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New Documented Records of the Mesopelagic Fish *Valenciennellus tripunctulatus* (Sternoptychidae) in the Strait of Messina and a Review of Its Mediterranean Occurrences

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Abstract: The constellation fish, *Valenciennellus tripunctulatus*, is a small mesopelagic teleost typically found in equatorial and temperate waters worldwide, although the species has been also rarely recorded in the Mediterranean Sea (less than 20 specimens from the available literature since 1918). The Mediterranean records have been documented for the Strait of Messina, the southern Tyrrhenian Sea, the Ligurian Sea and the Adriatic Sea. The present paper offers an updated review on the occurrence of *V. tripunctulatus* in the Mediterranean basin and provides data on three new specimens, collected in the Strait of Messina between April 2010 and March 2024. Furthermore, we also report information from two individuals found in March 1992 and February 2017, respectively. Overall, the standard length of these specimens ranged from 24.1 to 28.2 mm, whereas weight varied from 0.18 g to 0.20 g. Morphometric and meristic data were reported, and this analysis revealed few differences between examined individuals in the number of PV (ventral series anterior to pelvic fin base) and AC (from anal fin origin to caudal fin base) photophore series. The relationship between total length and standard length (SL = 0.75 × TL + 2.98), total length and head length (HL = 0.17 × TL + 1.47) and standard length and head length (HL = 0.23 × SL + 0.88) showed high correlation values. Considering the lack of data on this species in the Mediterranean, updating morphometric, meristic, biological, ecological and distribution information is very important for taxonomic purposes and useful in understanding the characteristics of the regional population and eventual differences between Mediterranean stock(s) and those from other oceanic areas.

Keywords: mesopelagic zone; hatchetfish; Osteichthyes; deep sea; morphometry; meristics; Mediterranean Sea; review

Key Contribution: The present study reports new records of the uncommon mesopelagic fish *Valenciennellus tripunctulatus* and presents an updated review of the occurrence of the species in Mediterranean waters. A comparison of the morphological and meristic data from the collected specimens and information available in the literature revealed few differences in the number of photophores forming the AC series. Morphometric relationships have also been calculated.

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1. Introduction

The constellation fish *Valenciennellus tripunctulatus* [1] is a mesopelagic teleost belonging to the family Sternoptychidae, order Stomiiformes. The species was discovered for the first time at the end of the XIX century thanks to the capture of two specimens,

one off Madagascar (Indian Ocean) and the other in the North Atlantic, between Iceland and Greenland [2]. When the species was first described, it was placed under the genus *Maurolicus* [1], but later Jordan and Evermann [3] established the genus *Valenciennellus*, characterized by the particular arrangement of the photophore ventral series from anal fin origin to caudal fin base (AC), grouped in clusters of no more than four and spaced apart. A full description of the anatomical features of this species was given by Weitzman [4]. Overall, this genus currently includes two species [5]: *V. tripunctulatus* and *V. carlsbergi*.

Valenciennellus tripunctulatus occurs in all oceanic waters from equatorial to temperate [5], but it is rare in the Mediterranean [6,7].

Valenciennellus tripunctulatus is a rather small teleost and has a compressed, slightly elongated body, silvery anteriorly and hyaline posteriorly, having numerous melanophores [8] scattered throughout the body along the lateral line (Figure 1a). The snout is slightly shorter than the diameter of the orbits and the mouth is oblique and narrow and has teeth arranged in a single row, whereas they are absent from vomer, tongue, palatines and pterygoids [6]. The dorsal fin starts from the median portion of the body and consists of 7–10 rays, whereas the anal has 22–25 rays, the pectoral has 12–17 rays, the pelvic has 6–9 rays and the caudal has about 20 primary rays [5,6,9–11]. There is also a small adipose fin that is located well behind the dorsal fin [6]. Head photophores include one orbital (ORB), three opercular (OP) and six branchiostegal (BR) photophores. The ventral series (IC) has 37 to 44 photophores: IP (ventral series anterior to pectoral fin base) = 3 + 4; PV (ventral series anterior to pelvic fin base) = 15–18. The remaining photophores are arranged in the following series: OA (lateral series) = 5; VAV (ventral series between pelvic fin base and anal fin base) = 5; AC (ventral series posterior to anal fin origin) = 3 + 3+2 + 4 [6,9,10,12] (Figure 1b). The photophores begin their development at about 8 mm SL (standard length), and the first to appear are PV (ventral series anterior to pelvic fin base) and BR (on the branchiostegal membranes) [13], which are fully formed at 17 mm SL [6,12]. The presence of several photophores on the ventral margin of the body, which are used for counter-illumination, suggests the species' adaptation to life in mesopelagic waters [14].

Biological and ecological information is scarce and mainly based on specimens caught in the Pacific [15–17] and Atlantic Oceans [18–24] or collected in the Strait of Messina [6,9,10,25,26]. While *V. tripunctulatus* is listed as among the most abundant components of some mesopelagic fish assemblages [16,19,24], many studies only report on its vertical distribution. Most diel studies of vertical distribution suggest that *V. tripunctulatus* may not migrate or may undertake a limited vertical migration at best [15,17,18,21,23].

Reproduction takes place throughout the year, and the species reaches sexual maturity at approximately 25 mm SL [12,16]. According to the few studies carried out in the Atlantic Ocean that investigated the feeding habits and trophodynamics of this species [21,22], *V. tripunctulatus* has a daytime feeding behaviour and zooplanktonic organisms are the main component of its diet. Analysis of the entire digestive tract revealed that *V. tripunctulatus* mainly preyed upon copepods, in particular *Pleuromamma* spp. [19,21,22].

The aim of this paper is to improve the knowledge of this poorly investigated species by providing new data (e.g., morphometry, meristic) obtained by the collection of some fresh individuals from the Strait of Messina. Moreover, we present here a brief review on the occurrence of *V. tripunctulatus* in the Mediterranean basin, using information from bibliographic sources on previous findings.

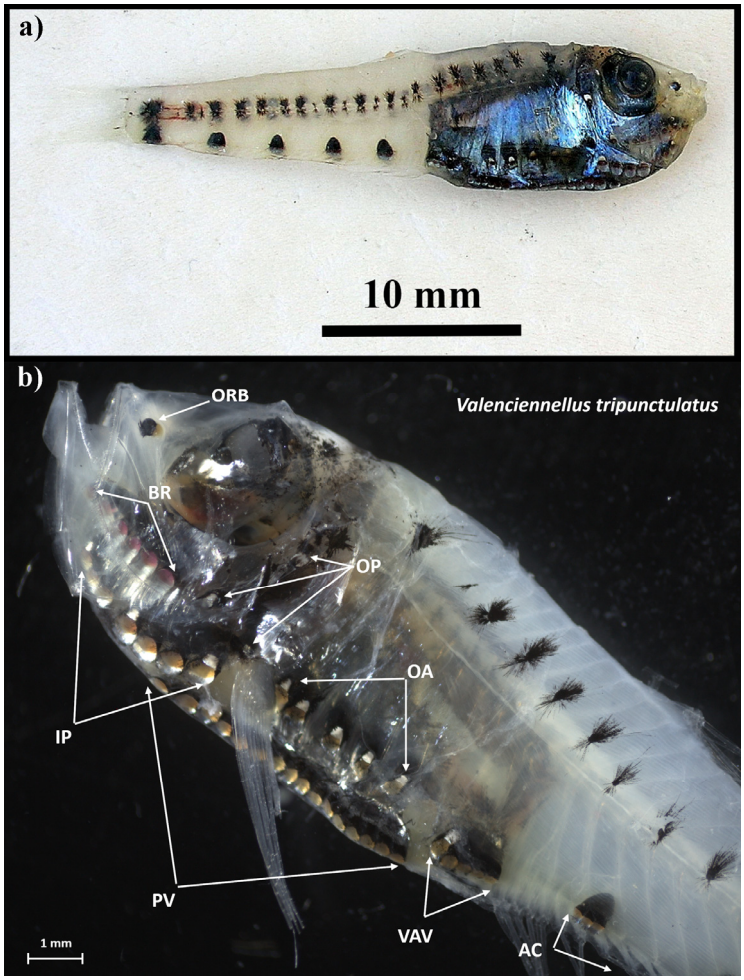

Figure 1. (**a**) Specimen of *Valenciennellus tripunctulatus* (Val_pun_01) found stranded in Strait of Messina on 10 April 2010. (**b**) Photophore placement in *Valenciennellus tripunctulatus* (Val_pun_03). ORB = orbital photophore; OP = opercular photophores; BR = photophores on the branchiostegal membranes; OA = lateral series; IP = ventral series anterior to pectoral fin base; PV = ventral series anterior to pelvic fin base; VAV = ventral series between pelvic fin base and anal fin base; AC = ventral series posterior to anal fin origin (AC ventral series is not fully shown in this image).

2. Materials and Methods

2.1. New Records

Overall, we report here 3 new records of individuals belonging to the species *V. tripunctulatus*. All specimens were found stranded on the shores of the Sicilian coasts of the Strait of Messina (Figure 2), Western Mediterranean Sea. The first specimen was collected on 20 February 2004, whereas the others were found on 13 December 2023 and 10 March 2024. Moreover, we provide new data on two individuals found in the same location and previously mentioned by Spalletta et al. [25] and Battaglia et al. [26], respectively, although these authors did not report any morphometric and meristic information. Sample collection took place in the morning, before and at sunrise, to avoid predation on samples from seabirds, damage from ants and wasps and also the sun's drying effect [27,28]. Taxonomic identification was made according to characters described in the work of Badcock [12]. Fresh individuals were photographed and weighed to the nearest 0.01 g, and then morphometric (to the nearest 0.1 mm) and meristic data were recorded. All measurements were taken following Agger et al. [29]. The specimens were preserved in 80% ethanol solution. Our morphometric data were integrated with information available in the literature [10] and used for building relationship equations between total length (TL), standard length

(SL) and head length (HL), with the aim to provide useful tools for rebuilding fish length from a known measure during studies on population structure or trophic ecology.

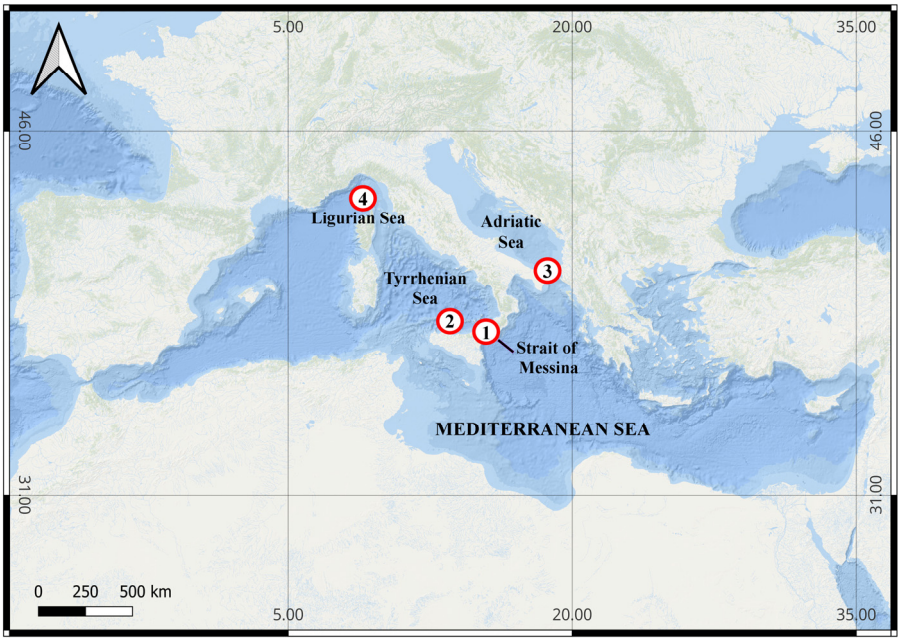

Figure 2. A map of the records of *Valenciennellus tripunctulatus* in the Mediterranean Sea: (1) [9,10,25,26,30], present paper; (2) [31]; (3) [32]; (4) [33].

2.2. Historical Records

In order to review the occurrence of *V. tripunctulatus* within the Mediterranean Sea, we collected information through a bibliographic search on published records of the species. For this purpose, we used both academic literature search engines (Google Scholar, Web of Science) as well as other web search tools, such as biodiversity databases and collections (e.g., Fishbase, World Register of Marine Species—WoRMS, Biodiversity Heritage Library, Ocean Biodiversity Information System—OBIS). For those publications in which a Mediterranean record of *V. tripunctulatus* was reported, we annotated the date, area, location name, catch methods and length of the individuals, when available. We also plotted location data on a map using the software QGIS 3.28.6-Firenze, to show the updated occurrences of *V. tripunctulatus* in the Mediterranean Sea.

3. Results

3.1. New Records

The 'pristine' condition of our three specimens suggests that stranding occurred shortly before collection. Morphometric and meristic data obtained from our three new specimens are compared with information available for specimens in the studies of Spalletta et al. [25] and Battaglia et al. [26] (Tables 1 and 2). Total length ranged from 29.0 mm to 33.2 mm, but this measure was not available for specimen 'Val_pun_03' since the caudal fin was quite damaged. Standard length varied from 24.1 mm to 28.2 mm, while the weight range was 0.18–0.20 g. The analysis of meristic data showed that both the dorsal fin and pelvic fin always consisted of 7 rays, the anal fin rays varied from 23 to 25 and the pectoral fin rays from 12 to 13, whereas the caudal fin had 18–22 primary rays. The number of photophores (Figure 1a) had a little variability in the PV ventral series (17 in Val_pun_01, Val_pun_02 and Spalletta et al. [25] against 16 in Val_pun_03 and Battaglia et al. [26]). Moreover, the specimen in the study of Spalletta et al. [25] had one additional AC photophore (i.e., 16 photophores grouped as 3 + 3 + 3 + 3 + 4, against 15 in other specimens: 3 + 3 + 3 + 2 + 4) (Table 2).

Table 1. Morphometrics (mm and proportions) and weight (in grams) of five specimens of *Valenciennellus tripunctulatus* stranded on the shore of the Strait of Messina. Lim—range of variation (in grams for weight and in mm for measurements); X ± st.err.—mean and standard error. Measurements follow Agger et al. [29].

Code Number **Date**	**Val_pun_01** **14 April 2010**	**Val_pun_02** **13 December 2023**	**Val_pun_03** **10 March 2024**	**Spalletta et al. [25]** **5 March 1992**	**Battaglia et al. [26]** **20 February 2004**	**Lim**	**X ± st.err.**
Total weight (g)	0.20	0.18	0.20	0.19	0.18	0.18–0.20	0.18 ± 0.01
Total length	33.2	31	broken tail	31.4	29.0	29.0–33.2	31.15 ± 0.77
Standard length (SL)	28.2	25.2	24.1	26.9	25.0	24.1–28.2	25.88 ± 0.73
In % SL:							
Caudal fin length	17.7	23.0	broken tail	16.7	16	4.0–5.8	4.82 ± 0.34
Head length (HL)	25.2	27.0	26.6	26.4	25.6	6.4–7.1	6.76 ± 0.16
Operculum–posterior margin of caudal peduncle distance	74.8	73.0	74.4	73.6	73.2	17.7–21.1	19.06 ± 0.61
Predorsal length	49.2	52.7	47.7	51.6	48.8	11.5–13.9	12.96 ± 0.48
Prepectoral length	20.5	22.2	21.9	23.4	21.2	5.3–6.3	5.66 ± 0.19
Preanal length	43.9	52.3	45.6	50.1	47.6	11.0–13.5	12.40 ± 0.45
Preventral length	41.1	44.8	39.8	42.3	42	9.6–11.6	10.88 ± 0.37
Pectoral fin length	25.5	25.7	broken	26.0	26	17.9–23.3	6.80 ± 0.16
Pelvic fin length	5.3	9.1	5.8	6.6	5.2	6.5–7.2	1.66 ± 0.18
Base dorsal fin	6.3	6.7	4.9	8.5	6	1.3–2.3	1.70 ± 0.18
Base anal fin	41.1	39.6	40.6	38.6	40.4	1.2–2.3	10.38 ± 0.32
Body depth at posterior margin of operculum	23.0	26.1	24.4	24.1	22.4	9.8–11.6	6.22 ± 0.19
Minimum caudal peduncle height	9.2	8.7	10.7	8.1	8.8	5.6–6.6	2.36 ± 0.09
Body depth at anus	17.7	17.0	20.7	19.3	17.2	2.2–2.6	4.76 ± 0.19
In % HL:							
Preorbital length	32.3	32.3	35.9	32.3	34.3	4.3–5.2	2.26 ± 0.02
Posterior margin of the orbit–operculum distance	29.6	27.9	25.0	33.8	26.6	2.2–2.3	1.94 ± 0.14
Horizontal eye diameter	38.0	39.7	39.0	33.8	39.0	1.6–2.4	2.56 ± 0.06
Vertical eye diameter	43.6	42.6	35.9	40.8	45.3	2.4–2.7	2.82 ± 0.13

Table 2. Meristic data of five specimens of *Valenciennellus tripunctulatus* stranded on the shore of the Strait of Messina. ORB = orbital photophore; OP = opercular photophores; BR = photophores on the branchiostegal membranes; OA = lateral series; IP = ventral series anterior to pectoral fin base; PV = ventral series anterior to pelvic fin base; VAV = ventral series between pelvic fin base and anal fin base; AC = ventral series posterior to anal fin origin. Lim—range of variation; X ± st.err.—mean and standard error.

Code Number **Date**	**Val_pun_01** **14 April 2010**	**Val_pun_02** **13 December 2023**	**Val_pun_03** **10 March 2024**	**Spalletta et al. [25]** **5 March 1992**	**Battaglia et al. [26]** **20 February 2004**	**Lim**	**X ± st.err.**
Dorsal fin rays	7	7	7	7	7	7	7.0 ± 0.00
Anal fin rays	25	23	23	25	23	23–25	23.8 ± 0.49
Pectoral fin rays	13	13	12	13	-	12–13	12.75 ± 0.23
Pelvic fin rays	7	7	7	7	7	7	7.0 ± 0.00
Caudal fin primary rays	22	22	21	18	20	18–22	20.6 ± 0.75
Head photophores							
ORB	1	1	1	1	1	1	1.0 ± 0.00
OP	3	3	3	3	3	3	3.0 ± 0.00
BR	6	6	6	6	6	6	6.0 ± 0.00
Lateral photophores							
OA	5	5	5	5	5	5	5.0 ± 0.00
Ventral photophores							
IP	7	7	7	7	7	7	7.0 ± 0.00
PV	17	17	16	17	16	16–17	16.6 ± 0.24
VAV	5	5	5	5	5	5	5.0 ± 0.00
AC	15	15	15	16	15	15–16	15.2 ± 0.20

The relationships between total length and standard length (Figure 3a; SL = 0.75 × TL + 2.98, R^2 = 0.93), total length and head length (Figure 3b; HL = 0.17 × TL + 1.47, R^2 = 0.81) and standard length and head length (Figure 3c; HL = 0.23 × SL + 0.88, R^2 = 0.85), obtained from both bibliographic data and our observations, were always positive and showed high R^2 values (Figure 3).

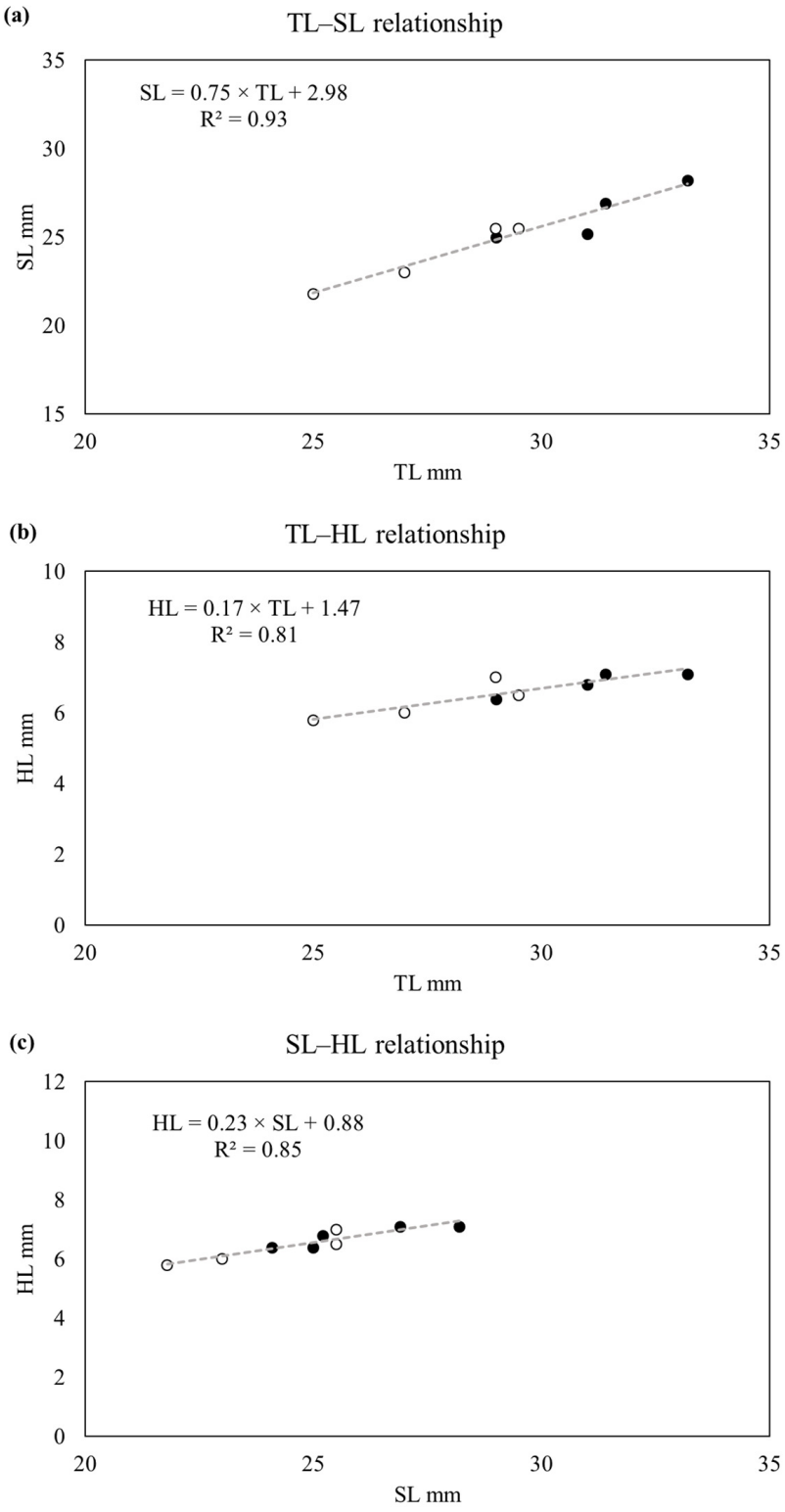

Figure 3. Linear relationships between (**a**) total length (TL) and standard length (SL); (**b**) total length (TL) and head length (HL); (**c**) standard length (SL) and head length (HL). Black dots refer to individuals measured in present paper; white dots refer to fish measurements reported by Potoschi et al. [10].

3.2. Historical Records

Here, we report a description of all known historical records of *V. tripunctulatus* in the Mediterranean basin. These data are summarized in Table 3, and records are shown in the map (Figure 2). The first reliable report of *V. tripunctulatus* in the Mediterranean Sea was provided by Torchio, who in 1960, during the reorganisation of the fish collection of the Milan Museum of Natural History, examined a specimen that had been stored by *L. Gianferrari* as *Maurolicus tripunctulatus* [9]. Torchio [9] re-catalogued the individual and guessed that the species had never been reported before in the Mediterranean. This fish, in good condition but having a damaged caudal fin, measured 25 mm SL [9]. According to the provenance reported in the label, the specimen refers to a capture made by Mr. Arena in the Strait of Messina. Later, in a new paper, Torchio [30] reported additional information on the catch of *V. tripunctulatus* from the Strait of Messina, again obtained by Arena, who caught the largest specimen (about 70–75 mm in the period 1918–1920) at the Messina harbour and five individuals in April 1922, but he did not mention the exact sampling location [30]. Information on other individuals from the Strait of Messina was provided by Potoschi et al. [10], who examined three old individuals preserved at the Thalassographic Institute of Messina. The first two specimens measured 25 mm and 29.50 mm TL and were collected in April 1922, whereas the last one (29 mm TL) was found in March 1948 [10]. Curiously, the individuals collected in 1922 had the same date of specimens found by Arena, so it is plausible that these samples belong to the same fish pool mentioned by Torchio [30]. Indeed, most mesopelagic fish found by Arena had been stored in the collection of the Thalassographic Institute of Messina. In addition, Potoschi et al. [10] also described a fresh specimen (27 mm TL) found stranded along the coast of Capo Peloro in January 1980.

Table 3. Historical records of *Valenciennellus tripunctulatus* in the Mediterranean Sea.

Reference	Year/Date	Length	Area	Location	Catch Method
[9]	Unknown	25 mm SL	Strait of Messina	Unknown	Unknown
[30]	1918–1920 (February–March)	70–75 mm	Strait of Messina	Messina harbour	Unknown
[30]	1922 (April)	/	Strait of Messina	Unknown	Unknown
[30]	1922 (April)	/	Strait of Messina	Unknown	Unknown
[30]	1922 (April)	/	Strait of Messina	Unknown	Unknown
[30]	1922 (April)	/	Strait of Messina	Unknown	Unknown
[30]	1922 (April)	/	Strait of Messina	Unknown	Unknown
[10] [1]	1922 (April)	25 mm TL	Strait of Messina	Capo Peloro	Stranding
[10] [1]	1922 (April)	29.5 mm TL	Strait of Messina	Capo Peloro	Stranding
[10]	1948 (March)	29 mm TL	Strait of Messina	Capo Peloro	Stranding
[10]	1980 (January)	27 mm TL	Strait of Messina	Capo Peloro	Stranding
[31]	1985	/	Southern Tyrrhenian Sea	Capo Cavalà-Capo Gallo	Bottom trawl net
[25]	1992 (March)	/	Strait of Messina	Ganzirri	Stranding
[32]	1975 (May)	28.4 mm TL	Adriatic Sea	Southern Adriatic	IOSN international net
[33]	2003 (September)	/	Ligurian Sea	South of Genoa	IKMT net
[33]	2003 (September)	/	Ligurian Sea	South of Genoa	IKMT net
[26]	2010 (April)	33.2 mm TL	Strait of Messina	Strait of Messina	Stranding

[1] The individuals collected in 1922 and described by Potoschi et al. [10] had the same date of specimens mentioned by Torchio [30]. They were both preserved at the Thalassographic Institute of Messina, so it is plausible that these authors reported information on the same fish. IOSN = Indian Ocean Standard Net; IKMT = Isaac-Kidd Midwater trawl.

Another interesting catch, which confirmed the presence of the species in the southern Tyrrhenian Sea (northern Sicily), was obtained using a bottom trawl net during the 1985 fishing campaigns between Capo Calavà and Capo Gallo [31].

Spalletta et al. [25] provided information on a fresh *V. tripunctulatus* stranded at Ganzirri in March 1992, but they did not describe morphometric and meristic characteristics of this individual. We had the opportunity to examine this specimen in the present paper, and data are reported in Tables 1 and 2.

The presence of *V. tripunctulatus* in the Adriatic Sea was confirmed during an experimental cruise in May 1975, when a specimen of 28.4 mm TL was collected at 100 m depth in the southern Adriatic [32]. This material was collected using an IOSN international net (250 µm mesh, 113 cm in diameter and 350 cm in length).

In September 2003, two specimens of *V. tripunctulatus* were collected in the Ligurian Sea (off Genoa), using an Isaacs-Kidd Midwater trawl (IKMT), having meshes 2 × 2 mm in the cod-end [33].

The most recent bibliographic record dates from Battaglia et al. [26], who found a 33.2 mm TL specimen stranded in the Strait of Messina in April 2010, whose meristic and morphometric data are here provided (Tables 1 and 2).

4. Discussion

The present paper reports new data on the mesopelagic fish *V. tripunctulatus* and provides for the first time a review of the occurrence of this rare species in the Mediterranean Sea. The presence of *V. tripunctulatus* in the Mediterranean was first hypothesized by Pietschmann [34], who caught a teleost of 110 mm in the Adriatic Sea [11]. However, later, Karlovac [35] and Sojan [36] confirmed that there was a misidentification and attributed this individual to the species *Maurolicus muelleri*, another sternoptychid commonly occurring in the Mediterranean Sea. The first confirmed record of *V. tripunctulatus* was reported by Torchio [9,30], who examined and described a specimen that was caught in the Strait of Messina. To date, only 19 individuals of *V. tripunctulatus* have been recorded in the Mediterranean, including ones reported for the first time in the present paper, and the paucity of these specimens suggests that this species is quite rare here. Our observations and literature analysis highlight the importance of the Strait of Messina as the main occurrence area for *V. tripunctulatus* in this basin. Overall, analysing the available literature, it is evident that most data on *V. tripunctulatus* belong to individuals caught or beached in the Strait of Messina, where the recurrent stranding of mesopelagic and bathypelagic fish fauna is due to upwelling conditions and environmental factors, like wind and the lunar cycle [26,37–39]. The most favourable period for the collection of *V. tripunctulatus* was winter and early spring, in particular February, March and April, as confirmed by the specimens caught by Arena from 1918 to 1922 or stranded later. The presence of *V. tripunctulatus* in surface waters of the Strait of Messina during February–April is helped by the wintering homeothermy as well as by the upwelling regime of this area, which also brings non-migrating fauna in the upper water layers [26,40]. According to Hopkins and Baird [21], *V. tripunctulatus* lives in a limited bathymetric range (about 200–550 m) both during day and night, with highest densities occurring between 290 and 460 m. Then, it can be considered a non-migrating or very weak migrating species. The exact date of collection is available for only six individuals stranded in the Strait of Messina (Val_tri_01, Val_tri_02; Val_tri_03; Potoschi et al. [10]; Spalletta et al. [25]; Battaglia et al. [26]), and an analysis of correspondent lunar cycles confirms that they were all found during the new moon phase. Moreover, the available data regarding the environmental conditions during their stranding reports a strong wind blowing from the south-east in all cases. The new moon phase in conjunction with the south-east wind are recognized as the best conditions for the stranding of mesopelagic and bathypelagic fauna in the Strait of Messina [26].

All individuals here examined are adults, and the maximum length of this species is still debated. The largest *V. tripunctulatus* caught in the Pacific Ocean measured 33 mm SL [41], whereas Atlantic specimens reach 35 mm SL [21] and, generally, Mediterranean individuals do not exceed 33.2 mm TL (ranging from 25 to 33.2 mm TL). However, Torchio mentioned a specimen caught in the Strait of Messina having a length of about 70–75 mm [30]. Torchio never examined this large individual, but was only alerted by Mr. Arena, who captured the animal. This specimen probably has not been preserved or has been lost, so its identity and length cannot be verified. The linear relationships TL–SL, TL–HL and SL–HL calculated in the present paper will be useful in future population studies or for reconstruction of total length from other known measures (SL, HL) when the

caudal fin is damaged as sometimes occurs during sample collection of fragile mesopelagic fishes. These kinds of relationships are often useful in dietary studies for reconstruction of prey size from stomach contents.

The taxonomic features of the examined individuals are consistent with the descriptions of *V. tripunctulatus* reported by various authors in previous papers [1,6,9,10,12,30]. Meristic analysis in Mediterranean specimens revealed minor differences in the number of photophores, some (e.g., the AC series) that have never been reported before. Comparing the meristic descriptions of previous authors, there are few differences in the number of photophores of the PV series: Torchio [9] and Dulčić [32] counted 16 photophores in the respective specimens analysed, while Potoschi et al. [10] observed a total of 15 photophores on the specimen found on 18 January 1980. According to Jespersen [42], the number of PV photophores could vary from 16 to 17, while Bini [6] reported a range of 15–17 photophores. The only Atlantic individual examined by Banon et al. [43] had 15 PV photophores. In our specimens, three individuals (Val_tri_01; Val_tri_02; Spalletta et al. [25]) had 17 PV photophores, but the other two (Val_tri_03; Battaglia et al. [26]) had 16. The ventral AC series, according to previous descriptions [6,9,10,32], was composed of 15 photophores divided into groups of 3 + 3 + 3 + 2 + 4, while the individual found by Spalletta et al. [25] had one more photophore (3 + 3 + 3 + 3+4). Therefore, this variation in the number of some photophore series observed here should be considered when identifying sternoptychid fishes. According to the few data available for the Atlantic Ocean, provided by Banon et al. [43], the main photophore series are made up as follows: VAV: 5; PV: 15; OA: 4; AC: 3 + 3 + 3 + 2 + 4; IP: 3 + 4. The main differences between Atlantic and Mediterranean individuals are the number of OA (4 in Atlantic fish and 5 in Mediterranean specimens) and in general the number of PV (15 in Atlantic fish and generally 16–17 in Mediterranean ones) photophore series. This variation could indicate a potential difference in the fish population of the two basins, although further investigation should be performed.

The results of the present study highlight that *V. tripunctulatus* is quite rare in the Mediterranean basin, but it is also true that very few research surveys have been conducted in this region with the aim to describe mesopelagic fish assemblage, using appropriate sampling tools such as an Isaac-Kidd midwater trawl and similar nets (e.g., [33,44–47]). In addition, sampling *V. tripunctulatus* is probably made even more difficult by the behaviour of the species, which does not carry out extensive vertical movements and seems to concentrate in a quite narrow water layer (generally 250–500 m depth).

Considering the lack of data on this species in the Mediterranean, updating morphometric, meristic, biological, ecological and distribution information is important to better understand the characteristics of regional population(s) and potential differences between Mediterranean stock(s) and those from other oceanic areas.

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References

1. Esmark, L. Om Tvende Nye Fiskearter: *Argyropelecus elongatus* E. Og *Maurolicus tripunctulatus* E. *Vid. Selsk. Forh. Christiania* **1871**, *1870*, 489.
2. Goode, G.B.; Bean, T.H. *Oceanic Ichthyology: A Treatise on the Deep-Sea and Pelagic Fishes of the World, Based Chiefly upon the Collections Made by the Steamers Blake, Albatross, and Fish Hawk in the Northwestern Atlantic, with an Atlas Containing 417 Figures*; U.S. Government Printing Office: Washington, DC, USA, 1895; Volume 2, pp. 553 plus 123 plates.
3. Jordan, D.S.; Evermann, B.W. *The Fishes of North and Middle America: A Descriptive Catalogue of the Species of Fish-like Vertebrates Found in the Waters of North America, North of the Isthmus of Panama*; Bulletin of the United States Museum; US Government Printing Office: Washington, DC, USA, 1896; Volume 47, 1240p.
4. Weitzman, S.H. Osteology and Evolutionary Relationships of the Sternoptychidae, with a New Classification of Stomiatoid Families. *Bull. Am. Mus. Nat. Hist.* **1974**, *153*, 329–478.
5. FishBase. Available online: https://www.fishbase.us/summary/Valenciennellus-tripunctulatus.html (accessed on 3 August 2024).
6. Bini, G. *Atlante Dei Pesci Delle Coste Italiani*; Mondo Sommerso: Roma, Italy, 1970; Volume 2, 311p.
7. Tortonese, E. Fauna Italiana. In *Osteichthyes (Pesci Ossei)*; Calderini: Bologna, Italy, 1970; Volume 1, 580p.
8. Badcock, J. Colour Variation in Two Mesopelagic Fishes and Its Correlative with Ambient Light Conditions. *Nature* **1969**, *221*, 383–385. [CrossRef]
9. Torchio, M. *Valenciennellus tripunctulatus* (Esmark, 1871) (Pisces-Gonostomatidae) Nel Mediterraneo. *Natura* **1960**, *51*, 138–139.
10. Potoschi, A.; Andaloro, F.; Cavalieri, A.; Berdar, A. Osservazioni Su *Valenciennellus tripunctulatus* (Esmark 1871) (Pisces: Gonostomatidae). *Mem. Biol. Mar. Oceanogr.* **1981**, *11*, 131–137.
11. Costa, F. *Atlante Dei Pesci Dei Mari Italiani*; Gruppo Ugo Mursia Editore: Milano, Italy, 1991; 432p.
12. Badcock, J. Sternoptychidae. In *Fishes of the North-Eastern Atlantic and the Mediterranean*; Whitehead, P.J.P., Bauchot, M.-L., Hureau, J.-C., Nielsen, J., Tortonese, E., Eds.; UNESCO: Paris, France, 1984; pp. 302–317.
13. Ahlstrorn, E.H. The Diverse Patterns of Metamorphosis in Gonostomatid Fishes an Aid to Classification. In *The Early Life History of Fishes*; Blaxter, J.H., Ed.; Springer: New York, NY, USA, 1974; pp. 659–674.
14. Witzell, W.N. Family Gonostomatidae. In *Check-List of the Fishes of the North-Eastern Atlantic and of the Mediterranean*; Hureau, J.-C., Monod, T., Eds.; UNESCO: Paris, France, 1973; Volume 1, pp. 114–122.
15. Krueger, W.H. Biological Studies of the Bermuda Ocean Acre IV. In *Life History, Vertical Distribution and Sound Scattering in the Gonostomatid Fish Valenciennellus tripunctulalus (Esmark)*; Smithsonian Institution: Washington, DC, USA, 1972; p. 37.
16. Clarke, T.A. Some Aspects of the Ecology of Stomiatoid Fishes in the Pacific Ocean near Hawaii. *Fish. Bull.* **1974**, *72*, 337–351.
17. Loeb, V.J. Vertical Distribution and Development of Larval Fishes in the North Pacific Central Gyre during Summer. *Fish. Bull.* **1979**, *77*, 777–793.
18. Badcock, J. The Vertical Distribution of Mesopelagic Fishes Collected on the SON D Cruise. *J. Mar. Biol. Assoc.* **1970**, *50*, 1001–1044. [CrossRef]
19. Merrett, N.; Roe, H.S.J. Patterns and Selectivity in the Feeding of Certain Mesopelagic Fishes. *Mar. Biol.* **1974**, *28*, 115–126. [CrossRef]
20. Badcock, J.; Merrett, N.R. Midwater Fishes in the Eastern North Atlantic, I: Vertical Distribution and Associated Biology in 30°N, 23°W, with Developmental Notes on Certain Myctophids. *Progr. Oceanogr.* **1976**, *7*, 3–58. [CrossRef]
21. Hopkins, T.L.; Baird, R.C. Trophodynamics of the Fish *Valenciennellus tripunctulatus* I. Vertical Distribution, Diet and Feeding Chronology. *Mar. Ecol. Progr. Ser.* **1981**, *5*, 1. [CrossRef]
22. Baird, R.C.; Hopkins, T.L. Trophodynamics of the Fish *Valenciennellus tripunctulatus* III. Energetics, Resources and Feeding Strategy. *Mar. Ecol. Progr. Ser.* **1981**, *5*, 21–28. [CrossRef]
23. Gibbs, R.H.J.; Krueger, W.H. *Biology of Midwater Fishes of the Bermuda Ocean Acre*; Smithsonian Institution Press: Washington, DC, USA, 1987; p. 187.
24. Agersted, M.D.; Khodabandeloo, B.; AKlevjer, T.A.; Agersted, M.; García-Seoane, E.; Strand, E.; Underwood, M.J.; Melle, W. Mass Estimates of Individual Gas-Bearing Mesopelagic Fish from In Situ Wideband Acoustic Measurements Ground-Truthed by Biological Net Sampling. *ICES J. Mar Sci.* **2021**, *78*, 3658–3673. [CrossRef]
25. Spalletta, B.; Mento, G.; Costa, F.; Ammendolia, G.; Giordano, D.; Capecchi, D.; Berdar, A. Importanza Dello Spiaggiamento Nella Raccolta Di Specie Ittiche Rare Ed Endemiche Dello Stretto Di Messina (Cenni Di Parassitosi). *Rivista Parassitol.* **1995**, *56*, 279–297.
26. Battaglia, P.; Ammendolia, G.; Cavallaro, M.; Consoli, P.; Esposito, V.; Malara, D.; Rao, I.; Romeo, T.; Andaloro, F. Influence of Lunar Phases, Winds and Seasonality on the Stranding of Mesopelagic Fish in the Strait of Messina (Central Mediterranean Sea). *Mar. Ecol.* **2017**, *38*, e12459. [CrossRef]
27. Battaglia, P.; Malara, D.; Romeo, T.; Andaloro, F. Relationships between Otolith Size and Fish Size in Some Mesopelagic and Bathypelagic Species from the Mediterranean Sea (Strait of Messina, Italy). *Sci. Mar.* **2010**, *74*, 605–612. [CrossRef]
28. Battaglia, P.; Malara, D.; Ammendolia, G.; Romeo, T.; Andaloro, F. Relationships between Otolith Size and Fish Length in Some Mesopelagic Teleosts (Myctophidae, Paralepididae, Phosichthyidae and Stomiidae). *J. Fish Biol.* **2015**, *87*, 774–782. [CrossRef]
29. Agger, P.; Bagge, O.; Hansen, O.; Hoffman, E.; Holden, M.J.; Kesteven, G.L.; Knudsen, H.; Raitt, D.F.S.; Saville, A.; Williams, T. *Manual of Fisheries Science. Part 2—Methods of Resource Investigation and their Application*; Food and Agriculture Organization of the United Nations: Rome, Italy, 1974; p. 214.

30. Torchio, M. Grammonus Ater (Risso) 1810 Nelle Acque Siciliane e Precisazioni Sulla Comparsa Di *Valenciennellus tripunctulatus* (Esmark) 1871 Nello Stretto Di Messina. *Natura* **1962**, *53*, 141–145.
31. Cavaliere, A.; Greco, S.; Perdichizzi, F.; Azzaro, F.; Arena, G. Valutazione Delle Risorse Demersali: Primi Risultati Di Due Campagne Di Pesca (Anno 1985) Condotte Nell'area Compresa Tra Capo Calavà e Capo Gallo (Sicilia). *Pubbl. Min. Mar. Mercantile C.N.R* **1988**, *3*, 1335–1367.
32. Dulčić, J. On the Occurrence of Three Meso-and Bathypelagic Fishes in the Adriatic Sea. *Cybium* **2001**, *25*, 285–288.
33. Orsi Relini, L.; Garibaldi, F.; Lanteri, L.; Relini, G. Possible Use of Small Mesopelagic Ichthyofauna to Ascertain GES in Oceanic Areas of the Mediterranean. *Biol. Mar. Mediterr.* **2013**, *20*, 79–87.
34. Pietschmann, V. Fische Der Achten "Najade"—Fahrt (Jungfischtrawlfänge). In *Sitzungsberichte der Akademie der Wissenschaften Mathematisch-Naturwissenschaftliche Klasse*; 1914; Volume 123, pp. 405–463.
35. Karlovac, J. *Sternoptychidae, Stomiatidae and Scopelidae in the Adriatic Sea*; Reports on the R/V "Hvar" cruises researches into Fisheries Biology; Institut za Oceanografiju i Ribarstvo: Split, Croatia, 1953; Volume 5, pp. 1–45.
36. Šoljan, T. *Fishes of the Adriatic (Ribe Jadrana)*; NOLIT Publishing House: Belgrade, Yugoslavia, 1963; Volume 1, p. 428.
37. Mazzarelli, G. Gli Animali Abissali e Le Correnti Sottomarine Dello Stretto Di Messina. *Riv. Mens. Pesca Idrobiol.* **1909**, *11*, 177–218.
38. Genovese, S.; Berdar, A. Guglielmo Spiaggiamenti Di Fauna Abissale Nello Stretto Di Messina. In *Atti Della Società Peloritana di Scienze Fisiche, Matematiche e Naturali*; 1971; Volume 17, pp. 331–370.
39. Battaglia, P.; Pedà, C.; Malara, D.; Milisenda, G.; MacKenzie, B.R.; Esposito, V.; Consoli, P.; Vicchio, T.M.; Stipa, M.G.; Pagano, L.; et al. Importance of the Lunar Cycle on Mesopelagic Foraging by Atlantic Bluefin Tuna in the Upwelling Area of the Strait of Messina (Central Mediterranean Sea). *Animals* **2022**, *12*, 2261. [CrossRef] [PubMed]
40. Battaglia, P.; Pagano, L.; Consoli, P.; Esposito, V.; Granata, A.; Guglielmo, L.; Pedá, C.; Romeo, T.; Zagami, G.; Vicchio, T.M.; et al. Consumption of Mesopelagic Prey in the Strait of Messina, an Upwelling Area of the Central Mediterranean Sea: Feeding Behaviour of the Blue Jack Mackerel *Trachurus picturatus* (Bowdich, 1825). *Deep Sea Res. Part Oceanogr. Res. Pap.* **2020**, *155*, 103158. [CrossRef]
41. Clarke, T.A. Diel feeding patterns of 16 species of mesopelagic fishes from Hawaiian waters. *Fish. Bull.* **1978**, *76*, 495–513.
42. Jespersen, P. Teleostei Isospondyli-Gonostomatidae: *Valenciennellus tripunctulatus* (Esmark, 1871). In *Faune Ichtyologique de l'Atlantique Nord*; Joubin, L., Ed.; ICES: Copenhagen, Denmark, 1933; Volume 14, pp. 80–81.
43. Banon, R.; Arronte-Prieto, J.C.; Rodriguez-Cabello, C.; Piñeiro-Álvarez, C.G.; Punzon, A.; Serrano, A. Commented checklist of marine fishes from the Galicia Bank seamount (NW Spain). *Zootaxa* **2016**, *4067*, 293–333. [CrossRef]
44. Tåning, A.V. Mediterranean Scopelidae (Saurus, Aulopus, Cholorphthalmus, and Myctophum). In *Report on the Danish Oceanographical Expeditions to the Mediterranean and Adjacent Seas*; Host: Copenhagen, Denmark, 1918; Volume 2, pp. 1–154.
45. Jespersen, P.; Tåning, A.V. Mediterranean Sternoptychidae. In *Report on the Danish Oceanographical Expeditions to the Mediterranean and Adjacent Seas*; 1926; Volume 2, pp. 1–59.
46. Goodyear, R.H.; Gibbs, R.H.J.; Roper, C.F.E.; Kleckner, R.C.; Sweeney, M.J. *Mediterranean Biological Studies*; Smithsonian Institution: Washington, DC, USA, 1972; Volume 2.
47. Olivar, M.P.; Bernal, A.; Molí, B.; Peña, M.; Balbín, R.; Castellón, A.; Miguel, J.; Massuti, E. Vertical Distribution, Diversity and Assemblages of Mesopelagic Fishes in the Western Mediterranean. *Deep Sea Res. Part Oceanogr. Res. Pap.* **2012**, *62*, 53–69. [CrossRef]