

University of Groningen

A New Northernmost Distribution Record of the Reef Coral *Duncanopsammia axifuga* at Bird's Head Peninsula, West Papua, Indonesia

Subhan, Beginer; Razak, Tries B.; Arafat, Dondy; Zamani, Neviaty P.; Prehadi; Lestari, Dea Fauzia; Hoeksema, Bert

Published in:
Diversity

DOI:
[10.3390/d14090713](https://doi.org/10.3390/d14090713)

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2022

[Link to publication in University of Groningen/UMCG research database](#)

Citation for published version (APA):

Subhan, B., Razak, T. B., Arafat, D., Zamani, N. P., Prehadi, Lestari, D. F., & Hoeksema, B. (2022). A New Northernmost Distribution Record of the Reef Coral *Duncanopsammia axifuga* at Bird's Head Peninsula, West Papua, Indonesia. *Diversity*, 14(9), [713]. <https://doi.org/10.3390/d14090713>

Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Interesting Images

A New Northernmost Distribution Record of the Reef Coral *Duncanopsammia axifuga* at Bird's Head Peninsula, West Papua, Indonesia

Beginer Subhan ¹, Tries B. Razak ¹, Dondy Arafat ¹, Neviaty P. Zamani ¹, Prehadi ², Dea Fauzia Lestari ¹ and Bert W. Hoeksema ^{3,4,5,*}

- ¹ Department of Marine Science and Technology, Faculty of Fisheries and Marine Science, IPB University, Bogor 16680, Indonesia
 - ² Coastal and Marine Resource Management Unit of Sorong, Directorate General of Marine Spatial Management, Ministry of Marine Affairs and Fisheries, Sorong 98418, Indonesia
 - ³ Taxonomy, Systematics and Geodiversity Group, Naturalis Biodiversity Center, P.O. Box 9517, 2300 RA Leiden, The Netherlands
 - ⁴ Groningen Institute for Evolutionary Life Sciences, University of Groningen, P.O. Box 11103, 9700 CC Groningen, The Netherlands
 - ⁵ Institute of Biology Leiden, Leiden University, P.O. Box 9505, 2300 RA Leiden, The Netherlands
- * Correspondence: bert.hoeksema@naturalis.nl

Abstract: *Duncanopsammia axifuga* (Scleractinia: Dendrophylliidae) is reported for the first time from Indonesia. A population was found in 5-m deep, murky water on a sediment-rich, inshore reef at Bird's Head Peninsula, West Papua. Some corals were attached to dead coral and others were loose fragments living on sediment. One attached specimen was observed to be damaged as a result of direct contact with an adjacent *Goniopora* coral. Free-living specimens on sand are more likely able to escape competition for space. These observations may help to better understand the northernmost range limit and the natural environment of *D. axifuga*, a species that is popular in the international aquarium trade, but has not been studied very well in the field.

Keywords: aquarium industry; coastline; competition; coral fragments; Dendrophylliidae; free-living; murky water; Scleractinia; sediment



Citation: Subhan, B.; Razak, T.B.; Arafat, D.; Zamani, N.P.; Prehadi; Lestari, D.F.; Hoeksema, B.W. A New Northernmost Distribution Record of the Reef Coral *Duncanopsammia axifuga* at Bird's Head Peninsula, West Papua, Indonesia. *Diversity* **2022**, *14*, 713. <https://doi.org/10.3390/d14090713>

Academic Editor: Michael Wink

Received: 18 August 2022

Accepted: 25 August 2022

Published: 28 August 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 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/>).

Duncanopsammia axifuga (Milne Edwards & Haime, 1848) is an uncommon but conspicuous coral species [1–3], which is categorized as “Near Threatened” in the IUCN Red List of Threatened Species [4]. The species belongs to the scleractinian family Dendrophylliidae and is only known to occur in tropical Australia [5], Southwest Papua New Guinea [5] and East Timor [3,6]. Previously the species was also reported from Vietnam [4,5,7] and even the whole South China Sea [2], but these records were not confirmed in more recent coral literature [8–11] and appear to be withdrawn without notice [12]. An illustrated specimen of “*Duncanopsammia* aff. *axifuga*” from Mayotte in the West Indian Ocean [13] is in our opinion most probably a misidentified *Eguchipsammia*, which is phylogenetically closely related to *D. axifuga* [14]. Recent records of *Duncanopsammia* from sunken warships in Chuuk Lagoon, Micronesia [15], and from Peninsular Malaysia [16] could not be verified due to the absence of photographic evidence and are therefore considered doubtful.

Duncanopsammia axifuga, also known as Duncan coral, is popular in the international aquarium industry [17], which relies entirely on collecting by Australian coral fisheries [18–21]. Despite this popularity and the knowledge that harvesting of wild corals is known to form a threat to their natural populations [18,22], little is known about the ecology of *D. axifuga*. In Australia, for instance, it has been reported as common in murky waters deeper than 20 m with much fine sediment [2,12], but it has also been reported from the intertidal [23]. Therefore, there is a need to better document this species' habitat [3,21].

During a recent coral reef survey in March 2022 at the southwestern coastline of Bird's Head Peninsula in Seget District, West Papua, Indonesia ($01^{\circ}29'50''$ S $131^{\circ}17'48''$ E), a population of *D. axifuga* was discovered in quiet murky water (visibility 3 m) on a fringing reef at 5 m depth. The reef is in close proximity to several river outlets. This discovery represents a new northernmost distribution record of the species and the first one from Indonesia (Figure 1), even though its possible discovery in Indonesia was expected [12,24].

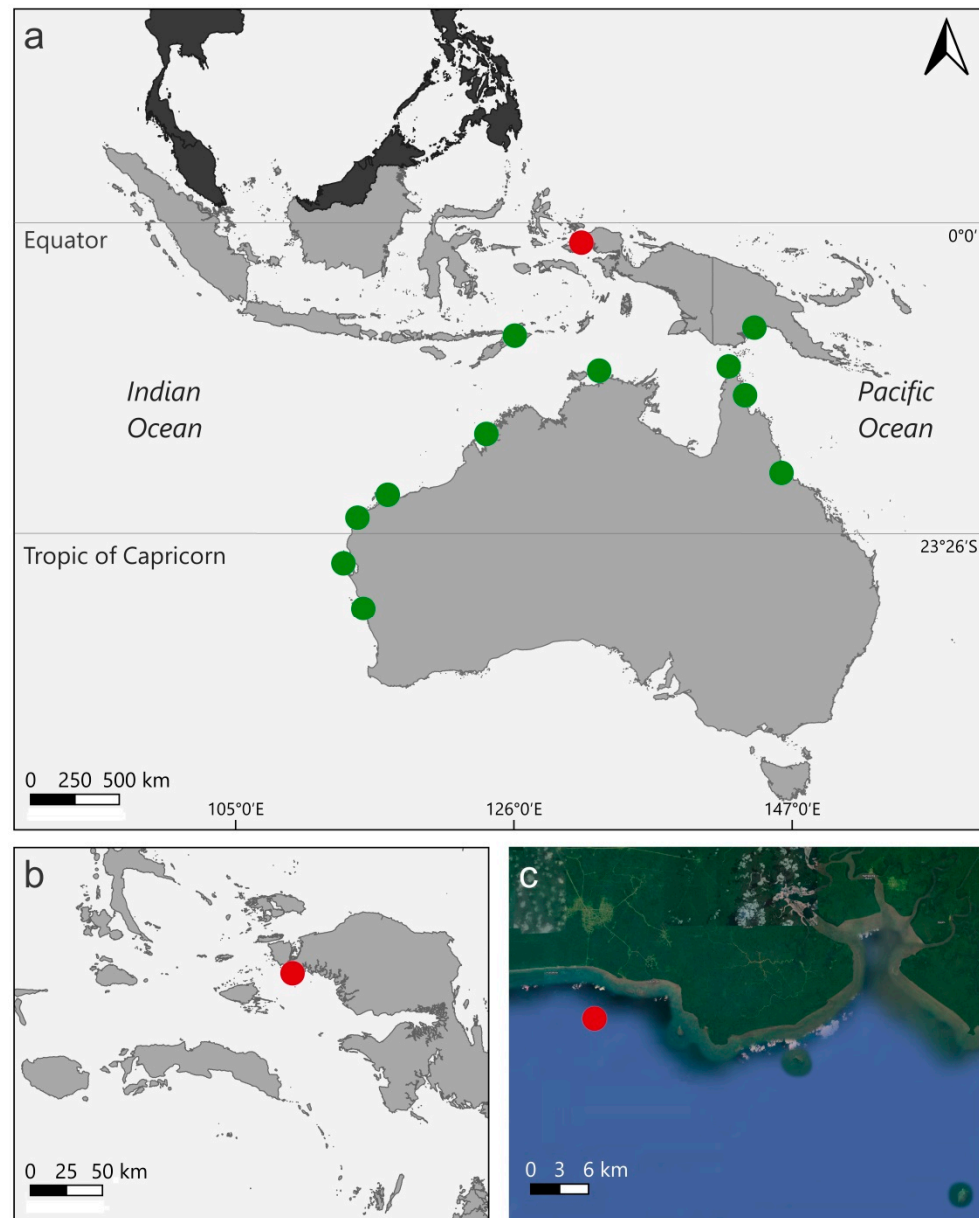


Figure 1. (a) Published distribution records of *Duncanopsammia axifuga* from Australia, New Guinea, and East Timor (green dots) [5,6]; and a new record from Bird's Head Peninsula, Indonesia (red dot). (b) A detailed map of Bird's Head Peninsula and adjacent waters. (c) Satellite imagery of the observation location at Seget District, West Papua, Indonesia, showing the muddy coastline (Source: Google Maps; Imagery ©2022 TerraMetric. Map data ©2022).

The habitat of the corals consisted of fine sediment with dead and live coral (Figure 2a,b). Other coral species were alcyonacean whip corals (Figure 2b) and scleractinians of the genera *Astreopora*, *Dipsastraea*, *Goniopora*, *Hydnophora*, *Porites*, *Trachyphyllia*, and *Turbinaria*. The tentacles of *D. axifuga* were either extended (Figure 2a–d) or retracted (Figures 2a and 3a). Some small colonies were found on unattached coral fragments

(Figure 2a). The largest coral colony was over 1 m in diameter. The corals were either attached or free-living; some of them were dead at their basis (Figures 2a and 3b). One observed colony was in direct contact with a colony of *Goniopora* (Figure 4a). Polyps in the contact zone were either dead or severely injured (Figure 4b).

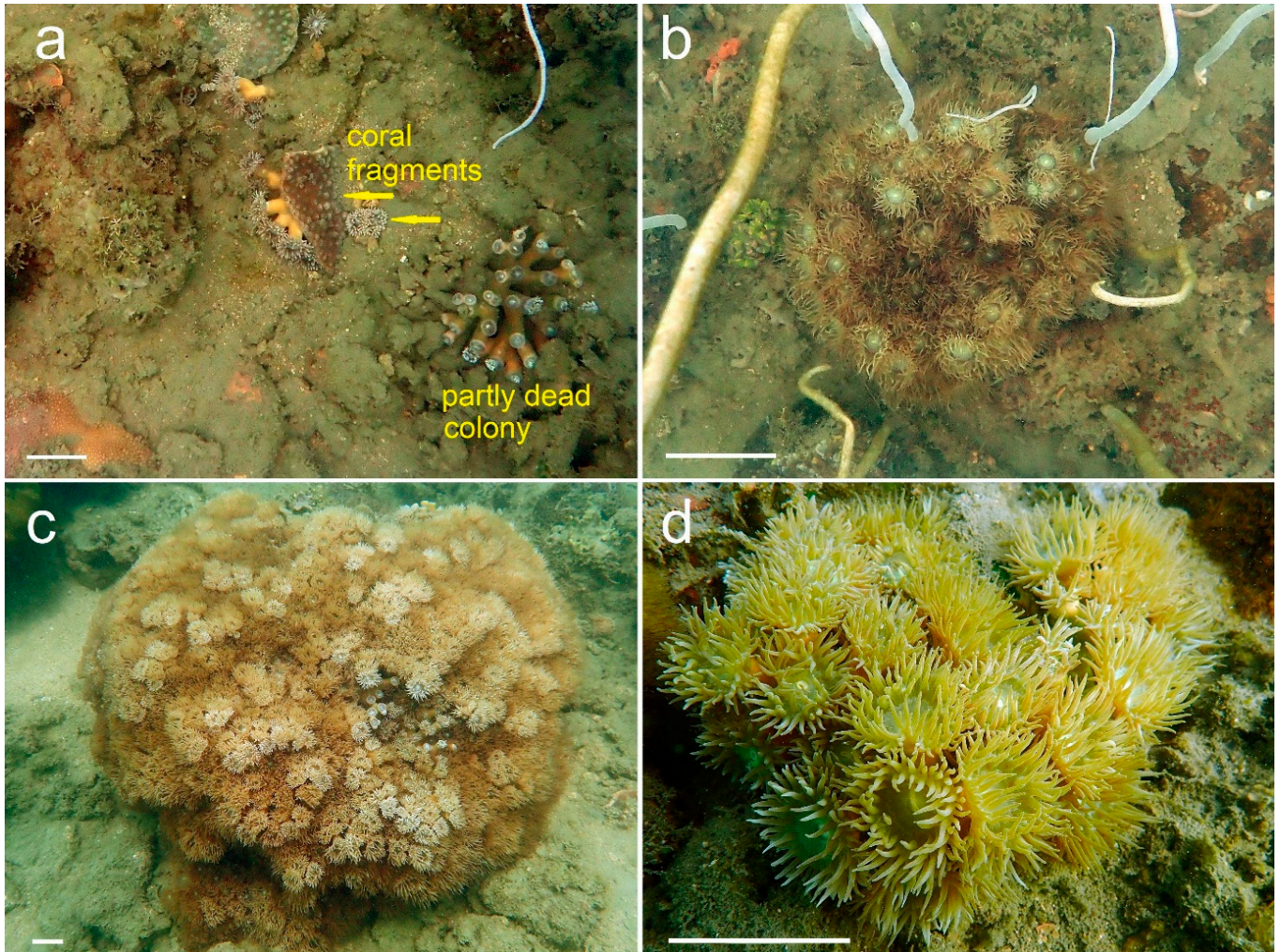


Figure 2. Habitat of *Duncanopsammia axifuga* in West Papua. (a) The bottom consists of fine sediment and dead coral; some *Duncanopsammia* colonies were attached to coral fragments (arrows) and another one had branches that were dead at the basis. (b) Coral colony surrounded by whip corals. (c,d) A large and a small colony with tentacles extended. Scale bars: 5 cm.

The branching shape of *D. axifuga* appears to facilitate fragmentation, which explains its occurrence as free-living corals on soft substrates. This mechanism resembles asexual reproduction in various other branching coral species [25–30] and also in some free-living mushroom corals, which are well known for their capacity to form dense aggregations on sandy bottoms [30–34]. Owing to aquarium experiments it is also known that *D. axifuga* fragments can easily regenerate and grow into new colonies, making it suitable for aquaculture [35].

Coral damage caused by interspecific competition for space is a commonly known phenomenon [36–38], but information involving *D. axifuga* was not yet available. In the present case, the aggressive neighbour of *D. axifuga* is a *Goniopora*. Corals of this genus have a reputation of representing some of the most aggressive species [37,39,40]. *Turbinaria* spp., which are close relatives of *D. axifuga*, have been categorized as intermediate aggressive [38]. It is therefore not surprising that *D. axifuga* colonies or their fragments may become dam-

aged when they are in contact with other corals, a risk that is less high when they live on soft substrates with fewer competitors for space.

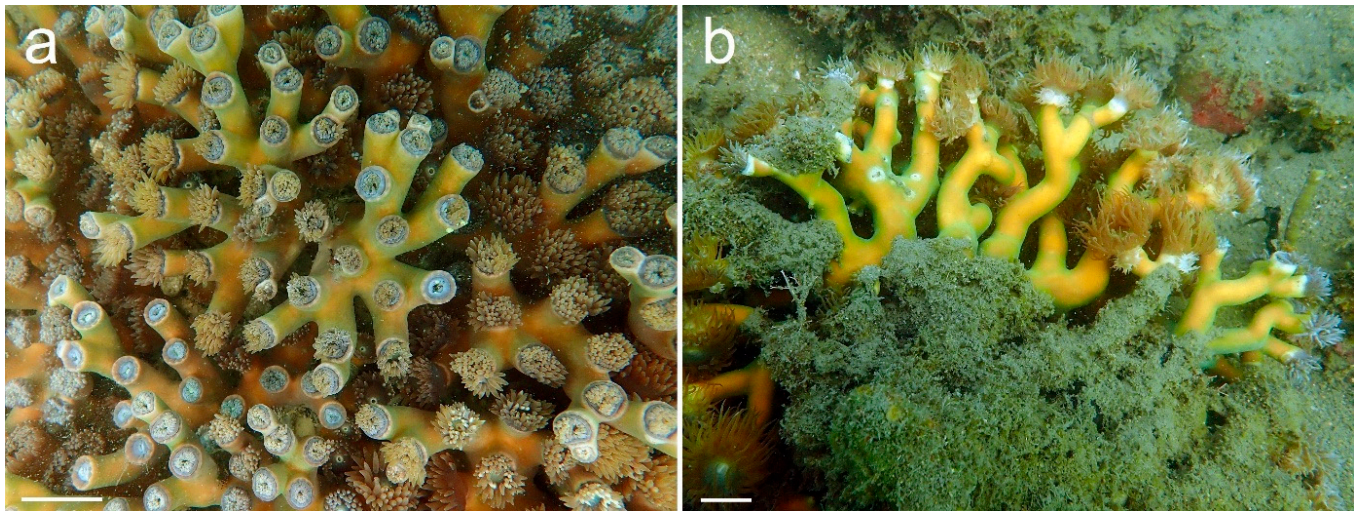


Figure 3. *Duncanopsammia axifuga* colonies with tentacles contracted showing branching pattern. (a) Large colony viewed from above. (b) Unattached coral from aside with partial mortality at the coral basis. Scale bars: 2.5 cm.

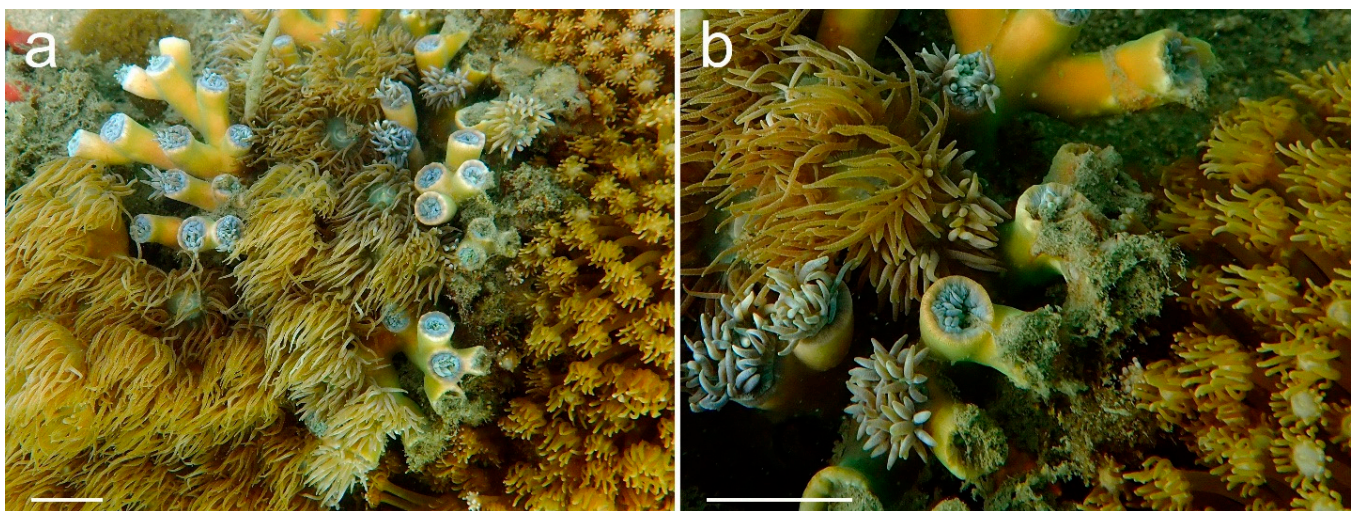


Figure 4. Overview (a) and close-up (b) of a *Duncanopsammia axifuga* colony (left-hand side) with stretched tentacles showing damaged and dead coral polyps that are in contact with a *Goniopora* colony (right-hand side). Scale bars: 2.5 cm.

The discovery of an Indonesian population of *D. axifuga* and the previous finding in East Timor [3,6] suggest that additional marine biodiversity surveys in murky reef habitats may result in novel range extensions for this species. Earlier observations in Australia also confirm the occurrence of this species on soft substrate in turbid water, which is characteristic for inshore waters [41,42]. Other surveys on murky reefs have also resulted in extensions of known distributions, like that of the scleractinian *Coscinaraea marshae* Wells, 1962 in West Sumatra [43]. Such surveys also produced records of generally rare species that appeared to be exceptionally common in quiet water on silt-rich reefs, such as the acroporid *Isopora togianensis* Wallace, 1997 in Tomini Bay, Sulawesi [44], and the fungiids *Halomitra clavator* Hoeksema, 1989 and *Lithophyllon ranjithi* Ditlev, 2003 in Darvel Bay, NE Borneo [45,46]. In the Miocene, such reefs hosted a high diversity of coral species that could adapt to environmental changes and may have played an important role in coral

evolution [47]. Other studies suggest that more surveys at Bird's Head Peninsula and the adjacent Raja Ampat islands also have potential for the discovery of rare and new coral species [48,49]. The marine ecosystems of this area, collectively referred to as the "Bird's Head Seascape", are recognized as being extremely rich in species and habitats, which are in need for protection [50–52].

One of the major findings of this report, is that the northernmost distribution of *D. axifuga* appears to be poorly known. Various records cannot be verified because there is no evidence in the form of photographs or collected specimens. It is apparent that *D. axifuga* is confused with other species of the family Dendrophyllidae. Its large polyps resemble those of *Duncanopsammia peltata* Esper, 1790, *Eguchipsammia fistula* (Alcock, 1902), and *Tubastraea micranthus* Ehrenberg, 1834, but these species have different growth forms [2,12,14]. The present study may therefore help readers to recognize the species more easily in the field, especially on murky reefs. Since coral diversity surveys on sediment in poor light conditions at depths >25 m also resulted in new locality records of fragmenting coral species [53–55], it is possible that dives at such depths may also result in more records of *D. axifuga*. When the tentacles of *D. axifuga* are extended (Figure 2b–d), it does not stand out as extraordinary. On the other hand, when the tentacles are retracted, its unique shape becomes more obvious (Figure 3).

More studies may also help to understand how corals may adapt to murky reef environments. It may for instance be relevant to examine possible sediment rejection mechanisms of *D. axifuga*. Its large polyps resemble those of its congener, *D. peltata* (Esper, 1790), which is able to live in sediment-rich habitats as well, although also in more wave-exposed conditions [56]. Further research is needed for a better understanding of *D. axifuga*'s life history and ecology, partly because of its popularity in the international aquarium industry.

Author Contributions: Conceptualization, B.S., T.B.R. and B.W.H.; investigation, B.S., D.A., N.P.Z., P. and D.F.L.; data curation, B.S., and D.A.; writing—original draft preparation, B.W.H.; writing—review and editing, B.S., T.B.R., D.A., N.P.Z., P., D.F.L. and B.W.H.; supervision, B.S. and B.W.H.; project administration, B.S., and N.P.Z.; funding acquisition, B.S. and N.P.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research was partially funded by Riset Kolaborasi Indonesia (RKI) 16 PTNBH 2022 No: 3345/IT3.L1/PT.01.03/P/B/2022.

Institutional Review Board Statement: Not applicable.

Data Availability Statement: Data sharing not applicable.

Acknowledgments: We thank the Centre for Coastal and Marine Resources Management (*Loka Pengelolaan Sumberdaya Pesisir dan Laut*) of the Ministry of Marine Affairs and Fisheries in Sorong, West Papua; and the local coastal community at Seget District, West Papua, for their assistance in the field. We are grateful to Cut Aja Gita Alisa for help with the maps. We want to thank three anonymous reviewers for their constructive comments, which helped us to improve the manuscript.

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

References

1. Veron, J.E.N. *Corals in Space and Time: The Biogeography and Evolution of the Scleractinia*; Cornell University Press: Ithaca, NY, USA, 1995; p. 321.
2. Veron, J.E.N. *Corals of the World*; Australian Institute of Marine Science: Townsville, Australia, 2000; Volume 2, p. 429.
3. DeVantier, L.; Turak, E. Species richness and relative abundance of reef-building corals in the Indo-West Pacific. *Diversity* **2017**, *9*, 25. [[CrossRef](#)]
4. Hoeksema, B.; Rogers, A.; Quibilan, M. The IUCN Red List of Threatened Species: *Duncanopsammia axifuga*. 2008: e.T133114A3573682. Available online: <https://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T133114A3573682.en> (accessed on 1 August 2022).
5. Veron, J.E.N. A biogeographic database of hermatypic corals. Species of the Central Indo-Pacific genera of the World. *Aust. Inst. Mar. Sci. Monogr. Ser.* **1993**, *10*, 1–433.

6. Turak, E.; Devantier, L. Reef-building corals of Timor-Leste. In *A Rapid Marine Biological Assessment of Timor-Leste*; RAP Bulletin of Biological Assessment, 66; Erdmann, M.V., Mohan, C., Eds.; Coral Triangle Support Partnership, Conservation International: Dili, Timor-Leste, 2013; pp. 85–149. [[CrossRef](#)]
7. Vo, S.T.; Nguyen, H.Y.; Nguyen, V.L. Viet Nam. In *National Reports on Coral Reefs in the Coastal Waters of the South China Sea*; Nguyen, V.L., Ed.; UNEP/GEF South China Sea Project: Nha Trang, Vietnam, 2007; pp. 93–118.
8. Latypov, Y.Y. Scleractinian corals and reefs of Vietnam as a part of the Pacific Reef Ecosystem. *Open J. Mar. Sci.* **2011**, *1*, 50–68. [[CrossRef](#)]
9. Vo, S.T.; DeVantier, L.M.; Tuyen, H.T.; Hoàng, P.K. Ninh Hai waters (south Vietnam): A hotspot of reef corals in the western South China Sea. *Raffles Bull. Zool.* **2014**, *62*, 513–520.
10. Huang, D.; Licuanan, W.Y.; Hoeksema, B.W.; Chen, C.A.; Ang, P.O.; Huang, H.; Lane, D.J.W.; Vo, S.T.; Waheed, Z.; Amri, A.Y.; et al. Extraordinary diversity of reef corals in the South China Sea. *Mar. Biodivers.* **2015**, *45*, 157–168. [[CrossRef](#)]
11. Huang, D.; Hoeksema, B.W.; Amri, A.Y.; Ang, P.O.; Chen, C.A.; Huang, H.; Lane, D.J.W.; Licuanan, W.Y.; Vibol, O.; Vo, S.T.; et al. Conservation of reef corals in the South China Sea based on species and evolutionary diversity. *Biodivers. Conserv.* **2016**, *25*, 331–344. [[CrossRef](#)]
12. Veron, J.E.N.; Stafford-Smith, M.G.; Turak, E.; DeVantier, L.M. Corals of the World: *Duncanopsammia axifuga* (Milne Edwards and Haime, 1848). 2016. Available online: http://www.coralsoftheworld.org/species_factsheets/species_factsheet_summary/duncanopsammia-axifuga/ (accessed on 1 August 2022).
13. Mulochau, T.; Durville, P.; Maurel, L.; Barathieu, G.; Budet, D.; Delamarre, C.; Konieczny, O.; Loisil, C.; Quaglietti, S.; Plantard, P.; et al. *Inventaire Faunistique non Exhaustif de Quelques Sites Situés en Zone Récifale Mésotrophique à Mayotte*; Programme MesoMay, BIORECIF, DEAL: Mamoudzou, Mayotte, 2020; p. 47.
14. Arrigoni, R.; Kitano, Y.F.; Stolarski, J.; Hoeksema, B.W.; Fukami, H.; Stefani, F.; Galli, P.; Montano, S.; Castoldi, E.; Benzoni, F. A phylogeny reconstruction of the Dendrophylliidae (Cnidaria, Scleractinia) based on molecular and micromorphological criteria, and its ecological implications. *Zool. Scr.* **2014**, *43*, 661–688. [[CrossRef](#)]
15. Asner, G.P.; Giardina, S.F.; Balzotti, C.; Drury, C.; Hopson, S.; Martin, R.E. Are sunken warships biodiversity havens for corals? *Diversity* **2022**, *14*, 139. [[CrossRef](#)]
16. Lee, J.N.; Adzis, K.A.A.; Afiq-Rosli, L.; Tanzil, J.T.I.; Chan, A.A.; Ismail, M.N.; Akmal, K.F.; Affendi, Y.A. Scleractinian coral (Cnidaria, Hexacorallia, Scleractinia) diversity of the Mersing Islands, Peninsular Malaysia. *ZooKeys* **2022**, *1102*, 177–190. [[CrossRef](#)]
17. Ulrich, A.B. Saltwater Aquarium Blog: Duncan coral: *Duncanopsammia axifuga*. 2016. Available online: <https://www.saltwateraquariumblog.com/duncan-coral/> (accessed on 1 August 2022).
18. Harriott, V.J. *The Sustainability of Queensland's Coral Harvest Fishery*; CRC Reef Research Centre Technical Report No. 40; CRC Reef Research Centre: Townsville, Australia, 2001; p. 33.
19. Pratchett, M.S.; Caballes, C.F.; Newman, S.J.; Wilson, S.K.; Messmer, V.; Pratchett, D.J. Bleaching susceptibility of aquarium corals collected across northern Australia. *Coral Reefs* **2020**, *39*, 663–673. [[CrossRef](#)]
20. Morton, J.; Jacobsen, I.; Dedini, E. *Queensland Coral Fishery Ecological Risk Assessment Update [Phase 1]*; Fisheries Queensland, Department of Agriculture and Fisheries, Queensland Government: Brisbane, Australia, 2022; p. 44.
21. Smith, K.A.; Bissell, A.; Bruce, C. *Ecological Risk Assessment for the Marine Aquarium Fish Resource*; Fisheries Research Report No. 323; Department of Primary Industries and Regional Development, Western Australian Government: Perth, Australia, 2022; p. 149.
22. Wabnitz, C.; Taylor, M.; Green, E.; Razak, T. *From Ocean to Aquarium: The Global Trade in Marine Ornamental Species*; UNEP-WCMC Biodiversity Series 17; UNEP-WCMC: Cambridge, UK, 2003; p. 64.
23. Wolstenholme, J.; Dinesen, Z.D.; Alderslade, P. Hard corals of the Darwin region, Northern Territory, Australia. In *Proceedings of the Sixth International Marine Biological Workshop, the Marine Flora and Fauna of Darwin Harbour, Northern Territory, Australia, 5–8 June 1993*; Hanley, R., Caswell, G., Megirian, D., Larson, H.K., Eds.; Museums and Art Galleries of the Northern Territory and the Australian Marine Sciences Association: Darwin, Australia, 1997; pp. 381–398.
24. Best, M.B.; Hoeksema, B.W.; Moka, W.; Moll, H.; Suharsono; Sutarna, I.N. Recent scleractinian coral species collected during the Snellius-II expedition in eastern Indonesia. *Neth. J. Sea Res.* **1989**, *23*, 107–115. [[CrossRef](#)]
25. Glynn, P.W. Rolling stones amongst the Scleractinia: Mobile coralliths in the Gulf of Panama. In *Proceedings of the 2nd International Coral Reef Symposium, Brisbane, Australia, 22 June–26 July 1973*; Volume 2, pp. 183–198.
26. Paz-García, D.A.; Balart, E.F. New record of the endemic coral *Porites sverdrupi* (Gulf of California): Do fluctuations in seawater temperature regulate its southernmost range limit? *Mar. Biodivers.* **2016**, *46*, 499–502. [[CrossRef](#)]
27. Dias, M.; Ferreira, A.; Gouveia, R.; Cereja, R.; Vinagre, C. Mortality, growth and regeneration following fragmentation of reef-forming corals under thermal stress. *J. Sea Res.* **2018**, *141*, 71–82. [[CrossRef](#)]
28. Hoeksema, B.W.; Hassell, D.; Meesters, E.H.W.G.; van Duyl, F.C. Wave-swept coralliths of Saba Bank, Dutch Caribbean. *Mar. Biodivers.* **2018**, *48*, 2003–2016. [[CrossRef](#)]
29. Feingold, J.S.; Riegl, B.; Hendrickson, K.; Toth, L.T.; Cheng, H.; Edwards, R.L.; Aronson, R.B. 7700-year persistence of an isolated, free-living coral assemblage in the Galápagos Islands: A model for coral refugia? *Coral Reefs* **2020**, *39*, 639–647. [[CrossRef](#)]
30. Pichon, M. Free living scleractinian coral communities in the coral reefs of Madagascar. In *Proceedings of the 2nd International Coral Reef Symposium, Brisbane, Australia, 22 June–26 July 1973*; Volume 2, pp. 173–181.

31. Littler, M.; Littler, D.; Brooks, B.; Koven, J.F. A unique coral reef formation discovered on the Great Astrolabe Reef, Fiji. *Coral Reefs* **1997**, *16*, 51–54. [[CrossRef](#)]
32. Hoeksema, B.W.; Gittenberger, A. High densities of mushroom coral fragments at West Halmahera, Indonesia. *Coral Reefs* **2010**, *29*, 691. [[CrossRef](#)]
33. Hoeksema, B.W.; Waheed, Z. Initial phase of autotomy in fragmenting Cycloseris corals at Semporna, eastern Sabah, Malaysia. *Coral Reefs* **2011**, *30*, 1087. [[CrossRef](#)]
34. Hoeksema, B.W.; Bouwmeester, J.; Range, P.; Ben-Hamadou, R. A large aggregation of self-fragmenting mushroom corals in the Arabian/Persian Gulf. *Ecology* **2018**, *99*, 1236–1238. [[CrossRef](#)]
35. Tagliafico, A.; Rangel, S.; Kelaher, B.; Scheffers, S.; Christidis, L. A new technique to increase polyp production in stony coral aquaculture using waste fragments without polyps. *Aquaculture* **2018**, *484*, 303–308. [[CrossRef](#)]
36. Lang, J. Interspecific aggression by scleractinian corals. 2: Why the race is not only to the swift. *Bull. Mar. Sci.* **1973**, *23*, 260–279.
37. Sheppard, C.R.C. Interspecific aggression between reef corals with reference to their distribution. *Mar. Ecol. Prog. Ser.* **1979**, *1*, 237–247. [[CrossRef](#)]
38. Dai, C.F. Interspecific competition in Taiwanese corals with special reference to interactions between alcyonaceans and scleractinians. *Mar. Ecol. Prog. Ser.* **1990**, *60*, 291–297. [[CrossRef](#)]
39. Thomason, J.C.; Brown, B.E. The cnidom: An index of aggressive proficiency in scleractinian corals. *Coral Reefs* **1986**, *5*, 93–101. [[CrossRef](#)]
40. Peach, M.B.; Hoegh-Guldberg, O. Sweeper polyps of the coral *Goniopora tenuidens* (Scleractinia: Poritidae). *Invert. Biol.* **1999**, *118*, 1–7. [[CrossRef](#)]
41. Marsh, L. Scleractinian corals of the Montebello Islands. *Rec. West. Aust. Mus. Suppl.* **2000**, *59*, 15–19.
42. Richards, Z.T.; Sampey, A.; Marsh, L. Kimberley marine biota. Historical data: Scleractinian corals. *Rec. West. Aust. Mus. Suppl.* **2014**, *84*, 111–132. [[CrossRef](#)]
43. Hoeksema, B.W.; Johan, O.; Kunzmann, A. The reef coral *Coscinaraea marshae* is not a high-latitude endemic. *Diversity* **2021**, *13*, 681. [[CrossRef](#)]
44. Wallace, C.C. New species and new records of recently described species of the coral genus *Acropora* (Scleractinia: Astrocoeniina: Acroporidae) from Indonesia. *Zool. J. Linn. Soc.* **1997**, *120*, 27–50. [[CrossRef](#)]
45. Ditlev, H. New scleractinian corals (Cnidaria: Anthozoa) from Sabah, North Borneo. Description of one new genus and eight new species, with notes on their taxonomy and ecology. *Zool. Med.* **2003**, *77*, 193–219.
46. Waheed, Z.; Hoeksema, B.W. A tale of two winds: Species richness patterns of reef corals around the Semporna peninsula, Malaysia. *Mar. Biodivers.* **2013**, *43*, 37–51. [[CrossRef](#)]
47. Santodomingo, N.; Renema, W.; Johnson, K.G. Understanding the murky history of the Coral Triangle: Miocene corals and reef habitats in East Kalimantan (Indonesia). *Coral Reefs* **2016**, *35*, 765–781. [[CrossRef](#)]
48. Hoeksema, B.W. Stony corals (Fungiidae). In *Cryptic Marine Biota of the Raja Ampat Island Group*; Hoeksema, B.W., van der Meij, S.E.T., Eds.; Naturalis: Leiden, The Netherlands; LIPI: Jakarta, Indonesia, 2008; pp. 8–12.
49. Wallace, C.C.; Turak, E.; DeVantier, L. Novel characters in a conservative coral genus: Three new species of *Astreopora* (Scleractinia: Acroporidae) from West Papua. *J. Nat. Hist.* **2011**, *45*, 1905–1924. [[CrossRef](#)]
50. Mangubhai, S.; Erdmann, M.V.; Wilson, J.R.; Huffard, C.L.; Ballamu, F.; Hidayat, N.I.; Hitipeuw, C.; Lazuardi, M.E.; Pada, D.; Purba, G.; et al. Papuan Bird's Head Seascape: Emerging threats and challenges in the global center of marine biodiversity. *Mar. Pollut. Bull.* **2012**, *64*, 2279–2295. [[CrossRef](#)] [[PubMed](#)]
51. Maas, D.L.; Capriati, A.; Ahmad, A.; Erdmann, M.V.; Lamers, M.; de Leeuw, C.A.; Prins, L.; Putri, A.P.; Tapilatu, R.F.; Becking, L.E. Recognizing peripheral ecosystems in marine protected areas: A case study of golden jellyfish lakes in Raja Ampat, Indonesia. *Mar. Pollut. Bull.* **2020**, *151*, 110700. [[CrossRef](#)] [[PubMed](#)]
52. Andradi-Brown, D.A.; Matualage, D.; Rumengan, I.; Pada, D.; Hidayat, N.I.; Fox, H.E.; Fox, M.; Mangubhai, S.; Hamid, L.; Lazuardi, M.E.; et al. The Bird's Head Seascape Marine Protected Area network—Preventing biodiversity and ecosystem service loss amidst rapid change in Papua, Indonesia. *Conser. Sci. Pract.* **2021**, *3*, e393. [[CrossRef](#)]
53. Denis, V.; De Palmas, S.; Benzoni, F.; Chen, C.A. Extension of the known distribution and depth range of the scleractinian coral *Psammocora stellata*: First record from a Taiwanese mesophotic reef. *Mar. Biodivers.* **2015**, *45*, 619–620. [[CrossRef](#)]
54. Randall, R.H. A new mesophotic branching coral species of *Psammocora* from the Mariana Islands Archipelago (Cnidaria: Scleractinia: Psammocoridae). *Bishop Mus. Bull. Zool.* **2015**, *9*, 129–146.
55. Hoeksema, B.W.; Giyanto; Suharsono. The role of maximum shelf depth versus distance from shore in explaining a diversity gradient of mushroom corals (Fungiidae) off Jakarta. *Diversity* **2019**, *11*, 46. [[CrossRef](#)]
56. Riegl, B.; Heine, C.; Branch, G.M. Function of funnel-shaped coral growth in a high-sedimentation environment. *Mar. Ecol. Prog. Ser.* **1996**, *145*, 87–93. [[CrossRef](#)]