 21 | *Alexandrium pseudogonyaulax* | 2 | 40 |
| 22 | *Pyrophacus sp* | 1 | 20 |
| 23 | *Oscillatoria sp2* | 4 | 80 |
| 24 | *Anabaenopsis sp.* | 14 | 280 |
| 25 | *T¶o am* | 1 | 20 |
| | | **239** | **4780** |

**STATION L36**

| No | Sampling date: 22/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira sp.* | 17 | 340 |
| 2 | *Thalassiosira spp.* | 26 | 520 |
| 3 | *Skeletonema costatum* | 33 | 660 |
| 4 | *Guinardia flaccida* | 2 | 40 |
| 5 | *Biddulphia dubia* | 1 | 20 |
| 6 | *Ditylum sol* | 1 | 20 |
| 7 | *Diatoma elongatum* | 5 | 100 |
| 8 | *Thalassionema nitzschioides* | 5 | 100 |
| 9 | *Thalassiothrix frauenfeldii* | 4 | 80 |
| 10 | *Navicula lyra* | 2 | 40 |
| 11 | *Trachyneis aspera* | 8 | 160 |
| 12 | *Diploneis bombus* | 1 | 20 |
| 13 | *Gyrosigma strigile* | 3 | 60 |
| 14 | *Gyrosigma sp.* | 11 | 220 |
| 15 | *Pleurosigma affine* | 11 | 220 |
| 16 | *Pleurosigma angulatum* | 3 | 60 |
| 17 | *Pleurosigma naviculaceum* | 25 | 500 |
| 18 | *Pleurosigma pelagicum* | 2 | 40 |
| 19 | *Amphiprora alata* | 69 | 1380 |
| 20 | *Nitzschia lorenziana* | 8 | 160 |
| 21 | *Nitzschia longissima* | 45 | 900 |
| 22 | *Nitzschia sigma v. intercedens* | 45 | 900 |
| 23 | *Bacillaria paxillifera* | 10 | 200 |
| 24 | *Pseudonitzschia spp.* | 1 | 20 |
| 25 | *Campylodiscus undulatus* | 2 | 40 |
| 26 | *Prorocentrum micans* | 1 | 20 |
| 27 | *Protoperidinium pellucidum* | 2 | 40 |
| | | **343** | **6860** |

## Survey Institute of Marine Resources and Environament, August 2006 - Zooplankton Species

**STATION A1**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 8 | 400 |
| 2 | *Oithona similis* | 22 | 1100 |
| 3 | *Copepoda* | 12 | 600 |
| 4 | *Microcyclops varicans* | 9 | 450 |
| | | **51** | **2550** |

**STATION A2**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 18 | 900 |
| 2 | *Acartia clausi* | 4 | 200 |
| 3 | *Oithona similis* | 50 | 2500 |
| 4 | *Copepoda* | 138 | 6900 |
| | | **210** | **10500** |

**STATION A3**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 2 | 100 |
| 2 | *Thermocyclops hyalinus* | 12 | 600 |
| 3 | *Microcetella norvegica* | 2 | 100 |
| 4 | *Copepoda* | 186 | 9300 |
| | | **202** | **10100** |

**STATION B4**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 22 | 1100 |
| 2 | *Oithona sp.* | 7 | 350 |
| 3 | *Microcetella norvegica* | 1 | 50 |
| 4 | *Copepoda* | 12 | 600 |
| | | **42** | **2100** |

**STATION B5**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus crassirostris* | 12 | 600 |
| 2 | *Oithona similis* | 23 | 1150 |
| 3 | *Macrocetella gracilis* | 1 | 50 |
| 4 | *Euterpina acutifront* | 1 | 50 |
| 5 | *Copepoda* | 6 | 300 |
| 6 | *Moinadapnhia macleayii* | 2 | 100 |
| | | **45** | **2250** |

**STATION B6**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 2 | 100 |
| 2 | *Calocalanus pavo* | 1 | 50 |
| 3 | *Pseudodiaptomus sp.* | 1 | 50 |
| 4 | *Scolecithrix spp.* | 1 | 50 |
| 5 | *Acartia pacifica* | 3 | 150 |
| 6 | *Acartia clausi* | 1 | 50 |
| 7 | *Oithona similis* | 6 | 300 |
| 8 | *Corycaeus sp.* | 1 | 50 |
| 9 | *Clytemnestra scutellata* | 2 | 100 |
| 10 | *Copepoda* | 118 | 5900 |
| | | **136** | **6800** |

**STATION C7**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 12 | 600 |

**STATION G19**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Harpaticoda* | 1 | 50 |
| 2 | *Paracalanus parvus* | 4 | 200 |
| 3 | *Labidocera kroyeri* | 3 | 150 |
| 4 | *Acartia clausi* | 10 | 500 |
| 5 | *Thermocyclops hyalinus* | 2 | 100 |
| 6 | *Oncaea venusta* | 2 | 100 |
| 7 | *Clytemnestra scutellata* | 2 | 100 |
| 8 | *Copepoda* | 6 | 300 |
| | | **30** | **1500** |

**STATION G20**

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 108 | 43200 |
| 2 | *Temora turbinata Dana* | 3 | 1200 |
| 3 | *Acartia clausi* | 62 | 24800 |
| 4 | *Oithona similis* | 6 | 2400 |
| 5 | *Copepoda* | 300 | 120000 |
| | | **479** | **191600** |

**STATION G21**

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus spp.* | 96 | 4800 |
| 2 | *Copepoda* | 270 | 13500 |
| | | **366** | **18300** |

**STATION H22**

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Harpaticoda* | 6 | 600 |
| 2 | *Acartia sp.* | 36 | 3600 |
| 3 | *Oithona sp.* | 72 | 7200 |
| 4 | *Copepoda* | 256 | 25600 |
| | | **370** | **37000** |

**STATION H24**

| No | Sampling date: 20/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus spp.* | 54 | 10800 |
| 2 | *Acartia sp.* | 23 | 4600 |
| 3 | *Oithona sp.* | 36 | 7200 |
| 4 | *Copepoda* | 224 | 44800 |
| | | **337** | **67400** |

**STATION 26**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Harpaticoda* | 6 | 300 |
| 2 | *Paracalanus spp.* | 12 | 600 |
| 3 | *Copepoda* | 250 | 12500 |
| | | **268** | **13400** |

**STATION 27**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus spp.* | 17 | 850 |
| 2 | *Acartia clausi* | 2 | 100 |
| 3 | *Oithona sp.* | 12 | 600 |
| 4 | *Copepoda* | 18 | 900 |
| | | **49** | **2450** |

**STATION 28**

| | | | |
|---|---|---|---|
| 2 | *Oithona similis* | 39 | 1950 |
| 3 | *Thermocyclops hyalinus* | 6 | 300 |
| 4 | *Microcetella norvegica* | 4 | 200 |
| 5 | *Clytemnestra scutellata* | 13 | 650 |
| 6 | *Copepoda* | 36 | 1800 |
| 7 | *Microcyclops varicans* | 1 | 50 |
| | | **111** | **5550** |

**STATION C8**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Evadne nordmani* | 2 | 100 |
| 2 | *Paracalanus parvus* | 2 | 100 |
| 3 | *Oithona similis* | 15 | 750 |
| 4 | *Euterpina acutifront* | 2 | 100 |
| 5 | *Copepoda* | 60 | 3000 |
| 6 | *Microcyclops varicans* | 1 | 50 |
| | | **82** | **4100** |

**STATION C9**

| No | Sampling date: 18/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 9 | 450 |
| 2 | *Oithona sp.* | 15 | 750 |
| 3 | *Copepoda* | 156 | 7800 |
| | | **180** | **9000** |

**STATION D10**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Oithona similis* | 18 | 900 |
| 2 | *Thermocyclops hyalinus* | 1 | 50 |
| 3 | *Clytemnestra scutellata* | 1 | 50 |
| 4 | *Copepoda* | 1 | 50 |
| | | **21** | **1050** |

**STATION D11**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Pseudodiaptomus sp.* | 11 | 550 |
| 2 | *Acartia clausi* | 12 | 600 |
| 3 | *Oithona sp.* | 60 | 3000 |
| 4 | *Thermocyclops hyalinus* | 6 | 300 |
| 5 | *Copepoda* | 60 | 3000 |
| | | **149** | **7450** |

**STATION D12**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 4 | 200 |
| 2 | *Acartia clausi* | 1 | 50 |
| 3 | *Oithona sp.* | 14 | 700 |
| 4 | *Copepoda* | 10 | 500 |
| | | **29** | **1450** |

**STATION E13**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 4 | 200 |
| 2 | *Oithona sp.* | 20 | 1000 |
| 3 | *Thermocyclops hyalinus* | 3 | 150 |
| 4 | *Clytemnestra scutellata* | 1 | 50 |
| 5 | *Copepoda* | 12 | 600 |
| 6 | *AT T«m* | 1 | 50 |
| | | **41** | **2050** |

**STATION E14**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Conchocia sp.* | 1 | 50 |
| 2 | *Paracalanus spp.* | 12 | 600 |
| 3 | *Pseudodiaptomus sp.* | 10 | 500 |
| 4 | *Acartia clausi* | 2 | 100 |
| 5 | *Oncaea venusta* | 3 | 150 |
| 6 | *Macrocetella gracilis* | 2 | 100 |
| | | **30** | **1500** |

**STATION 29**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus crassirostris* | 48 | 4800 |
| 2 | *Pseudodiaptomus sp.* | 2 | 200 |
| 3 | *Acartia clausi* | 6 | 600 |
| 4 | *Oithona similis* | 82 | 8200 |
| 5 | *Oithona brevicornis* | 4 | 400 |
| | | **142** | **14200** |

**STATION 30**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Conchocia imbricata* | 6 | 600 |
| 2 | *Paracalanus spp.* | 6 | 600 |
| 3 | *Pseudodiaptomus sp.* | 6 | 600 |
| 4 | *Oithona sp.* | 15 | 1500 |
| 5 | *Thermocyclops hyalinus* | 3 | 300 |
| 6 | *Copepoda* | 76 | 7600 |
| | | **112** | **11200** |

**STATION K32**

| No | Sampling date: 21/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 66 | 3300 |
| 2 | *Acartia clausi* | 42 | 2100 |
| 3 | *Oithona similis* | 180 | 9000 |
| 4 | *Copepoda* | 514 | 25700 |
| 5 | *Moinadapnhia macleayii* | 2 | 100 |
| | | **804** | **40200** |

**STATION K33**

| No | Sampling date: 22/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus spp.* | 37 | 14800 |
| 2 | *Acartia sp.* | 18 | 7200 |
| 3 | *Oithona sp.* | 12 | 4800 |
| 4 | *Copepoda* | 558 | 223200 |
| | | **625** | **250000** |

**STATION K37**

| No | Sampling date: 22/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus spp.* | 6 | 600 |
| 2 | *Oithona sp.* | 1 | 100 |
| 3 | *Oncaea venusta* | 6 | 600 |
| 4 | *Euterpina acutifront* | 6 | 600 |
| 5 | *Copepoda* | 105 | 10500 |
| | | **124** | **12400** |

**STATION L34**

| No | Sampling date: 22/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus spp.* | 194 | 38800 |
| 2 | *Acartia sp.* | 36 | 7200 |
| 3 | *Oithona sp.* | 30 | 6000 |
| | | **260** | **52000** |

| No | SPECIES | QUANTITY | INDS/M3 |
|---|---|---|---|
| 1 | *Paracalanus parvus* | 1 | 50 |
| 2 | *Oithona similis* | 5 | 250 |
| 3 | *Microcetella norvegica* | 1 | 50 |
| 4 | *Copepoda* | 6 | 300 |
| | | **13** | **650** |

**STATION E15**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 40 | 4000 |
| 2 | *Acartia clausi* | 6 | 600 |
| 3 | *Oithona sp.* | 26 | 2600 |
| 4 | *Thermocyclops hyalinus* | 6 | 600 |
| 5 | *Copepoda* | 230 | 23000 |
| | | **308** | **30800** |

**STATION F16**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 50 | 500 |
| 3 | *Harpaticoida* | 6 | 60 |
| 4 | *Copepoda* | 50 | 500 |
| | | **106** | **1060** |

**STATION F17**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Conchocia sp.* | 1 | 50 |
| 2 | *Harpaticoda* | 8 | 400 |
| 3 | *Paracalanus spp.* | 3 | 150 |
| 4 | *Acartia clausi* | 10 | 500 |
| 5 | *Oithona sp.* | 2 | 100 |
| 6 | *Copepoda* | 60 | 3000 |
| 7 | *Ambasiidae* | 6 | 300 |
| | | | 4500 |

**STATION F18**

| No | Sampling date: 19/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Pseudodiaptomus sp.* | 2 | 200 |
| 2 | *Acartia sp.* | 18 | 1800 |
| 3 | *Oithona sp.* | 24 | 2400 |
| 4 | *Copepoda* | 330 | 33000 |
| 5 | *Microcyclops varicans* | 6 | 600 |
| 6 | *Bosmina sp.* | 4 | 400 |
| | | **384** | **38400** |

**STATION L35**

| No | Sampling date: 22/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 12 | 2400 |
| 2 | *Paracalanus crassirostris* | 180 | 36000 |
| 3 | *Centropages orsini* | 1 | 200 |
| 4 | *Acartia clausi* | 1 | 200 |
| 5 | *Oithona nana* | 30 | 6000 |
| | | **224** | **44800** |

**STATION L36**

| No | Sampling date: 22/08/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus spp.* | 26 | 5200 |
| 2 | *Pseudodiaptomus sp.* | 4 | 800 |
| 3 | *Acartia clausi* | 2 | 400 |
| 4 | *Oithona sp.* | 2 | 400 |
| | | **34** | **6800** |

## Survey Institute of Marine Resources and Environament, November 2006

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A ($mg/m^3$ = µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,05 | <0.05 | 1,1 | | | | | | 7500 | | |
| | 1 | M | | – | 30,9 | | | | | | 7,5 | <1 | 6,2 | | | | | | | | | | | | | | | |
| | | B | 0,5 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,06 | <0.05 | 1,0 | | | | | | 1100 | | |
| A | 2 | M | | – | 31,1 | | | | | | 8,6 | <1 | 6,3 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,04 | 0,35 | 1,3 | | | | | | 1500 | | |
| | 3 | M | | – | 31,7 | | | | | | 8,7 | 1,0 | 6,4 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud - Clay - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,07 | <0.05 | 1,9 | | | | | | 1500 | | |
| | 4 | M | | 1,0 | 30,6 | | | | | | 7,6 | 1,5 | 6,3 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,05 | 0,08 | 0,8 | | | | | | 4300 | | |
| B | 5 | M | | 1,2 | 31,0 | | | | | | 7,9 | 2,0 | 6,2 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,05 | 0,17 | 0,5 | | | | | | 2400 | | |
| | 6 | M | | 0,8 | 31,2 | | | | | | 8,2 | <1 | 6,3 | | | | | | | | | | | | | | | |
| | | B | 0,4 | | | | | Mud - Clay - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,01 | 0,31 | 1,9 | | | | | | 4200 | | |
| | 7 | M | | 1,5 | 30,2 | | | | | | 7,6 | 3,5 | 6,5 | | | | | | | | | | | | | | | |
| | | B | 2,7 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,04 | 0,16 | 1,8 | | | | | | 400 | | |
| C | 8 | M | | 1,2 | 30,2 | | | | | | 6,9 | 1,0 | 6,4 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,03 | | 0,02 | 0,10 | 4,8 | | | | | | 3500 | | |
| | 9 | M | | 1,0 | 30,9 | | | | | | 7,3 | 1,0 | 6,5 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,03 | 0,51 | 2,7 | | | | | | 2000 | | |
| | 10 | M | | 1,2 | 29,9 | | | | | | 8,0 | 9,0 | 6,2 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | <0.05 | 3,0 | | | | | | 2700 | | |
| D | 11 | M | | – | 29,9 | | | | | | 8,1 | 10,5 | 6,5 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,04 | 0,14 | 3,6 | | | | | | 12000 | | |
| | 12 | M | | – | 30,9 | | | | | | 7,8 | 8,0 | 6,4 | | | | | | | | | | | | | | | |
| | | B | 1,4 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,11 | 0,02 | | 0,06 | 0,56 | 2,1 | | | | | | 1500 | | |
| | 13 | M | | 1,5 | 28,9 | | | | | | 7,8 | 19,5 | 6,3 | | | | | | | | | | | | | | | |
| | | B | 11,0 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,13 | 0,02 | | 0,05 | 0,20 | 0,7 | | | | | | 3400 | | |
| E | 14 | M | | 1,2 | 29,6 | | | | | | 7,2 | 2,5 | 6,5 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,06 | <0.02 | | 0,07 | 0,24 | 0,2 | | | | | | 21000 | | |
| | 15 | M | | 1,3 | 29,0 | | | | | | 7,8 | 5,5 | 6,4 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,06 | 0,27 | 1,6 | | | | | | 4400 | | |
| | 16 | M | | 1,6 | 28,8 | | | | | | 8,2 | 10,0 | 6,4 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,08 | 0,06 | 1,5 | | | | | | 2000 | | |
| F | 17 | M | | 1,5 | 29,0 | | | | | | 8,2 | 18,0 | 6,5 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,06 | 1,56 | 2,5 | | | | | | 700 | | |
| | 18 | M | | 1,0 | 29,3 | | | | | | 8,2 | 7,0 | 5,5 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud - Clay - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,06 | | 0,04 | 1,82 | 1,8 | | | | | | 300 | | |
| | 19 | M | | 1,9 | 27,5 | | | | | | 7,8 | 13,5 | 6,2 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 2,56 | 2,5 | | | | | | 2300 | | |
| G | 20 | M | | 2,2 | 28,1 | | | | | | 8,1 | 18,0 | 6,0 | | | | | | | | | | | | | | | |
| | | B | 2,7 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,02 | 1,79 | 0,4 | | | | | | 900 | | |
| | 21 | M | | 1,6 | 27,3 | | | | | | 8,0 | 11,5 | 5,9 | | | | | | | | | | | | | | | |
| | | B | 0,3 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,03 | 1,57 | 2,4 | | | | | | 1200 | | |
| | 22 | M | | 1,4 | 28,0 | | | | | | 7,9 | 9,3 | 6,1 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,03 | 2,22 | 3,0 | | | | | | 4300 | | |
| H | 23 | M | | 2,3 | 28,6 | | | | | | 8,0 | 9,3 | 6,2 | | | | | | | | | | | | | | | |
| | | B | 3,7 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | <0.01 | 2,24 | 3,3 | | | | | | 15000 | | |
| | 24 | M | | 1,6 | 28,1 | | | | | | 8,0 | 9,3 | 6,4 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,02 | 1,54 | 1,0 | | | | | | 2700 | | |
| | 25 | M | | 1,5 | 30,3 | | | | | | 8,2 | 13,0 | 6,5 | | | | | | | | | | | | | | | |
| | | B | 2,0 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,04 | 1,48 | 1,2 | | | | | | 1500 | | |
| I | 26 | M | | 2,0 | 31,9 | | | | | | 8,0 | 17,3 | 6,2 | | | | | | | | | | | | | | | |
| | | B | 3,3 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,01 | 1,61 | 0,5 | | | | | | 1400 | | |
| | 27 | M | | 2,3 | 32,3 | | | | | | 8,1 | 18,3 | 6,6 | | | | | | | | | | | | | | | |
| | | B | 3,1 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 1,57 | 1,7 | | | | | | 900 | | |
| | 28 | M | | 1,5 | 30,6 | | | | | | 8,3 | 15,0 | 6,1 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,04 | 1,57 | 0,9 | | | | | | 700 | | |
| J | 29 | M | | 1,6 | 29,7 | | | | | | 8,2 | 19,3 | 5,9 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,01 | 1,39 | 1,1 | | | | | | 3900 | | |
| | 30 | M | | 1,5 | 28,5 | | | | | | 8,2 | 33,5 | 5,9 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,04 | 0,90 | 2,2 | | | | | | 7500 | | |
| | 31 | M | | 2,5 | 33,4 | | | | | | 8,1 | 16,0 | 5,9 | | | | | | | | | | | | | | | |
| | | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,03 | 1,25 | 0,7 | | | | | | 2600 | | |
| K | 32 | M | | 2,0 | 29,7 | | | | | | 8,1 | 10,0 | 6,2 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,05 | 1,92 | 1,1 | | | | | | 1500 | | |
| | 33 | M | | 1,5 | 29,4 | | | | | | 8,2 | 17,5 | 6,1 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | 37 | M | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | 1,6 | | | | | Mud - Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,06 | 0,74 | 0,9 | | | | | | 12000 | | |
| | 34 | M | | 2,3 | 34,0 | | | | | | 8,2 | 17,0 | 6,4 | | | | | | | | | | | | | | | |
| L | | B | 2,1 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,04 | 1,10 | 1,5 | | | | | | 2700 | | |
| | 35 | M | | 1,6 | 29,4 | | | | | | 8,1 | 17,0 | 6,1 | | | | | | | | | | | | | | | |
| | | B | 1,9 | | | | | Clay - Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,04 | 0,79 | 1,8 | | | | | | 1100 | | |
| | 36 | M | | 1,5 | 33,2 | | | | | | 7,6 | 19,5 | 6,0 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud - Sand | | | | | | | | | | | | | | | | | | | | |

## Survey Institute of Marine Resources and Environament, November 2006 - Phytoplankton species

**STATION A1**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | Melosira granulata | 169 | 3380 |
| 2 | Flagilaria striatula | 30 | 600 |
| 3 | Thalassionema nitzschioides | 1 | 20 |
| 4 | Navicula sp | 6 | 120 |
| 5 | Navicula palpebralis | 1 | 20 |
| 6 | Diploneis smithii | 2 | 40 |
| 7 | Nitzschia sigma | 2 | 40 |
| 8 | Nitzschia sp. | 1 | 20 |
| 9 | Gymnodinium sp | 9 | 180 |
| 10 | Protoperidinium sp. | 1 | 20 |
| 11 | Alexandrium sp | 4 | 80 |
| 12 | Anabaena sp | 1 | 20 |
| 13 | Scenedesmus sp. | 8 | 160 |
| 14 | Gloeotila pelagicum | 127 | 2540 |
| | | **362** | **7240** |

**STATION A2**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | Melosira sp. | 81 | 1620 |
| 2 | Leptocylindrus danicus | 6 | 120 |
| 3 | Diatoma elongatum | 4 | 80 |
| 4 | Synedra pulchella | 3 | 60 |
| 5 | Nitzschia sp. | 2 | 40 |
| 6 | Gymnodinium sp | 12 | 240 |
| 7 | Alexandrium sp | 1 | 20 |
| 8 | Oscillatoria sp2 | 1 | 20 |
| 9 | Anabaena sp | 6 | 120 |
| | | **116** | **2320** |

**STATION A3**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | Melosira granulata v. angustissima | 21 | 420 |
| 2 | Synedra sp. | 16 | 320 |
| 3 | Gyrosigma sp. | 1 | 20 |
| 4 | Nitzschia lorenziana | 1 | 20 |
| 5 | Nitzschia sp. | 12 | 240 |
| 6 | Peridinium sp. | 3 | 60 |
| 7 | Oscillatoria sp1 | 16 | 320 |
| 8 | Oscillatoria sp2 | 3 | 60 |
| 9 | Anabaena sp | 1 | 20 |
| 10 | Pediastrum duplex | 1 | 20 |
| 11 | Spirogyra sp | 465 | 9300 |
| | | **540** | **10800** |

**STATION B4**

| No | Sampling date: 20/11/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | Melosira granulata | 27 | 540 |
| 2 | Nitzschia lorenziana | 8 | 160 |
| 3 | Nitzschia sigma | 6 | 120 |
| 4 | Oscillatoria sp2 | 9 | 180 |
| 5 | Spirulina sp | 1 | 20 |
| 6 | Anabaena sp | 420 | 8400 |
| | | **471** | **9420** |

**STATION B6**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | Melosira granulata v. angustissima | 42 | 840 |
| 2 | Melosira varians | 1 | 20 |
| 3 | Coscinodiscus sp. | 1 | 20 |
| 4 | Actinoptychus undulatus | 2 | 40 |
| 5 | Synedra sp. | 2 | 40 |
| 6 | Grammatophora marina | 2 | 40 |
| 7 | Trachyneis aspera | 1 | 20 |
| 8 | Cymbella sp. | 2 | 40 |
| 9 | Diploneis sp.1 | 23 | 460 |
| 10 | Gyrosigma strigile | 4 | 80 |
| 11 | Gyrosigma sp. | 5 | 100 |
| 12 | Pleurosigma sp | 53 | 1060 |
| 13 | Pleurosigma cf. fasciola | 1 | 20 |

**STATION G21**

| No | Sampling date: 02/12/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | Melosira nummuloides | 2 | 40 |
| 2 | Melosira sp. | 14 | 280 |
| 3 | Actinoptychus sp. | 6 | 120 |
| 4 | Leptocylindrus danicus | 10 | 200 |
| 5 | Guinardia flaccida | 1 | 20 |
| 6 | Chaetoceros affinis | 2 | 40 |
| 7 | Chaetoceros abnormis | 6 | 120 |
| 8 | Chaetoceros lorenzianus | 7 | 140 |
| 9 | Palmeria hardmaniana | 2 | 40 |
| 10 | Thalassionema nitzschioides | 3 | 60 |
| 11 | Pleurosigma affine | 1 | 20 |
| 12 | Pleurosigma sp | 16 | 320 |
| 13 | Amphiprora alata | 1 | 20 |
| 14 | Amphora lineata | 1 | 20 |
| 15 | Nitzschia longissima | 2 | 40 |
| 16 | Bacillaria paxillifera | 6 | 120 |
| 17 | Pseudonitzschia sp.1 (to) | 2 | 40 |
| 18 | Campylodiscus sp. | 1 | 20 |
| 19 | Prorocentrum minimum | 30 | 600 |
| 20 | Gymnodinium sp | 57 | 1140 |
| 21 | Polykrikos schwartzii | 7 | 140 |
| 22 | Ceratium furca | 3 | 60 |
| 23 | Gonyaulax sp | 2 | 40 |
| 24 | Protoperidinium pellucidum | 1 | 20 |
| 25 | Protoperidinium sp. | 4 | 80 |
| 26 | Peridinium quinquecorne | 1 | 20 |
| 27 | Peridinium sp. | 20 | 400 |
| 28 | Alexandrium sp | 3 | 60 |
| 29 | Alexandrium pseudogonyaulax | 3 | 60 |
| 30 | Diplopsalis sp. | 2 | 40 |
| 31 | Oblea sp | 11 | 220 |
| | | **227** | **4540** |

**STATION H23**

| No | Sampling date: 02/12/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | Coscinodiscus sp. | 1 | 20 |
| 2 | Chaetoceros lorenzianus | 6 | 120 |
| 3 | Thalassionema nitzschioides | 12 | 240 |
| 4 | Bacillaria paxillifera | 3 | 60 |
| 5 | Pseudonitzschia sp.2 (nho) | 2 | 40 |
| 6 | Prorocentrum minimum | 104 | 2080 |
| 7 | Prorocentrum emarginatum | 1 | 20 |
| 8 | Gymnodinium sp | 182 | 3640 |
| 9 | Polykrikos schwartzii | 4 | 80 |
| 10 | Ceratium furca | 1 | 20 |
| 11 | Gonyaulax sp | 14 | 280 |
| 12 | Protoperidinium sp. | 2 | 40 |
| 13 | Peridinium sp. | 33 | 660 |
| 14 | Alexandrium sp | 2 | 40 |
| 15 | Alexandrium pseudogonyaulax | 32 | 640 |
| 16 | Diplopsalis sp. | 2 | 40 |
| 17 | Oblea sp | 4 | 80 |
| 18 | Anabaena sp | 6 | 120 |
| 19 | Microcystis sp | 2 | 40 |
| | | **413** | **8260** |

**STATION H24**

| No | Sampling date: 02/12/2006 | | |
|---|---|---|---|
| | SPECIES | QUANTITY | CELLS/L |
| 1 | Coscinodiscus jonesianus v. commutata | 1 | 20 |
| 2 | Pleurosigma sp | 2 | 40 |
| 3 | Nitzschia longissima v. reversa | 1 | 20 |
| 4 | Prorocentrum minimum | 34 | 680 |
| 5 | Gymnodinium sp | 79 | 1580 |
| 6 | Polykrikos schwartzii | 8 | 160 |
| 7 | Ceratium furca | 1 | 20 |
| 8 | Gonyaulax sp | 27 | 540 |
| 9 | Protoperidinium pellucidum | 2 | 40 |
| 10 | Protoperidinium sp. | 3 | 60 |
| 11 | Scrippsiella sp. | 2 | 40 |
| 12 | Alexandrium pseudogonyaulax | 65 | 1300 |

| No | SPECIES | QUANTITY | CELLS/L |
|---|---|---|---|
| 14 | *Nitzschia lorenziana* | 53 | 1060 |
| 15 | *Nitzschia longissima v. reversa* | 27 | 540 |
| 16 | *Nitzschia sigma* | 12 | 240 |
| 17 | *Nitzschia sigma v. intercedens* | 12 | 240 |
| 18 | *Nitzschia sp.1* | 5 | 100 |
| 19 | *Nitzschia sp.* | 92 | 1840 |
| 20 | *Surirella gemma* | 2 | 40 |
| 21 | *Surirella tenera v. nervosa* | 28 | 560 |
| 22 | *Campylodiscus echeneis* | 3 | 60 |
| 23 | *Podolampas elegans* | 1 | 20 |
| 24 | *Oscillatoria sp1* | 13 | 260 |
| 25 | *Anabaena sp* | 2 | 40 |
| 26 | *Scenedesmus quadricauda* | 4 | 80 |
| 27 | *Spirogyra sp* | 1 | 20 |
| 28 | *Cosmarium sp* | 1 | 20 |
| 29 | *Closterium sp* | 1 | 20 |
| | | **396** | **7920** |

| STATION C7 | | | |
|---|---|---|---|
| No | Sampling date: 28/11/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata* | 12 | 240 |
| 2 | *Thalassiosira spp.* | 2 | 40 |
| 3 | *Amphiprora alata* | 2 | 40 |
| 4 | *Gymnodinium sp* | 1 | 20 |
| 5 | *Oscillatoria sp2* | 1 | 20 |
| 6 | *Anabaena sp* | 1 | 20 |
| 7 | *Gloeotila pelagicum* | 4 | 80 |
| | | **23** | **460** |

| STATION C8 | | | |
|---|---|---|---|
| No | Sampling date: 28/11/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira sp.* | 39 | 780 |
| 2 | *Nitzschia longissima* | 1 | 20 |
| 3 | *Nitzschia sigma* | 6 | 120 |
| 4 | *Pseudonitzschia spp.* | 1 | 20 |
| 5 | *Alexandrium sp* | 12 | 240 |
| 6 | *Oscillatoria sp1* | 1 | 20 |
| 7 | *Anabaena sp* | 25 | 500 |
| | | **85** | **1700** |

| STATION C9 | | | |
|---|---|---|---|
| No | Sampling date: 28/11/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata v. angustissima* | 44 | 880 |
| 2 | *Chaetoceros abnormis* | 4 | 80 |
| 3 | *Trachyneis aspera* | 1 | 20 |
| 4 | *Cymbella sp.* | 1 | 20 |
| 5 | *Nitzschia lorenziana* | 9 | 180 |
| 6 | *Nitzschia longissima v. reversa* | 63 | 1260 |
| 7 | *Nitzschia sigma v. intercedens* | 1 | 20 |
| 8 | *Nitzschia sp.* | 12 | 240 |
| 9 | *Peridinium sp.* | 33 | 660 |
| 10 | *Oscillatoria sp1* | 14 | 280 |
| 11 | *Oscillatoria sp2* | 9 | 180 |
| 12 | *Anabaena sp* | 1 | 20 |
| 13 | *Scenedesmus quadricauda* | 8 | 160 |
| 14 | *Euglena sp1.* | 2 | 40 |
| 15 | *Euglena acus v.acus* | 2 | 40 |
| 16 | *Phacus sp1.* | 1 | 20 |
| | | **205** | **4100** |

| STATION D10 | | | |
|---|---|---|---|
| No | Sampling date: 29/11/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira lineata* | 1 | 20 |
| 2 | *Rhizosolenia setigera* | 1 | 20 |
| 3 | *Chaetoceros abnormis* | 6 | 120 |
| 4 | *Pleurosigma angulatum* | 3 | 60 |
| 5 | *Pleurosigma sp* | 1 | 20 |
| 6 | *Nitzschia lorenziana* | 14 | 280 |
| 7 | *Nitzschia longissima* | 1 | 20 |
| 8 | *Nitzschia longissima v. reversa* | 1 | 20 |
| 9 | *Nitzschia sigma* | 12 | 240 |
| 10 | *Nitzschia sp.* | 4 | 80 |
| 11 | *Bacillaria paxillifera* | 2 | 40 |
| 12 | *Prorocentrum minimum* | 1 | 20 |
| 13 | *Gymnodinium sp* | 1 | 20 |
| 14 | Diplopsalis sp. | 1 | 20 |
| 15 | Oblea sp | 3 | 60 |
| 16 | Pyrophacus sp | 3 | 60 |
| 17 | Oscillatoria sp2 | 1 | 20 |
| | | **233** | **4660** |

| STATION 25 | | | |
|---|---|---|---|
| No | Sampling date: 01/12/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Pleurosigma affine* | 1 | 20 |
| 2 | *Pleurosigma sp* | 1 | 20 |
| 3 | *Nitzschia sigma* | 1 | 20 |
| 4 | *Nitzschia sp.* | 2 | 40 |
| 5 | *Prorocentrum minimum* | 16 | 320 |
| 6 | *Gymnodinium sp* | 20 | 400 |
| 7 | *Polykrikos schwartzii* | 1 | 20 |
| 8 | *Alexandrium sp* | 2 | 40 |
| 9 | *Alexandrium pseudogonyaulax* | 72 | 1440 |
| 10 | *Oblea sp* | 6 | 120 |
| 11 | *Pyrophacus sp* | 1 | 20 |
| 12 | *Oscillatoria sp2* | 32 | 640 |
| 13 | *Staurastrum sp.* | 1 | 20 |
| | | **156** | **3120** |

| STATION 29 | | | |
|---|---|---|---|
| No | Sampling date: 01/12/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cyclotella comta* | 1 | 20 |
| 2 | *Thalassiosira lineata* | 1 | 20 |
| 3 | *Guinardia flaccida* | 2 | 40 |
| 4 | *Guinardia striata* | 1 | 20 |
| 5 | *Chaetoceros curvisetus* | 14 | 280 |
| 6 | *Chaetoceros lorenzianus* | 4 | 80 |
| 7 | *Chaetoceros sp.* | 5 | 100 |
| 8 | *Palmeria hardmaniana* | 1 | 20 |
| 9 | *Navicula membranacea* | 1 | 20 |
| 10 | *Prorocentrum minimum* | 20 | 400 |
| 11 | *Polykrikos schwartzii* | 4 | 80 |
| 12 | *Gonyaulax sp* | 1 | 20 |
| 13 | *Protoperidinium sp.* | 18 | 360 |
| 14 | *Peridinium quinquecorne* | 1 | 20 |
| 15 | *Peridinium sp.* | 17 | 340 |
| 16 | *Alexandrium pseudogonyaulax* | 21 | 420 |
| 17 | *Oblea sp* | 1 | 20 |
| 18 | *Pyrophacus sp* | 4 | 80 |
| 19 | *Hermesium sp.* | 1 | 20 |
| 20 | *Anabaena sp* | 160 | 3200 |
| | | **278** | **5560** |

| STATION 30 | | | |
|---|---|---|---|
| No | Sampling date: 01/12/2006 | | |
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira sp.* | 4 | 400 |
| 2 | *Coscinodiscus oculus-iridis* | 2 | 200 |
| 3 | *Asteromphalus cleveanus* | 1 | 100 |
| 4 | *Lauderia borealis* | 4 | 400 |
| 5 | *Leptocylindrus danicus* | 93 | 9300 |
| 6 | *Guinardia flaccida* | 14 | 1400 |
| 7 | *Guinardia striata* | 38 | 3800 |
| 8 | *Bacteriastrum varians* | 15 | 1500 |
| 9 | *Bacteriastrum elongatum* | 2 | 200 |
| 10 | *Rhizosolenia cylindrus* | 14 | 1400 |
| 11 | *Rhizosolenia robusta* | 2 | 200 |
| 12 | *Rhizosolenia bergonii* | 1 | 100 |
| 13 | *Rhizosolenia sp.* | 16 | 1600 |
| 14 | *Chaetoceros affinis* | 12 | 1200 |
| 15 | *Chaetoceros curvisetus* | 78 | 7800 |
| 16 | *Chaetoceros denticulatus* | 2 | 200 |
| 17 | *Chaetoceros distans* | 7 | 700 |
| 18 | *Chaetoceros eibenii* | 2 | 200 |
| 19 | *Chaetoceros lorenzianus* | 79 | 7900 |
| 20 | *Biddulphia regia* | 4 | 400 |
| 21 | *Odontella mobiliensis* | 6 | 600 |
| 22 | *Odontella sinensis* | 1 | 100 |
| 23 | *Hemiaulus hauckii* | 1 | 100 |
| 24 | *Ditylum sol* | 3 | 300 |
| 25 | *Climacodium biconcavum* | 8 | 800 |
| 26 | *Thalassionema nitzschioides* | 56 | 5600 |
| 27 | *Navicula membranacea* | 85 | 8500 |

| No | SPECIES | QUANTITY | CELLS/L |
|---|---|---|---|
| 14 | *Peridinium sp.* | 3 | 60 |
| 15 | *Scrippsiella sp.* | 2 | 40 |
| 16 | *Oblea sp* | 1 | 20 |
| 17 | *Oscillatoria sp2* | 3 | 60 |
| | | **57** | **1140** |

**STATION D11**

| No | Sampling date: 29/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 5 | 100 |
| 2 | *Nitzschia longissima* | 3 | 60 |
| 3 | *Nitzschia sigma* | 2 | 40 |
| 4 | *Gymnodinium sanguineum* | 1 | 20 |
| 5 | *Gonyaulax polygramma* | 4 | 80 |
| 6 | *Protoperidinium spp.* | 6 | 120 |
| 7 | *Peridinium quinquecorne* | 1 | 20 |
| 8 | *Alexandrium sp* | 4 | 80 |
| 9 | *Alexandrium spp.* | 3 | 60 |
| 10 | *Anabaena sp* | 6 | 120 |
| | | **35** | **700** |

**STATION D12**

| No | Sampling date: 29/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira lineata* | 1 | 20 |
| 2 | *Nitzschia lorenziana* | 1 | 20 |
| 3 | *Nitzschia longissima* | 1 | 20 |
| 4 | *Nitzschia longissima v. reversa* | 3 | 60 |
| 5 | *Nitzschia sigma* | 7 | 140 |
| 6 | *Nitzschia sp.* | 2 | 40 |
| 7 | *Prorocentrum minimum* | 5 | 100 |
| 8 | *Peridinium sp.* | 5 | 100 |
| 9 | *Alexandrium sp* | 23 | 460 |
| 10 | *Oblea sp* | 5 | 100 |
| 11 | *Anabaena sp* | 4 | 80 |
| | | **57** | **1140** |

**STATION E13**

| No | Sampling date: 29/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Asteromphalus cleveanus* | 1 | 20 |
| 2 | *Thalassiosira spp.* | 4 | 80 |
| 3 | *Diatoma elongatum* | 2 | 40 |
| 4 | *Pseudonitzschia spp.* | 3 | 60 |
| 5 | *Surirella tenera v. nervosa* | 1 | 20 |
| 6 | *Polykrikos schwartzii* | 1 | 20 |
| 7 | *Ceratium furca* | 1 | 20 |
| 8 | *Alexandrium sp* | 1 | 20 |
| 9 | *Anabaena sp* | 4 | 80 |
| 10 | *Pediastrum sp.* | 1 | 20 |
| 11 | *Gloeotila pelagicum* | 9 | 180 |
| | | **28** | **560** |

**STATION E15**

| No | Sampling date: 29/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 2 | 40 |
| 2 | *Diatoma elongatum* | 2 | 40 |
| 3 | *Thalassionema nitzschioides* | 7 | 140 |
| 4 | *Thalassiothrix frauenfeldii* | 1 | 20 |
| 5 | *Diploneis smithii* | 1 | 20 |
| 6 | *Nitzschia longissima* | 3 | 60 |
| 7 | *Spirulina sp* | 1 | 20 |
| 8 | *Pediastrum sp.* | 1 | 20 |
| 9 | *Scenedesmus sp.* | 4 | 80 |
| 10 | *Gloeotila pelagicum* | 9 | 180 |
| | | **31** | **620** |

**STATION F17**

| No | Sampling date: 29/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Rhizosolenia cylindrus* | 3 | 60 |
| 2 | *Rhizosolenia setigera* | 1 | 20 |
| 3 | *Chaetoceros sp.* | 2 | 40 |
| 4 | *Diploneis sp.1* | 1 | 20 |
| 5 | *Pleurosigma angulatum* | 1 | 20 |
| 6 | *Pleurosigma sp* | 1 | 20 |
| 7 | *Nitzschia lorenziana* | 1 | 20 |
| 8 | *Nitzschia longissima* | 2 | 40 |

| No | SPECIES | QUANTITY | CELLS/L |
|---|---|---|---|
| 28 | *Pleurosigma sp* | 2 | 200 |
| 29 | *Nitzschia sigma* | 4 | 400 |
| 30 | *Bacillaria paxillifera* | 5 | 500 |
| 31 | *Pseudonitzschia sp.1 (to)* | 11 | 1100 |
| 32 | *Prorocentrum minimum* | 2 | 200 |
| 33 | *Prorocentrum sp.1 (hinh qua ot)* | 1 | 100 |
| 34 | *Protoperidinium depressum* | 1 | 100 |
| 35 | *Diplopsalis sp.* | 1 | 100 |
| | | **577** | **57700** |

**STATION K32**

| No | Sampling date: 30/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Nitzschia sigma* | 1 | 20 |
| 2 | *Prorocentrum minimum* | 27 | 540 |
| 3 | *Gymnodinium sp* | 42 | 840 |
| 4 | *Gonyaulax sp* | 2 | 40 |
| 5 | *Peridinium sp.* | 1 | 20 |
| 6 | *Alexandrium sp* | 1 | 20 |
| 7 | *Alexandrium pseudogonyaulax* | 163 | 3260 |
| 8 | *Oblea sp* | 4 | 80 |
| 9 | *Oscillatoria sp1* | 2 | 40 |
| 10 | *Anabaena sp* | 1 | 20 |
| | | **244** | **4880** |

**STATION L35**

| No | Sampling date: 30/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Cyclotella comta* | 1 | 20 |
| 2 | *Coscinodiscus oculus-iridis* | 1 | 20 |
| 3 | *Actinoptychus undulatus* | 1 | 20 |
| 4 | *Thalassiothrix elongatum* | 1 | 20 |
| 5 | *Thalassiosira spp.* | 8 | 160 |
| 6 | *Guinardia flaccida* | 3 | 60 |
| 7 | *Guinardia striata* | 2 | 40 |
| 8 | *Chaetoceros curvisetus* | 12 | 240 |
| 9 | *Thalassionema nitzschioides* | 17 | 340 |
| 10 | *Synedra pulchella* | 1 | 20 |
| 11 | *Grammatophora marina* | 3 | 60 |
| 12 | *Pleurosigma naviculaceum* | 3 | 60 |
| 13 | *Pseudonitzschia spp.* | 2 | 40 |
| 14 | *Ceratium furca* | 1 | 20 |
| 15 | *Gonyaulax polygramma* | 1 | 20 |
| 16 | *Alexandrium sp* | 524 | 10480 |
| 17 | *Diplopsalis sp.* | 1 | 20 |
| 18 | *Oscillatoria sp1* | 2 | 40 |
| | | **584** | **11680** |

| | | | |
|---|---|---|---|
| 9 | *Nitzschia longissima v. reversa* | 1 | 20 |
| 10 | *Nitzschia sp.* | 1 | 20 |
| 11 | *Pseudonitzschia sp.1 (to)* | 5 | 100 |
| 12 | *Prorocentrum micans* | 2 | 40 |
| 13 | *Prorocentrum minimum* | 28 | 560 |
| 14 | *Gymnodinium sp* | 104 | 2080 |
| 15 | *Polykrikos schwartzii* | 5 | 100 |
| 16 | *Gonyaulax sp* | 12 | 240 |
| 17 | *Protoperidinium sp.* | 19 | 380 |
| 18 | *Peridinium quinquecorne* | 2 | 40 |
| 19 | *Peridinium sp.* | 64 | 1280 |
| 20 | *Alexandrium pseudogonyaulax* | 2 | 40 |
| 21 | *Oblea sp* | 34 | 680 |
| 22 | *Pyrophacus sp* | 7 | 140 |
| | | **298** | **5960** |

**STATION F18**

| No | Sampling date: 29/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Melosira granulata v. angustissima* | 26 | 520 |
| 2 | *Prorocentrum minimum* | 4 | 80 |
| 3 | *Gonyaulax sp* | 1 | 20 |
| 4 | *Peridinium sp.* | 10 | 200 |
| 5 | *Oscillatoria sp1* | 1 | 20 |
| 6 | *Anabaena sp* | 20 | 400 |
| | | **62** | **1240** |

**STATION G19**

| No | Sampling date: 02/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **CELLS/L** |
| 1 | *Thalassiosira spp.* | 6 | 120 |
| 2 | *Chaetoceros spp.* | 25 | 500 |
| 3 | *Grammatophora marina* | 9 | 180 |
| 4 | *Nitzschia longissima* | 6 | 120 |
| 5 | *Pseudonitzschia spp.* | 1 | 20 |
| 6 | *Gymnodinium sp* | 17 | 340 |
| 7 | *Polykrikos schwartzii* | 7 | 140 |
| 8 | *Ceratium breve* | 1 | 20 |
| 9 | *Ceratium furca* | 3 | 60 |
| 10 | *Gonyaulax polygramma* | 29 | 580 |
| 11 | *Protoperidinium spp.* | 20 | 400 |
| 12 | *Peridinium quinquecorne* | 1 | 20 |
| 13 | *Alexandrium spp.* | 23 | 460 |
| 14 | *Anabaena sp* | 2 | 40 |
| | | **150** | **3000** |

## Survey Institute of Marine Resources and Environament, November 2006 Zooplankton Species

**STATION A1**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 14 | 140 |
| 2 | *Acartia clausi* | 1 | 10 |
| 3 | *AT T«m* | 1 | 10 |
| | | **16** | **160** |

**STATION A3**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 6 | 300 |
| 2 | *Acartia clausi* | 2 | 100 |
| 3 | *Oithona sp.* | 19 | 950 |
| 4 | *AT Lucifer* | 1 | 50 |
| 5 | *Copepoda* | 24 | 1200 |
| | | **52** | **2600** |

**STATION B4**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 13 | 650 |
| 2 | *Oncaea venusta* | 2 | 100 |
| 3 | *Corycaeus sp.* | 1 | 50 |
| 4 | *Acarbella sinemis* | 4 | 200 |
| | | **20** | **1000** |

**STATION B5**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 12 | 600 |
| 2 | *Acartia clausi* | 8 | 400 |
| 3 | *Oithona sp.* | 7 | 350 |
| 4 | *Copepoda* | 12 | 600 |
| | | **39** | **1950** |

**STATION B6**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Evadne nordmani* | 1 | 250 |
| 2 | *Paracalanus parvus* | 30 | 7500 |
| 3 | *Oithona sp.* | 32 | 8000 |
| | | **63** | **15750** |

**STATION C7**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 4 | 400 |
| 2 | *Acartia clausi* | 14 | 1400 |
| 3 | *Oithona sp.* | 3 | 300 |
| 4 | *Clytemnestra sp.* | 1 | 100 |
| | | **22** | **2200** |

**STATION C8**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Evadne tergestina Claus* | 9 | 450 |
| 2 | *Penilia schmackeri* | 1 | 50 |
| 3 | *Paracalanus parvus* | 1 | 50 |
| 4 | *Acartia clausi* | 1 | 50 |
| 5 | *Oithona sp.* | 12 | 600 |
| 6 | *Oncaea venusta* | 7 | 350 |
| 7 | *Oikopleura dioica* | 1 | 50 |
| | | **32** | **1600** |

**STATION C9**

| No | Sampling date: 28/11/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Acartia clausi* | 11 | 2750 |
| 2 | *Oithona sp.* | 120 | 30000 |
| 3 | *Copepoda* | 18 | 4500 |
| | | **149** | **37250** |

**STATION G20**

| No | Sampling date: 02/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Evadne tergestina Claus* | 4 | 80 |
| 2 | *Conchocia sp.* | 1 | 20 |
| 3 | *Paracalanus spp.* | 3 | 60 |
| 4 | *Pseudodiaptomus sp.* | 1 | 20 |
| 5 | *Acartia clausi* | 9 | 180 |
| 6 | *Oithona sp.* | 3 | 60 |
| 7 | *Euterpina acutifront* | 1 | 20 |
| 8 | *Copepoda* | 80 | 1600 |
| | | **102** | **2040** |

**STATION H22**

| No | Sampling date: 02/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Sagitta delicata* | 1 | 10 |
| 2 | *Penilia schmackeri* | 1 | 10 |
| 3 | *Paracalanus parvus* | 18 | 180 |
| 4 | *Oithona sp.* | 13 | 130 |
| 5 | *Corycaeus dalhi* | 1 | 10 |
| 6 | *Copepoda* | 6 | 60 |
| | | **40** | **400** |

**STATION H23**

| No | Sampling date: 02/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | Paracalanus parvus | 5 | 50 |
| 2 | Oithona sp. | 9 | 90 |
| 3 | Copepoda | 6 | 60 |
| | | **20** | **200** |

**STATION H24**

| No | Sampling date: 02/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 5 | 50 |
| 2 | *Oithona similis* | 6 | 60 |
| 3 | *Copepoda* | 48 | 480 |
| | | **59** | **590** |

**STATION I25**

| No | Sampling date: 01/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 9 | 90 |
| 2 | *Pseudodiaptomus sp.* | 6 | 60 |
| 3 | *Acartia clausi* | 8 | 80 |
| 4 | *Euterpina acutifront* | 1 | 10 |
| 5 | *Copepoda* | 48 | 480 |
| | | **72** | **720** |

**STATION I26**

| No | Sampling date: 01/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 15 | 150 |
| 2 | *Acartia clausi* | 14 | 140 |
| 3 | *Oithona sp.* | 1 | 10 |
| 4 | *Oncaea venusta* | 1 | 10 |
| 5 | *AT Gastropoda* | 1 | 10 |
| 6 | *Copepoda* | 60 | 600 |
| | | **92** | **920** |

**STATION I27**

| No | Sampling date: 01/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 6 | 60 |
| 2 | *Acartia clausi* | 1 | 10 |
| 3 | *Copepoda* | 57 | 570 |
| | | **64** | **640** |

**STATION I28**

| No | Sampling date: 01/12/2006 | | |
|---|---|---|---|
| | **SPECIES** | **QUANTITY** | **INDS/M3** |
| 1 | *Paracalanus parvus* | 5 | 50 |

| | | | |
|---|---|---|---|
| STATION D10 | | | |
| No | Sampling date: 29/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Evadne tergestina Claus* | 1 | 10 |
| 2 | *Penilia schmackeri* | 1 | 10 |
| 3 | *Conchocia imbricata* | 1 | 10 |
| 4 | *Oithona sp.* | 5 | 50 |
| 5 | *Oncaea venusta* | 1 | 10 |
| | | **9** | **90** |

| | | | |
|---|---|---|---|
| STATION D11 | | | |
| No | Sampling date: 29/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 6 | 60 |
| 2 | *Pseudodiaptomus sp.* | 2 | 20 |
| 3 | *AT T«m* | 3 | 30 |
| | | **11** | **110** |

| | | | |
|---|---|---|---|
| STATION D12 | | | |
| No | Sampling date: 29/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 4 | 40 |
| 2 | *Acartia clausi* | 28 | 280 |
| 3 | *Oithona brevicornis* | 4 | 40 |
| | | **36** | **360** |

| | | | |
|---|---|---|---|
| STATION E13 | | | |
| No | Sampling date: 29/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Evadne tergestina Claus* | 24 | 240 |
| 2 | *Penilia schmackeri* | 2 | 20 |
| 3 | *Paracalanus parvus* | 9 | 90 |
| 4 | *Centropages furcatus* | 1 | 10 |
| 5 | *Oithona sp.* | 2 | 20 |
| 6 | *Oncaea venusta* | 8 | 80 |
| 7 | *Microcetella norvegica* | 2 | 20 |
| 8 | *Oikopleura dioica* | 4 | 40 |
| 9 | *AT T«m* | 3 | 30 |
| 10 | *Cypridina noctiluca* | 5 | 50 |
| | | **60** | **600** |

| | | | |
|---|---|---|---|
| STATION E14 | | | |
| No | Sampling date: 29/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 14 | 140 |
| 2 | *Acartia sp.* | 2 | 20 |
| 3 | *Oithona sp.* | 5 | 50 |
| 4 | *Euterpina acutifront* | 1 | 10 |
| | | **22** | **220** |

| | | | |
|---|---|---|---|
| STATION E15 | | | |
| No | Sampling date: 29/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 1 | 10 |
| 2 | *Microcetella norvegica* | 1 | 10 |
| 3 | *Copepoda* | 6 | 60 |
| | | **8** | **80** |

| | | | |
|---|---|---|---|
| STATION F16 | | | |
| No | Sampling date: 21/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 9 | 90 |
| 2 | *Oithona sp.* | 2 | 20 |
| 3 | *Acarbella sinemis* | 1 | 10 |
| | | **12** | **120** |

| | | | |
|---|---|---|---|
| STATION F17 | | | |
| No | Sampling date: 29/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 2 | 20 |
| 2 | *Oithona sp.* | 1 | 10 |
| 3 | *Copepoda* | 12 | 120 |
| | | **15** | **150** |

| | | | |
|---|---|---|---|
| 3 | *Copepoda* | 6 | 60 |
| | | **13** | **130** |

| | | | |
|---|---|---|---|
| STATION 29 | | | |
| No | Sampling date: 01/12/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus spp.* | 28 | 280 |
| 2 | *Acartia clausi* | 4 | 40 |
| 3 | *Oithona sp.* | 2 | 20 |
| 4 | *Microcetella norvegica* | 3 | 30 |
| | | **37** | **370** |

| | | | |
|---|---|---|---|
| STATION 30 | | | |
| No | Sampling date: 01/12/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Eucalanus subcrassus Giesb.* | 2 | 200 |
| 2 | *Paracalanus parvus* | 36 | 3600 |
| 3 | *Acartia clausi* | 6 | 600 |
| 4 | *Oithona sp.* | 12 | 1200 |
| 5 | *Corycaeus dalhi* | 1 | 100 |
| 6 | *Corycaeus sp.* | 9 | 900 |
| | | **66** | **6600** |

| | | | |
|---|---|---|---|
| STATION K31 | | | |
| No | Sampling date: 30/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus spp.* | 2 | 20 |
| 2 | *Oithona sp.* | 1 | 10 |
| 3 | *Copepoda* | 6 | 60 |
| | | **9** | **90** |

| | | | |
|---|---|---|---|
| STATION K32 | | | |
| No | Sampling date: 30/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Penilia schmackeri* | 1 | 10 |
| 2 | *Paracalanus parvus* | 7 | 70 |
| 3 | *Oithona sp.* | 2 | 20 |
| 4 | *Oikopleura rufescen* | 2 | 20 |
| 5 | *Copepoda* | 160 | 1600 |
| | | **172** | **1720** |

| | | | |
|---|---|---|---|
| STATION K33 | | | |
| No | Sampling date: 30/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Sagitta delicata* | 1 | 10 |
| 2 | *Evadne nordmani* | 2 | 20 |
| 3 | *Paracalanus parvus* | 23 | 230 |
| 4 | *Acartia pacifica* | 7 | 70 |
| 5 | *Acartia clausi* | 10 | 100 |
| 6 | *Oithona sp.* | 6 | 60 |
| | | **49** | **490** |

| | | | |
|---|---|---|---|
| STATION K37 | | | |
| No | Sampling date: 30/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 9 | 450 |
| 2 | *Acartia clausi* | 1 | 50 |
| 3 | *Oithona sp.* | 3 | 150 |
| 4 | *Oncaea venusta* | 3 | 150 |
| | | **16** | **800** |

| | | | |
|---|---|---|---|
| STATION L34 | | | |
| No | Sampling date: 30/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 9 | 90 |
| 2 | *Acartia clausi* | 7 | 70 |
| 3 | *Oithona sp.* | 1 | 10 |
| 4 | *Copepoda* | 11 | 110 |
| | | **28** | **280** |

| | | | |
|---|---|---|---|
| STATION L35 | | | |
| No | Sampling date: 30/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Harpaticoda* | 1 | 10 |

| STATION F18 | | | |
|---|---|---|---|
| No | Sampling date: 29/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 2 | 20 |
| 2 | *Copepoda* | 6 | 60 |
| 3 | *AT T«m* | 3 | 30 |
| | | **11** | **110** |

| STATION G19 | | | |
|---|---|---|---|
| No | Sampling date: 02/12/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 48 | 480 |
| 2 | *Acartia clausi* | 70 | 700 |
| 3 | *Oithona sp.* | 18 | 180 |
| 4 | *Microcetella norvegica* | 6 | 60 |
| 5 | *Copepoda* | 86 | 860 |
| | | **228** | **2280** |

| | | | |
|---|---|---|---|
| 2 | *Paracalanus parvus* | 6 | 60 |
| 3 | *Acartia clausi* | 1 | 10 |
| 4 | *Copepoda* | 35 | 350 |
| | | **43** | **430** |

| STATION L36 | | | |
|---|---|---|---|
| No | Sampling date: 30/11/2006 | | |
| | SPECIES | QUANTITY | INDS/M3 |
| 1 | *Paracalanus parvus* | 14 | 140 |
| 2 | *Acartia clausi* | 1 | 10 |
| 3 | *AT T«m* | 1 | 10 |
| | | **16** | **160** |

## Survey Institute of Marine Resources and Environament, May 2007

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) Tide (Flood) | Flow velocity (m/s) Tide (Ebb) | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³=µg/l) | Zoobenthos biomass unit/m² | Zoobenthos biomass g/m³ | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,02 | 0,28 | 0,7 | | | | | | | | |
| | 1 | M | | | 27,3 | | | | | | 7,04 | <1 | 6,10 | | | | | | | | | | | | | | | |
| | | B | 0,5 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,05 | <0.02 | | 0,02 | 0,29 | 1,6 | | | | | | | | |
| A | 2 | M | | | 28,5 | | | | | | 6,09 | <1 | 6,30 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,03 | <0.05 | 8,0 | | | | | | | | |
| | 3 | M | | | 30,2 | | | | | | 7,95 | <1 | 6,65 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud, Clay, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,03 | 0,65 | 3,2 | | | | | | | | |
| | 4 | M | | | 28,5 | | | | | | 7,22 | <1 | 6,20 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,07 | <0.02 | | 0,05 | 0,39 | 0,6 | | | | | | | | |
| B | 5 | M | | | 28,5 | | | | | | 6,60 | <1 | 6,15 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,01 | 0,21 | 1,7 | | | | | | | | |
| | 6 | M | | | 30,0 | | | | | | 8,42 | <1 | 6,70 | | | | | | | | | | | | | | | |
| | | B | 0,4 | | | | | Mud, Clay, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,11 | <0.02 | | 0,02 | 0,37 | 3,7 | | | | | | | | |
| | 7 | M | | | 27,8 | | | | | | 7,82 | <1 | 6,65 | | | | | | | | | | | | | | | |
| | | B | 2,7 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 0,21 | 1,1 | | | | | | | | |
| C | 8 | M | | | 28,5 | | | | | | 7,55 | <1 | 6,35 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,03 | 0,49 | 4,2 | | | | | | | | |
| | 9 | M | | | 28,8 | | | | | | 7,61 | <1 | 6,15 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,06 | 0,02 | | 0,01 | 0,52 | 3,0 | | | | | | | | |
| | 10 | M | | | 27,4 | | | | | | 7,93 | <1 | 6,70 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,12 | <0.02 | | 0,01 | 0,65 | 2,3 | | | | | | | | |
| D | 11 | M | | | 27,6 | | | | | | 8,05 | 1,5 | 6,70 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,10 | <0.02 | | 0,02 | 0,31 | 3,4 | | | | | | | | |
| | 12 | M | | | 28,5 | | | | | | 7,86 | <1 | 6,60 | | | | | | | | | | | | | | | |
| | | B | 1,4 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,06 | 0,02 | | 0,01 | 0,39 | 1,7 | | | | | | | | |
| | 13 | M | | | 27,7 | | | | | | 8,23 | 2,3 | 7,25 | | | | | | | | | | | | | | | |
| | | B | 11,0 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,12 | 0,05 | | 0,02 | 0,60 | 1,1 | | | | | | | | |
| E | 14 | M | | | 28,7 | | | | | | 7,60 | <1 | 6,80 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,09 | 0,04 | | 0,02 | 0,35 | 1,2 | | | | | | | | |
| | 15 | M | | | 29,0 | | | | | | 7,49 | <1 | 7,10 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,06 | 0,02 | | 0,02 | 0,78 | 3,8 | | | | | | | | |
| | 16 | M | | | 29,5 | | | | | | 8,40 | 2,0 | 7,10 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,06 | 0,02 | | 0,02 | 1,05 | 2,7 | | | | | | | | |
| F | 17 | M | | | 29,0 | | | | | | 8,31 | 1,8 | 7,30 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,06 | <0.02 | | 0,03 | 1,28 | 3,6 | | | | | | | | |
| | 18 | M | | | 30,2 | | | | | | 8,55 | 1,6 | 7,25 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud, Clay, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,02 | 1,53 | 2,5 | | | | | | | | |
| | 19 | M | | | 28,5 | | | | | | 8,37 | 2,0 | 6,55 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | 0,06 | 0,04 | | 0,02 | 0,62 | | | | | | | | | |
| G | 20 | M | | | 28,5 | | | | | | 8,37 | 2,0 | 6,70 | | | | | | | | | | | | | | | |
| | | B | 2,7 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,02 | 0,93 | | | | | | | | | |
| | 21 | M | | | 28,9 | | | | | | 8,39 | 2,0 | 6,60 | | | | | | | | | | | | | | | |
| | | B | 0,3 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 0,91 | 2,8 | | | | | | | | |
| | 22 | M | | | 28,8 | | | | | | 8,27 | 2,2 | 7,35 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 1,08 | | | | | | | | | |
| H | 23 | M | | | 28,8 | | | | | | 8,34 | 2,2 | 7,55 | | | | | | | | | | | | | | | |
| | | B | 3,7 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,01 | 0,67 | | | | | | | | | |
| | 24 | M | | | 28,9 | | | | | | 8,34 | 2,2 | 7,50 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,03 | 0,78 | | | | | | | | | |
| | 25 | M | | | 29,0 | | | | | | 8,24 | 2,0 | 7,40 | | | | | | | | | | | | | | | |
| | | B | 2,0 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 1,30 | 4,0 | | | | | | | | |
| I | 26 | M | | | 29,3 | | | | | | 8,16 | 2,0 | 7,80 | | | | | | | | | | | | | | | |
| | | B | 3,3 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 0,96 | | | | | | | | | |
| | 27 | M | | | 29,1 | | | | | | 8,26 | 2,0 | 7,55 | | | | | | | | | | | | | | | |
| | | B | 3,1 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,01 | 0,69 | | | | | | | | | |
| | 28 | M | | | 29,6 | | | | | | 8,40 | 1,5 | 7,30 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,01 | 0,71 | 1,7 | | | | | | | | |
| J | 29 | M | | | 29,9 | | | | | | 8,81 | 1,3 | 7,10 | | | | | | | | | | | | | | | |
| | | B | 1,0 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 0,67 | 0,6 | | | | | | | | |
| | 30 | M | | | 28,3 | | | | | | 8,25 | 4,0 | 7,50 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,01 | 0,71 | 1,8 | | | | | | | | |
| | 31 | M | | | 30,5 | | | | | | 8,65 | 1,3 | 7,35 | | | | | | | | | | | | | | | |
| | | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,02 | 0,70 | | | | | | | | | |
| K | 32 | M | | | 30,3 | | | | | | 8,49 | 1,6 | 7,55 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | <0.01 | 0,65 | 1,1 | | | | | | | | |
| | 33 | M | | | 29,3 | | | | | | 8,30 | 1,5 | 7,25 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,01 | 0,68 | 0,8 | | | | | | | | |
| | 37 | M | | | 30,3 | | | | | | 8,83 | 1,3 | 7,20 | | | | | | | | | | | | | | | |
| | | B | 1,6 | | | | | Mud, Clay | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | <0.02 | | <0.01 | 1,45 | 1,1 | | | | | | | | |
| | 34 | M | | | 29,7 | | | | | | 8,88 | 1,5 | 7,10 | | | | | | | | | | | | | | | |
| | | B | 2,1 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |
| L | | T | | | | | | | | | | | | | <0.05 | <0.02 | | 0,03 | 0,98 | 1,4 | | | | | | | | |
| | 35 | M | | | 28,9 | | | | | | 8,56 | 1,5 | 7,25 | | | | | | | | | | | | | | | |
| | | B | 1,9 | | | | | Clay, Sand | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | <0.05 | 0,02 | | 0,03 | 0,49 | 2,4 | | | | | | | | |
| | 36 | M | | | 29,5 | | | | | | 8,70 | 1,3 | 7,35 | | | | | | | | | | | | | | | |
| | | B | 1,3 | | | | | Mud, Sand | | | | | | | | | | | | | | | | | | | | |

## Report by Chu Chi Thiet (2009)

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) Tide (Flood) | Flow velocity (m/s) Tide (Ebb) | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³=µg/l) | Zoobenthos biomass unit/m² | Zoobenthos biomass g/m³ | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T | | | | | | | | | 7,6 | 5,0 | 5,00 | 0,00 | 0,13 | 0,00 | | 0,00 | 0,28 | 2,4 | | | 80.500 | | | | | |
| | 1 | M | | 0,65 | 32,0 | | | | | | | | | | | | | | | 1,7 | | | 83.333 | | | | | |
| | | B | 1,1 | | | | | Sand, Mud | | | 8,4 | 16,0 | 5,00 | 0,00 | 0,07 | 0,00 | | 0,00 | 0,00 | 1,2 | | | 57.501 | | | | | |
| | | T | | | | | | | | | 8,3 | 17,0 | 5,33 | 0,00 | 0,00 | 0,00 | | 0,00 | 0,00 | 0,0 | | | 66.938 | | | | | |
| | 2 | M | | 0,70 | 32,0 | | | | | | | | | | | | | | | 0,0 | | | 29.670 | | | | | |
| | | B | 1,1 | | | | | Sand, Mud | | | 8,4 | 17,0 | 5,00 | 0,00 | 0,00 | 0,03 | | 0,00 | 0,00 | 0,4 | | | 36.936 | | | | | |
| | | T | | | | | | | | | 8,4 | 11,0 | 5,80 | 0,00 | 0,00 | 0,00 | | 0,00 | 0,00 | 0,0 | | | 13.500 | | | | | |
| | 3 | M | | 0,60 | 33,0 | | | | | | | | | | | | | | | 1,5 | | | 8.833 | | | | | |
| | | B | 1,2 | | | | | Sand, Mud | | | 8,5 | 11,0 | 5,70 | 0,00 | 0,00 | 0,00 | | 0,00 | 0,00 | 0,6 | | | 12.833 | | | | | |

## Survey Tran Dinh Minh, November 13th, 2011

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) Tide (Flood) | Tide (Ebb) | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³ = µg/l) | Zoobenthos biomass unit/m² | g/m³ | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms | E.coli | Vibrio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | A | M | | 0,65 | 28,5 | | | | | | 8,20 | 27,0 | 6,00 | | | | | | | | | | | | | | | |
| | | B | 1,1 | | | | | Sand Mud | | | | | | <0.02 | <0.05 | <0.02 | 115 | | | 3,09 | | | | | | 0 | 0 | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | B | M | | 0,70 | 28,0 | | | | | | 8,20 | 3,5 | 5,00 | | | | | | | | | | | | | | | |
| | | B | 1,1 | | | | | Sand Mud | | | | | | <0.02 | <0.05 | <0.02 | 80 | | | 2,89 | | | | | | 0 | 0 | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | C | M | | 0,60 | 28,0 | | | | | | 7,50 | 1,0 | 6,00 | | | | | | | | | | | | | | | |
| | | B | 1,2 | | | | | Sand Mud | | | | | | <0.02 | <0.05 | <0.02 | 20 | | | 4,95 | | | | | | 4000 | 43000 | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | D | M | | 0,56 | 28,0 | | | | | | 7,00 | 1,0 | 5,50 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Mud Sand | | | | | | <0.02 | <0.05 | <0.02 | 20 | | | 7,01 | | | | | | 4000 | 23000 | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | E | M | | 0,46 | 28,0 | | | | | | 7,90 | 2,0 | 5,50 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Sand Mud | | | | | | <0.02 | <0.05 | <0.02 | 40 | | | 2,10 | | | | | | 43000 | 43000 | |

## Survey Tran Dinh Minh, November 13th 2011 – Phytoplankton species

| Station A | Sampling date: 13/11/2011<br>Analysis date: 21/11/2011 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Aphanocapsa delicatissima* |
| 2 | *Aphanocapsa holsalica* |
| 3 | *Microcystis aeruginosa* |
| 4 | *Oscillatoria limosa* |
| 5 | *Oscillatoria tenuis* |
| | **CHRYSOPHYTA** |
| 6 | *Dinobryon selutaria* |
| | **BACILLARIOPHYTA** |
| 7 | *Asteromphalus cleveanus* |
| 8 | *Coconeis scutellum* |
| 9 | *Coscinodiscus bulliens* |
| 10 | *Coscinodiscus jonesianus* |
| 11 | *Coscinodiscus radiatus* |
| 12 | *Cyclotella striata* |
| 13 | *Chaetoceros lorenzianus* |
| 14 | *Chaetoceros paradoxus* |
| 15 | *Diploneis fusca* |
| 16 | *Gyrosigma attenuatum* |
| 17 | *Lauderia anulata* |
| 18 | *Lyrella lyroides* |
| 19 | *Melosira granulata* |
| 20 | *Melosira granulata var. angussima* |
| 21 | *Nitzschia closterium* |
| 22 | *Nitzschia sigma* |
| 23 | *Odontella regia* |
| 24 | *Odontella sinensis* |
| 25 | *Petroneis marina* |
| 26 | *Pleurosigma aestuarii* |
| 27 | *Pleurosigma affine* |
| 28 | *Rhizosolenia sp.* |
| 29 | *Surirella gemma* |
| 30 | *Surirella minuta* |
| 31 | *Synedra ulna* |
| 32 | *Thalassionema nitzschioides* |
| 33 | *Triceratium favus* |
| | **CHLOROPHYTA** |
| 34 | *Actinastrum hantzchii var. hantzchii* |
| 35 | *Arthrodesmus convergens* |
| 36 | *Closterium kuetzingii* |
| 37 | *Coelastrum cambricum* |
| 38 | *Coelastrum sphaericum* |
| 39 | *Cosmarium contractum* |
| 40 | *Cosmarium moniliforme* |
| 41 | *Dictyosphaerium pulchellum* |
| 42 | *Eunotia elegans* |
| 43 | *Micrastinium borhhemiense* |
| 44 | *Micrastinium quadrisetum var. quadrisetum* |
| 45 | *Pandorina morum* |
| 46 | *Pediastrum duplex var. duplex* |
| 47 | *Pediastrum duplex var. reticulatum* |
| 48 | *Pediastrum boryanum var. longicorne* |
| 49 | *Scenedesmus obliquus var. alternans* |
| 50 | *Scenedesmus acuminatus var. acuminatus* |
| 51 | *Scenedesmus acuminatus var. biseratus* |
| 52 | *Scenedesmus quadricauda var. quadricauda* |
| 53 | *Schroederia sp.* |
| 54 | *Staurastrum gracile* |
| 55 | *Staurastrum nodulosum* |
| 56 | *Staurastrum senarium* |
| 57 | *Staurastrum sp.* |
| 58 | *Staurastrum striolatum var. striolatum* |
| 59 | *Staurastrum wildemanii* |
| 60 | *Tetraedron gracile* |
| 61 | *Xanthidium cf. scotti* |
| | **DINOPHYTA** |
| 62 | *Alexandrium cf. affine* |
| 63 | *Peridinium cinctum* |
| | **DICTYOCHOPHYTA** |
| 64 | *Dictyocha fibula* |
| **TOTAL** | **64** |

| Station B | Sampling date: 13/11/2011<br>Analysis date: 24/11/2012 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Anabaena cf. crassa* |
| 2 | *Aphanocapsa delicatissima* |
| 3 | *Cyanodictyon imperfectum* |
| 4 | *Microcystis aeruginosa* |
| 5 | *Pseudonitzchia cf. moniliformis* |
| | **CHRYSOPHYTA** |
| 6 | *Dinobryon bavaricum* |
| | **BACILLARIOPHYTA** |
| 7 | *Asteromphalus cleveanus* |
| 8 | *Biddulphia sp.* |
| 9 | *Coconeis scutellum* |
| 10 | *Coscinodiscus radiatus* |
| 11 | *Cyclotella striata* |
| 12 | *Diploneis bombus* |
| 13 | *Dityllum brightwellii* |
| 14 | *Guinardia striata* |
| 15 | *Gyrosigma fasciola* |
| 16 | *Gyrosigma attenuatum* |
| 17 | *Lyrella lyroides* |
| 18 | *Melosira granulata* |
| 19 | *Melosira granulata var. angussima* |
| 20 | *Nitzschia sigma* |
| 21 | *Odontella sinensis* |
| 22 | *Petroneis marina* |
| 23 | *Pleurosigma aestuarii* |
| 24 | *Surirella robusta var. splendida* |
| 25 | *Thalassionema nitzschioides* |
| | **CHLOROPHYTA** |
| 26 | *Actinastrum hantzchii var. hantzchii* |
| 27 | *Closterium juncidum* |
| 28 | *Cosmarium contractum* |
| 29 | *Dictyosphaerium pulchellum* |
| 30 | *Eunotia elegans* |
| 31 | *Micrasterias pinnatifida* |
| 32 | *Pandorina morum* |
| 33 | *Pediastrum boryanum var. boryanum* |
| 34 | *Scenedesmus acuminatus var. biseratus* |
| 35 | *Scenedesmus denticulotus var. biseratus* |
| 36 | *Scenedesmus quadricauda var. quadricauda* |
| 37 | *Staurastrum gracile* |
| 38 | *Staurodesmus triangularis var. limneticus* |
| 39 | *Tetraedron gracile* |
| 40 | *Xanthidium cf. scotti* |
| | **EUGLENOPHYTA** |
| 41 | *Strombomonas napiformis var. brevicollis* |
| | **DINOPHYTA** |
| 42 | *Glenodinium cinctum* |
| 43 | *Peridinium cinctum* |
| **TOTAL** | **43** |

| Station C | Sampling date: 13/11/2011<br>Analysis date: 24/11/2011 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Aphanocapsa delicatissima* |
| 2 | *Arthrospira massartii* |
| 3 | *Merismopedia tenuissima* |
| 4 | *Oscillatoria limosa* |
| 5 | *Oscillatoria princeps* |
| | *Oscillatoria tenuis* |
| | **CHRYSOPHYTA** |
| 6 | *Dinobryon selutaria* |
| | **BACILLARIOPHYTA** |
| 7 | *Amphiprora alata* |
| 8 | *Campylodiscus daemelianus* |
| 9 | *Coscinodiscus subtilis* |
| 10 | *Cyclotella striata* |
| 11 | *Cyclotella comta* |
| 12 | *Chaetoceros lorenzianus* |
| 13 | *Diploneis bombus* |
| 14 | *Diploneis smithii* |
| 15 | *Gyrosigma fasciola* |
| 16 | *Gyrosigma sinensis* |
| 17 | *Melosira granulata* |
| 18 | *Melosira granulata var. angussima* |
| 19 | *Navicula tripunctata* |
| 20 | *Nitzschia closterium* |
| 21 | *Nitzschia sigma* |
| 22 | *Pleurosigma aestuarii* |
| 23 | *Pleurosigma affine* |
| 24 | *Surirella gemma* |
| 25 | *Surirella robusta var. splendida* |
| 26 | *Synedra ulna* |
| | **CHLOROPHYTA** |
| 27 | *Actinastrum hantzchii var. hantzchii* |
| 28 | *Ankistrodesmus spiralis* |
| 29 | *Closterium juncidum* |
| 30 | *Closterium kuetzingii* |
| 31 | *Closterium macilentum* |
| 32 | *Coelastrum cambricum* |
| 33 | *Cosmarium contractum* |
| 34 | *Cosmarium moniliforme* |
| 35 | *Dictyosphaerium pulchellum* |
| 36 | *Eunotia elegans* |
| 37 | *Hyalotheca mucosa* |
| 38 | *Micrastinium borhhemiense* |
| 39 | *Micrastinium quadrisetum var. quadrisetum* |
| 40 | *Pandorina morum* |
| 41 | *Pediastrum duplex var. duplex* |
| 42 | *Pediastrum duplex var. reticulatum* |
| 43 | *Pediastrum tetras var. tetras* |
| 44 | *Pediastrum boryanum var. longicorne* |
| 45 | Scenedesmus obliquus var. alternans |
| 46 | *Scenedesmus acuminatus var. acuminatus* |
| 47 | *Scenedesmus arcuatus var. platydisca* |
| 48 | *Scenedesmus denticulatus var. denticulatus* |
| 49 | *Scenedesmus quadricauda var. quadricauda* |
| 50 | *Spondylosium planum* |
| 51 | *Staurastrum dejectum* |
| 52 | *Staurastrum gracile* |
| 53 | *Staurastrum sp.* |
| 54 | *Staurastrum striolatum var. striolatum* |
| 55 | *Tetraedron gracile* |
| 56 | *Xanthidium cf. scotti* |
| | **EUGLENOPHYTA** |
| 57 | *Euglena spirogyra* |
| 58 | *Lepocinclis ovum* |
| 59 | *Phacus longicauda* |
| 60 | *Phacus pleuronectes var. pleuronectes* |
| 61 | *Strombomonas napiformis var. brevicollis* |
| 62 | *Trachelomonas armata* |
| 63 | *Trachelomonas volvocina* |
| | **DINOPHYTA** |
| 64 | *Alexandrium cf. affine* |
| 65 | *Ceratium hirunidella* |
| 66 | *Peridinium cinctum* |
| 67 | *Peridinium sp.* |
| **TOTAL** | **67** |

| Station D | Sampling date: 13/11/2012<br>Analysis date: 25/11/2012 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| **1** | *Aphanocapsa delicatissima* |
| **2** | *Merismopedia tenuissima* |
| **3** | *Microcystis aeruginosa* |
| **4** | *Oscillatoria perornata* |
| **5** | *Pseudonitzchia cf. moniliformis* |
| | CHRYSOPHYTA |
| **6** | *Dinobryon selutaria* |
| | **BACILLARIOPHYTA** |
| **7** | *Amphiprora alata* |
| **8** | *Biddulphia sp.* |
| **9** | *Coscinodiscus radiatus* |
| **10** | *Cyclotella comta* |
| **11** | *Lauderia anulata* |
| **12** | *Melosira granulata* |
| **13** | *Melosira granulata var. angussima* |
| **14** | *Nitzschia closterium* |
| **15** | *Nitzschia sigma* |
| **16** | *Pleurosigma aestuarii* |
| **17** | *Surirella gemma* |
| **18** | *Surirella robusta var. splendida* |
| **19** | *Synedra ulna* |
| | **CHLOROPHYTA** |
| **20** | *Actinastrum hantzchii var. hantzchii* |
| **21** | *Ankistrodesmus fusiformis* |
| **22** | *Ankistrodesmus spiralis* |
| **23** | *Arthrodesmus convergens* |
| **24** | *Closterium gracile* |
| **25** | *Closterium kuetzingii* |
| **26** | *Closterium setaceum* |
| **27** | *Coelastrum cambricum* |
| **28** | *Cosmarium moniliforme* |
| **29** | *Crucigenia quadrata* |
| **30** | *Desmidiumbaileyi* |
| **31** | *Dictyosphaerium pulchellum* |
| **32** | *Eunotia elegans* |
| **33** | *Hyalotheca mucosa* |
| **34** | *Micrastinium borhhemiense* |
| **35** | *Micrastinium quadrisetum var. quadrisetum* |
| **36** | *Onychonema laeve* |
| **37** | *Pandorina morum* |
| **38** | *Pediastrum duplex var. duplex* |
| **39** | *Pediastrum duplex var. reticulatum* |
| **40** | *Pediastrum tetras var. tetras* |
| **41** | *Scenedesmus acuminatus var. elongatus* |
| **42** | *Scenedesmus arcuatus var. platydisca* |
| **43** | *Scenedesmus quadricauda var. quadricauda* |
| **44** | *Staurastrum cuspidatum var. divergens* |
| **45** | *Staurastrum dejectum* |
| **46** | *Staurastrum gracile* |
| **47** | *Staurastrum nodulosum* |
| **48** | *Staurastrum sp.* |
| **49** | *Staurodesmus triangularis var. limneticus* |
| | **EUGLENOPHYTA** |
| **50** | *Euglena spirogyra* |
| **51** | *Phacus longicauda* |
| **52** | *Phacus pleuronectes var. pleuronectes* |
| **53** | *Strombomonas napiformis var. brevicollis* |
| **54** | *Trachelomonas armata* |
| | **DINOPHYTA** |
| **55** | *Ceratium hirunidella* |
| **56** | *Peridinium sp.* |
| **TOTAL** | **56** |

| Station E | Sampling date: 13/11/2011<br>Analysis date: 25/11/2011 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Microcystis aeruginosa* |
| 2 | *Oscillatoria limosa* |
| 3 | *Pseudonitzchia cf. moniliformis* |
| | **CHRYSOPHYTA** |
| 4 | *Dinobryon selutaria* |
| | **BACILLARIOPHYTA** |
| 5 | *Amphiprora alata* |
| 6 | *Asteromphalus cleveanus* |
| 7 | *Biddulphia sp.* |
| 8 | *Coconeis scutellum* |
| 9 | *Coscinodiscus radiatus* |
| 10 | *Cyclotella striata* |
| 11 | *Chaetoceros lorenzianus* |
| 12 | *Chaetoceros paradoxus* |
| 13 | *Chaetoceros pseudo-curvisetus* |
| 14 | *Chaetoceros sp.* |
| 15 | *Diploneis smithii* |
| 16 | *Dityllum brightwellii* |
| 17 | *Gyrosigma fasciola* |
| 18 | *Melosira granulata* |
| 19 | *Melosira granulata var. angussima* |
| 20 | *Nitzschia closterium* |
| 21 | *Nitzschia sigma* |
| 22 | *Odontella regia* |
| 23 | *Odontella sinensis* |
| 24 | *Petroneis granulata* |
| 25 | *Pleurosigma aestuarii* |
| 26 | *Rhizosolenia imbricata* |
| 27 | *Surirella robusta var. splendida* |
| 28 | *Synedra ulna* |
| 29 | *Thalassionema frauenfeldii* |
| 30 | *Thalassionema nitzschioides* |
| | **CHLOROPHYTA** |
| 31 | *Actinastrum hantzchii var. hantzchii* |
| 32 | *Kirchneriella lunaris* |
| 33 | *Coelastrum cambricum* |
| 34 | *Cosmarium sp.* |
| 35 | *Eunotia elegans* |
| 36 | *Micrastinium borhhemiense* |
| 37 | *Micrastinium quadrisetum var. quadrisetum* |
| 38 | *Oocystis borgei* |
| 39 | *Pediastrum duplex var. reticulatum* |
| 40 | *Pediastrum tetras var. tetras* |
| 41 | *Scenedesmus acuminatus var. biseratus* |
| 42 | *Scenedesmus arcuatus var. arcuatus* |
| 43 | *Scenedesmus quadricauda var. quadricauda* |
| 44 | *Scenedesmus sp.* |
| 45 | *Staurastrum dejectum* |
| 46 | *Staurastrum gracile* |
| 47 | *Staurastrum nodulosum* |
| 48 | *Staurastrum senarium* |
| 49 | *Staurastrum striolatum var. striolatum* |
| 50 | *Staurastrum wildemanii* |
| 51 | *Staurodesmus triangularis var. limneticus* |
| 52 | *Tetraedron gracile* |
| 53 | *Tetrastrum heterocanthum* |
| | **EUGLENOPHYTA** |
| 54 | *Euglena acus* |
| 55 | *Phacus longicauda* |
| 56 | *Phacus pleuronectes var. pleuronectes* |
| 57 | *Strombomonas napiformis var. brevicollis* |
| | **DINOPHYTA** |
| 58 | *Ceratium hirunidella* |
| 59 | *Dictyocha fibula* |
| **TOTAL** | **59** |

**Survey Tran Dinh Minh, November 18th, 2011**

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$(mg/l) | $NH_3$(mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m$^3$= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/m$^2$ | g/m$^3$ | | | | | | |
| | A | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,70 | 29,0 | | | | | | 7,20 | 1,0 | 6,00 | | | | | | | | | | | | | | | |
| | | B | 1,1 | | | | | Sand | | | | | | <0.02 | <0.05 | <0.02 | 40 | | | 1,20 | | | | | | 43000 | 0 | |
| | B | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,76 | 29,0 | | | | | | 7,40 | 0,5 | 5,50 | | | | | | | | | | | | | | | |
| | | B | 1,5 | | | | | Mud - Sand | | | | | | <0.02 | <0.05 | <0.02 | 30 | | | 3,68 | | | | | | 15000 | 93000 | |
| | C | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,00 | 29,0 | | | | | | 7,20 | 0,5 | 6,00 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Sand - Mud | | | | | | <0.02 | <0.05 | <0.02 | 40 | | | 3,10 | | | | | | 9000 | 93000 | |
| | D | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,72 | 29,0 | | | | | | 7,20 | 0,5 | 6,00 | | | | | | | | | | | | | | | |
| | | B | 1,8 | | | | | Mud - Sand | | | | | | <0.02 | <0.05 | <0.02 | 20 - 30 | | | 4,90 | | | | | | 7000 | 0 | |
| | E | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,84 | 29,0 | | | | | | 7,40 | 1,5 | 5,50 | | | | | | | | | | | | | | | |
| | | B | 0,9 | | | | | Sand - Mud | | | | | | <0.02 | <0.05 | <0.02 | 30 | | | 2,29 | | | | | | 0 | 0 | |

# Survey Tran Dinh Minh, November 18th 2011 Phytoplankton species

| Station A | Sampling date: 18/11/2011<br>Analysis date: 20/11/2011 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Arthrospira massartii* |
| 2 | *Microcystis aeruginosa* |
| 3 | *Microcystis botrys* |
| 4 | *Oscillatoria tenuis* |
| 5 | *Pseudonitzchia* cf. *moniliformis* |
| | **BACILLARIOPHYTA** |
| 6 | *Amphiprora alata* |
| 7 | *Baxillaria paxillifera* |
| 8 | *Coconeis scutellum* |
| 9 | *Coscinodiscus bulliens* |
| 10 | *Coscinodiscus radiatus* |
| 11 | *Diploneis smithii* |
| 12 | *Lyrella lyroides* |
| 13 | *Mastogloia quinquecostata* |
| 14 | *Melosira granulata* |
| 15 | *Melosira granulata* var. *angussima* |
| 16 | *Nitzschia closterium* |
| 17 | *Nitzschia lozenziana* |
| 18 | *Nitzschia sigma* |
| 19 | *Odontella sinensis* |
| 20 | *Pleurosigma aestuarii* |
| 21 | *Pleurosigma angulatum* |
| 22 | *Pleurosigma strigosum* |
| 23 | *Rhizosolenia imbricata* |
| 24 | *Surirella robusta* var. *splendida* |
| 25 | *Synedra ulna* |
| 26 | *Thalassionema frauenfeldii* |
| | **CHLOROPHYTA** |
| 27 | *Actinastrum hantzchii* var. *hantzchii* |
| 28 | *Closterium juncidum* |
| 29 | *Closterium kuetzingii* |
| 30 | *Coelastrum sphaericum* |
| 31 | *Crucigenia quadrata* |
| 32 | *Eunotia elegans* |
| 33 | *Oocystis borgei* |
| 34 | *Pandorina morum* |
| 35 | *Pediastrum duplex* var. *reticulatum* |
| 36 | *Pediastrum boryanum* var. *boryanum* |
| 37 | *Pediastrum boryanum* var. *longicorne* |
| 38 | *Scenedesmus acuminatus* var. *acuminatus* |
| 39 | *Staurastrum cuspidatum* var. *divergens* |
| 40 | *Staurastrum dejectum* |
| 41 | *Staurastrum gracile* |
| 42 | *Staurastrum nodulosum* |
| 43 | *Tetrastrum heterocanthum* |
| 44 | *Xanthidium* cf. *scotti* |
| | **DINOPHYTA** |
| 45 | *Ceratium furca* |
| **TOTAL** | **45** |

| Station B | Sampling date: 18/11/2012<br>Analysis date: 21/11/2012 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Aphanocapsa delicatissima* |
| 2 | *Aphanocapsa holsalica* |
| 3 | *Microcystis aeruginosa* |
| 4 | *Microcystis botrys* |
| 5 | *Oscillatoria limosa* |
| | **BACILLARIOPHYTA** |
| 6 | *Amphiprora alata* |
| 7 | *Asteromphalus cleveanus* |
| 8 | *Bellerochea horologicalis* |
| 9 | *Biddulphia* sp. |
| 10 | *Caloneis fenzlii* |
| 11 | *Campylodiscus daemelianus* |
| 12 | *Coconeis scutellum* |
| 13 | *Coscinodiscus bulliens* |
| 14 | *Coscinodiscus jonesianus* |
| 15 | *Coscinodiscus linearis* |
| 16 | *Coscinodiscus radiatus* |
| 17 | *Cyclotella comta* |
| 18 | *Gyrosigma fasciola* |
| 19 | *Gyrosygma* sp. |
| 20 | *Lyrella lyroides* |
| 21 | *Melosira granulata* |
| 22 | *Melosira granulata* var. *angussima* |
| 23 | *Nitzschia closterium* |
| 24 | *Nitzschia sigma* |
| 25 | *Odontella regia* |
| 26 | *Pleurosigma aestuarii* |
| 27 | *Pleurosigma angulatum* |
| 28 | *Stauroneis* sp. |
| 29 | *Surirella gemma* |
| 30 | *Surirella robusta* var. *splendida* |
| 31 | *Synedra ulna* |
| 32 | *Trachineis aspera* |
| | **CHLOROPHYTA** |
| 33 | *Actinastrum hantzchii* var. *hantzchii* |
| 34 | *Closterium gracile* |
| 35 | *Closterium juncidum* |
| 36 | *Closterium kuetzingii* |
| 37 | *Closterium setaceum* |
| 38 | *Coelastrum cambricum* |
| 39 | *Cosmarium contractum* |
| 40 | *Dictyosphaerium pulchellum* |
| 41 | *Eunotia elegans* |
| 42 | *Onychonema laeve* |
| 43 | *Oocystis borgei* |
| 44 | *Pandorina morum* |
| 45 | *Pediastrum duplex* var. *duplex* |
| 46 | *Pediastrum duplex* var. *reticulatum* |
| 47 | *Scenedesmus acuminatus* var. *acuminatus* |
| 48 | *Scenedesmus acuminatus* var. *biseratus* |
| 49 | *Scenedesmus arcuatus var. arcuatus* |
| 50 | *Scenedesmus quadricauda* var. *quadricauda* |
| 51 | *Staurastrum cuspidatum* var. *divergens* |
| 52 | *Staurastrum dejectum* |
| 53 | *Staurastrum gracile* |
| 54 | *Staurastrum nodulosum* |
| | **DINOPHYTA** |
| 55 | *Alexandrium* cf. *affine* |
| 56 | *Ceratium hirunidella* |
| 57 | *Dinophysis caudata* |
| | **DICTYOCHOPHYTA** |
| 58 | *Dictyocha fibula* |
| **TOTAL** | **58** |

| Station C | Sampling date: 18/11/2011<br>Analysis date: 22/11/2011 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Aphanocapsa delicatissima* |
| 2 | *Aphanocapsa holsalica* |
| 3 | *Microcystis aeruginosa* |
| 4 | *Oscillatoria limosa* |
| 5 | *Oscillatoria tenuis* |
| | **BACILLARIOPHYTA** |
| 6 | *Amphiprora alata* |
| 7 | *Asteromphalus cleveanus* |
| 8 | *Campylodiscus daemelianus* |
| 9 | *Coconeis scutellum* |
| 10 | *Coscinodiscus subtilis* |
| 11 | *Cyclotella striata* |
| 12 | *Chaetoceros lorenzianus* |
| 13 | *Diploneis bombus* |
| 14 | *Diploneis smithii* |
| 15 | *Gyrosigma fasciola* |
| 16 | *Gyrosigma attenuatum* |
| 17 | *Gyrosigma wormleyi* |
| 18 | *Gyrosigma sinensis* |
| 19 | *Lauderia anulata* |
| 20 | *Lyrella robertsiana* |
| 21 | *Mastogloia quinquecostata* |
| 22 | *Melosira granulata* |
| 23 | *Melosira granulata* var. *angussima* |
| 24 | *Navicula tripunctata* |
| 25 | *Nitzschia closterium* |
| 26 | *Nitzschia sigma* |
| 27 | *Nitzschia ventricosa* |
| 28 | *Odontella sinensis* |
| 29 | *Petroneis granulata* |
| 30 | *Petroneis marina* |
| 31 | *Petroneis monilifera* |
| 32 | *Pleurosigma aestuarii* |
| 33 | *Pleurosigma affine* |
| 34 | *Rhizosolenia* sp. |
| 35 | *Surirella gemma* |
| 36 | *Surirella robusta* var. *splendida* |
| 37 | *Synedra ulna* |
| 38 | *Thalassionema frauenfeldii* |
| 39 | *Thalassionema nitzschioides* |
| | **CHLOROPHYTA** |
| 40 | *Actinastrum hantzchii* var. *hantzchii* |
| 41 | *Ankistrodesmus spiralis* |
| 42 | *Closterium kuetzingii* |
| 43 | *Closterium macilentum* |
| 44 | *Coelastrum cambricum* |
| 45 | *Cosmarium contractum* |
| 46 | *Eunotia elegans* |
| 47 | *Pediastrum duplex* var. *duplex* |
| 48 | *Pediastrum duplex* var. *reticulatum* |
| 49 | *Pediastrum tetras* var. *tetras* |
| 50 | *Scenedesmus acuminatus* var. *biseratus* |
| 51 | *Scenedesmus denticulatus* var. *denticulatus* |
| 52 | *Scenedesmus quadricauda* var. *quadricauda* |
| 53 | *Staurastrum gracile* |
| 54 | *Staurastrum* sp. |
| 55 | *Staurodesmus triangularis* var. *limneticus* |
| 56 | *Tetraedron gracile* |
| 57 | *Tetrastrum heterocanthum* |
| | **EUGLENOPHYTA** |
| 58 | *Euglena spirogyra* |
| 59 | *Phacus pleuronectes* var. *pleuronectes* |
| | **DINOPHYTA** |
| 60 | *Ceratium hirunidella* |
| 61 | *Protoperidinium parthenopes* |
| **TOTAL** | **61** |

| Station D | Sampling date: 18/11/2011<br>Analysis date: 21/11/2011 |
|---|---|
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Aphanocapsa delicatissima* |
| 2 | *Microcystis aeruginosa* |
| 3 | *Pseudonitzchia* cf. *moniliformis* |
| 4 | *Pseudonitzchia mucicola* |
| | **BACILLARIOPHYTA** |
| 5 | *Amphiprora alata* |
| 6 | *Asteromphalus cleveanus* |
| 7 | *Coconeis scutellum* |
| 8 | *Coscinodiscus bulliens* |
| 9 | *Coscinodiscus subtilis* |
| 10 | *Cyclotella comta* |
| 11 | *Chaetoceros* sp. |
| 12 | *Diploneis fusca* |
| 13 | *Grammatophora oceanica* var. *macilenta* |
| 14 | *Gyrosigma fasciola* |
| 15 | *Lyrella clavata* var. *indica* |
| 16 | *Mastogloia braunii* |
| 17 | *Melosira granulata* var. *angussima* |
| 18 | *Navicula inflexa* |
| 19 | *Navicula tripunctata* |
| 20 | *Nitzschia closterium* |
| 21 | *Nitzschia sigma* |
| 22 | *Odontella regia* |
| 23 | *Pleurosigma affine* |
| 24 | *Pleurosigma angulatum* |
| 25 | *Rhizosolenia* sp. |
| 26 | *Surirella robusta* var. *splendida* |
| 27 | *Synedra ulna* |
| 28 | *Thalassionema frauenfeldii* |
| 29 | *Thalassiosira leptopus* |
| | **CHLOROPHYTA** |
| 30 | *Actinastrum hantzchii* var. *hantzchii* |
| 31 | *Arthrodesmus convergens* |
| 32 | *Closterium gracile* |
| 33 | *Closterium kuetzingii* |
| 34 | *Closterium setaceum* |
| 35 | *Coelastrum cambricum* |
| 36 | *Coelastrum sphaericum* |
| 37 | *Cosmarium contractum* |
| 38 | *Crucigenia quadrata* |
| 39 | *Dictyosphaerium pulchellum* |
| 40 | *Hyalotheca mucosa* |
| 41 | *Onychonema laeve* |
| 42 | *Pandorina morum* |
| 43 | *Pediastrum duplex* var. *duplex* |
| 44 | *Pediastrum duplex* var. *reticulatum* |
| 45 | *Scenedesmus acuminatus* var. *acuminatus* |
| 46 | *Scenedesmus apiculatus* var. *altenans* |
| 47 | *Scenedesmus bijugatus var. bijugatus* |
| 48 | *Scenedesmus denticulatus* var. *denticulatus* |
| 49 | *Scenedesmus longissima* |
| 50 | *Scenedesmus quadricauda* var. *quadricauda* |
| 51 | *Spondylosium planum* |
| 52 | *Staurastrum cuspidatum* var. *divergens* |
| 53 | *Staurastrum dejectum* |
| 54 | *Staurastrum gracile* |
| 55 | *Staurastrum nodulosum* |
| 56 | *Staurastrum* sp. |
| 57 | *Staurodesmus triangularis* var. *limneticus* |
| 58 | *Tetraedron gracile* |
| | **EUGLENOPHYTA** |
| 59 | *Phacus longicauda* |
| | **DINOPHYTA** |
| 61 | *Ceratium hirunidella* |
| 62 | *Peridinium* sp. |
| | DICTYOCHOPHYTA |
| 63 | *Dictyocha fibula* |
| **TOTAL** | **63** |

| Station E | Sampling date: 18/11/2011 |
|---|---|
| | Analysis date: 21/11/2011 |
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Aphanocapsa delicatissima* |
| 2 | *Microcystis aeruginosa* |
| 3 | *Microcystis botrys* |
| 4 | *Microcystis panniformis* |
| 5 | *Microcystis wessenbergii* |
| 6 | *Pseudonitzchia* cf. *moniliformis* |
| | **BACILLARIOPHYTA** |
| 7 | *Amphiprora alata* |
| 8 | *Baxillaria paxillifera* |
| 9 | *Biddulphia* sp. |
| 10 | *Caloneis fenzlii* |
| 11 | *Coscinodiscus jonesianus* |
| 12 | *Coscinodiscus radiatus* |
| 13 | *Cyclotella comta* |
| 15 | *Gyrosigma fasciola* |
| 16 | *Gyrosigma sinensis* |
| 17 | *Melosira granulata* |
| 18 | *Melosira granulata* var. *angussima* |
| 19 | *Nitzschia closterium* |
| 20 | *Nitzschia lozenziana* |
| 21 | *Nitzschia sigma* |
| 22 | *Odotella longicruric* |
| 23 | *Pleurosigma aestuarii* |
| 24 | *Pleurosigma angulatum* |
| 25 | *Thalassionema nitzschioides* |
| | **CHLOROPHYTA** |
| 26 | *Actinastrum hantzchii* var. *hantzchii* |
| 27 | *Coelastrum cambricum* |
| 28 | *Coelastrum sphaericum* |
| 29 | *Crucigenia quadrata* |
| 30 | *Dictyosphaerium pulchellum* |
| 31 | *Hyalotheca mucosa* |
| 32 | *Micrastinium borhhemiense* |
| 33 | *Pediastrum duplex* var. *duplex* |
| 34 | *Pediastrum duplex* var. *reticulatum* |
| 35 | *Scenedesmus acuminatus* var. *acuminatus* |
| 36 | *Spondylosium planum* |
| 37 | *Staurastrum dejectum* |
| 38 | *Staurastrum gracile* |
| 39 | *Staurastrum nodulosum* |
| 40 | *Staurastrum wildemanii* |
| 41 | *Staurodesmus triangularis* var. *limneticus* |
| | **EUGLENOPHYTA** |
| 42 | *Trachelomonas volvocina* |
| | **DINOPHYTA** |
| 43 | *Ceratium hirunidella* |
| | **DICTYOCHOPHYTA** |
| 44 | *Dictyocha fibula* |
| **TOTAL** | **44** |

## Survey Tran Dinh Minh, November 23rd, 2011

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$(mg/l) | $NH_3$(mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| | A | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,54 | 27,0 | | | | | | 8,70 | 32,0 | 6,00 | | | | | | | | | | | | | | | |
| | | B | 1,6 | | | | | Sand | | | | | | <0.02 | >0.05 | <0.02 | 60–100 | | | 4,56 | | | | | | 0 | 0 | |
| | B | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 1,39 | 27,0 | | | | | | 8,40 | 32,0 | 5,00 | | | | | | | | | | | | | | | |
| | | B | 1,6 | | | | | Sand | | | | | | <0.02 | >0.05 | <0.02 | 60–100 | | | 3,74 | | | | | | 0 | 0 | |
| | C | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,60 | 26,5 | | | | | | 8,20 | 29,5 | 5,50 | | | | | | | | | | | | | | | |
| | | B | 0,7 | | | | | Mud Sand | | | | | | <0.02 | >0.05 | <0.02 | 70–110 | | | 5,92 | | | | | | 9000 | 23000 | |
| | D | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,66 | 27,0 | | | | | | 8,30 | 32,0 | 6,00 | | | | | | | | | | | | | | | |
| | | B | 2,5 | | | | | Mud Sand | | | | | | <0.02 | >0.05 | <0.02 | 70–110 | | | 3,60 | | | | | | 0 | 0 | |
| | E | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | M | | 0,58 | 27,0 | | | | | | 8,30 | 32,0 | 5,50 | | | | | | | | | | | | | | | |
| | | B | 0,8 | | | | | Sand Mud | | | | | | <0.02 | >0.05 | <0.02 | 60–100 | | | 4,94 | | | | | | 0 | 0 | |

## Survey Tran Dinh Minh, November 23th 2011 Phytoplankton Species

| Station A | Sampling date: 23/11/2011 |
|---|---|
| | Analysis date: 26/11/2011 |
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Trichodesmium erythraeum* |
| | **BACILLARIOPHYTA** |
| 2 | *Amphiprora alata* |
| 3 | *Amphora ostrearia var. vitrea* |
| 4 | *Asteromphalus cleveanus* |
| 5 | *Asterionellopsis glacialis* |
| 6 | *Bacteriastrum comosum* |
| 7 | *Bacteriastrum comosum var. hispida* |
| 8 | *Biddulphia* sp. |
| 9 | *Campylodiscus kittonianus var. zanibaricus* |
| 10 | *Campylodiscus decorus var. pinnatus* |
| 11 | *Chaetoceros decipiens* |
| 12 | *Chaetoceros denticulatus* |
| 13 | *Chaetoceros diversus* |
| 14 | *Chaetoceros indicus* |
| 15 | *Chaetoceros lorenzianus* |
| 16 | *Chaetoceros paradoxus* |
| 17 | *Chaetoceros peruvianus* |
| 18 | *Chaetoceros pseudo-curvisetus* |
| 19 | *Chaetoceros* sp. |
| 20 | *Cyclotella striata* |
| 21 | *Coscinodiscus bulliens* |
| 22 | *Coconeis scutellum* |
| 23 | *Corethron pennatum* |
| 24 | *Coscinodiscus centralis* |
| 25 | *Coscinodiscus gigas* |
| 26 | *Diploneis fusca* |
| 27 | *Dactyliosolen blavyanus* |
| 28 | *Dityllum brightwelli* |
| 29 | *Dityllum sol* |
| 30 | *Eucampia zodiacus* |
| 31 | *Guinardia striata* |
| 32 | *Lauderia anulata* |
| 33 | *Lyrella clavala var. indica* |
| 34 | *Navicula yarrensis var. americana* |
| 35 | *Navicula* sp. |
| 36 | *Nitzschia sigma* |
| 37 | *Odontella mobilensis* |
| 38 | *Odontella regia* |
| 39 | *Odotella longicruric* |
| 40 | *Paralia sulcata* |
| 41 | *Pleurosigma aestuarii* |
| 42 | *Pleurosigma affine* |
| 43 | *Rhizosolenia fomosa* |
| 44 | *Rhizosolenia* sp. |
| 45 | *Podosira stelligera* |
| 46 | *Skeletonema costatum* |
| 47 | *Surirella amonicana* |
| 48 | *Thalassionema frauenfeldii* |
| 49 | *Thalassionema nitzschioides* |
| 50 | *Triceratium favus* |
| 51 | *Thalassiosira eccentrica* |
| | **DINOPHYTA** |
| 52 | *Ceratium fusus* |
| 53 | *Ceratium trichoceros* |
| 54 | *Diplopelta asymmetica* |
| 55 | *Dinophysis caudata* |
| 56 | *Dinophysis miles* |
| 57 | *Protoperidinium oblongum* |
| 58 | *Protoperidinium pentagonum* |
| | **DICTYOCHOPHYTA** |
| 59 | *Dictyocha fibula* |
| **TOTAL** | **59** |

| Station B | Sampling date: 23/11/2012 |
|---|---|
| | Analysis date: 26/11/2012 |
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Trichodesmium erythraeum* |
| | **BACILLARIOPHYTA** |
| 2 | *Amphiprora alata* |
| 3 | *Amphora spectabilis* |
| 4 | *Asteromphalus cleveanus* |
| 5 | *Asterionellopsis glacialis* |
| 6 | *Bacteriastrum furcatum* |
| 7 | *Bacteriastrum hyalinum var. princeps* |
| 8 | *Biddulphia* sp. |
| 9 | *Campylodiscus decorus var. pinnatus* |
| 10 | *Caloneis linearis* |
| 11 | *Chaetoceros affine* |
| 12 | *Chaetoceros cuvisetus* |
| 13 | *Chaetoceros decipiens* |
| 14 | *Chaetoceros diversus* |
| 15 | *Chaetoceros lorenzianus* |
| 16 | *Chaetoceros peruvianus* |
| 17 | *Chaetoceros pseudo-curvisetus* |
| 18 | *Chaetoceros* sp. |
| 19 | *Cyclotella striata* |
| 20 | *Coscinodiscus bulliens* |
| 21 | *Coconeis scutellum* |
| 22 | *Coscinodiscus jonesianus* |
| 23 | *Coscinodiscus* sp. |
| 24 | *Diploneis fusca* |
| 25 | *Diploneis smithii* |
| 26 | *Diploneis crabro* |
| 27 | *Dactyliosolen blavyanus* |
| 28 | *Dityllum brightwelli* |
| 29 | *Dityllum sol* |
| 30 | *Guinardia striata* |
| 31 | *Hemiaulus sinensis* |
| 32 | *Lauderia anulata* |
| 33 | *Lithodesmium undulatum* |
| 34 | *Menuniera membranacea* |
| 35 | *Navicula yarrensis var. americana* |
| 36 | *Navicula cf. direta* |
| 37 | *Odontella mobilensis* |
| 38 | *Odontella regia* |
| 39 | *Odontella sinensis* |
| 40 | *Odotella longicruric* |
| 41 | *Petroneis granulata* |
| 42 | *Pleurosigma aestuarii* |
| 43 | *Pleurosigma salinarum* |
| 44 | *Pleurosigma* sp. |
| 45 | *Proboscia alata* |
| 46 | *Pseudonitzchia* sp. |
| 47 | *Rhizosolenia bergonii* |
| 48 | *Rhizosolenia fomosa* |
| 49 | *Podosira stelligera* |
| 50 | *Skeletonema costatum* |
| 51 | *Thalassionema frauenfeldii* |
| 52 | *Thalassionema nitzschioides* |
| 53 | *Thalassiosira eccentrica* |
| | **DINOPHYTA** |
| 54 | *Ceratium furca* |
| 55 | *Ceratium fusus* |
| 56 | *Ceratium trichoceros* |
| 57 | *Dinophysis miles* |
| 58 | *Protoperidinium oceanicum* |
| 59 | *Protoperidinium roseum* |
| | **DICTYOCHOPHYTA** |
| 60 | *Dictyocha fibula* |
| | **CHLOROPHYTA** |
| 61 | *Pediastrum duplex var. duplex* |
| **TOTAL** | **61** |

| Station C | Sampling date: 23/11/2011 |
|---|---|
| | Analysis date: 27/11/2011 |
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Trichodesmium erythraeum* |
| | *BACILLARIOPHYTA* |
| 2 | *Amphiprora alata* |
| 3 | *Asteromphalus cleveanus* |
| 4 | *Asterionellopsis glacialis* |
| 5 | *Bacteriastrum furcatum* |
| 6 | *Bacteriastrum hyalinum var. princeps* |
| 7 | *Bellerochea horologicalis* |
| 8 | *Biddulphia* sp. |
| 9 | *Campylodiscus decorus var. pinnatus* |
| 10 | *Campylodiscus brightwelii* |
| 11 | *Chaetoceros cuvisetus* |
| 12 | *Chaetoceros decipiens* |
| 13 | *Chaetoceros denticulatus* |
| 14 | *Chaetoceros didymus* |
| 15 | *Chaetoceros diversus* |
| 16 | *Chaetoceros indicus* |
| 17 | *Chaetoceros lorenzianus* |
| 18 | *Chaetoceros paradoxus* |
| 19 | *Chaetoceros peruvianus* |
| 20 | *Chaetoceros pseudo-curvisetus* |
| 21 | *Cyclotella striata* |
| 22 | *Coscinodiscus bulliens* |
| 23 | *Coconeis scutellum* |
| 24 | *Coscinodiscus centralis* |
| 25 | *Coscinodiscus jonesianus* |
| 26 | *Diploneis smithii* |
| 27 | *Dactyliosolen blavyanus* |
| 28 | *Dityllum brightwelli* |
| 29 | *Dityllum sol* |
| 30 | *Guinardia striata* |
| 31 | *Gyrosigma balticum* |
| 32 | *Gyrosigma fasciola* |
| 33 | *Hemiaulus membranaceus* |
| 34 | *Hemiaulus sinensis* |
| 35 | *Hemiaulus* sp. |
| 36 | *Lauderia anulata* |
| 37 | *Lyrella lyroides* |
| 38 | *Melosira moniliformes* |
| 39 | *Melosira granulata* |
| 40 | *Nitzschia lorenziana* |
| 41 | *Odontella mobilensis* |
| 42 | *Odontella regia* |
| 43 | *Odontella sinensis* |
| 44 | *Petroneis granulata* |
| 45 | *Pleurosigma aestuarii* |
| 46 | *Pleurosigma salinarum* |
| 47 | *Pleurosigma angulatum* |
| 48 | *Pleurosigma rectum* |
| 49 | *Pleurosigma* sp. |
| 50 | *Proboscia alata* |
| 51 | *Pseudonitzchia* sp. |
| 52 | *Pseudosolenia calca-avis* |
| 53 | *Rhizosolenia* sp. |
| 54 | *Rhizosolenia styliformis* |
| 55 | *Podosira stelligera* |
| 56 | *Skeletonema costatum* |
| 57 | *Thalassionema frauenfeldii* |
| 58 | *Thalassionema nitzschioides* |
| 59 | *Thalassiosira eccentrica* |
| | **DINOPHYTA** |
| 60 | *Ceratium fusus* |
| 61 | *Dinophysis caudata* |
| | **DICTYOCHOPHYTA** |
| 62 | *Dictyocha fibula* |
| **TOTAL** | **62** |

| Station D | Sampling date: 23/11/2011 |
|---|---|
| | Analysis date: 28/11/2011 |
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Trichodesmium erythraeum* |
| | **BACILLARIOPHYTA** |
| 2 | *Amphiprora alata* |
| 3 | *Amphora spectabilis* |
| 4 | *Asteromphalus cleveanus* |
| 5 | *Asterionellopsis glacialis* |
| 6 | *Bacteriastrum comosum var. hispida* |
| 7 | *Bellerochea horologicalis* |
| 8 | *Chaetoceros affine* |
| 9 | *Chaetoceros cuvisetus* |
| 10 | *Chaetoceros debilis* |
| 11 | *Chaetoceros decipiens* |
| 12 | *Chaetoceros denticulatus* |
| 13 | *Chaetoceros diversus* |
| 14 | *Chaetoceros indicus* |
| 15 | *Chaetoceros lorenzianus* |
| 16 | *Chaetoceros paradoxus* |
| 17 | *Chaetoceros peruvianus* |
| 18 | *Chaetoceros pseudo-curvisetus* |
| 19 | *Climacodium biconcavum* |
| 20 | *Cyclotella striata* |
| 21 | *Coscinodiscus bulliens* |
| 22 | *Coscinodiscus centralis* |
| 23 | *Coscinodiscus jonesianus* |
| 24 | *Coscinodiscus* sp. |
| 25 | *Diploneis bombus* |
| 26 | *Dactyliosolen blavyanus* |
| 27 | *Dityllum brightwelli* |
| 28 | *Dityllum sol* |
| 29 | *Gramatophora marina* |
| 30 | *Guinardia striata* |
| 31 | *Gyrosigma fasciola* |
| 32 | *Hemiaulus membranaceus* |
| 33 | *Hemiaulus sinensis* |
| 34 | *Lauderia anulata* |
| 35 | *Melosira granulata* |
| 36 | *Navicula yarrensis var. americana* |
| 37 | *Nitzschia sigma* |
| 38 | *Odontella regia* |
| 39 | *Odontella sinensis* |
| 40 | *Petroneis granulata* |
| 41 | *Pleurosigma aestuarii* |
| 42 | *Pleurosigma salinarum* |
| 43 | *Pleurosigma* sp. |
| 44 | *Proboscia alata* |
| 45 | *Pseudonitzchia* sp. |
| 46 | *Pseudosolenia calca-avis* |
| 47 | *Rhizosolenia bergonii* |
| 48 | *Rhizosolenia cochlea* |
| 49 | *Podosira stelligera* |
| 50 | *Skeletonema costatum* |
| 51 | *Surirella robusta var. splendida* |
| 52 | *Thalassionema frauenfeldii* |
| 53 | *Thalassionema nitzschioides* |
| | **DINOPHYTA** |
| 54 | *Ceratium furca* |
| 55 | *Ceratium fusus* |
| 56 | *Ceratium trichoceros* |
| 57 | *Dinophysis caudata* |
| 58 | *Protoperidinium oblongum* |
| 59 | *Protoperidinium oceanicum* |
| 60 | *Protoperidinium pentagonum* |
| 61 | *Protoperidinium roseum* |
| | **DICTYOCHOPHYTA** |
| 62 | *Dictyocha fibula* |
| | **CHLOROPHYTA** |
| 63 | *Pediastrum duplex var. duplex* |
| **TOTAL** | **63** |

| Station E | Sampling date: 23/11/2012 |
|---|---|
| | Analysis date: 28/11/2012 |
| **No** | **SPECIES** |
| | **CYANOPHYTA** |
| 1 | *Trichodesmium erythraeum* |
| | **BACILLARIOPHYTA** |
| 2 | *Amphiprora alata* |
| 3 | *Asteromphalus cleveanus* |
| 4 | *Asteromphalus flabellatus* |
| 5 | *Asterionellopsis glacialis* |
| 6 | *Bacteriastrum comosum* |
| 7 | *Bacteriastrum hyalinum var. princeps* |
| 8 | *Campylodiscus decorus var. pinnatus* |
| 9 | *Campylodiscus brightwelii* |
| 10 | *Campylodiscus daemelianus* |
| 11 | *Caloneis linearis* |
| 12 | *Chaetoceros coarctatus* |
| 13 | *Chaetoceros cuvisetus* |
| 14 | *Chaetoceros debilis* |
| 15 | *Chaetoceros decipiens* |
| 16 | *Chaetoceros denticulatus* |
| 17 | *Chaetoceros diversus* |
| 18 | *Chaetoceros lorenzianus* |
| 19 | *Chaetoceros paradoxus* |
| 20 | *Chaetoceros peruvianus* |
| 21 | *Chaetoceros pseudo-curvisetus* |
| 22 | *Chaetoceros sp.* |
| 23 | *Cyclotella striata* |
| 24 | *Coconeis scutellum* |
| 25 | *Coscinodiscus jonesianus* |
| 26 | *Coscinodiscus sp.* |
| 27 | *Diploneis fusca* |
| 28 | *Dactyliosolen blavyanus* |
| 29 | *Dityllum sol* |
| 30 | *Gyrosigma sinensis* |
| 31 | *Hemiaulus sp.* |
| 32 | *Lauderia anulata* |
| 33 | *Lyrella lyroides* |
| 34 | *Mastogloia quinquecostata* |
| 35 | *Melosira moniliformes* |
| 36 | *Melosira granulata* |
| 37 | *Odontella regia* |
| 38 | *Odontella sinensis* |
| 39 | *Odotella longicruric* |
| 40 | *Paralia sulcata* |
| 41 | *Petroneis granulata* |
| 42 | *Pleurosigma aestuarii* |
| 43 | *Pleurosigma angulatum* |
| 44 | *Pleurosigma rectum* |
| 45 | *Pleurosigma sp.* |
| 46 | *Pseudonitzchia sp.* |
| 47 | *Rhizosolenia bergonii* |
| 48 | *Rhizosolenia cochlea* |
| 49 | *Podosira stelligera* |
| 50 | *Skeletonema costatum* |
| 51 | *Surirella robusta var. splendida* |
| 52 | *Thalassionema frauenfeldii* |
| 53 | *Thalassionema nitzschioides* |
| 54 | *Thalassiosira leptopus* |
| 55 | *Trachineis debyi* |
| | **DINOPHYTA** |
| 56 | *Ceratium furca* |
| 57 | *Ceratium fusus* |
| 58 | *Dinophysis caudata* |
| 59 | *Dinophysis miles* |
| 60 | *Protoperidinium divergens* |
| 61 | *Protoperidinium oceanicum* |
| 62 | *Protoperidinium roseum* |
| | **DICTYOCHOPHYTA** |
| 63 | *Dictyocha fibula* |
| | **CHLOROPHYTA** |
| 64 | *Staurastrum gracile* |
| **TOTAL** | **64** |

**Environmental survey, first quarter 2015 (spring, beginning of the production season) (analyses carried out in the Hue Centre for Environmental Monitoring)**

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) Tide (Flood) | Tide (Ebb) | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m$^3$= µg/l) | Zoobenthos biomass unit/m$^2$ | g/m$^3$ | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tam Giang | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg1 | M | | 4,4 | | | | | | | 7,30 | | 5,40 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 12,8 | | | | | | 0,390 | | | | | | | | | | | 650 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg2 | M | | 6,0 | | | | | | | 7,30 | | 5,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4,6 | | | | | | 0,530 | | | | | | | | | | | 1600 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg3 | M | | 12,6 | | | | | | | 7,40 | | 5,60 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 3,8 | | | | | | 0,400 | | | | | | | | | | | 700 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg4 | M | | 6,1 | | | | | | | 7,40 | | 5,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 2,8 | | | | | | 0,400 | | | | | | | | | | | 360 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg5 | M | | 3,3 | | | | | | | 7,90 | | 5,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 6,4 | | | | | | 0,260 | | | | | | | | | | | 104 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg6 | M | | 7,1 | | | | | | | 7,90 | | 5,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 7,8 | | | | | | 0,080 | | | | | | | | | | | 59 | | |
| ruyen Thu | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt1 | M | | 9,4 | | | | | | | 8,70 | | 7,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 7,8 | | | | | | 0,040 | | | | | | | | | | | 950 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt2 | M | | 13,0 | | | | | | | 8,80 | | 8,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 22 | | | | | | 0,017 | | | | | | | | | | | 4600 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt3 | M | | 26,5 | | | | | | | 7,60 | | 7,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 14,4 | | | | | | 0,070 | | | | | | | | | | | 1800 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt4 | M | | 29,4 | | | | | | | 7,40 | | 7,10 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 12,8 | | | | | | 0,120 | | | | | | | | | | | 2700 | | |
| Cau Hai | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch1 | M | | 36,1 | | | | | | | 9,20 | | 7,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 10,2 | | | | | | 0,120 | | | | | | | | | | | 2600 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch2 | M | | 26,0 | | | | | | | 8,90 | | 6,50 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 14 | | | | | | 0,017 | | | | | | | | | | | 930 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch3 | M | | 8,6 | | | | | | | 9,10 | | 9,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5 | | | | | | 0,310 | | | | | | | | | | | 1400 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch4 | M | | 24,2 | | | | | | | 7,90 | | 6,40 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 9 | | | | | | 0,070 | | | | | | | | | | | 2300 | | |

## Environmental survey, second quarter 2015 (summer, during the production season) (analyses carried out in the Hue Centre for Environmental Monitoring

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/$m^3$= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| Tam Giang | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg1 | M | | 36,3 | | | | | | | 7,00 | | 5,10 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 10 | | | | | | 0,306 | | | | | | | | | | | 150 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg2 | M | | 81,3 | | | | | | | 7,00 | | 5,60 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 22,3 | | | | | | 0,268 | | | | | | | | | | | 150 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg3 | M | | 39,8 | | | | | | | 7,00 | | 4,40 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 37,3 | | | | | | 0,127 | | | | | | | | | | | 460 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg4 | M | | 9,1 | | | | | | | 7,00 | | 5,10 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8 | | | | | | 0,264 | | | | | | | | | | | 1100 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg5 | M | | 14,1 | | | | | | | 8,00 | | 4,80 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 2 | | | | | | 0,017 | | | | | | | | | | | 23 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg6 | M | | 9,2 | | | | | | | 8,10 | | 5,40 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 9,3 | | | | | | 0,340 | | | | | | | | | | | 9 | | |
| Truyen Thu | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt1 | M | | 20,6 | | | | | | | 7,90 | | 5,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 3,7 | | | | | | 0,130 | | | | | | | | | | | 460 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt2 | M | | 48,7 | | | | | | | 8,60 | | 8,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 10,7 | | | | | | 0,017 | | | | | | | | | | | 23 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt3 | M | | 28,3 | | | | | | | 7,60 | | 7,50 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5,6 | | | | | | 0,046 | | | | | | | | | | | 11000 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt4 | M | | 31,8 | | | | | | | 7,40 | | 7,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 6,7 | | | | | | 0,017 | | | | | | | | | | | 4600 | | |
| Cau Hai | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch1 | M | | 45,0 | | | | | | | 9,60 | | 13,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 10,7 | | | | | | 0,017 | | | | | | | | | | | 23 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch2 | M | | 28,4 | | | | | | | 8,90 | | 6,80 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5,7 | | | | | | 0,017 | | | | | | | | | | | 9 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch3 | M | | 9,5 | | | | | | | 9,10 | | 9,80 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 2,3 | | | | | | 0,264 | | | | | | | | | | | 23 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch4 | M | | 29,9 | | | | | | | 7,90 | | 6,10 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 6,3 | | | | | | 0,258 | | | | | | | | | | | 1100 | | |

## Environmental survey, third quarter 2015 fall, typhoon season) (analyses carried out in the Hue Centre for Environmental Monitoring)

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/$m^3$= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| Tam Giang | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg1 | M | | 19,1 | | | | | | | 7,50 | | 5,80 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4,3 | | | | | | 0,020 | | | | | | | | | | | 240 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg2 | M | | 22,3 | | | | | | | 7,50 | | 4,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4,7 | | | | | | 0,018 | | | | | | | | | | | 460 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg3 | M | | 13,7 | | | | | | | 7,20 | | 3,90 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4 | | | | | | 0,018 | | | | | | | | | | | 460 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg4 | M | | 19,9 | | | | | | | 7,20 | | 5,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4,3 | | | | | | 0,031 | | | | | | | | | | | 75 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg5 | M | | 17,3 | | | | | | | 8,10 | | 4,60 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 10,3 | | | | | | 0,017 | | | | | | | | | | | 93 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg6 | M | | 13,5 | | | | | | | 8,20 | | 4,60 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 9 | | | | | | 0,017 | | | | | | | | | | | 210 | | |
| Truyen Thu | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt1 | M | | 92,5 | | | | | | | 8,20 | | 6,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 12,2 | | | | | | 0,140 | | | | | | | | | | | 240 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt2 | M | | 14,4 | | | | | | | 8,70 | | 7,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 12,3 | | | | | | 0,017 | | | | | | | | | | | 43 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt3 | M | | 19,9 | | | | | | | 8,20 | | 6,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 10,3 | | | | | | 0,017 | | | | | | | | | | | 43 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt4 | M | | 21,0 | | | | | | | 8,10 | | 6,10 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 9,6 | | | | | | 0,017 | | | | | | | | | | | 23 | | |
| Cau Hai | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch1 | M | | 15,7 | | | | | | | 8,70 | | 7,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4,3 | | | | | | 0,330 | | | | | | | | | | | 460 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch2 | M | | 20,2 | | | | | | | 8,90 | | 10,40 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 21 | | | | | | 0,017 | | | | | | | | | | | 93 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch3 | M | | 26,7 | | | | | | | 8,80 | | 9,10 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 14,3 | | | | | | 0,017 | | | | | | | | | | | 240 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch4 | M | | 24,0 | | | | | | | 8,60 | | 8,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8,6 | | | | | | 0,017 | | | | | | | | | | | 460 | | |

## Environmental survey, fourth quarter 2015 (winter, end of the production season) (analyses carried out in the Hue Centre for Environmental Monitoring)

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/$m^3$= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| Tam Giang | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg1 | M | | 22,7 | | | | | | | 6,70 | | 5,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 14,4 | | | | | | 0,200 | | | | | | | | | | | 150 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg2 | M | | 28,0 | | | | | | | 6,70 | | 4,60 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 16 | | | | | | 0,017 | | | | | | | | | | | 290 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg3 | M | | 22,7 | | | | | | | 6,80 | | 4,90 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 15,8 | | | | | | 0,280 | | | | | | | | | | | 75 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg4 | M | | 24,9 | | | | | | | 6,80 | | 4,50 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 16,5 | | | | | | 0,160 | | | | | | | | | | | 23 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg5 | M | | 18,2 | | | | | | | 7,30 | | 6,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 9 | | | | | | 0,280 | | | | | | | | | | | 44 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg6 | M | | 15,5 | | | | | | | 7,10 | | 6,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8,2 | | | | | | 0,510 | | | | | | | | | | | 93 | | |
| Truyen Thu | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt1 | M | | 13,4 | | | | | | | 7,40 | | 4,80 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 12,6 | | | | | | 0,840 | | | | | | | | | | | 460 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt2 | M | | 34,0 | | | | | | | 9,50 | | 9,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 6 | | | | | | 0,017 | | | | | | | | | | | 240 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt3 | M | | 10,8 | | | | | | | 8,10 | | 6,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5,3 | | | | | | 0,017 | | | | | | | | | | | 23 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt4 | M | | 23,9 | | | | | | | 7,40 | | 4,50 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5,4 | | | | | | 0,140 | | | | | | | | | | | 240 | | |
| Cau Hai | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch1 | M | | 21,7 | | | | | | | 8,30 | | 6,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 3,4 | | | | | | 0,250 | | | | | | | | | | | 43 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch2 | M | | 33,6 | | | | | | | 6,90 | | 3,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 12,6 | | | | | | 0,460 | | | | | | | | | | | 29 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch3 | M | | 13,4 | | | | | | | 6,80 | | 5,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5,4 | | | | | | 0,060 | | | | | | | | | | | 23 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch4 | M | | 13,9 | | | | | | | 8,20 | | 6,90 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 14,8 | | | | | | 0,170 | | | | | | | | | | | 21 | | |

## Environmental survey, average values 2015 (analyses carried out in the Hue Centre for Environmental Monitoring)

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A ($mg/m^3$= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| Tam Giang | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg1 | M | | 20,6 | | | | | | | 7,10 | | 5,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 10,4 | | | | | | 0,23 | | | | | | | | | | | 297,5 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg2 | M | | 34,4 | | | | | | | 7,10 | | 5,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 11,9 | | | | | | 0,21 | | | | | | | | | | | 625 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg3 | M | | 22,2 | | | | | | | 7,10 | | 4,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 15,2 | | | | | | 0,21 | | | | | | | | | | | 423,8 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg4 | M | | 15,0 | | | | | | | 7,10 | | 5,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 7,9 | | | | | | 0,21 | | | | | | | | | | | 389,5 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg5 | M | | 13,2 | | | | | | | 7,80 | | 5,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 6,9 | | | | | | 0,14 | | | | | | | | | | | 66 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg6 | M | | 11,3 | | | | | | | 7,80 | | 5,40 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8,6 | | | | | | 0,24 | | | | | | | | | | | 92,8 | | |
| ruyen Thu | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt1 | M | | 34,0 | | | | | | | 8,10 | | 5,90 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 9,1 | | | | | | 0,29 | | | | | | | | | | | 527,5 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt2 | M | | 27,5 | | | | | | | 8,90 | | 8,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 12,8 | | | | | | 0,02 | | | | | | | | | | | 1,22 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt3 | M | | 21,4 | | | | | | | 7,90 | | 6,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8,9 | | | | | | 0,04 | | | | | | | | | | | 3216 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt4 | M | | 26,5 | | | | | | | 7,60 | | 6,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8,6 | | | | | | 0,07 | | | | | | | | | | | 1890 | | |
| Cau Hai | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch1 | M | | 29,6 | | | | | | | 9,00 | | 8,50 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 7,2 | | | | | | 0,18 | | | | | | | | | | | 781,5 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch2 | M | | 27,1 | | | | | | | 8,40 | | 6,90 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 13,3 | | | | | | 0,13 | | | | | | | | | | | 265,3 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch3 | M | | 14,6 | | | | | | | 8,50 | | 8,50 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 6,8 | | | | | | 0,16 | | | | | | | | | | | 421,5 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch4 | M | | 23,0 | | | | | | | 8,20 | | 6,90 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 9,7 | | | | | | 0,13 | | | | | | | | | | | 970,3 | | |

# Annex 2 – Comprehensive datasets of surveys 2015-2018, primary data collected during the implementation of this PhD project.

**Environmental survey, January 14th 2016 (analyses carried out in the Hue Centre for Environmental Monitoring)**

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) Tide (Flood) | Flow velocity (m/s) Tide (Ebb) | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³= µg/l) | Zoobenthos biomass unit/m² | Zoobenthos biomass g/m³ | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ster South of Bridge | D1 | T M B | 155 | 1,35 | 25,78 | | | silt-sand (?) | 192,0 | 192,0 | 7,86 | 7,9 | 8,75 | 0,00 | 0,00 | 0,00 | 3 (drops) | 0,24 | <1.4 | 4,02 | | | 205792 | | 125758 | 11000000 | 11,0 | 41,0 |
| Cluster North | D2 | T M B | 180 | 1,3 | 25,40 | | | sand | 283,0 | 283,0 | 8,29 | 16,3 | 9,74 | 0,00 | 0,00 | 0,00 | 4 (drops) | 0,08 | <1.4 | 2,15 | | | 127050 | | 51638 | 460000 | 2,4 | <1 |
| Cluster North of Brid | D3 | T M B | 55 | 0,55 | 25,50 | | | sand (?) | 58,0 | 58,0 | 8,81 | 6,9 | 8,84 | 0,00 | 0,00 | 0,00 | 3 (drops) | 0,36 | 2,8 | 2,80 | | | 79354 | | 76978 | 210000 | 2,4 | >1 |
| | D5 | T M B | 140 | 1 | 24,00 | | | (?) | 145,0 | 145,0 | 9,38 | 10,0 | 14,28 | 0,25 | 0,25 | 0,25 | 4 (drops) | 0,23 | <1.4 | 4,18 | | | 91664 | | 28694 | 15000000 | 110,0 | 20,0 |
| | D6 | T M B | 135 | 1,35 | 25,36 | | | (?) | 23,0 | 23,0 | 9,26 | 8,6 | 14,80 | 0,00 | 0,00 | 0,00 | 4 (drops) | 0,11 | <1.4 | 3,72 | | | 54940 | | 28289 | 430000 | 460,0 | 23,0 |
| | D7 | T M B | 130 | 1,3 | 24,13 | | | (?) | 197,5 | 197,5 | 6,7 | 9,6 | 12,24 | 0,00 | 0,00 | 0,00 | 4 (drops) | 0,34 | <1.4 | 4,20 | | | 56971 | | 55592 | 2900000 | 1100,0 | 44,0 |
| | DC | T M B | 120 | 1,2 | 25,23 | | | silt-mud(?) | 49,0 | 49,0 | 8,5 | 7,0 | 9,71 | 0,00 | 0,00 | 0,25 | 4 (drops) | 0,11 | <1.4 | 3,1 | | | 58088 | | 56167 | 43000 | 4,6 | 11,0 |
| ter South of Bridge (C | DE | T M B | 130 | 1,2 | 25,63 | | | silt-mud(?) | 64,5 | 64,5 | 7,94 | 6,9 | 9,61 | 0,00 | 0,00 | 0,00 | 3 (drops) | 0,59 | 7,0 | 3,60 | | | 142042 | | 98634 | 240000 | 4,6 | >1 |

**Environmental survey, first quarter 2016 (spring,beginning of the production season) (analyses carried out in the Hue Centre for Environmental Monitoring)**

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) Tide (Flood) | Flow velocity (m/s) Tide (Ebb) | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³= µg/l) | Zoobenthos biomass unit/m² | Zoobenthos biomass g/m³ | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tam Giang | Nptg1 | T M B | | 13,2 | 20,9 | | | | 10,8 | | 5,50 | | 4,60 | | 0,380 | | | | | | | | | | | 93 | | |
| | Nptg2 | T M B | | 22,2 | 20,8 | | | | 8,4 | | 6,10 | | 4,50 | | 0,396 | | | | | | | | | | | 150 | | |
| | Nptg3 | T M B | | 23,9 | 20,7 | | | | 14 | | 5,30 | | 5,30 | | 0,564 | | | | | | | | | | | 290 | | |
| | Nptg4 | T M B | | 27,1 | 20,8 | | | | 12,4 | | 5,80 | | 5,90 | | 0,170 | | | | | | | | | | | 28 | | |
| | Nptg5 | T M B | | 14,7 | 21,7 | | | | 10,4 | | 7,60 | | 5,60 | | 0,060 | | | | | | | | | | | 21 | | |
| | Nptg6 | T M B | | 10,5 | 21,2 | | | | 8,2 | | 7,70 | | 5,20 | | <0.017 | | | | | | | | | | | 43 | | |
| Truyen Thu | Ndtt1 | T M B | | 3,9 | 21,6 | | | | 17,6 | | 8,20 | | 4,10 | | 0,420 | | | | | | | | | | | 75 | | |
| | Ndtt2 | T M B | | 0,1 | 21,8 | | | | 5 | | 8,00 | | 5,00 | | 0,840 | | | | | | | | | | | 2100 | | |
| | Ndtt3 | T M B | | 6,5 | 21,3 | | | | 8,8 | | 7,60 | | 6,90 | | 0,220 | | | | | | | | | | | 240 | | |
| | Ndtt4 | T M B | | 5,2 | 22,2 | | | | 6,6 | | 7,50 | | 4,50 | | 0,400 | | | | | | | | | | | 150 | | |
| Cau Hai | Ndch1 | T M B | | 6,4 | 20,8 | | | | 5 | | 7,80 | | 4,00 | | 0,230 | | | | | | | | | | | 460 | | |
| | Ndch2 | T M B | | 5,5 | 20,5 | | | | 6 | | 7,70 | | 4,20 | | 0,620 | | | | | | | | | | | 240 | | |
| | Ndch3 | T M B | | 8,5 | 21,4 | | | | 11,4 | | 7,60 | | 4,00 | | 0,210 | | | | | | | | | | | 2100 | | |
| | Ndch4 | T M B | | 5,0 | 21,5 | | | | 4,6 | | 7,70 | | 4,20 | | 0,140 | | | | | | | | | | | 460 | | |

**Environmental survey, second quarter 2016 (summer, during the production season) (analyses carried out in the Hue Centre for Environmental Monitoring)**

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) Tide (Flood) | Flow velocity (m/s) Tide (Ebb) | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A (mg/m³= µg/l) | Zoobenthos biomass unit/m² | Zoobenthos biomass g/m³ | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tam Giang | Nptg1 | T M B | | | 28,5 | | | | 2,3 | | 7,10 | | 5,30 | <0.009 | 0,050 | | | | | | | | | | | 290 | | |
| | Nptg2 | T M B | | | 28,7 | | | | 2 | | 6,90 | | 5,50 | <0.009 | 0,075 | | | | | | | | | | | 93 | | |
| | Nptg3 | T M B | | | 28,9 | | | | 4,7 | | 7,00 | | 4,80 | <0.009 | <0.017 | | | | | | | | | | | 460 | | |
| | Nptg4 | T M B | | | 29,0 | | | | 4,7 | | 7,00 | | 5,10 | <0.009 | <0.017 | | | | | | | | | | | 240 | | |
| | Nptg5 | T M B | | | 28,6 | | | | 2,7 | | 7,10 | | 4,70 | <0.009 | <0.017 | | | | | | | | | | | 150 | | |
| | Nptg6 | T M B | | | 28,4 | | | | 10 | | 7,00 | | 4,60 | <0.009 | <0.017 | | | | | | | | | | | 240 | | |
| Truyen Thu | Ndtt1 | T M B | | | 33,2 | | | | 6,5 | | 7,90 | | 5,50 | <0.009 | 0,540 | | | | | | | | | | | 23 | | |
| | Ndtt2 | T M B | | | 32,1 | | | | 11 | | 8,60 | | 6,20 | <0.009 | <0.017 | | | | | | | | | | | 93 | | |
| | Ndtt3 | T M B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt4 | T M B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cau Hai | Ndch1 | T M B | | | 35,5 | | | | 15 | | 7,50 | | 9,10 | <0.009 | <0.017 | | | | | | | | | | | 93 | | |
| | Ndch2 | T M B | | | 34,9 | | | | 18,5 | | 7,60 | | 7,30 | <0.009 | <0.017 | | | | | | | | | | | 150 | | |
| | Ndch3 | T M B | | | 37,5 | | | | 11 | | 7,40 | | 5,30 | 0,011 | 0,039 | | | | | | | | | | | 1100 | | |
| | Ndch4 | T M B | | | 34,0 | | | | 16,5 | | 7,90 | | 7,10 | <0.009 | <0.017 | | | | | | | | | | | 43 | | |

### Environmental survey, third quarter 2016 fall, typhoon season) (analyses carried out in the Hue Centre for Environmental Monitoring)

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A ($mg/m^3$= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| Tam Giang | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg1 | M | | | | | | | | | 6,10 | | 5,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5,3 | | | | | <0.009 | 0,615 | | | | | | | | | | | 39 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg2 | M | | | | | | | | | 6,10 | | 5,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 6 | | | | | <0.009 | 0,143 | | | | | | | | | | | 43 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg3 | M | | | | | | | | | 6,10 | | 6,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 7,7 | | | | | <0.009 | 0,364 | | | | | | | | | | | 240 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg4 | M | | | | | | | | | 5,90 | | 4,70 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8,3 | | | | | <0.009 | 0,399 | | | | | | | | | | | 1100 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg5 | M | | | | | | | | | 8,30 | | 5,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8,3 | | | | | <0.009 | 1,376 | | | | | | | | | | | 93 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg6 | M | | | | | | | | | 8,40 | | 5,10 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 3,3 | | | | | <0.009 | 0,520 | | | | | | | | | | | 15 | | |
| Truyen Thu | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt1 | M | | | | | | | | | 8,30 | | 5,60 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 2 | | | | | <0.009 | 0,254 | | | | | | | | | | | 1100 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt2 | M | | | | | | | | | 8,60 | | 6,40 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 3,3 | | | | | <0.009 | <0.017 | | | | | | | | | | | 1100 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt3 | M | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt4 | M | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cau Hai | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch1 | M | | | | | | | | | 7,90 | | 6,10 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8 | | | | | <0.009 | <0.017 | | | | | | | | | | | 93 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch2 | M | | | | | | | | | 8,70 | | 7,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4,3 | | | | | <0.009 | 0,017 | | | | | | | | | | | 46 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch3 | M | | | | | | | | | 7,90 | | 4,50 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 24,3 | | | | | 0,012 | <0.017 | | | | | | | | | | | 240 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch4 | M | | | | | | | | | 8,50 | | 5,80 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 2 | | | | | <0.009 | <0.017 | | | | | | | | | | | 43 | | |

### Environmental survey, fourth quarter 2016 (winter, end of the production season) (analyses carried out in the Hue Centre for Environmental Monitoring)

| Site | Station | T/B | Depth (m) | Turbidity | Temp (°C) | Flow velocity (m/s) | | Bottom sediment type | Total solid (TSS) | Suspended solid (SS) | pH | Salinity (ppt) | DO (mg/l) | $NO_2$ (mg/l) | $NO_3$ (mg/l) | $NH_3$ (mg/l) | Alkalinity (Kh) | Total P | Total N | Chlorophyll A ($mg/m^3$= µg/l) | Zoobenthos biomass | | Phytoplankton (cells/l) | Microalgae | Toxic algae (cell/l) | Total coliforms (MPN/100ml) | *E. coli* | *Vibrio* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Tide (Flood) | Tide (Ebb) | | | | | | | | | | | | | | unit/$m^2$ | g/$m^3$ | | | | | | |
| Tam Giang | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg1 | M | | | | | | | | | 7,10 | | 5,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 10,5 | | | | | <0.009 | <0.017 | | | | | | | | | | | 93 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg2 | M | | | | | | | | | 6,90 | | 5,80 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4 | | | | | <0.009 | 0,115 | | | | | | | | | | | 43 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg3 | M | | | | | | | | | 7,10 | | 4,90 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 6,5 | | | | | <0.009 | 0,437 | | | | | | | | | | | 43 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg4 | M | | | | | | | | | 6,80 | | 4,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 12 | | | | | <0.009 | 5,900 | | | | | | | | | | | 93 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg5 | M | | | | | | | | | 8,20 | | 6,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 8,3 | | | | | 0,01 | <0.017 | | | | | | | | | | | 93 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Nptg6 | M | | | | | | | | | 8,50 | | 6,20 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5,3 | | | | | 0,009 | <0.017 | | | | | | | | | | | 460 | | |
| Truyen Thu | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt1 | M | | | | | | | | | 7,90 | | 5,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 2,7 | | | | | 0,021 | <0.017 | | | | | | | | | | | 460 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt2 | M | | | | | | | | | 8,20 | | 4,30 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 3,7 | | | | | 0,011 | <0.017 | | | | | | | | | | | 290 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt3 | M | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndtt4 | M | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | B | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Cau Hai | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch1 | M | | | | | | | | | 8,20 | | 5,60 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 20 | | | | | <0.009 | <0.017 | | | | | | | | | | | 460 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch2 | M | | | | | | | | | 7,50 | | 5,00 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 5,5 | | | | | 0,012 | 2,000 | | | | | | | | | | | 210 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch3 | M | | | | | | | | | 7,70 | | 5,90 | | | | | | | | | | | | | | | |
| | | B | | | | | | | 4,5 | | | | | <0.009 | 3,760 | | | | | | | | | | | 93 | | |
| | | T | | | | | | | | | | | | | | | | | | | | | | | | | | |
| | Ndch4 | M | | | | | | | | | 8,50 | | 5,80 | | | | | | | | | | | | | | | |
| | | B | | | | | | | <2 | | | | | <0.009 | 0,370 | | | | | | | | | | | 93 | | |