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# Finding a Pied-à-Terre: Harbour Infrastructure Facilitates the Settlement of Non-Native Corals (*Tubastraea* spp.) in the Southern Caribbean

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**Abstract:** Semi-submersible platforms are used in the offshore oil and gas industry. They are specialised marine vessels that float on submersed drafts, which are composed of pontoons and columns and can serve as habitats for biofouling marine benthic communities. When these vessels sail from one place to another, either by using their own propellers or being towed, they can act as vectors for introducing non-native marine species. To establish themselves in new areas, these exotic species require suitable benthic habitats. Artificial substrates, such as harbour infrastructure where such vessels are moored, appear to be highly suitable for this purpose. In the present study, a mooring buoy and a harbour piling at Curaçao (southern Caribbean), frequently used by semi-submersible platforms, were found to be colonised by the sun corals *Tubastraea coccinea* and *T. tagusensis* at shallow depths. This report presents the first record of *T. tagusensis* as an introduced non-native species in the southern Caribbean, highlighting the potential role of harbour infrastructure in facilitating coral settlement at depths shallower than those typically observed. These findings underscore the ecological impact of artificial substrates in supporting invasive species and emphasise the need for monitoring programs and defouling facilities.

**Keywords:** artificial substrate; biofouling; Curaçao; exotic; invasive; manmade substrate; non-indigenous



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Maritime ports and marinas are recognised as gateways for the introduction of exotic marine species transported via ballast water and hull biofouling [1–7]. Non-native and cryptogenic marine species have also been reported from the Caribbean and the Gulf of Mexico, although only a few of these cases involve species observed on shipping and harbour infrastructure [8–15]. Others are introduced through different pathways, such as aquarium animals released into the wild, including fishes and octocorals [10,16–22], mushroom corals that were left over from a scientific experiment [23,24], and biofoulers on shipwrecks and oil rigs [25–34].

Curaçao is an island nation in the southern Caribbean, where extensive research on coral reef biodiversity has been conducted [35]. It is the second locality from which the invasive coral *Tubastraea coccinea* Lesson, 1930, has been reported, the first being Puerto Rico [8,36,37]. St. Michiel Bay and Caracas Bay (Figure 1) are among several sites at Curaçao, where this species was reported as *Tubastraea tenuilamellosa* (Milne Edwards & Haime, 1848) [38], based on collections made by the Dutch naturalist Dr. Pieter Wagenaar Hummelinck in the 1940s and 1950s [39,40]. In 1955, Wagenaar Hummelinck himself mentioned the presence of corals on a mooring buoy anchored in Caracas Bay since 1942, but he did not mention which species [40].

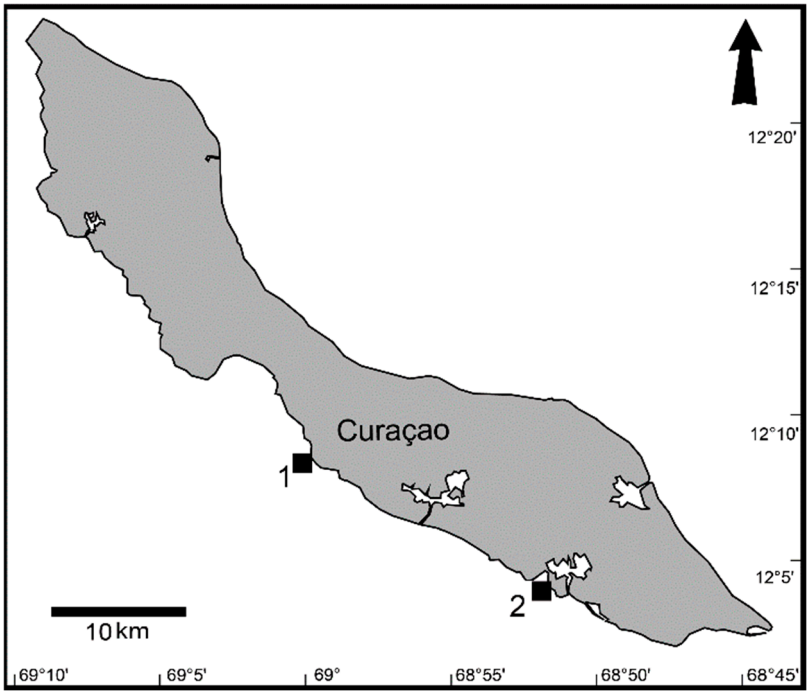


**Figure 1.** Map of Curaçao showing the position of long-term mooring locations for semi-submersible platforms: 1. Mooring buoy at Boca Sami Beach, St. Michiel Bay; 2. Caracas Bay mooring jetties and harbour pilings near Tugboat Beach.

Both sites have a history of moored semisubmersible platforms for the offshore oil and gas industry, which use these locations for maintenance or parking during temporary or final decommission [14]. One of these platforms was examined in 2017 for the presence of non-native species, resulting in new records of some non-indigenous species in the southern Caribbean, among which was *Tubastraea tagusensis* Wells, 1982, co-occurring with *T. coccinea* [14,15].

*Tubastraea tagusensis* had not been reported before as an introduced species in the southern Caribbean [14]. Previous records in the West Atlantic are from Brazil, where it was first observed in 2000 [37,41,42] and the northern Gulf of Mexico, where it was recorded in 2019 [37,43]. The observation of *T. tagusensis* on a semisubmersible platform that was moored for one year near Boca Sami Beach off Curaçao [14] does not really constitute a record for a new introduced species. This is because it was found on a floating structure that was only temporarily stationed there after operating in the southern Gulf of Mexico for two decades [14]. Two monitoring dives on the mooring buoy at Boca Sami in March 2019 only revealed high densities of *T. coccinea* but no presence of *T. tagusensis* (B.W.H., unpublished observation). The latter species was also not found during extensive reef surveys at these localities in October–December 2021 and April 2022 [44,45].

In March 2023, new coral diversity surveys were performed, which included Boca Sami Beach in St. Michiel Bay and Tugboat Beach in Caracas Bay (Figures 2 and 3). At both sites, *T. tagusensis* was found to co-occur with *T. coccinea.* The mooring buoy at Boca Sami (12°08′49.8″ N, 69°00′02.1″ W) showed a high cover of *T. coccinea* at its underside (Figure 4a) and on the 40 cm wide anchor chain (ranging from 0.5 to 16 m depth) underneath the buoy (Figure 4b). A cluster of *T. tagusensis* was found at 7–8 m depths. Other chains, attached to concrete blocks on the reef flat, were either partly covered by native reef corals or had no coral cover (Figure 4c,d).

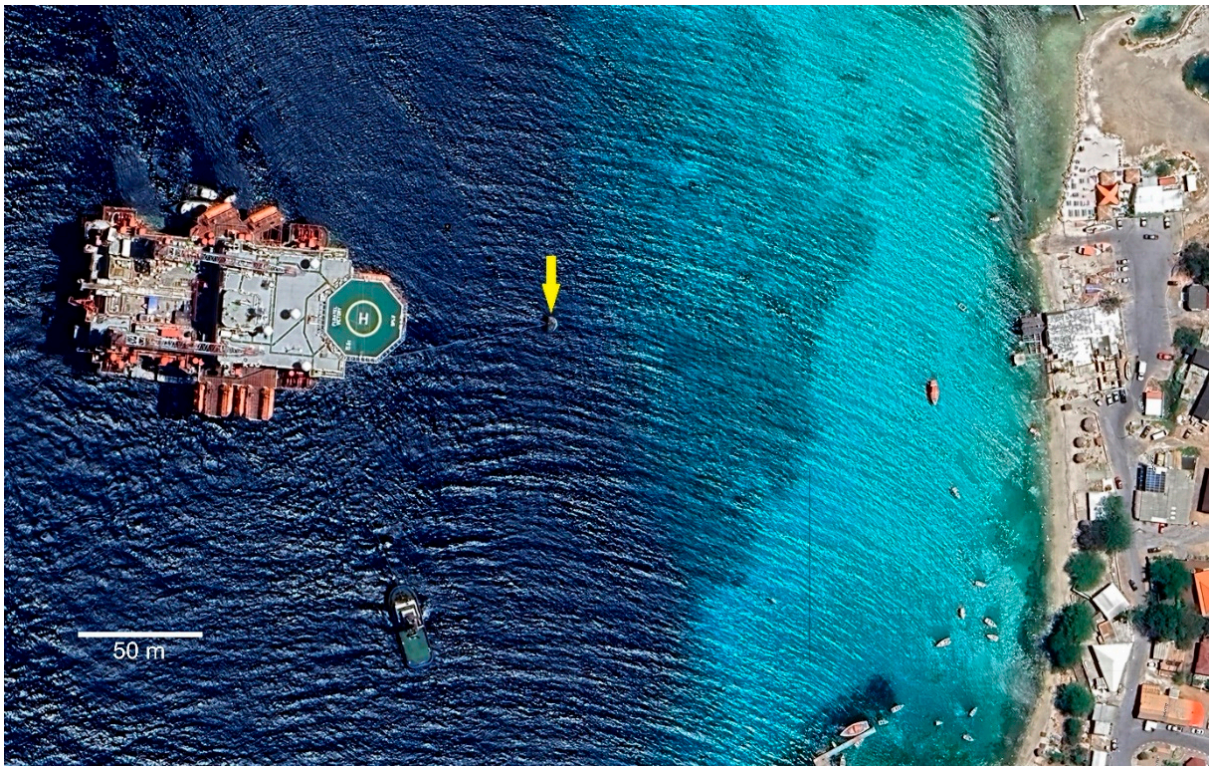


**Figure 2.** Aerial view of a semi-submersible platform attached to a mooring buoy (arrow) near Boca Sami Beach (St. Michiel Bay, Curaçao), on which two *Tubastraea* species were found. Source: Google Maps; Imagery, Airbus Maxar ©2024.

The pink, orange *T. coccinea* with relatively short calyces (Figure 5a) and the yellow-orange *T. tagusensis* with longer calyces (Figure 5b,c) on the buoy could easily be distinguished based on their morphology and colouration [14,37,41]. Another colony of *T. tagusensis* was observed at 1 m depth on a harbour piling at Tugboat Beach in Caracas Bay (12°04′05.9″ N, 68°51′43.3″ W), next to a colony of *T. coccinea* (Figure 5d).

These observations represent the first records of *T. tagusensis* settling in a coral reef area in the southern Caribbean, but it has to be noted that the corals were only found on man-made substrates. Without artificial substrates, such as mooring buoys, harbour pilings and jetties, this species may not be able to colonise the coastline of Curaçao. Another sun coral, the endemic deep-water species *Cladopsammia manuelensis* (Chevalier, 1966), was recently discovered on Caribbean reefs and can also be found on artificial substrates [28,46]. It can be distinguished from both invasive *Tubastraea* species by the presence of stolons, fused septa (following the so-called *Pourtalès plan*), and its unique colouration, which ranges from grey to brick-red or dark orange [28]. Furthermore, there is a smaller endemic cup coral in the Caribbean, *Rhizopsammia goesi* (Lindstrom, 1877), usually found in deeper, mesophotic waters [47–49] but also reported from less than 30 m deep [50].

It is noteworthy that the *T. tagusensis* colonies in Curaçao were observed at shallow depths (7–8 m and 1 m). In its native Indo-Pacific range, this species has been recorded from depths between 3 and 43 m [51]. In Brazil, it has been reported at various depths, such as 2 m [52], 5 m [53], 3–8 m [54], 4–7 m [55], and 15–30 m [56]. In the Northern Gulf of Mexico, it has been reported from a depth range of 20–40 m [43]. Depth records from some other non-native localities are ambiguous, as they refer to a mix of *T. tagusensis* and *T. coccinea.* The shallow records from Curaçao could be related to the availability of artificial substrates, such as harbour infrastructure that extends up to and above the water surface. Maximum depths are less relevant to this study because the species is azooxanthellate and does not need sunlight [36]. Minimum depth records of other Caribbean corals are also linked to man-made substrates. For example, the deep-water species *C. manuelensis* was observed at 3 m depth

underneath a sunken pontoon in Piscadera Bay and at 4 m depth inside a shipwreck in Caracas Bay (both Curaçao) [28], despite its typical depth range of 70–366 m [36].


**Figure 3.** Aerial view of two semi-submersible platforms moored at jetties in Caracas Bay, Curaçao. Arrow: the position of a harbour piling at Tugboat Beach where two *Tubastraea* species were found. Source: Google Maps; Imagery, Airbus Maxar ©2024.

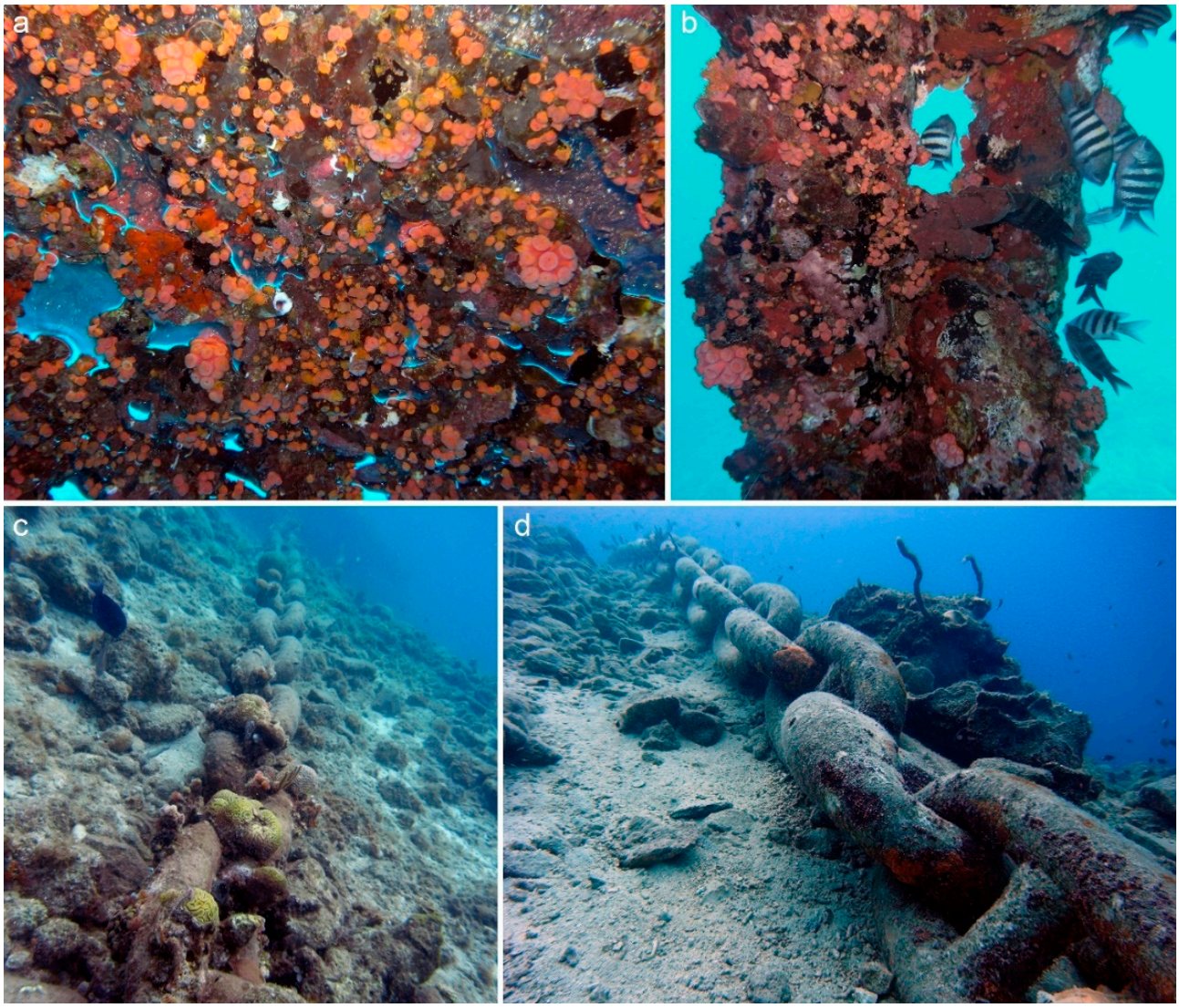


**Figure 4.** Mooring buoy at Boca Sami, St. Michiel Bay, Curaçao (March 2023). (**a**) Underside of the buoy showing a high density of *Tubastraea coccinea*, 0.5 m depth; (**b**) Part of the anchor chain underneath the buoy with 100% cover of fouling organisms, including *Tubastraea* spp., 3 m depth; and (**c**) Chain section, partially overgrown by native reef corals attached to a concrete block to hold the buoy in position, 5 m depth. (**d**) Chain links not covered by fouling animals (40 cm wide), 8 m depth. Photo credit: B.W.H.

Similarly, the cryptogenic *Phyllangia pequegnatae* Cairns, 2000, was recorded at 0.3 m depth on a concrete substrate under docks in a marina at Puerto Velero, Colombia [57], rather than its previously known depth range of 48–112 m [36]. These findings suggest that artificial substrates in harbour environments may enable certain coral species to establish at much shallower depths than those typically observed in natural habitats.

The present observations support earlier findings that semi-submersible platforms can act as vectors for introducing non-native species [14,15,37,58,59], facilitated by harbour infrastructure that serves as a settlement substrate (present study). These findings should motivate port authorities to (a) monitor semi-submersible platforms and mooring infrastructure for the presence of non-native marine biota and (b) offer defouling facilities [58,59].


**Figure 5.** Non-native *Tubastraea* corals as fouling organisms on harbour infrastructure in Curaçao (March 2023). (**a**) *Tubastraea coccinea* (two colour morphs) attached to the underside of a mooring buoy at Boca Sami, 0.5 m depth; (**b**,**c**) *Tubastraea tagusensis* attached to the buoy's anchor chain at Boca Sami, 7–8 m depth; and (**d**) Adjacent colonies of *Tubastraea coccinea* (top) and *T. tagusensis* (bottom) on a harbour piling at Tugboat Beach in Caracas Bay, 1 m depth. Scale bars: 1 cm. Photo credit: B.W.H.

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## References


1. Gittenberger, A.; Rensing, M.; Stegenga, H.; Hoeksema, B.W. Native and non-native species of hard substrata in the Dutch Wadden Sea. *Ned. Faun. Meded.* **2010**, *33*, 21–75.
2. Gittenberger, A.; van Stelt, R.C. Artificial structures in harbors and their associated ascidian fauna. *Aquat. Invasions* **2011**, *6*, 413–420. [CrossRef]
3. Tempesti, J.; Mangano, M.C.; Langeneck, J.; Lardicci, C.; Maltagliati, F.; Castelli, A. Non-indigenous species in Mediterranean ports: A knowledge baseline. *Mar. Environ. Res.* **2020**, *161*, 105056. [CrossRef] [PubMed]
4. Costello, K.E.; Lynch, S.A.; McAllen, R.; O'Riordan, R.M.; Culloty, S.C. Assessing the potential for invasive species introductions and secondary spread using vessel movements in maritime ports. *Mar. Pollut. Bull.* **2022**, *177*, 113496. [CrossRef] [PubMed]
5. Madon, B.; David, R.; Torralba, A.; Jung, A.; Marengo, M.; Thomas, H. A review of biodiversity research in ports: Let's not overlook everyday nature! *Ocean Coast. Manag.* **2023**, *242*, 106623. [CrossRef]
6. Fernandes, M.R.; Suga, C.M.; Marques, M.M.; Salgueiro, F. From port to port: The invasive bivalve *Mytilopsis* cf. *sallei* (Dreissenidae) is confirmed in southeastern Brazil. *Molluscan Res.* **2024**, *44*, 229–240. [CrossRef]
7. Ferrario, J.; Marchini, A.; Gazzola, F.; Occhipinti-Ambrogi, A. The influence of recreational boat traffic in the introduction of non-indigenous fouling species in three Ligurian marinas (Mediterranean Sea, Italy). *Estuar. Coast. Shelf Sci.* **2024**, *303*, 108810. [CrossRef]
8. Boschma, H. On specimens of the coral genus *Tubastraea*, with notes on phenomena of fission. *Stud. Fauna Curaçao Caribb. Isl.* **1953**, *4*, 9–12.
9. Fenner, D. Biogeography of three Caribbean corals (Scleractinia) and the invasion of *Tubastraea coccinea* into the Gulf of Mexico. *Bull. Mar. Sci.* **2001**, *69*, 1175–1189.
10. Wells, F.E.; Bieler, R. A low number of introduced marine species at low latitudes: A case study from southern Florida with a special focus on Mollusca. *Manag. Biol. Invasions* **2020**, *11*, 372–398. [CrossRef]
11. Tidbury, H.J.; Copp, G.H.; Davison, P.I.; Olsson, K.; Graham, J.A.; Hill, T.W.; Vilizzi, L.; Stebbing, P.D. Non-native marine species risk screening and vector analysis to inform conservation management in the southern Caribbean. *Aquat. Conserv. Mar. Freshw. Ecosyst.* **2021**, *31*, 3564–3579. [CrossRef]
12. Samimi-Namin, K.; van Ofwegen, L.P.; Hoeksema, B.W.; Woodall, L.C.; Meijer Zu Schlochtern, M.; McFadden, C.S. New records of the cryptogenic soft coral genus *Stragulum* (Tubiporidae) from the Eastern Caribbean and the Persian Gulf. *Diversity* **2022**, *14*, 909. [CrossRef]
13. Hoeksema, B.W.; Meijer zu Schlochtern, M.P.; Samimi-Namin, K.; McFadden, C.S. In the aftermath of Hurricane Irma: Colonisation of a 4-year-old shipwreck by native and non-native corals, including a new cryptogenic species for the Caribbean. *Mar. Pollut. Bull.* **2023**, *188*, 112576. [CrossRef]
14. Hoeksema, B.W.; Samimi-Namin, K.; McFadden, C.S.; Rocha, R.M.; van Ofwegen, L.P.; Hiemstra, A.F.; Vermeij, M.J.A. Non-native coral species dominate the fouling community on a semi-submersible platform in the southern Caribbean. *Mar. Pollut. Bull.* **2023**, *194*, 115354. [CrossRef] [PubMed]
15. Hoeksema, B.W.; Samimi-Namin, K.; Vermeij, M.J.A. Neutral interactions among three nonindigenous coral species in a tropical marine fouling community. *Ecology* **2024**, *105*, e4371. [CrossRef]
16. Betancur, R.-R.; Hines, A.; Acero, A.P.; Ortí, G.; Wilbur, A.E.; Freshwater, D.W. Reconstructing the lionfish invasion: Insights into Greater Caribbean biogeography. *J. Biogeogr.* **2011**, *38*, 1281–1293. [CrossRef]
17. Côté, I.M.; Green, S.J.; Hixon, M.A. Predatory fish invaders: Insights from Indo-Pacific lionfish in the western Atlantic and Caribbean. *Biol. Conserv.* **2013**, *164*, 50–61. [CrossRef]
18. Debrot, A.O.; Brunel, T.; Izioka, A.K. The levelling-off and recent rapid decline in population density of the highly prolific invasive lionfish on the Saba Bank, Eastern Caribbean. *Biol. Invasions* **2023**, *25*, 3033–3041. [CrossRef]
19. Del Río, L.; Navarro-Martínez, Z.M.; Cobián-Rojas, D.; Chevalier-Monteagudo, P.P.; Angulo-Valdes, J.A.; Rodriguez-Viera, L. Biology and ecology of the lionfish *Pterois volitans*/*Pterois miles* as invasive alien species: A review. *PeerJ* **2023**, *11*, e15728. [CrossRef]
20. Ruiz Allais, J.P.; Amaro, M.E.; McFadden, C.S.; Halász, A.; Benayahu, Y. The first incidence of an alien soft coral of the family Xeniidae in the Caribbean, an invasion in eastern Venezuelan coral communities. *Coral Reefs* **2014**, *33*, 287. [CrossRef]
21. Espinosa, J.; Estrada, R.; Ruiz-Allais, J.P. Presencia en Cuba de la especie marina invasora *Unomia stolonifera* (Gohar, 1938) (Octocorallia, Alcyonacea). Acciones para su control y eliminación. *Rev. Investig. Mar.* **2023**, *43*, 140–146. [CrossRef]
22. Ruiz-Allais, J.P.; Benayahu, Y.; Lasso-Alcalá, O.M. The invasive octocoral Unomia stolonifera (Alcyonacea, Xeniidae) is dominating the benthos in the Southeastern Caribbean Sea. *Mem. Fund. Salle Cienc. Nat.* **2021**, *79*, 63–80. [CrossRef]
23. Bush, S.L.; Precht, W.F.; Woodley, J.D.; Bruno, J.F. Indo-Pacific mushroom corals found on Jamaican reefs. *Coral Reefs* **2004**, *23*, 234. [CrossRef]
24. LaJeunesse, T.C.; Lee, S.; Bush, S.; Bruno, J.F. Persistence of non-Caribbean algal symbionts in Indo-Pacific mushroom corals released to Jamaica 35 years ago. *Coral Reefs* **2005**, *24*, 157–159. [CrossRef]
25. Fenner, D.; Banks, K. Orange cup coral *Tubastraea coccinea* invades Florida and the Flower Garden Banks, northwestern Gulf of Mexico. *Coral Reefs* **2004**, *23*, 505–507. [CrossRef]

26. Bieler, R.; Granados-Cifuentes, C.; Rawlings, T.A.; Sierwald, P.; Collins, T.M. Non-native molluscan colonizers on deliberately placed shipwrecks in the Florida Keys, with description of a new species of potentially invasive worm-snail (Gastropoda: Vermetidae). *PeerJ* **2017**, *5*, e3158. [CrossRef]
27. Hoeksema, B.W.; Hove, H.A.T. The invasive sun coral *Tubastraea coccinea* hosting a native Christmas tree worm at Curaçao, Dutch Caribbean. *Mar. Biodivers.* **2017**, *47*, 59–65. [CrossRef]
28. Hoeksema, B.W.; Hiemstra, A.F.; Vermeij, M.J. The rise of a native sun coral species on southern Caribbean coral reefs. *Ecosphere* **2019**, *10*, e02942. [CrossRef]
29. Sammarco, P.W.; Atchison, A.D.; Boland, G.S. Expansion of coral communities within the Northern Gulf of Mexico via offshore oil and gas platforms. *Mar. Ecol. Prog. Ser.* **2004**, *280*, 129–143. [CrossRef]
30. Sammarco, P.W.; Porter, S.A.; Cairns, S.D. A new coral species introduced into the Atlantic Ocean—*Tubastraea micranthus* (Ehrenberg, 1834) (Cnidaria, Anthozoa, Scleractinia): An invasive threat. *Aquat. Invasions* **2010**, *5*, 131–140. [CrossRef]
31. Sammarco, P.W.; Porter, S.A.; Sinclair, J.; Genazzio, M. Depth distribution of a new invasive coral (Gulf of Mexico)—*Tubastraea micranthus*, comparisons with *T. coccinea*, and implications for control. *Manag. Biol. Invasions* **2013**, *4*, 291–303. [CrossRef]
32. Precht, W.F.; Hickerson, E.L.; Schmahl, G.P.; Aronson, R.B. The invasive coral *Tubastraea coccinea* (Lesson, 1829): Implications for natural habitats in the Gulf of Mexico and the Florida Keys. *Gulf Mex. Sci.* **2014**, *32*, 55–59. [CrossRef]
33. Sammarco, P.W.; Porter, S.A.; Sinclair, J.; Genazzio, M. Population expansion of a new invasive coral species, *Tubastraea micranthus*, in the northern Gulf of Mexico. *Mar. Ecol. Prog. Ser.* **2014**, *495*, 161–173. [CrossRef]
34. Derouen, Z.C.; Peterson, M.R.; Wang, H.H.; Grant, W.E. Determinants of *Tubastraea coccinea* invasion and likelihood of further expansion in the northern Gulf of Mexico. *Mar. Biodivers.* **2020**, *50*, 101. [CrossRef]
35. Hoeksema, B.W.; Reimer, J.D.; Vonk, R. Biodiversity of Caribbean coral reefs (with a focus on the Dutch Caribbean). *Mar. Biodivers.* **2017**, *47*, 1–10. [CrossRef]
36. Cairns, S.D. A revision of the shallow-water azooxanthellate Scleractinia of the Western Atlantic. *Stud. Nat. Hist. Caribb.* **2000**, *75*, 1–240.
37. Creed, J.C.; Fenner, D.; Sammarco, P.; Cairns, S.; Capel, K.; Junqueira, A.O.R.; Cruz, I.; Miranda, R.J.; Carlos-Junior, L.; Mantelatto, M.C.; et al. The invasion of the azooxanthellate coral Tubastraea (Scleractinia: Dendrophylliidae) throughout the world: History, pathways and vectors. *Biol. Invasions* **2017**, *19*, 283–305. [CrossRef]
38. Roos, P.J. The shallow-water stony corals of the Netherlands Antilles. *Stud. Fauna Curaçao Caribb. Isl.* **1971**, *37*, 1–108.
39. Wagenaar Hummelinck, P. Description of new localities. *Stud. Fauna Curaçao Caribb. Isl.* **1953**, *4*, 1–90.
40. Wagenaar Hummelinck, P. Marine localities. *Stud. Fauna Curaçao Caribb. Isl.* **1977**, *51*, 1–68.
41. De Paula, A.F.; Creed, J.C. Two species of the coral *Tubastraea* (Cnidaria, Scleractinia) in Brazil: A case of accidental introduction. *Bull. Mar. Sci.* **2004**, *74*, 175–183.
42. Capel, K.C.C.; Creed, J.; Kitahara, M.V.; Chen, C.A.; Zilberberg, C. Multiple introductions and secondary dispersion of *Tubastraea* spp. in the Southwestern Atlantic. *Sci. Rep.* **2019**, *9*, 13978. [CrossRef] [PubMed]
43. Figueroa, D.F.; McClure, A.; Figueroa, N.J.; Hicks, D.W. Hiding in plain sight: Invasive coral Tubastraea tagusensis (Scleractinia: Hexacorallia) in the Gulf of Mexico. *Coral Reefs* **2019**, *38*, 395–403. [CrossRef]
44. Hoeksema, B.W.; Smith-Moorhouse, A.; Harper, C.E.; van der Schoot, R.J.; Timmerman, R.F.; Spaargaren, R.; Langdon-Down, S.J. Black mantle tissue of endolithic mussels (*Leiosolenus* spp.) is cloaking borehole orifices in Caribbean reef corals. *Diversity* **2022**, *14*, 401. [CrossRef]
45. van der Schoot, R.J.; Hoeksema, B.W. Abundance of coral-associated fauna in relation to depth and eutrophication along the leeward side of Curaçao, southern Caribbean. *Mar. Environ. Res.* **2022**, *181*, 105738. [CrossRef]
46. Hammerman, N.M.; Williams, S.M.; Veglia, A.J.; García-Hernández, J.E.; Schizas, N.V.; Lang, J.C. *Cladopsammia manuelensis* sensu Cairns, 2000 (Order: Scleractinia): A new distribution record for Hispaniola and Puerto Rico. *Cah. Biol. Mar.* **2021**, *62*, 1–10. [CrossRef]
47. Cairns, S.D. The deep-water Scleractinia of the Caribbean Sea and adjacent waters. *Stud. Fauna Curacao Other Caribb. Isl.* **1979**, *180*, 1–341.
48. Santodomingo, N.; Reyes, J.; Flórez, P.; Chacón-Gómez, I.C.; van Ofwegen, L.P.; Hoeksema, B.W. Diversity and distribution of azooxanthellate corals in the Colombian Caribbean. *Mar. Biodivers.* **2013**, *43*, 7–22. [CrossRef]
49. Slattery, M.; Lesser, P.L. The Bahamas and Cayman Islands. In *Mesophotic Coral Ecosystems*; Loya, Y., Puglise, K.A., Bridge, T.C.L., Eds.; Springer: Cham, Switzerland, 2019; pp. 47–56. [CrossRef]
50. Humann, P.; Deloach, N. *Reef Coral Identification: Florida, the Caribbean and the Bahamas*, 3rd ed.; New World Publications Inc.: Jacksonville, FL, USA, 2013.
51. Wells, J.W. Notes on Indo-Pacific scleractinian corals. Part 9. New corals from the Galápagos Islands. *Pac. Sci.* **1982**, *36*, 211–219.
52. Mantelatto, M.C.; Creed, J.C.; Mourão, G.G.; Migotto, A.E.; Lindner, A. Range expansion of the invasive corals *Tubastraea coccinea* and *Tubastraea tagusensis* in the Southwest Atlantic. *Coral Reefs* **2011**, *30*, 397. [CrossRef]
53. Capel, K.C.C.; Migotto, A.E.; Zilberberg, C.; Lin, M.F.; Forsman, Z.; Miller, D.J.; Kitahara, M.V. Complete mitochondrial genome sequences of Atlantic representatives of the invasive Pacific coral *species Tubastraea coccinea* and *T. tagusensis* (Scleractinia, Dendrophylliidae): Implications for species identification. *Gene* **2016**, *590*, 270–277. [CrossRef] [PubMed]
54. Zanotti, A.A.; Gregoracci, G.B.; Capel, K.C.C.; Kitahara, M.V. Microbiome of the Southwestern Atlantic invasive scleractinian coral, *Tubastraea tagusensis*. *Anim. Microbiome* **2020**, *2*, 29. [CrossRef] [PubMed]

55. Silva, M.d.S.; de Moraes, F.C.; Batista, D.; Bahia, R.d.G.; Bertoncini, A.; Machado, A.A.; Muricy, G.; Karez, C.S.; Pereira-Filho, G.H.; Salgado, L.T.; et al. Distribution, population structure and settlement preference of *Tubastraea* spp. (Cnidaria: Scleractinia) on rocky shores of the Cagarras Islands Natural Monument and surroundings, Rio de Janeiro, Brazil. *Reg. Stud. Mar. Sci.* **2022**, *52*, 102245. [CrossRef]
56. Costa, T.J.; Pinheiro, H.T.; Teixeira, J.B.; Mazzei, E.F.; Bueno, L.; Hora, M.S.; Joyeux, J.C.; Carvalho-Filho, A.; Amado-Filho, G.; Sampaio, C.L.S.; et al. Expansion of an invasive coral species over Abrolhos Bank, Southwestern Atlantic. *Mar. Pollut. Bull.* **2014**, *85*, 252–253. [CrossRef] [PubMed]
57. Durán-Fuentes, J.; Gracia, C.A.; Santodomingo, N. Occurrence of the azooxanthellate coral *Phyllangia pequegnatae* (Scleractinia: Caryophylliidae) in the Colombian Caribbean Sea: Hidden diversity or another invasive species? *Mar. Biodivers.* **2021**, *51*, 34. [CrossRef]
58. Hopkins, G.A.; Forrest, B.M. Challenges associated with pre-border management of biofouling on oil rigs. *Mar. Pollut. Bull.* **2010**, *60*, 1924–1929. [CrossRef]
59. Yeo, D.C.J.; Ahyong, S.T.; Lodge, D.M.; Ng, P.K.L.; Naruse, T.; Lane, D.J.W. Semisubmersible oil platforms: Understudied and potentially major vectors of biofouling-mediated invasions. *Biofouling* **2010**, *26*, 179–186. [CrossRef]