

Interesting Images

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

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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



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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whole South China Sea [2], but these records were not confirmed in more recent coral literature [8–11] and appear to be withdrawn without notice [12].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].

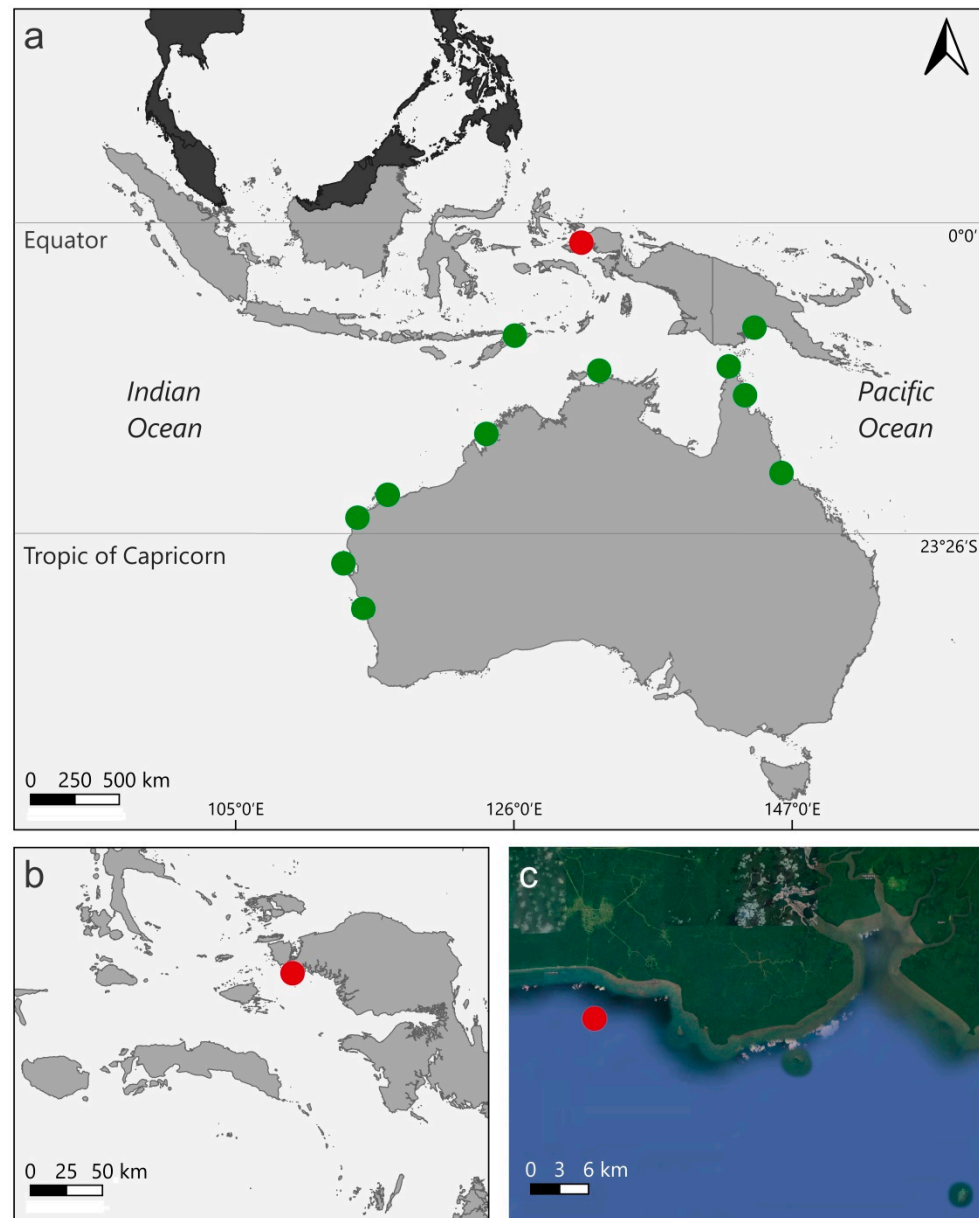


Figure 1. (a) Published distribution records of *Duncanopsammia axifuga* from Australia, New Guinea, and East Timor (green dots) [5,6]; and a new record from Bird's Head Peninsula, Indonesia (red dot). (b) A detailed map of Bird's Head Peninsula and adjacent waters. (c) Satellite imagery of the observation 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).

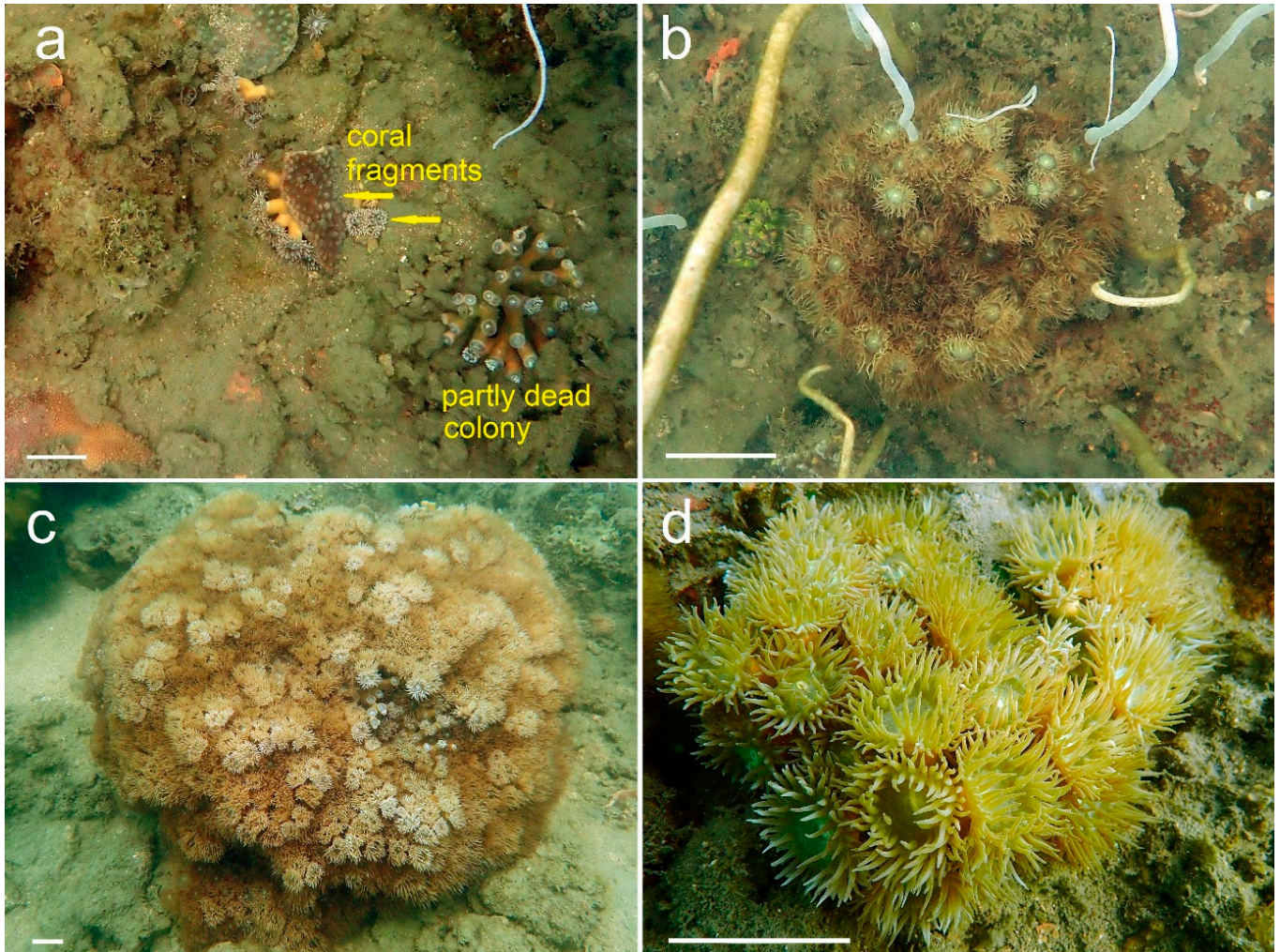


Figure 2. Habitat of *Duncanopsammia axifuga* in West Papua. (a) The bottom consists of fine sediment and dead coral; some *Duncanopsammia* colonies were attached to coral fragments (arrows) and another one had branches that were dead at the basis. (b) Coral colony surrounded by whip corals. (c,d) A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

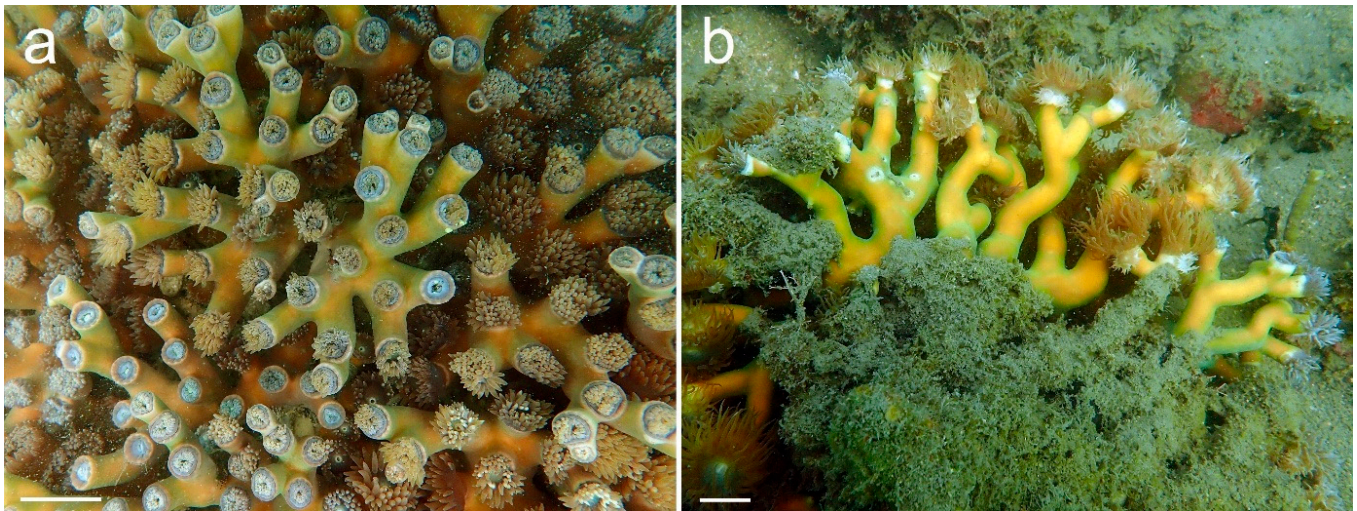


Figure 3. *Duncanopsammia axifuga* colonies with tentacles contracted showing branching pattern. (a) Large colony viewed from above. (b) Unattached coral from aside with partial mortality at the coral basis. Scale bars: 2.5 cm.

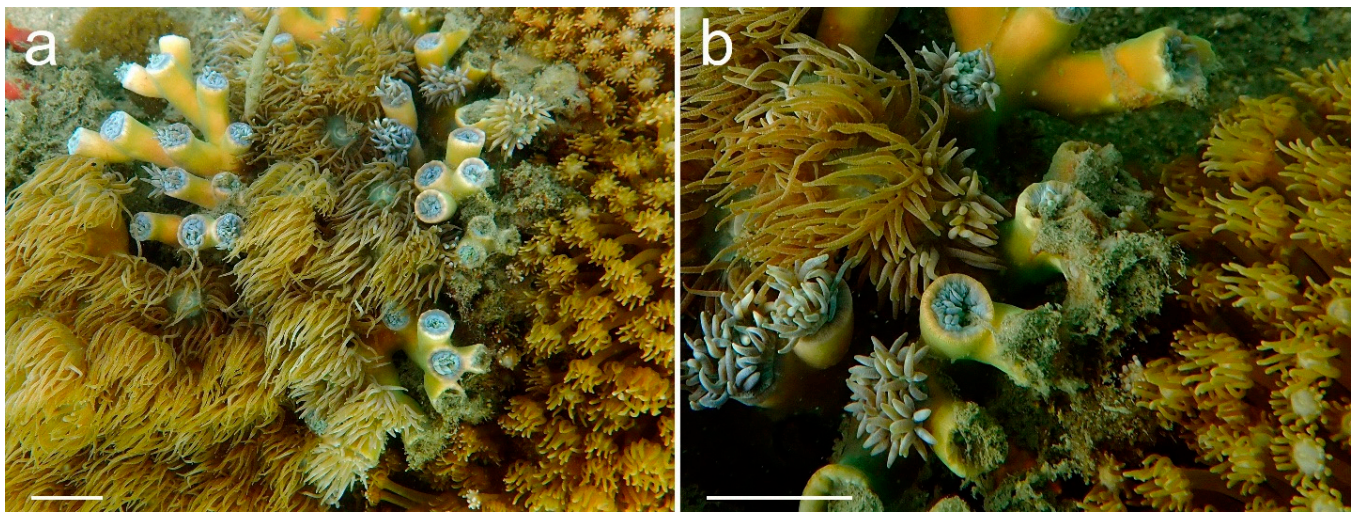


Figure 4. Overview (a) and close-up (b) of a *Duncanopsammia axifuga* colony (left-hand side) with stretched tentacles showing damaged and dead coral polyps that are in contact with a *Goniopora* colony (right-hand side). Scale bars: 2.5 cm.

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.

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