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Protect the Natives to Combat the Aliens: Could *Octopus vulgaris* Cuvier, 1797 Be a Natural Agent for the Control of the Lionfish Invasion in the Mediterranean Sea?

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Biological invasions constitute a major threat to native ecosystems and to global biodiversity [1,2]. The Mediterranean Sea, a biodiversity hotspot hosting about 17,000 species, is facing an unprecedented challenge due to the invasion of nonindigenous species (NIS) and is considered to be the most bioinvaded marine region in the world [3,4]. Although the number of recorded NIS has reached about 1000 so far, only a fraction of those have been documented to cause adverse impacts to the environment, pose a threat to human health and/or result in economic losses and increased management efforts [5–8].

Among NIS, the lionfish *Pterois miles* (Bennett, 1828) raised the concern of the regional scientific community of the Mediterranean Sea because of its rapid invasion and population expansion during the last decade [9,10]. The lionfish is native to the Indian Ocean and abundant in the Red Sea, with a geographical distribution that extends southwards to the eastern parts of South Africa, the Arabian Sea, the Persian Gulf, the Gulf of Oman, the Laccadive Sea, the Bay of Bengal, the Andaman Sea and the Indonesian region [11]. This taxon, together with other congeneric species, is involved in an ongoing invasion in the western Atlantic, where it is causing significant ecological and socioeconomic impacts [12–14]. The lionfish was reported for the first time in the Mediterranean Sea off Israel in 1991 [15], and following a twenty-year gap in observations it was sighted off nearby Lebanon in 2012 [16]. Then, within two years, a plethora of records followed from the entire Levantine Sea [17–21]. Its population expansion and establishment in the Mediterranean Sea were finally evident in several areas of the southern and central Aegean Sea and the eastern parts of the Ionian Sea, even reaching areas of the central Mediterranean Sea since 2015 [22–31]. Such timing accounts for one of the fastest fish invasions ever reported in the region.

The biological and ecological traits of lionfishes favor their invasion successes and impacts to the recipient ecosystems. They are coastal fish species that thrive in a wide range of depths [32–34] and usually hide in crevices or caves, thus making commercial fisheries techniques challenging [35]. They can also occur in unstable environmental conditions such as in areas with low salinity and/or characterized as turbid with high sediment

loads [36,37], and are generalist predators [38–40]. Lionfishes have a reproductive strategy that enables them to mature in less than a year [35]. The production of over two million eggs per year [41], and the planktonic larvae phase with an ability to drift for approximately 20–35 days before settlement, are additional traits that facilitate their dispersion across long distances [42]. Finally, they possess venomous dorsal, pelvic and anal spines that act as a protection from predators [26].

During a recreational scuba dive at the Cyclops dive site (Famagusta, Cyprus; 34.98584 N, 34.07787 E) on 09/02/2021 at 10:30 a.m., a lionfish (~25 cm in total length) was spotted by one of the coauthors of this note (M. S.-O.) at a depth of approximately 5 m near a small ledge. Soon after, a large *Octopus vulgaris* Cuvier, 1797 approached the lionfish and captured it by attaching its two arms along the lionfish's body. It slowly hauled it toward its mouth until it finally covered it with all its arms and web. The octopus did not release its prey, despite several attempts to escape. It then moved to the bottom of the ledge and first hid in a small crevice before moving to a bigger crevice. During this last phase, the lionfish was not moving anymore, suggesting that the toxin produced by the octopus was presumably already acting (Figure 1; Electronic Supplementary Material).

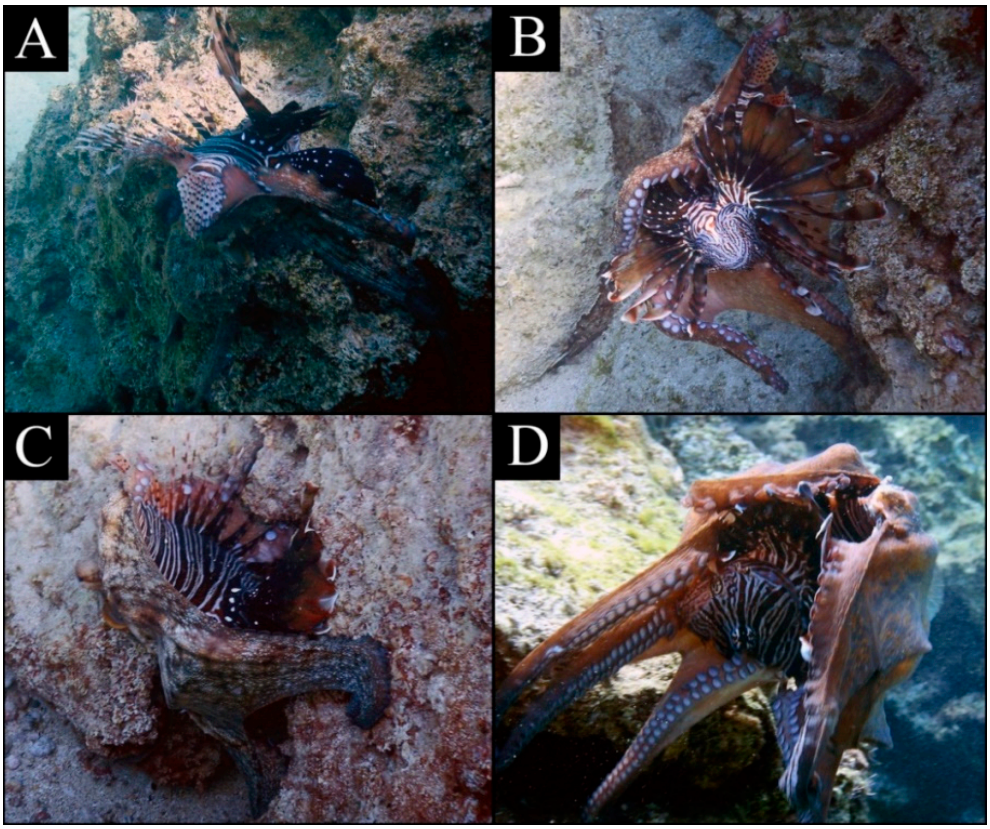

Figure 1. *Octopus vulgaris* Cuvier, 1797 preying on a lionfish in Famagusta (Cyprus). (**A**) The octopus soon after the catch. (**B**) The octopus enveloping the lionfish with all the arms and the web, moving to the bottom of the cliff. (**C**) The octopus hiding in a small crevice. (**D**) The octopus while moving to a bigger crevice. Photos by Maria Shokouros-Oskarsson.

To our knowledge, this is the first reliable evidence of lionfish predation in the Mediterranean Sea. In fact, only Turan et al. [43] reported and pictured a dusky grouper *Epinephelus marginatus* (Lowe, 1834) as "capturing and digesting a lionfish" (see [43]: Figure 8). However, the figure in the study of Turan et al. [43] clearly shows a grouper preying/feeding on a small native scorpaenid species of the genus *Scorpaena* Linnaeus, 1758.

Several species have been documented to prey on lionfishes in their native ranges, including groupers, cornetfishes, sharks, spotted moray eels and sea eagles [44–47], but information on predation from the invaded areas has only been rarely documented [48–50].

This is most likely because native predators are not yet adapted to this new potential prey. Lack of natural competitors might also be attributed to the higher growth rates and larger sizes of individuals in the invaded regions compared to those residing in the native ones, but also to the overfishing of top predators [35,51,52].

Octopus vulgaris, and octopuses in general, are well-known opportunistic predators with a broad generalist diet, including species with venomous spines [53–58]. At the same time, octopuses are also a target fishery species, with catches and landings strongly decreasing in several countries of the Mediterranean Sea [58]. Kleitou et al. [51] recently proposed the protection of native top predators as one of the possible ways to combat NIS establishment in the Mediterranean Sea; a proposal that is in line with our observation. Although more research would be needed to prove that such an observation is not a casual event, and that *O. vulgaris* may act as a natural predator of lionfishes in the Mediterranean Sea, the present study provides valuable information for future directed studies with the aim to improve the knowledge on NIS spread and developing control efforts. In addition, it suggests that proper fisheries management of *O. vulgaris* in the Mediterranean Sea could serve to control this and other NIS in the future.

Supplementary Materials: The following are available online at https://www.mdpi.com/2077-1312/9/3/308/s1, Video S1: *Octopus vulgaris* Cuvier, 1797 preying on a lionfish in Famagusta (Cyprus).

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References

1. Vitousek, P.M.; D'Antonio, C.M.; Loope, L.L.; Westbrooks, R. Biological invasions as global environmental change. *Am. Sci.* **1996**, *84*, 468–478.
2. Bax, N.; Williamson, A.; Aguero, M.; Gonzalez, E.; Geeves, W. Marine invasive alien species: A threat to global biodiversity. *Mar. Policy* **2003**, *27*, 313–323. [CrossRef]
3. Coll, M.; Piroddi, C.; Steenbeek, J.; Kaschner, K.; Lasrma, F.B.R.; Aguzzi, J.; Ballesteros, E.; Bianchi, C.N.; Corbera, J.; Dailianis, T.; et al. The biodiversity of the Mediterranean Sea: Estimates, Patterns, and Threats. *PLoS ONE.* **2010**, *5*, e11842. [CrossRef] [PubMed]
4. Edelist, D.; Rilov, G.; Golani, D.; Carlton, J.T.; Spanier, E. Restructuring the Sea: Profound shifts in the world's most invaded marine ecosystem. *Divers. Distrib.* **2013**, *19*, 69–77. [CrossRef]
5. Kalogirou, S. Ecological characteristics of the invasive pufferfish *Lagocephalus sceleratus* (Gmelin, 1789) in Rhodes, Eastern Mediterranean Sea. A case study from Rhodes. *Medit. Mar. Sci.* **2013**, *14*, 251–260. [CrossRef]
6. Katsanevakis, S.; Coll, M.; Piroddi, C.; Steenbeek, C.; Lasram, F.B.R.; Zenetos, A.; Cardoso, A.C. Invading the Mediterranean Sea: Biodiversity patterns shaped by human activities. *Front. Mar. Sci.* **2014**, *1*, 32. [CrossRef]
7. Ghermandi, A.; Galil, B.; Gowdy, J.; Nunes, P.A. Jellyfish outbreak impacts on recreation in the Mediterranean Sea: Welfare estimates from a socioeconomic pilot survey in Israel. *Ecosyst. Serv.* **2015**, *11*, 140–147. [CrossRef]
8. Zenetos, A.; Çinar, M.E.; Crocetta, F.; Golani, D.; Rosso, A.; Servello, G.; Shenkar, N.; Turon, X.; Verlaque, M. Uncertainties and validation of alien species catalogues: The Mediterranean as an example. *Estuar. Coast. Shelf Sci.* **2017**, *191*, 171–187. [CrossRef]
9. Kleitou, P.; Savva, I.; Kletou, D.; Hall-Spencer, J.M.; Antoniou, C.; Christodoulides, Y.; Chartosia, N.; Hadjioannou, L.; Dimitrou, A.C.; Jimenez, C.; et al. Invasive lionfish in the Mediterranean: Low public awareness yet high stakeholder concerns. *Mar. Policy* **2019**, *104*, 66–74. [CrossRef]
10. Kleitou, P.; Hall-Spencer, J.; Savva, I.; Kletou, D.; Hadjistylli, M.; Azzurro, E.; Katsanevakis, S.; Antoniou, C.; Hadjioannou, L.; Chartosia, N.; et al. The Case of Lionfish (*Pterois miles*) in the Mediterranean Sea Demonstrates Limitations in EU Legislation to Address Marine Biological Invasions. *J. Mar. Sci. Eng.* **2021**, in press.

11. Kulbicki, M.; Beets, J.; Chabanet, P.; Cure, K.; Darling, E.; Floeter, S.R.; Galzin, R.; Green, A.; Harmelin-Vivien, M.; Hixon, M.; et al. Distributions of Indo-Pacific lionfishes *Pterois* spp. in their native ranges: Implications for the Atlantic invasion. *Mar. Ecol. Prog. Ser.* **2012**, *446*, 189–205. [CrossRef]
12. Hixon, M.A.; Green, S.J.; Albins, M.A.; Akins, J.L.; Morris Jr., J.A. Lionfish: A major marine invasion. *Mar. Ecol. Prog. Ser.* **2016**, *558*, 161–165. [CrossRef]
13. Bors, E.K.; Herrera, S.; Morris Jr, J.A.; Shank, T.M. Population genomics of rapidly invading lionfish in the Caribbean reveals signals of range expansion in the absence of spatial population structure. *Ecol. Evol.* **2019**, *9*, 3306–3320. [CrossRef] [PubMed]
14. Bumbeer, J.; Moreira da Rocha, R.; Bornatowski, H.; de Castro Robert, M.; Ainsworth, C. Predicting impacts of lionfish (*Pterois volitans*) invasion in a coastal ecosystem of southern Brazil. *Biol. Invasions* **2018**, *20*, 1257–1274. [CrossRef]
15. Golani, D.; Sonin, O. New records of the Red Sea fishes, *Pterois miles* (Scorpaenidae) and *Pteragogus pelycus* (Labridae), from the eastern Mediterranean Sea. *Jpn. J. Ichthyol.* **1992**, *39*, 167–169. [CrossRef]
16. Bariche, M.; Torres, M.; Azzurro, E. The presence of the invasive Lionfish *Pterois miles* in the Mediterranean Sea. *Mediterr. Mar. Sci.* **2013**, *14*, 292–294. [CrossRef]
17. Turan, C.; Öztürk, B. First record of the lionfish *Pterois miles* from the Aegean Sea. *J. Black Sea/Mediterr. Environ.* **2015**, *21*, 334–338.
18. Oray, I.; Sınay, E.; Saadet Karakulak, F.; Yıldız, T. An expected marine alien fish caught at the coast of Northern Cyprus: *Pterois miles* (Bennett, 1828). *J. Appl. Ichthyol.* **2015**, *31*, 733–735. [CrossRef]
19. Crocetta, F.; Agius, D.; Balistreri, P.; Bariche, M.; Bayhan, Y.K.; Çakir, M.; Ciriaco, S.; Corsini-Foka, M.; Deidun, A.; El Zrelli, R.; et al. New Mediterranean Biodiversity Records (October 2015). *Mediterr. Mar. Sci.* **2015**, *16*, 682–702. [CrossRef]
20. Iglésias, P.S.; Frotté, L. Alien marine fishes in Cyprus: Update and new records. *Aquat. Invasions* **2015**, *10*, 425–438. [CrossRef]
21. Kletou, D.; Hall-Spencer, J.M.; Kleitou, P. A lionfish (*Pterois miles*) invasion has begun in the Mediterranean Sea. *Mar. Biodivers. Rec.* **2016**, *9*, 46. [CrossRef]
22. Dailianis, T.; Akyol, O.; Babali, N.; Bariche, M.; Crocetta, F.; Gerovasileiou, V.; Ghanem, R.; Gökoğlu, M.; Hasiotis, T.; Izquierdo-Muñoz, A.; et al. New Mediterranean Biodiversity Records (July 2016). *Mediterr. Mar. Sci.* **2016**, *17*, 608–626. [CrossRef]
23. Mytilineou, Ch.; Akel, E.H.K.; Babali, N.; Balistreri, P.; Bariche, M.; Boyaci, Y.Ö.; Cilenti, L.; Constantinou, C.; Crocetta, F.; Çelik, M.; et al. New Mediterranean Biodiversity Records (November, 2016). *Mediterr. Mar. Sci.* **2016**, *17*, 794–821. [CrossRef]
24. Azzurro, E.; Stancanelli, B.; Di Martino, V.; Bariche, M. Range expansion of the common lionfish *Pterois miles* (Bennett, 1828) in the Mediterranean Sea: An unwanted new guest for Italian waters. *Bioinvasions Rec.* **2017**, *6*, 95–98. [CrossRef]
25. Bariche, M.; Kleitou, P.; Kalogirou, S.; Bernardi, G. Genetics reveal the identity and origin of the lionfish invasion in the Mediterranean Sea. *Sci. Rep.* **2017**, *7*, 6782. [CrossRef]
26. Karachle, P.K.; Corsini Foka, M.; Crocetta, F.; Dulčić, J.; Dzhembekova, N.; Galanidi, M.; Ivanova, P.; Shenkar, N.; Skolka, M.; Stefanova, E.; et al. Setting-up a billboard of marine invasive species in the ESENIAS area: Current situation and future expectancies. *Acta Adriatica* **2017**, *58*, 429–458. [CrossRef]
27. Yokeş, M.B.; Andreou, V.; Bakiu, R.; Bonanomi, S.; Camps, J.; Christidis, G.; Crocetta, F.; Giovos, I.; Gori, A.; Juretić, T.; et al. New Mediterranean Biodiversity Records (November 2018). *Mediterr. Mar. Sci.* **2018**, *19*, 675–689. [CrossRef]
28. Charalambos, A.; Kleitou, P.; Crocetta, F.; Lorenti, M. First record of ectoparasitic isopods on the invasive lionfish *Pterois miles* (Bennett, 1828). *Spixiana* **2019**, *42*, 217–218.
29. Dimitriadis, C.; Galanidi, M.; Zenetos, A.; Corsini-Foka, M.; Giovos, I.; Karachle, P.; Fournari-Konstantinidoy, I.; Kytinou, E.; Issaris, Y.; Azzurro, E.; et al. Updating the occurrences of *Pterois miles* in the Mediterranean Sea, with considerations on thermal boundaries and future range expansion. *Mediterr. Mar. Sci.* **2020**, *21*, 62–69. [CrossRef]
30. Katsanevakis, S.; Poursanidis, D.; Hoffman, R.; Rizgalla, J.; Bat-Sheva Rothman, S.; Levitt-Barmats, Y.; Hadjioannou, L.; Trkov, D.; Garmendia, J.M.; Rizzo, M.; et al. Unpublished Mediterranean records of marine alien species. *Bioinvasions Rec.* **2020**, *9*, 165–182. [CrossRef]
31. Poursanidis, D.; Kalogirou, S.; Azzurro, E.; Parravicini, V.; Bariche, M.; Dohnaf, H. Habitat suitability, niche unfilling and the potential spread of *Pterois miles* in the Mediterranean Sea. *Mar. Poll. Bull.* **2020**, *154*, 111054. [CrossRef] [PubMed]
32. Schultz, E.T. *Pterois volitans* and *Pterois miles*: Two valid species. *Copeia* **1986**, *3*, 686–690. [CrossRef]
33. Andradi-Brown, D.A. Invasive Lionfish (*Pterois volitans* and *P. miles*): Distribution, Impact, and Management. In *Mesophotic Coral Ecosystems. Coral Reefs of the World*; Loya, Y., Puglise, K., Bridge, T., Eds.; Springer: Cham, Germany, 2019; Volume 12, pp. 931–941. [CrossRef]
34. Gress, E.; Andradi-Brown, D.A.; Woodall, L.; Schofield, P.J.; Stanley, K.; Rogers, A.D. Lionfish (*Pterois* spp.) invade the upper-bathyal zone in the western Atlantic. *PeerJ* **2017**, *5*, e3683. [CrossRef] [PubMed]
35. Savva, I.; Chartosia, N.; Antoniou, C.; Kleitou, P.; Georgiou, A.; Stern, N.; Hadjioannou, L.; Jimenez, C.; Andreou, V.; Hall-Spencer, J.M.; et al. They are here to stay: The biology and ecology of lionfish (*Pterois miles*) in the Mediterranean Sea. *J. Fish Biol.* **2020**, *97*, 148–162. [CrossRef] [PubMed]
36. Cure, K.; Mcllwain, J.; Hixon, M.A. Habitat plasticity in native Pacific red lionfish *Pterois volitans* facilitates successful invasion of the Atlantic. *Mar. Ecol. Prog. Ser.* **2014**, *506*, 243–253. [CrossRef]
37. Jud, Z.R.; Nichols, P.K.; Layman, C.A. Broad salinity tolerance in the invasive lionfish *Pterois* spp. may facilitate estuarine colonization. *Environ. Biol. Fish.* **2015**, *98*, 135–143. [CrossRef]
38. Eddy, C.; Pitt, J.; Morris, J.; Smith, S.; Goodbody-Gringley, G.; Bernal, D. Diet of invasive lionfish (*Pterois volitans* and *P. miles*) in Bermuda. *Mar. Ecol. Prog. Ser.* **2016**, *558*, 193–206. [CrossRef]

39. Peake, J.; Bogdanoff, A.K.; Layman, C.A.; Castillo, B.; Reale-Munroe, K.; Chapman, J.; Dahl, K.; Patterson III, W.F.; Eddy, C.; Ellis, R.D.; et al. Feeding ecology of invasive lionfish (*Pterois volitans* and *Pterois miles*) in the temperate and tropical western Atlantic. *Biol. Invasions* **2018**, *20*, 2567–2597. [CrossRef]
40. Zannaki, K.; Corsini-Foka, M.; Kampouris, Th.E.; Batjakas, I.E. First results on the diet of the invasive *Pterois miles* (Actinopterygii: Scorpaenidae) in the Hellenic waters. *Acta Ichthyol. Piscat.* **2019**, *49*, 311–317. [CrossRef]
41. Morris, J.A.; Whitfield, P.E. *Biology, Ecology, Control and Mmanagement of the Invasive Indo-Pacific Lionfish: An Updated Untegrated Assessment*; NOAA Technical Memorandum NOS NCCOS 99: Beaufort, SC, USA, December 2009.
42. Ahrenholz, D.W.; Morris, J.A. Larval duration of the lionfish, *Pterois volitans* along the Bahamian Archipelago. *Environ. Biol. Fish.* **2010**, *88*, 305–309. [CrossRef]
43. Turan, C.; Uygur, N.; İğde, M. Lionfishes *Pterois miles* and *Pterois volitans* in the North-eastern Mediterranean Sea: Distribution, Habitation, Predation and Predators. *NESciences* **2017**, *2*, 35–43. [CrossRef]
44. Bernadsky, G.; Goulet, D. A natural predator of the lionfish, *Pterois miles*. *Copeia* **1991**, *1*, 230–231. [CrossRef]
45. Barbour, A.B.; Allen, M.S.; Frazer, T.K.; Sherman, K.D. Evaluating the Potential Efficacy of Invasive Lionfish (*Pterois volitans*) Removals. *PLoS ONE* **2011**, *6*, e19666. [CrossRef]
46. Mumby, P.J.; Harborne, A.R.; Brumbaugh, D.R. Grouper as a Natural Biocontrol of Invasive Lionfish. *PLoS ONE* **2011**, *6*, e21510. [CrossRef] [PubMed]
47. Bos, A.R.; Sanad, A.M.; Elsayed, K. *Gymnothorax* spp. (Muraenidae) as natural predators of the lionfish *Pterois miles* in its native biogeographical range. *Environ. Biol. Fish.* **2017**, *100*, 745–748. [CrossRef]
48. Maljković, A.; Van Leeuwen, T.E.; Cove, S.N. Predation on the invasive red lionfish, *Pterois volitans* (Pisces: Scorpae-nidae), by native groupers in the Bahamas. *Coral Reefs* **2008**, *27*, 501. [CrossRef]
49. Diller, J.L.; Frazer, T.K.; Jacoby, C.A. Coping with the lionfish invasion: Evidence that naïve, native predators can learn to help. *J. Exp. Mar. Biol. Ecol.* **2014**, *455*, 45–49. [CrossRef]
50. Muñoz, R.C. Evidence of natural predation on invasive lionfish, *Pterois* spp., by the spotted moray eel, *Gymnothorax moringa*. *Bull. Mar. Sci.* **2017**, *93*, 789–790. [CrossRef]
51. Darling, E.S.; Green, S.J.; O'Leary, J.K.; Côté, I.M. Indo-Pacific lionfish are larger and more abundant on invaded reefs: A comparison of Kenyan and Bahamian lionfish populations. *Biol. Invasions* **2011**, *13*, 2045–2051. [CrossRef]
52. Kleitou, P.; Crocetta, F.; Giakoumi, S.; Giovos, I.; Hall-Spencer, J.M.; Kalogirou, S.; Kletou, D.; Moutopoulos, D.H.; Rees, S. Fishery reforms for the management of non-indigenous species. *J. Environ. Manag.* **2021**, *280*, 111690. [CrossRef] [PubMed]
53. Taylor, P.B.; Chen, L.C. The predator-prey relationship between the octopus (*Octopus bimaculatus*) and the California scorpionfish (*Scorpaena guttata*). *Pac. Sci.* **1969**, *23*, 311–316.
54. Ambrose, R.F.; Nelson, B.V. Predation by *Octopus vulgaris* in the Mediterranean. *Mar. Ecol.* **1983**, *4*, 251–261. [CrossRef]
55. Hanlon, R.T.; Messenger, J.B. *Cephalopod Behaviour*; Cambridge University Press: Cambridge, UK, 1996.
56. Villanueva, R.; Nozais, C.; Boletzky, S.v. Swimming behaviour and food searching in planktonic *Octopus vulgaris* Cuvier from hatching to settlement. *J. Exp. Mar. Biol. Ecol.* **1997**, *208*, 169–184. [CrossRef]
57. Pierce, G.J.; Allcock, L.; Bruno, I.; Bustamante, P.; González, A.; Guerra, A.; Jereb, P.; Lefkaditou, E.; Malham, S.; Moreno, A.; et al. *Cephalopod Biology and Fisheries in Europe*; ICES cooperative research report, 303; ICES: Copenhagen, Denmark, August 2010; p. 175.
58. Sauer, W.H.H.; Gleadall, I.G.; Downey-Breedt, N.; Doubleday, Z.; Gillespie, G.; Haimovici, M.; Ibáñez, C.M.; Katugin, O.N.; Leporati, S.; Lipinski, M.R.; et al. World Octopus Fisheries. *Rev. Fish. Sci. Aquac.* **2021**, 1–151. [CrossRef]