

Case Report

The First Report of *Pennella* (Crustacea: Copepoda) Infesting *Stenella coeruleoalba* Stranded in Malta: Morphological and Genetic Analyses

Adriana Vella *  and Noel Vella 

Conservation Biology Research Group, Department of Biology, University of Malta, MSD 2080 Msida, Malta

* Correspondence: adriana.vella@um.edu.mt

Simple Summary: A striped dolphin was found dead in Maltese waters in July 2020, displaying a severe infestation of the mesoparasite *Pennella balaenoptera*. This parasite is the largest known mesoparasite to grow on cetaceans and the level of infestation is typically associated with the health status of its host. This incident emphasizes the importance of monitoring the presence of these parasites, to better understand the health of dolphins in the area and to contribute to conservation efforts.

Abstract: Here, we document the stranding of a striped dolphin *Stenella coeruleoalba* (Meyen, 1833) (Mammalia: Delphinidae), which was found dead in Maltese waters in July 2020. The stranded dolphin exhibited a severe infestation of the mesoparasitic copepod, *Pennella balaenoptera* Koren and Danielssen, 1877 (Copepoda: Pennellidae). Parasites of this genus represent the largest known mesoparasites to infest cetaceans. Under normal circumstances, cetaceans may have a few *P. balaenoptera* individuals attached to them, but cetaceans with compromised health are more prone to heavy infestations. The identification of the parasite was accomplished through morphological and genetic analyses. This incident highlights the significance of monitoring mesoparasitic infestations, offering valuable insights into the health of cetacean populations and emphasizing the potential implications for conservation efforts in the region.



Citation: Vella, A.; Vella, N. The First Report of *Pennella* (Crustacea: Copepoda) Infesting *Stenella coeruleoalba* Stranded in Malta: Morphological and Genetic Analyses. *Animals* **2024**, *14*, 1107. <https://doi.org/10.3390/ani14071107>

Academic Editor: B. Louise Chilvers

Received: 31 January 2024

Revised: 20 March 2024

Accepted: 3 April 2024

Published: 4 April 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Keywords: cetacean; DNA barcoding; mesoparasitic copepod; mitochondrial DNA; *Pennella balaenoptera*; striped dolphin

1. Introduction

The genus *Pennella* Oken, 1816, is composed of highly modified mesoparasitic copepods [1,2]. The life cycle of members of this genus is complex and they show variations in developmental stages and the use of intermediate hosts and definitive hosts. Typically, *Pennella* species are characterized by a brief planktonic phase, followed by a copepodid stage where they attach to an intermediate host, most likely a cephalopod [3]. Subsequently, they develop into an adult stage [4]. After mating, inseminated females parasitize the definitive host, usually a fish or a marine mammal. During this stage, the copepod's cephalothorax including its antennary processes and holdfasts becomes deeply embedded in the host's tissue while the posterior end, including the egg sacs and the brush-like abdominal plumes, remains outside the definitive host's body surface [2,3,5]. During the latter stage, most of these mesoparasitic copepods become very conspicuous and, consequently, this represents the most studied stage in their complex life cycle.

For most *Pennella* species, the specific details of their life cycle are missing, yet identification keys indicate that adult female *Pennella* species exhibit definitive host specificity, except for *P. filosa* (Linnaeus, 1758) and *P. balaenoptera* Koren and Danielssen, 1877 [2]. The former parasitizes several pelagic fish species, while the latter parasitizes different marine

mammals [2,6–8], with the main distinguishing feature between these two species being that for *P. balaenoptera*, the definitive host is a marine mammal, usually a cetacean [2].

Currently, there are 10 to 14 species within the genus that are considered as valid or *species inquirendae* [2,9], yet mitochondrial DNA data indicate that most of these species, including *P. balaenoptera* and *P. filosa*, may be synonymous [5,7]. This genetic insight challenges the current classification and underscores the need for further molecular investigations to refine our understanding of *Pennella* species.

Taxonomic descriptions for the majority of the *Pennella* species are biased as they have been based on specific life stages, associated with the definitive host, and limited to a few adult mesoparasitic inseminated females [2]. Consequently, sexual dimorphism, morphological variations between life stages, and phenotypic plasticity, especially that observed on the cephalothorax of these species, have led to taxonomic revisions [2]. To address these complexities, the use of standard molecular genetic techniques such as DNA barcoding [10] has become invaluable. Utilizing systems such as BOLD [11], which algorithmically clusters different operational taxonomic units (OTUs) into BIN clusters based on DNA sequences [12], allows for improvements in taxonomic identification, revisions, and biodiversity assessments [13–15]. This approach contributes to a more comprehensive understanding of the phylogenetic relationships between different species of *Pennella*, while assisting in better delimitation of species [5,7,16] at all life stages, allowing for improved knowledge of their complex life history.

Accurate parasite identification is crucial not only for taxonomic purposes but also for evaluating the health of individual hosts. Studies have shown that while *Pennella* is frequently present on cetaceans [7], on healthy hosts, the normal numbers of *Pennella* individuals are typically low. Elevated infestations are often linked to underlying health conditions, such as immunosuppression related to viral infections or heavy loads of pollutants [8,17,18]. Consequently, monitoring for *Pennella* infestations can provide valuable insights into the health status of cetacean populations [19,20]. In the Mediterranean, such efforts play a crucial role in effective conservation strategies, especially in the context of various international agreements and protocols, such as ACCOBAMS [21], SPA/BD Protocol [22], CITES [23], and CMS [24], which emphasize the importance of monitoring, protecting, and conserving cetaceans [25–27].

The current work represents the first scientific investigation of the occurrence of this mesoparasitic copepod on a heavily parasitized cetacean in Maltese waters, offering a unique perspective from a stranding event in the central Mediterranean.

2. Materials and Methods

2.1. Sample Collection

A dead dolphin, *Stenella coeruleoalba* (Meyen, 1833) [26], was stranded ashore on 13 July 2020, at St Julian's, Malta (GPS coordinates: 35°55'10.4'' N 14°29'42.2'' E or 35.919556, 14.495056). During an external post-mortem examination (Figure 1), it was evident that the specimen was heavily infested with the mesoparasite *Pennella* (Figure 2). The striped dolphin was photographed and the mesoparasites visible during the post-mortem examination were counted. A few parasites including associated tissue were collected and stored in 95% ethanol until analyzed.

The antennary processes and holdfasts of the collected parasites were examined under a low-power microscope. The morphological identification of the parasite was carried out following Hogans [2], Fraija-Fernández et al. [7], and Suyama et al. [5].



(A)



(B)

Figure 1. (A) Views of the heavily parasitized striped dolphin, *Stenella coeruleoalba*, stranded in coastal Maltese waters. (B) Closer view of the lower ventral anal right side of the dolphin also showing the large lesion wound close to its anus.



Figure 2. An image of a *P. balaenoptera* individual collected during this study (total length: 110 mm—measured following Suyama et al. [5]).

2.2. Genetic Analyses

The total genomic DNA was extracted from a tissue sample of the *Pennella* parasite using the GF-1 Tissue DNA Extraction Kit (Vivantis, Malaysia). The PCR amplification of the COI sequence was carried out using the genus-specific primers HijikiCOI-F (5'-GGATATTGGR ACTTTGTA CTTATTAAG-3') and HijikiCOI-R (5'-AAAAATCAAATAAATGCTGG-3'), which prevent the amplification of cetacean DNA [5]. The amplification protocol followed Vella et al. [28]. The PCR amplification was visually confirmed on 1.5% agarose gel stained with ethidium bromide. Purified PCR products were sequenced using both the forward and reverse primers via ABI3730XL. The quality check, editing, and assembly of the complementary sequences were carried out using GeneiousR10 (<http://www.geneious.com>; [29]). The sequence generated during this study was deposited in GenBank under the accession number PP396156.

The sequence generated during this study was then compared against readily available data on the NCBI GenBank database via Blastn (<https://blast.ncbi.nlm.nih.gov/Blast.cgi> (accessed on 15 September 2023)) and the BOLD database using the Species Level Barcode Records Identification Engine (<http://www.boldsystems.org> (accessed on 15 September 2023); [11]).

3. Results

3.1. Morphological Analyses

This dolphin was a female of 200 cm total body length. Lengths at sexual maturity for females of this species have been reported beyond 209 cm. However, other research publishing a growth curve for Mediterranean striped dolphins shows the maximum body length to be 205 cm from around 11 years of age, while specimens at 200 cm body length would be around 7 years of age [30]. This may, however, vary according to population genetics, distribution, and general health, with unhealthy dolphins remaining smaller in size [31–33]. The dolphin under study had an empty stomach, except for a couple of cephalopod beaks, and its dorsal blubber thickness was 1.5 cm.

The dolphin analyzed in this study was heavily infested with 450 *Pennella balaenoptera* individuals. A higher number of *P. balaenoptera* specimens was observed on the dolphin's lower lateral side. Notably, the dolphin must have experienced a period of physical distress due to the parasite load it was carrying; thus, it cannot be excluded that the wound on its right side may have been caused by its attempts to remove parasites by rubbing against substrates.

Although the specimen was in an advanced stage of decomposition, some other parasites were recorded. Adult nematode *Pseudaliidae* parasites were found in the lungs of the affected dolphin. Parasitic cysts (Cestoda), meanwhile, were observed mostly in the subcutaneous blubber of the dolphin's abdominal area. Two types of Tetracystid merocercoids have been widely recognized in delphinids, including *Phyllobothrium delphini* (Bosc, 1802), usually encysted in the abdominal subcutaneous blubber, and *Monorygma grimaldii* (Moniez, 1889), encysted mainly in the peritoneum of the abdominal cavity [34]. No specific investigations on the presence of viral, fungal, or bacterial pathogens or environmental contaminants were performed by the authors.

3.2. Genetic Analyses of the Mesoparasite

The 605 bp COI sequence produced during this study matched: 99.0% with MG701289 [host: *Grampus griseus* (Mammalia: Delphinidae)—Spain] and 98.9% with MG701287, MG701290, and MG701291 [host: *Delphinus delphis* (Mammalia: Delphinidae)—Spain], representing *P. balaenoptera* as identified in Fraija-Fernández et al. [7]; 98.5% with MG701282 [host: *Xiphias gladius* (Actinopterygii: Xiphiidae)—Spain], representing *P. filosa* as identified in Fraija-Fernández et al. [7]; and 98.8% with LC198844 and LC638618 [host: *Cololabis saira* (Actinopterygii: Scomberesocidae)—Pacific Ocean] and LC638573 [host: *Molamola* (Actinopterygii: Molidae) Pacific Ocean], representing *Pennella* sp. as identified in Suyama et al. [5].

When the sequence was analyzed through BOLD, it clustered within BOLD:ADW8004, which contains *Pennella balaenoptera*, *P. filosa*, and *Pennella* sp., as identified in Suyama et al. [5]. This BOLD BIN is composed of 147 individuals exhibiting a maximum interspecific divergence of 3.08% (mean distance 1.06%), with its closest neighbor being BOLD:AEN6079, which also represents *Pennella* sp.

4. Discussion

Species delimitation becomes difficult when species exhibit morphological polymorphism that may arise due to various factors, including variations that may be associated with the host, while using identification keys that represent only a specific gender for a specific stage of a species' complex life cycle. Consequently, the minor morphological differences noted between mature inseminated females of *P. balaenoptera* and *P. filosa* may not be enough to distinguish them reliably, leading to conflicting observations [2,7]. Instead, the main distinguishing feature may be the definitive host specificity rather than the actual parasites' specific morphology [2]. However, while definitive host specificity may at times be an effective tool in discriminating between parasites, as some parasites tend to exhibit species-specific ecological interactions [2,35,36], in this case, the molecular data, namely those from DNA barcoding, indicated otherwise [5,7]. Our comparative genetic analyses showed that the currently studied specimen's COI data represent a newly sequenced DNA barcode that closely matches both *P. balaenoptera* and *P. filosa*. This corroborates the outcomes from Fraija-Fernández et al.'s [7] and Suyama et al.'s [5] studies, where genetic evidence showed that these two species are probably synonymous, with *P. balaenoptera* being a junior synonym of *P. filosa*. Accordingly, mitochondrial genetics indicate that synonymy is prevalent in the genus *Pennella* [5].

Nonetheless, while genetics indicate that definitive host specificity cannot be used to validate a parasite species' identification, the current work opts to keep the parasite's name as *P. balaenoptera* rather than using *P. filosa*, a decision made since the former is considered valid by current morphological identification keys [2] and species databases [9].

Global records of *P. balaenoptera* indicate that inseminated females can parasitize at least 17 cetacean species [7], with Mediterranean records including *Balaenoptera acutorostrata* [37], *Balaenoptera physalus* [17,38], *Delphinus delphis* [7], *Globicephala melas* [7], *Grampus griseus* [7,18,39], *Stenella coeruleoalba* [7,20,39,40], *Tursiops truncatus* [7,39], *Phocoena phocoena* [8,41], and *Ziphius cavirostris* [7,42] as hosts. Usually, the number of parasites per host is generally low, although records for the same dolphin species indicate that as many as 344 *P. balaenoptera* parasites have previously been found on a single individual [7]. The current study of this heavily parasitized *S. coeruleoalba* surpasses the previous record for the number of parasites per specimen. Furthermore, the presence of a wound or ulceration on the lower right side suggests that either the dolphin may have engaged in rubbing itself against substrates to remove parasites or that the heavy load of this large parasite in this area together with any other underlying infection may have caused ulceration. In this regard, bottom contact behavior has been recorded in some cetacean species [19,43–45].

The fast movement of most cetaceans makes it difficult for parasites to settle, while slow-moving individuals tend to be easier hosts for colonization [40]. The high presence of *Pennella* parasites on the currently analyzed striped dolphin specimen is indicative of an immunocompromised individual that suffered from sickness-induced lethargy, possibly due to pollutants, stress, or infections [5,17].

The relationships and order of factors causing the dolphin's death may be multifaceted and intricate. Just as parasites, including *Pennella balaenoptera*, may benefit from a weakened host, the parasites themselves may be carriers of infectious pathogens, such as *Brucella ceti*, which, in turn, may have long debilitating effects on the dolphin, potentially facilitating further parasite infestation. At the same time, other diseases, such as Cetacean morbillivirus (CeMV), may also coinfect or activate various other latent infections, weakening the dolphin in various life-threatening ways [32,34,46–50].

In the Mediterranean, CeMV and *Brucella ceti* are known to be responsible for infectious outbreaks and deaths in striped dolphins [40,46,47,51–54]. Infected individuals are or may become immunosuppressed and exhibit significant depletion of lymphoid tissue [39]. Likewise, elevated levels of polychlorinated biphenyls are also associated with immunosuppression [55]. Since sick dolphins are notably prone to opportunistic infections from various organisms, non-invasive tracking of the presence of these mesoparasites in free-living cetaceans may potentially serve as an indicator, facilitating a more comprehensive understanding of changes related to cetacean health [18].

5. Conclusions

This article represents the first scientific record of a heavily infested *S. coeruleoalba* by *P. balaenoptera* from Malta. This study has incorporated genetic analysis of the parasite because, despite being the sole *Pennella* species identified to infect marine mammals [2], the parasite species displays significant morphological variability across different life stages. Standardized identification methods, such as DNA barcoding, thus become essential in comprehending the parasite's life cycle and contribute to our knowledge of the complexities surrounding its life stages.

Cetacean strandings and unique observations linked to these cases allow for a more in-depth consideration of the ailments these marine mammals are suffering in a degrading marine environment, which is affecting their general good health and conservation needs. However, the various causes of distress and poor health are not always easy to link to the effects observed. Nonetheless, as cetaceans play a unique and important role in the marine ecosystem and are also legally protected in most regions, flagging records, such as that in this case study, is essential to increase awareness of the status of cetacean health and measures to improve the status of their marine habitat.

Author Contributions: Conceptualization, A.V.; methodology, A.V. and N.V.; formal analysis, A.V. and N.V.; investigation, A.V. and N.V.; writing—original draft preparation, A.V. and N.V.; writing—review and editing, A.V. and N.V.; project administration, A.V.; funding acquisition, A.V. All authors have read and agreed to the published version of the manuscript.

Funding: This work was financially supported by the BioCon_Innovate Research Excellence Grant from the University of Malta (grant no. I18LU06-01) awarded to A.V.

Institutional Review Board Statement: For this study involving protected species, necessary approvals were sought and obtained from the local Environment and Resource Authority, Malta (ERA). The deceased striped dolphin was collected from the stranding site by the ERA, and the specimen was analyzed and the parasites sampled in adherence with ERA permits and in the presence of ERA officials.

Informed Consent Statement: Not applicable.

Data Availability Statement: Mitochondrial DNA data related to the analyses conducted during this study are available on GenBank under accession number PP396156.

Acknowledgments: The authors would like to thank the local authorities, namely, the ERA, for making this dead specimen available for academic scientific research. Thanks are also due to K. A. Stockin, M. Marcondes, S. Mazzariol, U. Siebert, G. Sciancalepore, and C. Centelleghé for their insights on this case.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Ohtsuka, S.; Lindsay, D.J.; Izawa, K. A new genus and species of the family Pennellidae (Copepoda, Siphonostomatoida) infecting the Pacific viperfish *Chauliodus macouni*. *Parasite* **2018**, *25*, 6. [[CrossRef](#)]
2. Hogans, W.E. Review of *Pennella* Oken, 1816 (Copepoda: Pennellidae) with a description of *Pennella benzi* sp. Nov., a parasite of Escolar, *Lepidocybium flavobrunneum* (Pisces) in the northwest Atlantic Ocean. *Zootaxa* **2017**, *4244*, 1–38. [[CrossRef](#)]

3. Suyama, S.; Kakehi, S.; Yanagimoto, T.; Chow, S. Infection of the Pacific saury *Cololabis saira* (Brevoort, 1856) (Teleostei: Belontiiformes: Scomberesocidae) by *Pennella* sp. (Copepoda: Siphonostomatoida: Pennellidae) south of the subarctic front. *J. Crustac. Biol.* **2020**, *40*, 384–389. [CrossRef]
4. Abaunza, P.; Arroyo, N.L.; Preciado, I. A contribution to the knowledge on the morphometry and the anatomical characters of *Pennella balaenopterae* (Copepoda, Siphonostomatoida, Pennellidae), with special reference to the buccal complex. *Crustaceana* **2001**, *74*, 193–210. [CrossRef]
5. Suyama, S.; Yanagimoto, T.; Nakai, K.; Tamura, T.; Shiozaki, K.; Ohshimo, S.; Chow, S. A taxonomic revision of *Pennella* Oken, 1815 based on morphology and genetics (Copepoda: Siphonostomatoida: Pennellidae). *J. Crustac. Biol.* **2021**, *41*, ruab040. [CrossRef]
6. Larena-Reino, M.; Abollo, E.; Pascual, S. Morphological and genetic identification of *Pennella instructa* (Copepoda: Pennellidae) on Atlantic swordfish (*Xiphias gladius*, L. 1758). *Fish. Res.* **2019**, *209*, 178–185. [CrossRef]
7. Fraija-Fernández, N.; Hernández-Hortelano, A.; Ahuir-Baraja, A.E.; Raga, J.A.; Aznar, F.J. Taxonomic status and epidemiology of the mesoparasitic copepod *Pennella balaenoptera* in cetaceans from the western Mediterranean. *Dis. Aquat. Organ.* **2018**, *128*, 249–258. [CrossRef]
8. Dailey, M.D.; Haulena, M.; Lawrence, J. First report of a parasitic copepod (*Pennella balaenopterae*) infestation in a pinniped. *J. Zoo Wildl. Med.* **2002**, *33*, 62–65. [CrossRef]
9. Walter, T.C.; Boxshall, G. World of Copepods Database. *Pennella* Oken, 1815. (World Register of Marine Species). Available online: <https://www.marinespecies.org/aphia.php?p=taxdetails&id=135648> (accessed on 18 September 2023).
10. Hebert, P.D.N.N.; Cywinska, A.; Ball, S.L.; Jeremy, R.; DeWaard, J.R. Biological identifications through DNA barcodes. *Proc. R. Soc. B Biol. Sci.* **2003**, *270*, 313–321. [CrossRef]
11. Ratnasingham, S.; Hebert, P.D.N. BOLD: The Barcode of Life Data System: Barcoding. *Mol. Ecol. Notes* **2007**, *7*, 355–364. [CrossRef]
12. Ratnasingham, S.; Hebert, P.D.N. A DNA-Based Registry for All Animal Species: The Barcode Index Number (BIN) System. *PLoS ONE* **2013**, *8*, e66213. [CrossRef] [PubMed]
13. Ortiz, A.S.; Rubio, R.M.; Guerrero, J.J.; Garre, M.J.; Serrano, J.; Hebert, P.D.N.; Hausmann, A. Close congruence between Barcode Index Numbers (bins) and species boundaries in the Erebidae (Lepidoptera: Noctuoidea) of the Iberian Peninsula. *Biodivers. Data J.* **2017**, *5*, e19840. [CrossRef]
14. Vella, A.; Mifsud, C.M.; Magro, D.; Vella, N. DNA Barcoding of Lepidoptera Species from the Maltese Islands: New and Additional Records, with an Insight into Endemic Diversity. *Diversity* **2022**, *14*, 1090. [CrossRef]
15. Vella, A.; Vella, N.; Schembri, S. A molecular approach towards taxonomic identification of elasmobranch species from Maltese fisheries landings. *Mar. Genom.* **2017**, *36*, 17–23. [CrossRef] [PubMed]
16. Suyama, S.; Masuda, Y.; Yanagimoto, T.; Chow, S. Genetic and morphological variation in *Pennella* sp. (Copepoda: Siphonostomatoida) collected from Pacific saury, *Cololabis saira*. *Mar. Biodivers.* **2019**, *49*, 1233–1245. [CrossRef]
17. Oren, S.; Edery, N.; Yasur-Landau, D.; King, R.; Leszkowicz Mazuz, M.; Eben Bari, S.; Moss, L. First Report of *Pennella balaenopterae* Infestation in a Fin Whale (*Balaenoptera physalus*) Carcass Washed Ashore on the Israeli Coastline. *Isr. J. Vet. Med.* **2023**, *78*, 4–8.
18. Vecchione, A.; Aznar, F.J. The mesoparasitic copepod *Pennella balaenopterae* and its significance as a visible indicator of health status in dolphins (Delphinidae): A review. *J. Mar. Anim. Their. Ecol.* **2014**, *7*, 4–11.
19. Meynecke, J.O.; Gustafon, J.; Cade, D.E. Exfoliating Whales—Sandy Bottom Contact Behaviour of Humpback Whales. *J. Mar. Sci. Eng.* **2023**, *11*, 600. [CrossRef]
20. Aznar, F.J.; Perdiguero, D.; Pérez Del Olmo, A.; Repullés, A.; Agustí, C.; Raga, J.A. Changes in epizotic crustacean infestations during cetacean die-offs: The mass mortality of Mediterranean striped dolphins *Stenella coeruleoalba* revisited. *Dis. Aquat. Organ.* **2005**, *67*, 239–247. [CrossRef]
21. ACCOBAMS. Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area. 1996. Available online: <https://accobams.org/documents-resolutions/agreement-text/> (accessed on 18 September 2023).
22. UNEP/MAP-SPA/RAC SPA-BD Protocol Annex II: List of Endangered or Threatened Species. Available online: https://www.rac-spa.org/sites/default/files/annex/annex_2_en_20182.pdf (accessed on 8 August 2023).
23. CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora. Appendices I, II and III. Available online: <https://cites.org/sites/default/files/eng/app/2023/E-Appendices-2023-05-21.pdf> (accessed on 8 August 2023).
24. CMS Appendices I and II of the Convention on the Conservation of Migratory Species of Wild Animals. Available online: https://www.cms.int/sites/default/files/basic_page_documents/appendices_cop13_e_0.pdf (accessed on 8 August 2023).
25. Braulik, G.T.; Taylor, B.L.; Minton, G.; Notarbartolo di Sciara, G.; Collins, T.; Rojas-Bracho, L.; Crespo, E.A.; Ponnampalam, L.S.; Double, M.C.; Reeves, R.R. Red-list status and extinction risk of the world’s whales, dolphins, and porpoises. *Conserv. Biol.* **2023**, *37*, e14090. [CrossRef]
26. Otero, M.d.M.; Fabrizio, S.; Gerovasileiou, V.; Barone, M.; Bo, M.; Arcos, J.M.; Vulcano, A.; Joana, X. *Identification Guide of Vulnerable Species Incidentally Caught in Mediterranean Fisheries*; IUCN: Malaga, Spain, 2019.
27. FAO. *Monitoring the Incidental Catch of Vulnerable Species in Mediterranean and Black Sea Fisheries. Methodology for Data Collection*; Carpentieri, P., Ed.; FAO Fisheries and Aquaculture Technical Paper No. 640; FAO: Rome, Italy, 2019; ISBN 9789251315484.
28. Vella, A.; Giarrusso, E.; Monaco, C.; Mifsud, C.M.; Darmanin, S.A.; Raffa, A.; Tumino, C.; Peri, I.; Vella, N. New Records of *Callinectes sapidus* (Crustacea, Portunidae) from Malta and the San Leonardo River Estuary in Sicily (Central Mediterranean). *Diversity* **2023**, *15*, 679. [CrossRef]

29. Kearse, M.; Moir, R.; Wilson, A.; Stones-Havas, S.; Cheung, M.; Sturrock, S.; Buxton, S.; Cooper, A.; Markowitz, S.; Duran, C.; et al. Geneious Basic: An integrated and extendable desktop software platform for the organization and analysis of sequence data. *Bioinformatics* **2012**, *28*, 1647–1649. [[CrossRef](#)] [[PubMed](#)]
30. Marsili, L. Lipophilic contaminants in marine mammals: Review of the results of ten years' work at the Department of Environmental Biology, Siena University (Italy). *Int. J. Environ. Pollut.* **2000**, *13*, 416–452. [[CrossRef](#)]
31. Calzada, N.; Aguilar, A.; Lockyer, C.; Grau, E. Patterns of growth and physical maturity in the western Mediterranean striped dolphin, *Stenella coeruleoalba* (Cetacea: Odontoceti). *Can. J. Zool.* **1997**, *75*, 632–637. [[CrossRef](#)]
32. Roca-Monge, K.; González-Barrientos, R.; Suárez-Esquivel, M.; Palacios-Alfaro, J.D.; Castro-Ramírez, L.; Jiménez-Soto, M.; Cordero-Chavarría, M.; García-Párraga, D.; Barratclough, A.; Moreno, E.; et al. Age and Sexual Maturity Estimation of Stranded Striped Dolphins, *Stenella coeruleoalba*, Infected with *Brucella ceti*. *Oceans* **2022**, *3*, 494–508. [[CrossRef](#)]
33. Guarino, F.M.; Di Nocera, F.; Galiero, G.; Iaccarino, D.; Giglio, S.; Madeo, E.; Pollaro, F.; Mezzasalma, M.; Iavarone, I.; Odierna, G.; et al. Age estimation and growth of striped dolphins *Stenella coeruleoalba* stranded along the coasts of south-western Italy. *Eur. Zool. J.* **2021**, *88*, 417–424. [[CrossRef](#)]
34. Agustí, C.; Aznar, F.J.; Olson, P.D.; Littlewood, D.T.J.; Kostadinova, A.; Raga, J.A. Morphological and molecular characterization of tetraphyllidean merocercoids (Platyhelminthes: Cestoda) of striped dolphins (*Stenella coeruleoalba*) from the Western Mediterranean. *Parasitology* **2005**, *130*, 461–474. [[CrossRef](#)] [[PubMed](#)]
35. Yumura, N.; Adachi, K.; Nitta, M.; Kondo, Y.; Komeda, S.; Wakabayashi, K.; Fukuchi, J.; Boxshall, G.A.; Ohtsuka, S. Exploring evolutionary trends within the Pennellidae (Copepoda: Siphonostomatoida) using molecular data. *Syst. Parasitol.* **2022**, *99*, 477–489. [[CrossRef](#)] [[PubMed](#)]
36. Williams, E.H.; Lucy, B.W. Checklists of the parasites of dolphin, *Coryphaena hippurus*, and pompano dolphin, *C. equiselis* with new records, corrections, and comments on the literature. *Rev. Fish. Sci.* **2010**, *18*, 73–93. [[CrossRef](#)]
37. Novelletto, A.; Testa, L.; Iacovelli, F.; Blasi, P.; Garofalo, L.; Mingozzi, T.; Falconi, M. Polymorphism in mitochondrial coding regions of Mediterranean loggerhead turtles: Evolutionary relevance and structural effects. *Physiol. Biochem. Zool.* **2016**, *89*, 473–486. [[CrossRef](#)]
38. Çiçek, E.; Oktener, A.; Capar, O.B.; Profile, S.E.E.; Profile, S.E.E. First report of *Pennella balaenopterae* Koren and Danielssen, 1877 (Copepoda: Pennellidae) from Turkey. *Turkiye Parazitol. Derg.* **2007**, *31*, 239–241. [[PubMed](#)]
39. Cornaglia, E.; Reborá, L.; Gili, C.; Guardo, G.D.I. Histopathological and Immunohistochemical Studies on Cetaceans Found Stranded on the Coast of Italy between 1990 and 1997. *J. Vet. Med. Ser. A Physiol. Pathol. Clin. Med.* **2000**, *47*, 129–142. [[CrossRef](#)] [[PubMed](#)]
40. Aznar, F.J.; Balbuena, J.A.; Raga, J.A. Are epizootics biological indicators of a western Mediterranean striped dolphin die-off? *Dis. Aquat. Organ.* **1994**, *18*, 159–163. [[CrossRef](#)]
41. Danyer, E.; Tonay, A.M.; Aytemiz, I.; Dede, A.; Yildirim, F.; Gurel, A. First report of infestation by a parasitic copepod (*Pennella balaenopterae*) in a harbour porpoise (*Phocoena phocoena*) from the Aegean Sea: A case report. *Vet. Med.* **2014**, *59*, 403–407. [[CrossRef](#)]
42. Foskolos, I.; Tougeli Provata, M.; Frantzis, A. First record of *Conchoderma auritum* (Cirripedia: Lepadidae) on *Ziphius cavirostris* (Cetacea: Ziphiidae) in Greece. *Ann. Ser. Hist. Nat.* **2017**, *27*, 29–34. [[CrossRef](#)]
43. Smith, T.G.; Aubin, D.J.S.; Hammill, M.O. Rubbing behaviour of belugas, *Delphinapterus leucas*, in a high Arctic estuary. *Can. J. Zool.* **1992**, *70*, 2405–2409. [[CrossRef](#)]
44. Morlock, G.E.; Ziltener, A.; Geyer, S.; Tersteegen, J.; Mehl, A.; Schreiner, T.; Kamel, T.; Brümmer, F. Evidence that Indo-Pacific bottlenose dolphins self-medicate with invertebrates in coral reefs. *iScience* **2022**, *25*, 104271. [[CrossRef](#)] [[PubMed](#)]
45. Fortune, S.M.E.; Koski, W.R.; Higdon, J.W.; Trites, A.W.; Baumgartner, M.F.; Ferguson, S.H. Evidence of molting and the function of “rock-nosing” behavior in bowhead whales in the eastern Canadian Arctic. *PLoS ONE* **2017**, *12*, e0186156. [[CrossRef](#)]
46. Garofalo, G.; Petrella, A.; Lucifora, G.; Di Francesco, G.; Di Guardo, G.; Pautasso, A.; Iulini, B.; Varello, K.; Giorda, F.; Gorla, M.; et al. Occurrence of *Brucella ceti* in striped dolphins from Italian Seas. *PLoS ONE* **2020**, *15*, e0240178. [[CrossRef](#)]
47. Grattarola, C.; Petrella, A.; Lucifora, G.; Di Francesco, G.; Di Nocera, F.; Pintore, A.; Cocumelli, C.; Terracciano, G.; Battisti, A.; Di Renzo, L.; et al. *Brucella ceti* Infection in Striped Dolphins from Italian Seas: Associated Lesions and Epidemiological Data. *Pathogens* **2023**, *12*, 1034. [[CrossRef](#)]
48. Duignan, P.J.; Geraci, J.R.; Raga, J.A.; Calzada, N. Pathology of morbillivirus infection in striped dolphins (*Stenella coeruleoalba*) from Valencia and Murcia, Spain. *Can. J. Vet. Res.* **1992**, *56*, 242–248. [[PubMed](#)]
49. Cuvertoret-Sanz, M.; López-Figueroa, C.; O'Byrne, A.; Canturri, A.; Martí-García, B.; Pintado, E.; Pérez, L.; Ganges, L.; Cobos, A.; Abarca, M.L.; et al. Causes of cetacean stranding and death on the Catalan coast (western Mediterranean Sea), 2012–2019. *Dis. Aquat. Organ.* **2020**, *142*, 239–253. [[CrossRef](#)] [[PubMed](#)]
50. Isidoro-Ayza, M.; Ruiz-Villalobos, N.; Pérez, L.; Guzmán-Verri, C.; Muñoz, P.M.; Alegre, F.; Barberán, M.; Chacón-Díaz, C.; Chaves-Olarte, E.; González-Barrientos, R.; et al. *Brucella ceti* infection in dolphins from the Western Mediterranean Sea. *BMC Vet. Res.* **2014**, *10*, 206. [[CrossRef](#)]
51. Vargas-Castro, I.; Peletto, S.; Mattioda, V.; Gorla, M.; Serracca, L.; Varello, K.; Sánchez-Vizcaíno, J.M.; Puleio, R.; Nocera, F.D.; Lucifora, G.; et al. Epidemiological and genetic analysis of Cetacean Morbillivirus circulating on the Italian coast between 2018 and 2021. *Front. Vet. Sci.* **2023**, *10*, 1216838. [[CrossRef](#)] [[PubMed](#)]

52. Rubio-Guerri, C.; Melero, M.; Esperón, F.; Bellière, E.N.; Arbelo, M.; Crespo, J.L.; Sierra, E.; García-Párraga, D.; Sánchez-Vizcaíno, J.M. Unusual striped dolphin mass mortality episode related to cetacean morbillivirus in the Spanish Mediterranean Sea. *BMC Vet. Res.* **2013**, *9*, 106. [[CrossRef](#)] [[PubMed](#)]
53. Di Guardo, G.; Di Francesco, C.E.; Eleni, C.; Cocumelli, C.; Scholl, F.; Casalone, C.; Peletto, S.; Mignone, W.; Tittarelli, C.; Di Nocera, F.; et al. Morbillivirus infection in cetaceans stranded along the Italian coastline: Pathological, immunohistochemical and biomolecular findings. *Res. Vet. Sci.* **2013**, *94*, 132–137. [[CrossRef](#)] [[PubMed](#)]
54. Van Bressen, M.F.; Duignan, P.J.; Banyard, A.; Barbieri, M.; Colegrove, K.M.; de Guise, S.; di Guardo, G.; Dobson, A.; Domingo, M.; Fauquier, D.; et al. Cetacean morbillivirus: Current knowledge and future directions. *Viruses* **2014**, *6*, 5145–5181. [[CrossRef](#)]
55. Aguilar, A.; Borrell, A. Abnormally high polychlorinated biphenyl levels in striped dolphins (*Stenella coeruleoalba*) affected by the 1990–1992 Mediterranean epizootic. *Sci. Total Environ.* **1994**, *154*, 237–247. [[CrossRef](#)]

Disclaimer/Publisher’s Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.