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The West Atlantic Hoary Rubble Crab, *Banareia palmeri*, Behaves Like a Corallivore

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Abstract: Various photographs of the West Atlantic hoary rubble crab, *Banareia palmeri* (Rathbun, 1894), published on the internet show individuals being perched on branching octocorals. This habitat relationship has not been given attention in the scientific literature. The crab belongs to the brachyuran decapod family Xanthidae, which includes other species that associate with corals and zoantharians. Other aspects of the biology of *B. palmeri*, such as its diet, are unknown. During a night dive in Bonaire, an individual of *B. palmeri* was observed cutting off the tip of a sea rod, *Pseudoplexaura* sp., and pulling the loose fragment to its hiding place. The crab has also been observed in association with other octocoral species, such as *Gorgonia ventalina* Linnaeus, 1758. Close examination of the crab's claws revealed that the inner edges resemble saws by bearing tooth-like structures with sharp edges, which explains how this animal is able to cut through the coral's soft tissue and horny axis. These findings suggest that the crab is an expert in clipping octocoral branches, which may explain why some sea rod branches can be observed missing their original rounded tips and have regenerated pointy ends instead. Considering the octocoral's regeneration capacity, it would be relevant to study how fast these branch tips are able to heal and whether fragments escaping from the crab's claws are able to survive. Future examination of the crab's gut contents and aquarium experiments may be able to provide more information about its dietary preferences.

Keywords: citizen science; Bonaire; Brachyura; Xanthidae; Octocorallia; corallivory; coral damage; coral predator

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Some marine animal species receive little attention in the scientific literature but are well known among underwater photographers who publish their pictures on the Internet. As experienced recreational divers, they notice rare species or animals that show remarkable behaviour. In particular, nocturnal animals may show activities that are only seen by night-diving naturalists who frequently visit their favorite dive spots and know their underwater environment very well. When recreational divers and professional biologists share a mutual interest, their collaboration may result in unusual observations being published in the scientific literature, which is becoming an increasingly common phenomenon [1–7]. Here, we report a new example of citizen science, involving the behaviour of a crab cutting off a branch tip of a sea rod, which may explain why some octocorals miss some of their original branch tips. This observation and others, which are published on the Internet,

suggest that cutting octocorals is normal behaviour of this crab species and that it could be a corallivore.

During a night dive in southern Bonaire (12°04′15″N 68°16′50″W; 23 August 2024; 20:20–20:30 h), the first author observed a hoary rubble crab, *Banareia palmeri* (Rathbun, 1894), perched on a sea rod, *Pseudoplexaura* sp., at an 8 m depth (Figure 1). Upon initial observation, the crab's activity was unclear until it was seen severing a substantial segment of the coral, approximately three times its own size. After detaching the tip of the sea rod, the crab transported the loose fragment downward along the coral's length to its base. Subsequently, the crab retreated with the piece into a coral crevice, disappearing from view.

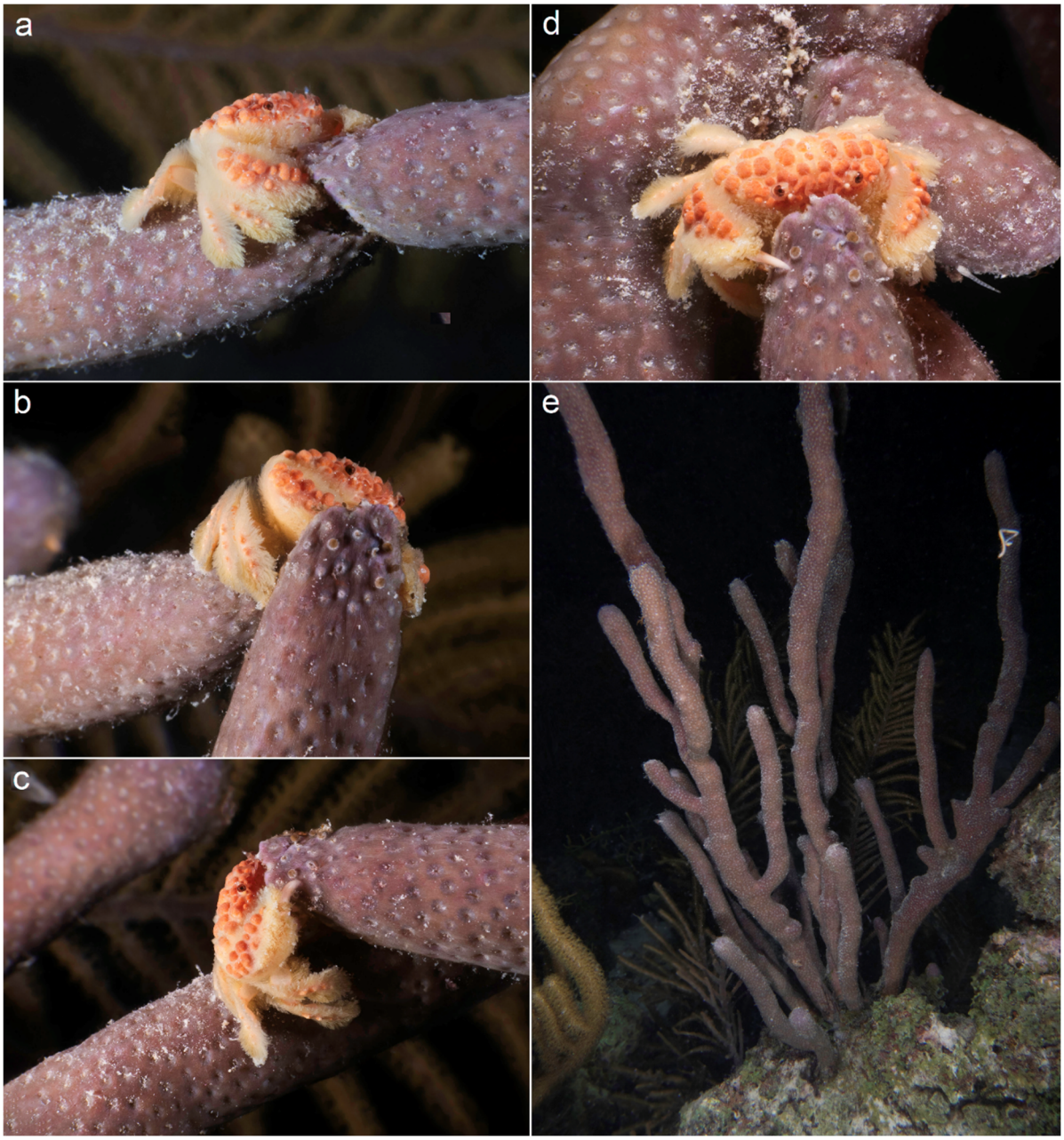

Figure 1. A hoary rubble crab, *Banareia palmeri*, cutting off a branch tip of a sea rod, *Pseudoplexaura* sp., in the southern part of Bonaire (2024). Dive site: Tori's Reef (12°04′15″N 68°16′50″W), 8 m depth. (**a**) Crab on top of the sea rod cutting the branch. (**b**) The branch tip is loose and taken by the crab. (**c**,**d**) The crab is carrying the branch tip downward. (**e**) Overview of the sea rod. Photo credits: L.A.O.L.

During an earlier night dive in the northern part of Bonaire (12°13′04″N 68°20′40″W; 9 June 2020; 20:08–20:14 h), the same diver found two crab individuals on coral colonies belonging to other octocoral species. The first one was in the process of cutting and removing a piece of coral from a sea fan, *Gorgonia ventalina* Linnaeus, 1758, at a 5–6 m depth (Figure 2). This coral fragment was also carried downward to the coral's base. The second crab was smaller and observed within a time frame of less than five minutes (20:22–20:26 h). It was cutting a small branch of a sea rod belonging to a different plexaurid species (Figure 3). The octocoral appeared to be secreting mucus from the wounds (Figure 3b), which glued to the crab's body when it descended (Figure 3d).

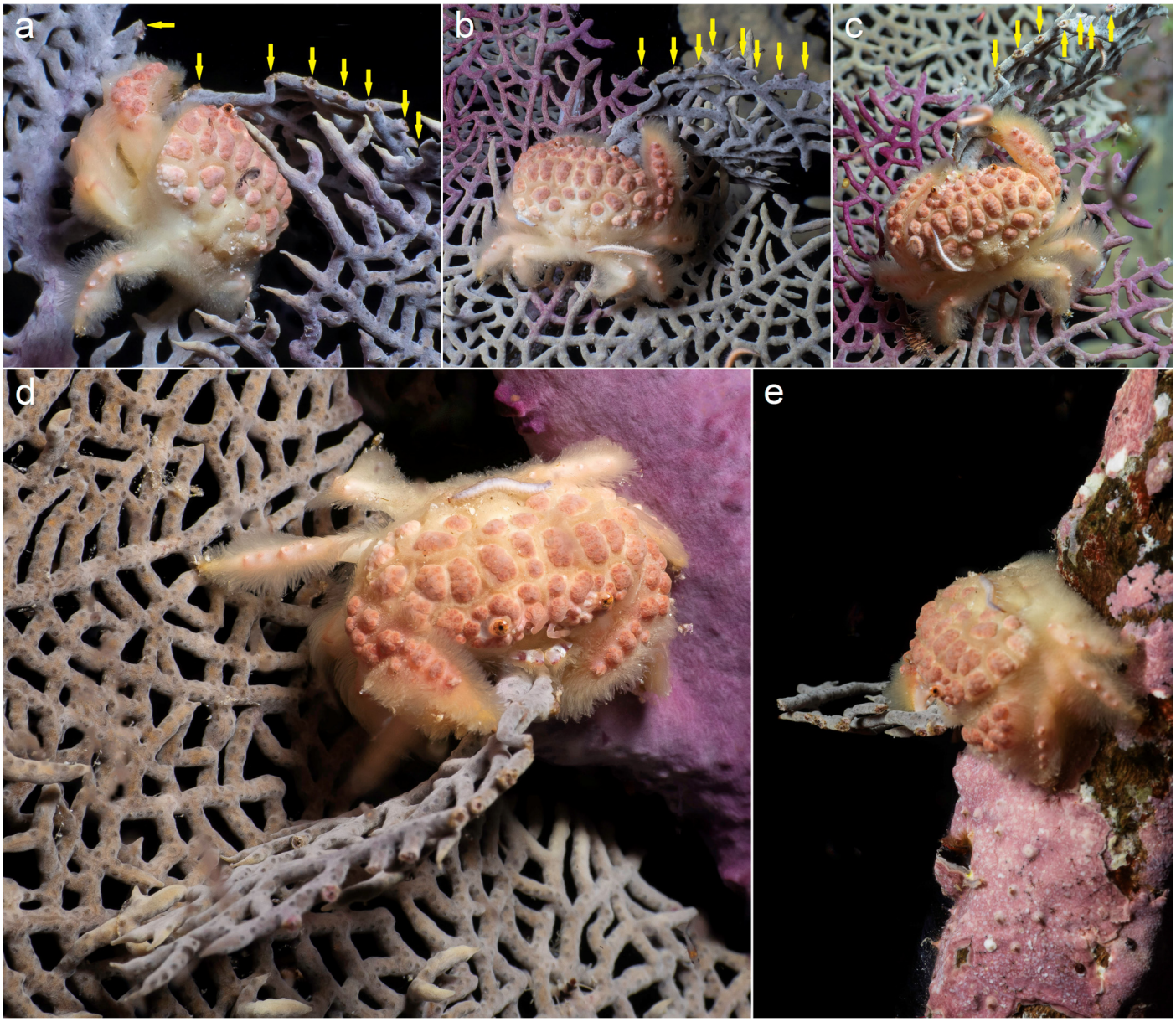

Figure 2. A hoary rubble crab, *Banareia palmeri*, cutting off a piece of a sea fan, *Gorgonia ventalina*, and moving it to the base of the coral during a night dive in the northern part of Bonaire (2020). Dive site: Bruce's Rappel (12°13′04″N 68°20′40″W), 5–6 m depth. (**a**) The crab was in the process of cutting the coral fragment, which was still partly attached. (**b**–**d**) The coral fragment being carried over the coral's surface. (**e**) The coral fragments were transported downward over the coral's base. Arrows: fresh cuts. Photo credits: L.A.O.L.

Figure 3. A hoary rubble crab, *Banareia palmeri*, cutting and transporting a small branch of a plexaurid octocoral during a night dive in the northern part of Bonaire (2020). Dive site: Bruce's Rappel (12°13′04″N 68°20′40″W), 5–6 m depth. (**a**) The crab cutting the branch. (**b**) The coral branch is severed and excretes mucus at the wound (arrow). (**c**). The detached branch is carried downward. (**d**) The crab and the branch are partly covered by sticky coral mucus. Photo credits: L.A.O.L.

This crab species is infrequently encountered in Bonaire's dive sites, potentially due to divers' preferences for certain sites over others that are more remote or challenging to access. Also, the crab appears to be active during the night, when there are not so many divers around. The sightings in northern Bonaire (Figures 2 and 3) occurred at a dive site that is inaccessible from the shore and, consequently, less frequented during night dives. The sighting in southern Bonaire (Figure 1), while accessible from shore, is not visited a lot at night. The crab is quite small (Figure 4) and, therefore, divers do perhaps not pay much attention to the crab's nocturnal activities at the tips of sea rods and sea fans.

The reason for the crab severing the tips of octocorals remains uncertain. As this species is not a decorator crab [8–10], it is unlikely that the fragment is utilised for camouflage. A plausible hypothesis is that the crab engages in predation on the octocorals. After detaching coral fragments, the crab might consume them within the seclusion of its den.

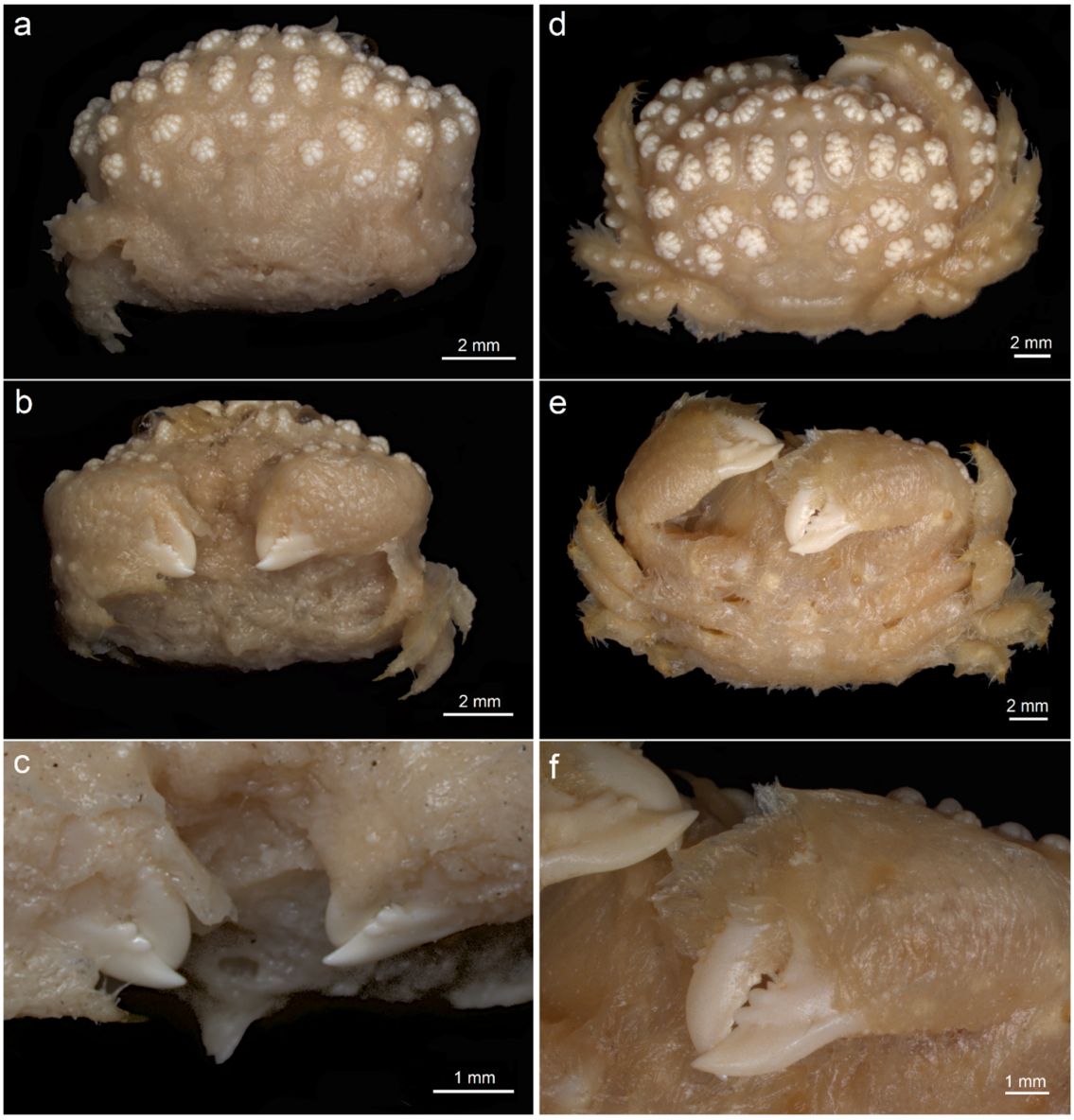

Figure 4. Ethanol-preserved museum specimens (Naturalis Biodiversity Center, Leiden) of *Banareia palmeri* showing habitus and claws: (**a**–**c**) small female (carapace 0.9 cm wide) from Bonaire, Lac Boca, behind the reef, October 1948 (RMNH.CRUS.D.8166); (**d**–**f**) large male (carapace 1.8 cm wide) from the Dominican Republic, SW of Isla Beata, 19 July 1970 (RMNH.CRUS.D.29064); (**a**,**c**) dorsal sides; (**b**,**d**) ventral sides; (**c**,**f**) close-ups showing the sharp-edged teeth of the saw-shaped inner edges of the claws. Photo credit: M.W.

Close examination of museum specimens from Bonaire (a female with a carapace width of 0.9 cm) and the Dominican Republic (a male with a carapace width of 1.8 cm) revealed that the inner edges of the crab's claws resemble saws by bearing tooth-like structures with sharp edges (Figure 4). This explains how the small crabs are able to cut through relatively thick, soft tissue and the strong horn-like axis found in most Caribbean octocorals [11,12]. According to provenance data of old museum specimens, *B. palmeri* has been collected from stony corals, sponges, and the octocoral *Plexaurella regia* Castro, 1989 [13–16], but these associations are not confirmed by recent observations during SCUBA diving and could be based on host misidentifications since not all sea rods are easily recognised as octocorals when their polyps are retracted (Figure 1).

Pictures on the Internet show additional examples of the same hosts [17–21] and others, such as the sea rod *Eunicea* sp. in Bonaire [22]. In most of these records, the crab

has erroneously been identified as the nodose rubble crab, *Paractaea rufopunctata* (H. Milne Edwards, 1834), which is originally described as being from Mauritius in the Indian Ocean and is also known from other Indo-West Pacific localities [23–26]. Online records at iNaturalist and GBIF show a misidentified specimen of *B. palmeri* in the Cayman Islands [17,18] displaying similar coral-cutting and coral-fragment-carrying behaviour as the individuals of Bonaire. In other photographs from the Cayman Islands, a misidentified *B. palmeri* individual appears to be eating a fragment of *G. ventalina* [27,28]. These misidentifications are shortchanging knowledge on the distribution of *B. palmeri* and its behaviour. *Banareia palmeri* has originally been found in Florida [29], and subsequent records are from various other localities in the Gulf of Mexico [30], the Caribbean [31], and Brazil [16,32,33]. It has also been reported from rubble at depths up to 145 m [30,33].

The presumed predatory nature of the relationship between *Banareia palmeri* and its octocoral prey would resemble that of crabs of the genus *Platypodiella* Guinot, 1967 (family Xanthidae), which cut holes in zoantharians by use of their claws [34–36]. Sequencing of gut contents of *Platypodiella picta* (A. Milne-Edwards, 1869) revealed that this crab species actively feeds on the zoantharian *Palythoa caribaeorum* Duchassaing & Michelotti, 1860 [37]. The association between *B. palmeri* and different octocoral species also resembles that of the well-known corallivorous snail *Cyphoma gibbosum* (Linnaeus, 1758), which is common in the Caribbean and predates on a large range of octocorals [38–42]. *Cyphoma* individuals, however, are commonly found alongside the branches of their hosts, where they may leave large, elongated scars [43–47], very different from the apical damage inflicted by *B. palmeri*. The corallivorous gastropod *Coralliophila salebrosa* H. Adams and A. Adams, 1864 (previously known as *Coralliophila caribaea* Abbott, 1958) has been reported to cause harm to five genera of octocorals and some scleractinians [42,47]. In contrast to *B. palmeri*, both snail species graze on their host corals in situ and do not take fragments away. Another corallivorous invertebrate, the bearded fireworm *Hermodice carunculata* (Pallas, 1766), is also known to attack gorgonians [48,49], but unlike *Banareia,* it is unable to cut their horny axis. *Hermodice carunculata* is a generalist predator known to attack a large range of prey, which is not limited to corals, although some prey species are more preferred than others [49–52]. So far, it appears that *B. palmeri* is a corallivore with a preferred diet consisting of a few octocoral species, but there is no definitive evidence for this. The species is unique by being able to cut through the horny octocoral axis and take fragments away. Additional research is needed to examine the foraging behaviour of *B. palmeri* and its gut contents. In addition, aquarium experiments may help to clarify if this crab species has any prey preferences. This study would not be the first showing that the discovery of novel trophic relationships and feeding strategies in the sea are serendipitous, often depending on recreational and professional divers being at the right time and the right place, which is corroborated by the increasing popularity of underwater photography that enables the documentation of such new observations [1–3,53–67].

Various octocorals are known for their strong regeneration capacity [68,69]. They may be able to heal wounds, but when the horny axis is cut and the apex is taken away, it is unlikely that the branch will continue to grow further, and the original rounded tip may remain damaged. On Bonaire, some sea rods can be seen with regenerated branch tips, which are either blunt or sharp, depending on the presence of the axis (Figures 5–7). These could be the result of the crab's coral-cutting behaviour because well-known predators are not known to cut the branch tips and there are also no diseases or parasites known to affect octocorals in this way [70–73]. One octocoral colony with multiple damaged branch tips showed one branch with a large unfinished cut, as if the axis gave too much resistance (Figure 5). The fate of disconnected branch fragments is not known. If they are not consumed or only partly eaten, it is possible that the fragments survive the crab attacks

and contribute to asexual reproduction [74]. The fate of octocorals that have been damaged by the tiny coral-cutting crabs also needs further investigation.

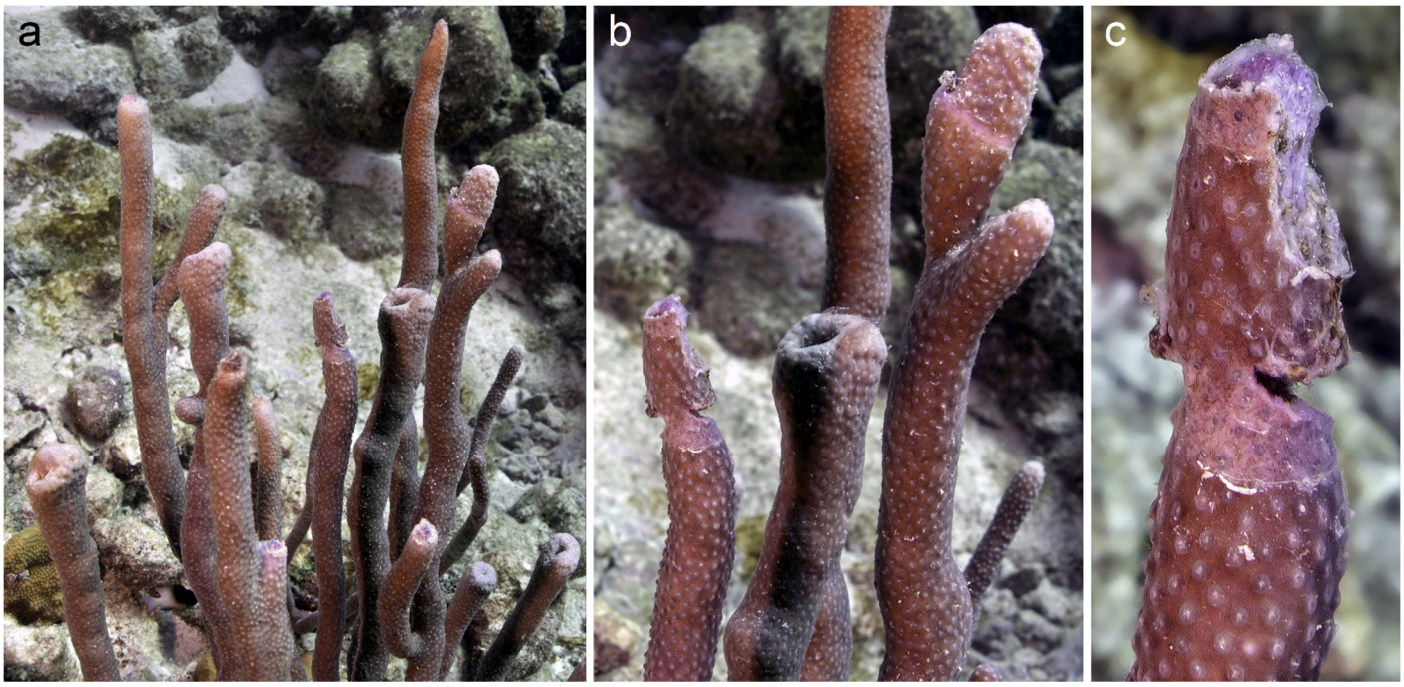

Figure 5. *Pseudoplexaura* sp. at Bonaire (2025). Dive site: Jeanie's Glory (12°05′14″N 68°16′59″W), 6–8 m depth. (**a**) Overview of a coral colony showing various damaged and regenerated branch tips. (**b**) Variation in wounded branch tips. (**c**) Close-up of a cut-off branch tip with an unfinished cut underneath, consistent with the cutting behaviour of the crab *Banareia palmeri*. Photo credits: L.A.O.L.

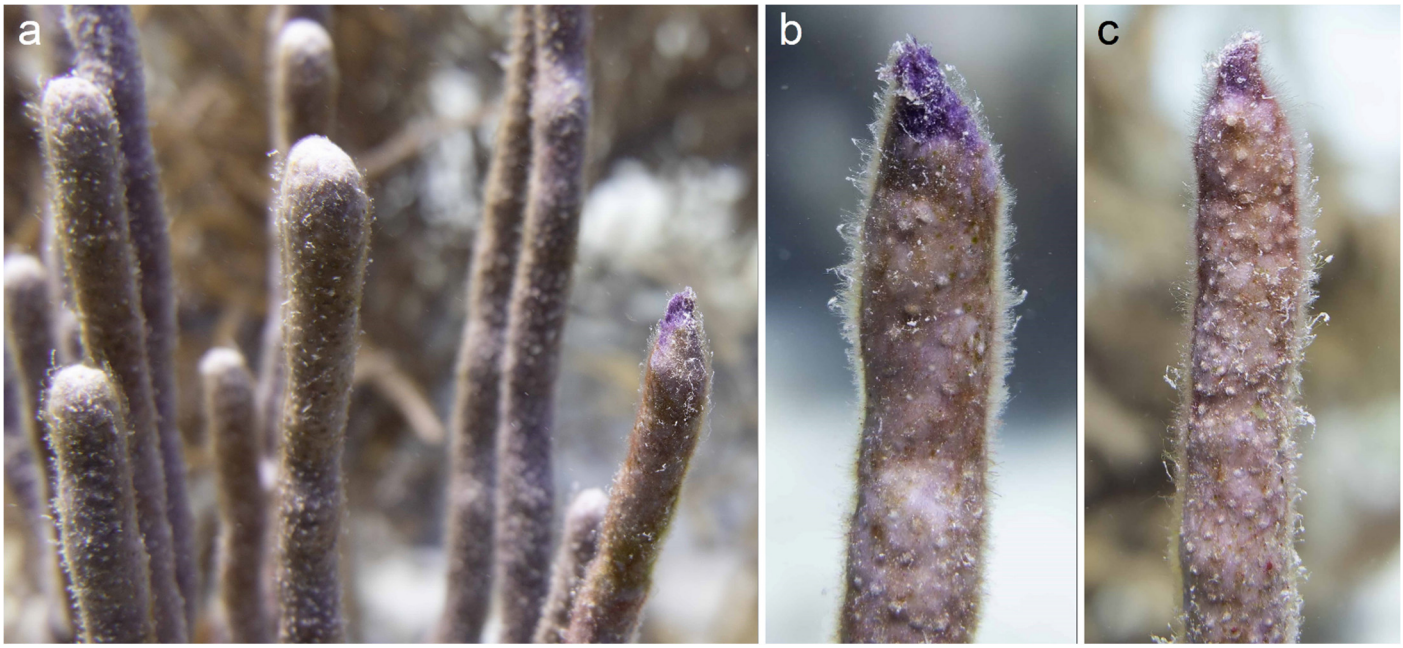

Figure 6. Examples of healthy and damaged branch tips of sea rods, *Pseudoplexaura* sp., at Bonaire (2024). Dive site: Tori's Reef (12°04′15″N 68°16′50″W), 8–9 m depth. (**a**) Overview of a coral colony showing one wounded, regenerated branch (most right). (**b**,**c**) Close-ups of regenerated branches with the original apical tips missing, which could have been removed by the crab *Banareia palmeri*. Photo credits: L.A.O.L.

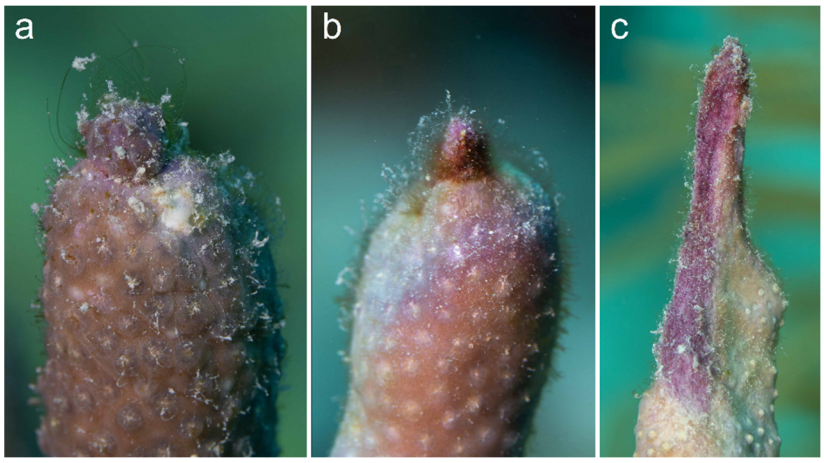

Figure 7. Close-ups of damaged branch tips of sea rods, *Pseudoplexaura* sp., at Bonaire (2025). Dive site: The Rock (12°04′30″N 68°16′51″W), 5–9 m depth. They show regeneration of soft tissue around cut-off axis tips, varying from blunt (**a**) to medium sharp (**b**) and very sharp (**c**). Photo credits: L.A.O.L.

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