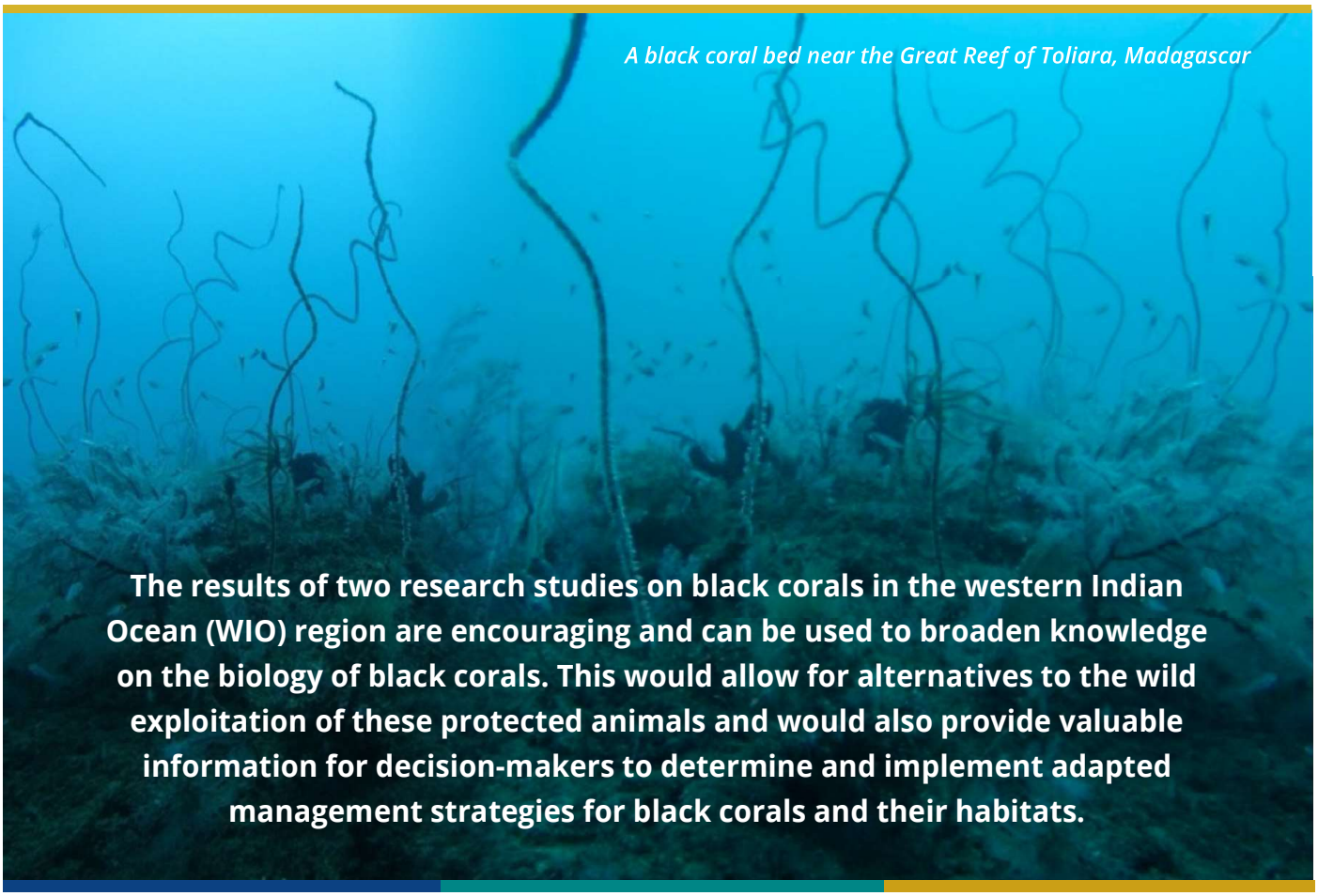
BLACK CORALS UNDER THREAT, BUT STUDIES SHOW HOPE | *By Gildas Todinanahary and Gilles Lepoint*



A black coral bed near the Great Reef of Toliara, Madagascar

The results of two research studies on black corals in the western Indian Ocean (WIO) region are encouraging and can be used to broaden knowledge on the biology of black corals. This would allow for alternatives to the wild exploitation of these protected animals and would also provide valuable information for decision-makers to determine and implement adapted management strategies for black corals and their habitats.

***Antipatharians*, also known as black corals, are colonial organisms found worldwide, from tropical to polar latitudes and from shallow waters to abyssal depths. There are 247 described species.**

For a very long time, especially in the tropical regions, black corals have been used as money, for medicinal purposes and for making jewellery. Except in Hawaii where these fisheries are well known, black coral harvests are usually made without clear management strategies, and this is especially true in the western Indian Ocean region.

To date, the east coast of Africa and islands of the Indian Ocean are amongst the least controlled regions involving black coral trade. In Madagascar, illegal harvests have increased since 2011, despite a ministerial decree since 2014 which prohibits any form of exploitation. The fisheries department continues to arrest divers collecting black corals from Madagascar's deep south. **The last arrest was in October 2021, with 38 kg of black coral skeletons and dozens of diving rigs seized.**

Recent research undertaken by the Fishery and Marine Science Institute of Toliara and its Belgian partners, have highlighted the consequences of this illegal trade. Some black coral species are already on Appendix II of the Convention on International Trade in Endangered Species of Wild Fauna and Flora, but because of a lack of knowledge for the WIO region, it is impossible to establish an evidence-based conservation policy and therefore, no *Antipatharia* is presently on the Red List of the International Union for Conservation of Nature.

Conservation and Biology of Black Corals project

The two research papers reported on in this article are the results of the Conservation and Biology of Black Corals (COBICO) project (2018 to 2022), funded by the National Fund of Scientific Research (Belgium) and the Fishery and Marine Science Institute of Toliara. The first is on the mechanical properties of four black coral species found along a shallow area of Toliara Great Reef and a first in situ cultivation study of *Cirrhipathes anguina.*

Dugauquier et al. (2021) measured the modulus of elasticity in tension or compression and the flexural stiffness of both branched and whip-shaped antipatharians living under similar environmental conditions. The study was performed on 12 colonies of four black coral species (whip corals *Cirrhipathes anguina* and *Stichopathes cf. maldivensis*, and the branched corals *Cupressopathes abies* and *Cupressopathes cf. pumila*) collected at two sites on the Great Reef of Toliara.

The four species did not present significantly different Young's modulus, but the elasticity was higher in the distal segment of colonies, compared with the basal and median segments. By contrast, the flexural stiffness was significantly higher in whip species compared with branched ones. In the whip species, flexural stiffness was also higher in the basal segment compared with the other two segments.

These results, especially the flexural stiffness, suggest that the different morphologies of the species correspond to their contrasted feeding strategies in a similar strong current environment.

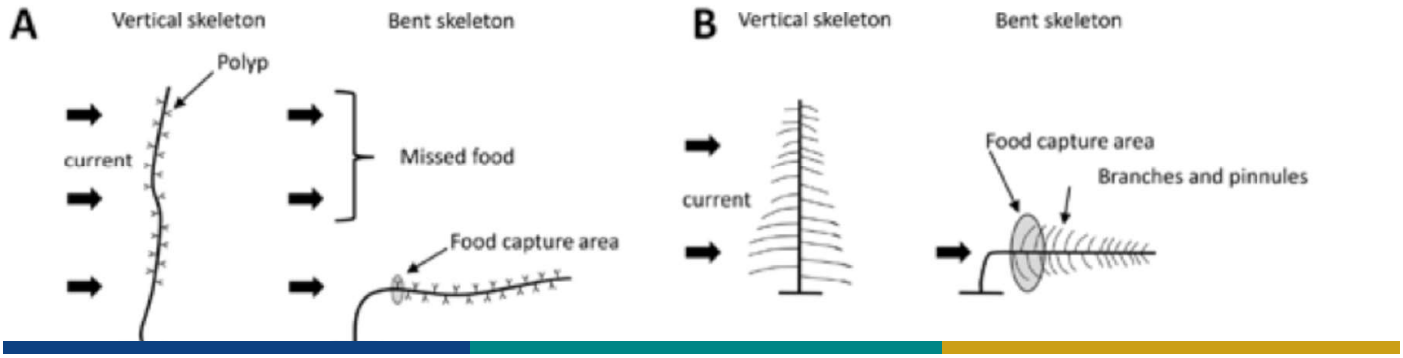


Figure 1. Diagrams of food capture by colonies of antipatharians with different morphologies. A. In whip corals, food capture is reduced when the skeleton bends under the current. In a vertical position, the skeleton maintains all the polyps in an optimized feeding position. B. In branched corals, there is less reduction of food capture when the skeleton bends under the current. The food capture area remains functional because of the polyps on the branches and pinnules. Source: modified from Dugauquier et al., 2021.

The feasibility of transplanting whip black corals

In May 2019, Godefroid et al., performed experimental research on working underwater with black coral nubbins of the *Cirrhipathes anguina* species from the Great Reef of Toliara. **The aim of the experiment was to test the feasibility of transplanting the whip black corals at two sites with distinct environmental conditions:** North Pass (NP, 23 m depth) and Grande Vasque (GV, 13 m depth). Apart from depth (and light, accordingly), current regimes also differ. The NP is well exposed to the waves and current generated by the dominant south wind, while the GV is a basin of approximately 1.5 km in length and 300 m width situated in the flat of the reef and well protected from the swell.

A total of 56 fragments from four colonies collected at 23 m depth (from NP) were transplanted at the two sites: 28 fragments each at NP and GV. Each fragment was attached to one iron barred table per site, with special care taken to keep the nubbins in their original direction, i.e. with the apical part directed upwards. Every month, photographs of every fragment were taken, and the length of the growing part (skeleton covered by tissues) was measured in millimetres using the software, ImageJ.

Results show a successful transplantation in both sites with zero mortality (except in the form of missing fragments) and a certain growth over 200 days. Maximum growth rates were 3.4 cm per month and 2.0 cm per month in the North Pass and in the Grande Vasque, respectively.

In addition, mean time to total healing was delayed in the Grande Vasque by ten days compared to the transplants in the North Pass. Differences between sites are likely to be related to differences in environmental parameters.

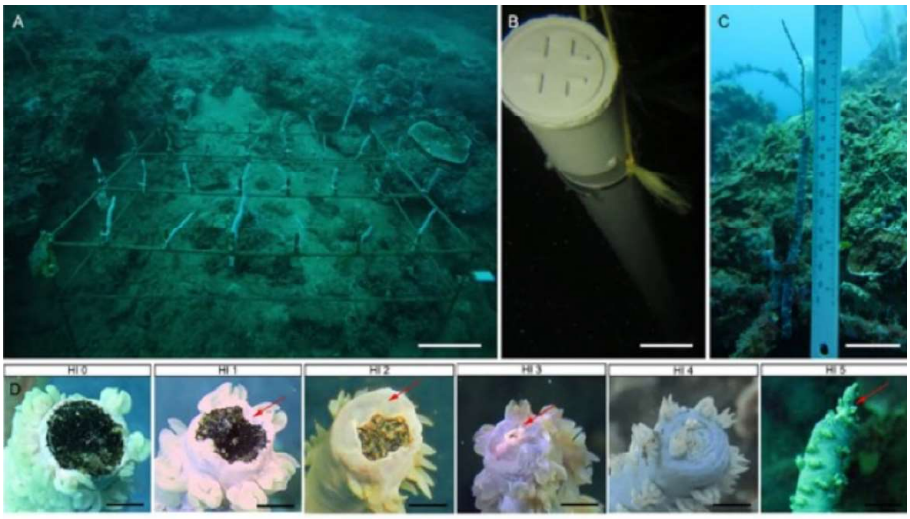


Figure 2. A, the table used with fragments of colonies attached (Scale: 15 cm); B, the PVC pipes used to transport entire colonies (Scale: 5 cm); C, a growing fragment attached with a plastic tie to the table (Scale: 3 cm); and D, the Healing Index used, represented by photographs of the apical portions of the nubbins (Scale: 500 µm). HI 0 corresponds to a clear section with the skeleton fully exposed; HI 1 is for nubbins with a peripheral bulge of healed tissues (red arrow); HI 2 is for nubbins which have tissues growing over the skeleton (red arrow); HI 3 represents an almost fully overgrown section with the possible development of an apical polyp (red arrow); HI 4 represents nubbins totally recovered but with no sign of growth; and HI 5 represents nubbins having a vertically growing apical part (red arrow). Source: Modified from Godefroid et al., 2021.

The promising results obtained with the easy protocol used in this study encourage the use of black coral transplants in further experiments and restoration projects.

READ THE FULL PAPER:

Dugauquier, J.M., Godefroid, M., M'Zoudi, S., Terrana, L., Todinanahary, G., Eeckhaut, I. & Dubois, P. 2021. Ecomechanics of black corals (Cnidaria: Anthozoa: Hexacorallia: Antipatharia): A comparative approach. *Invertebrate Biology*, e12347.

Available Here

Godefroid, M., Todinanahary, G.G.B., Dubois, P., Eeckhaut, I., Lepoint, G., Terrana, L. 2021. Perspectives on working underwater with black coral nubbins (Cnidaria: Antipatharia): the case of Cirrhipathes anguina (Dana, 1846). *Journal of Experimental Marine Biology and Ecology*, 545: 151645.

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