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Unveiling the submarine landscape of the Namuncurá Marine Protected Area, Burdwood Bank, SW Atlantic Ocean

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Abstract. In this contribution we provide the first images of the submarine landscape of the Namuncurá Marine Protected Area, Burdwood Bank, at the SW Atlantic Ocean. This non-invasive approach revealed and offered a complementary view of the seafloor and its fauna, only previously reported from trawl catches.

Keywords: benthic richness, habitat structure, submarine image, Argentina

Resumen. **Revelando el paisaje submarino del Área Marina Protegida Namuncurá, Banco Burdwood, Océano Atlántico Sudoccidental**. En este estudio proporcionamos las primeras imágenes del paisaje submarino del Área Marina Protegida Namuncurá, Banco Burdwood, en el Océano Atlántico Sudoccidental. Este enfoque no invasivo revela una vista complementaria del fondo marino y su fauna, sólo conocida hasta el momento a partir del estudio de las capturas registradas con artes de arrastre de fondo.

Palabras clave: riqueza bentónica, estructura del hábitat, imagen submarina, Argentina

In July 2013 Argentina established its first offshore Marine Protected Area (MPA) named "Namuncurá", at the Burdwood Bank, a segment of the North Scotia Ridge in the SW Atlantic Ocean. The bank is located about 150 km east of Isla de los Estados, Tierra del Fuego Province, and 200 km south of the Malvinas Islands. The rocky slopes of the bank rise from more than 4000 m depth in the Yaghan Basin (Drake Passage) to form a wide plateau with depths as shallow as 50 m. This large MPA circumscribed by the 200 m isobath (Fig. 1) has joined the 43 already existing Coastal-Marine Protected Areas in Argentina (Caille *et al*. 2013). For managing purposes, it was divided into a Core, a Buffer and a Transition areas (National Law 26875, Argentina). The direct influence of the Antarctic Circumpolar Current and persistent westerlies blowing at the "fifties" (50°S) make the region an extremely dynamic environment of subantarctic waters, fairly homogeneous vertically in the plateau (without a thermocline), ranging seasonally from 4 to 9ºC and with a mean salinity of 34 (Piola and Gordon 1989; Guerrero *et al*. 1999). Although this plateau is known since 1842 (Findlay, 1867), and the first faunistic sampling probably dates from 1903, performed by the S/Y "Scotia" during an Antarctic Expedition (Scottish National Antarctic Expedition, 1908), the benthic realm is only scarcely studied. Schejter *et al*. (2016) have recently recorded 250 species of epibenthic organisms, comprising fragile and vulnerable taxa, which provide a baseline inventory for the MPA. Additionally and according to the ongoing research, the bank is also home to more than 90 species of small organisms belonging to Peracarida (Doti *et al*., 2014; Chiesa *et al*., 2015) and also to new species recently described (i.e. corals: Cairns, 2012; sponges: Schejter *et al*., 2017).

As a first attempt to obtain images of the sea-bottom and the benthic realm of the MPA, a GO-

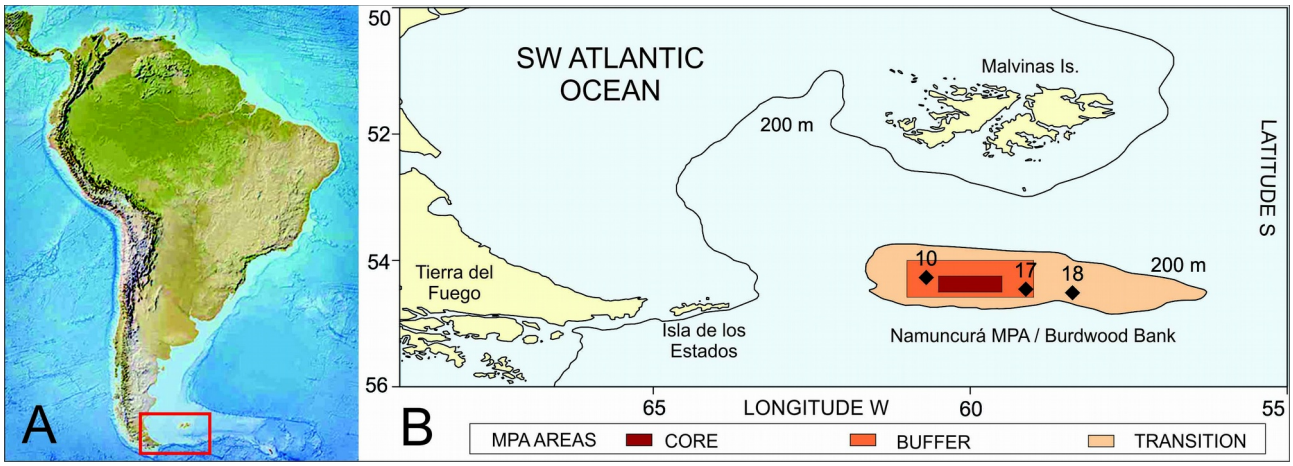

Figure 1. A. Study area in South America. B. Namuncurá MPA, Burdwood Bank: zonation of the MPA and stations visited during the CG "Prefecto García" research cruise.

PRO Hero-4 Silver camera with a flashlight (Subacqua W40V, 2600 lumens, White light LED CREE XM-L U2) were housed in a special pressure case (IqSub) designed to fit a GO-PRO camera and maintain water tightness down to 150 m depth. This equipment was attached to a CTD probe, and sent to the bottom of the Namuncurá MPA at 120-140 m depth during a research cruise conducted aboard the vessel "Prefecto García" (Prefectura Naval Argentina - Argentine Coastguards) in December 2015. The camera was set to film at 25-frames per second with a video resolution of 2.7 k and a white balance of 5500K. Three videos unveiling the sea bottom scape were obtained from stations 10 (54°16'01''S; 60°41'37''W, 120 m depth) and 17 (54°27'10''S; 59°07'23'' W, 130 m depth) in the Buffer area, and from station 18 (54°30'31''S; 58°23'11''W, 137m depth) in the Transition area. These movies were not a primary goal of the cruise, but rather a "collateral" opportunity to obtain them at the same time as we vertically profiled the water column properties with the CTD, without any extra consumption of time or burden to the operations on deck. Screen captures of the videos of the three sites were obtained using free software (Bandisoft and VLC Media Player) and are presented in Figures 2 – 4. The scales shown in the photos are approximate and were estimated considering the sizes of the fauna collected during the research cruises. This non-invasive approach revealed the first records of the submarine landscape of the MPA and offered a complementary view of the seafloor and its fauna, only previously reported from bottom trawling samples. Additionally, some pictures of trawl catches performed on board the RV "Puerto Deseado" during a cruise in 2016 are provided for comparative purposes.

Based on the images, our results, revealed highly heterogeneous substrata over the bank. At station 18 at the Transition area (Fig. 2), the underwater images unveiled a rocky environment, punctuated by patches of living and dead valves of brachiopods and tubeworms, along with a rich sessile community dominated by many species of bryozoans, hydrozoans and stylasterid corals (*Errina antarctica*). The three-dimensional architecture of this kind of habitat provides home and refuge to polychaetes, crustaceans and echinoderms. An image of the biogenic sediment that covers the seafloor, together with some of the most conspicuous species, is also shown in Figure 2, from samples collected onboard the RV "Puerto Deseado" cruise, conducted during 2016.

The submarine images from the west of the Buffer area (station 10) revealed also a rocky bottom, mainly colonized by bryozoans, brachiopods and serpulid tubeworms among the most conspicuous elements of the sediment. Hydrozoan colonies were also evident in this station, as well as the primnoid corals. Living specimens but also many dead hard parts of all these organisms were gathered by trawls. Camouflaged fauna could be also detected after a careful inspection (Figure 3). Among them we found the sea star *Glabraster antarctica*, the common brachiopod *Terebratella dorsata*, the Patagonian scallop *Zygochlamys patagonica*, the ophiuroid *Ophiacantha vivipara* and the spider crab *Eurypodius* cf. *latreillii*.

The site located in the east of the Buffer area (station 17) was dominated by coarse biogenic sand over which king crabs were detected; some sponges were also visible in the distance (Figure 4). Other conspicuous organisms were primnoid corals (probably *Primnoella* sp.) and a colonial ascideacea.

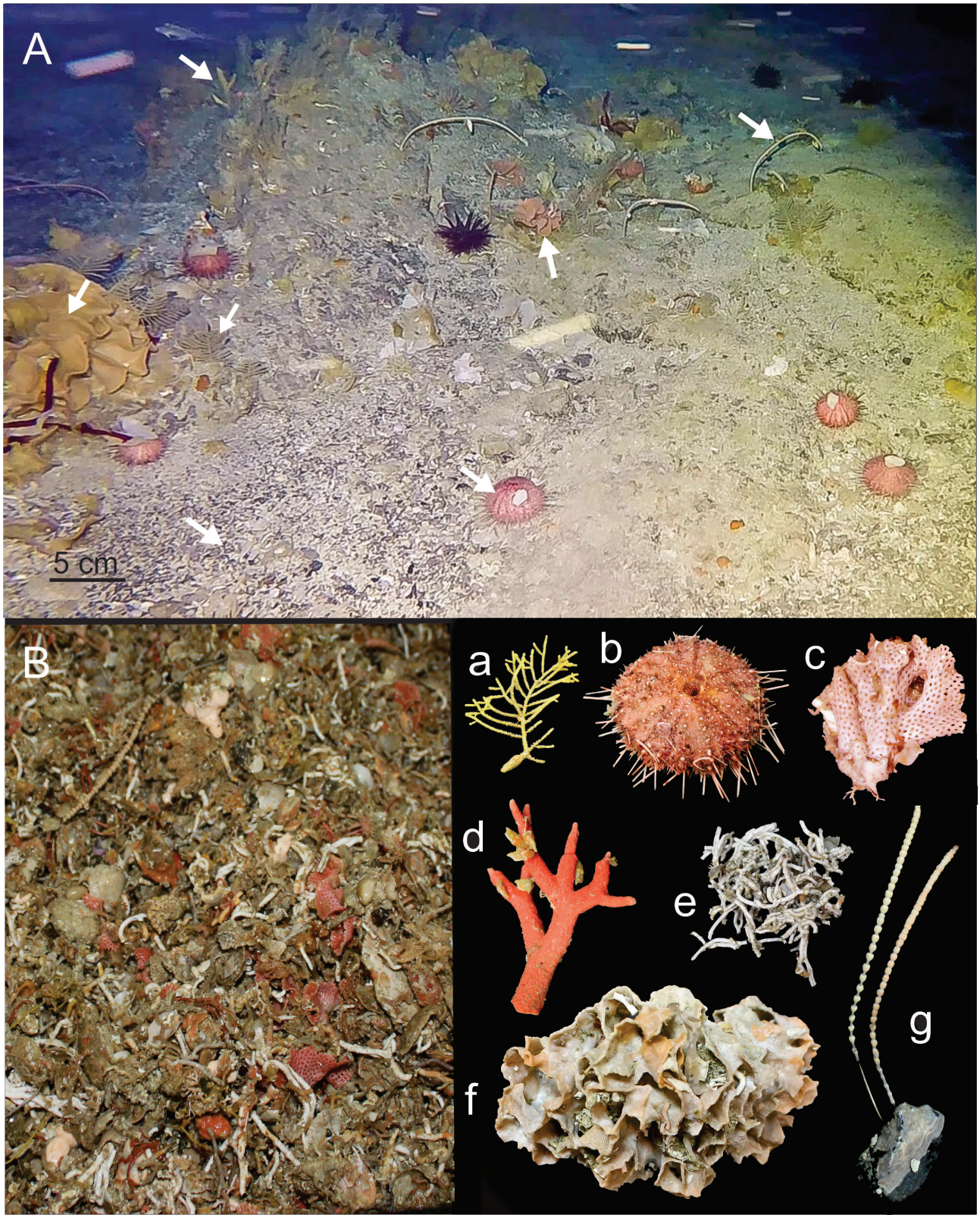

Figure 2. A. Submarine landscape at station 18 (~140 m depth) during the "Prefecto García" cruise, in 2015. Conspicuous organisms are pointed using arrows; from collected specimens, the same species are shown separately as follows: a, hydrozoan colony; b, *Sterechinus agassizii*; c, *Reteporella magellanica* (Bryozoa); d, *Errina antarctica* (Stylasteridae) with epibiotic stalked barnacles *Ornatoscalpellum gibberum;* e, Serpulidae (tubeworm); f, Ascophora (Bryozoa); g, epibiotic primnoidae (soft coral) on a pebble. B, the possible composition of the substrate is suggested, based on the catches.

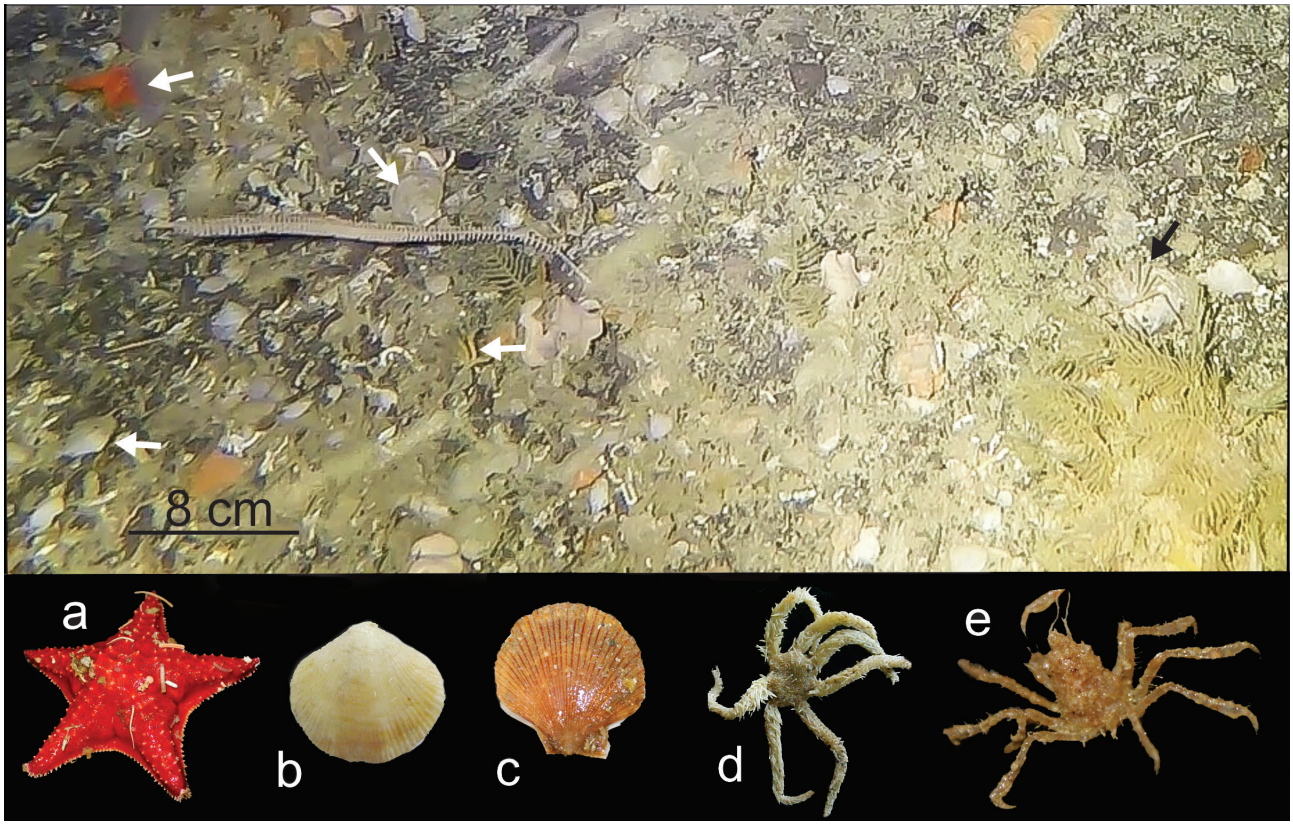

Figure 3. Image of the submarine landscape recorded at station 10. Some of the camouflaged species recorded are pointed with arrows and showed from collected samples as follows a, *Glabraster antarctica*; b, *Terebratella dorsata*; c, *Zygochlamys patagonica*; d, *Ophiacantha vivipara*; e, *Eurypodius* cf. *latreillii.*

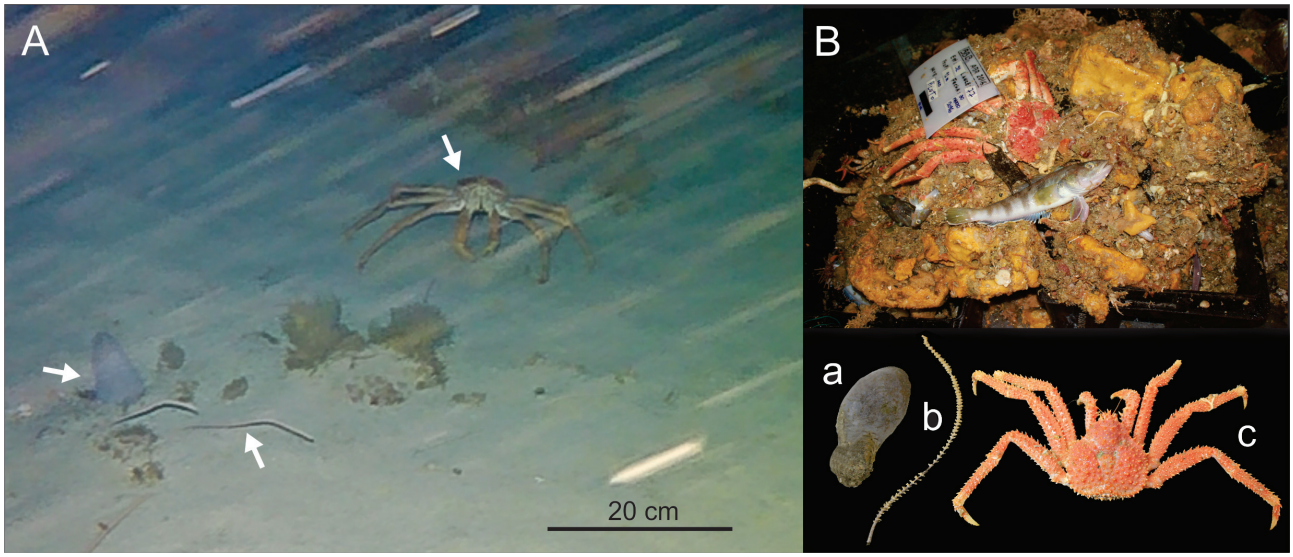

Figure 4. A. Underwater image recorded at station 17, 130m depth. Arrows correspond to the most conspicuous species, as follows: a, colonial ascideacea; b, primnoid coral, probably *Primnoella* sp.; c, king crab *Lithodes confundens*; B. Image of a trawl catch from a neighboring region collected during a 2016 cruise on board RV "Puerto Deseado".

Most likely, catches taken by research cruises in this kind of bottom patches should look alike to the Figure 4B. In this image, a catch dominated by sponges (mainly of the genus *Mycale* and *Tedania)* was evident. King crabs (*Lithodes confundes*) were also conspicuous, together with the longtail southern cod *Patagonotothen ramsayi*. Other species showed up after a careful inspection of the catch (such as

ascidiaceans, Primnoid corals, polychaetes and echinoderms, among others). Similar catches were obtained in the Core area during a cruise conducted in 2013 (Schejter *et al*., 2016) and also during a cruise performed in 2016 (L. Schejter, Pers. obs.).

Images from such a simple dispositive, as our GOPRO camera, with its limitations, provide a very useful, cheap (compared to Remote Operated Vehicles) and non-invasive tool to understand how benthic species are actually distributed in the seafloor, how the species are associated to each other or how the three dimensional structure of the community looks like. Furthermore, this approach complements the information and records obtained with more traditional approaches, such as the trawls and dredges used for benthic sampling. Estimations of *in-situ* monitoring of macrozoobenthos by means of images and videos taken using similar devices were previously conducted in Antarctica by McClintock *et al.* (2010) and Peirano *et al.* (2016), among others.

Summarizing, the images here provided of the submarine landscape at 130-140 m depth inside the Namuncurá MPA, Burdwood Bank, are only the "tip of the iceberg" regarding the existing biodiversity and of our understanding of the benthic community, but constitute a valuable contribution to increase our comprehension of the arrangement of this particular seascape. This highly heterogeneous bank represents a very important piece in the "bridge" between the Magellan Region and the Antarctic Continent (Arntz *et al*., 2005; Griffiths *et al.*, 2008), home of many endemic species (Schejter *et al*., 2016), and that must be studied considering also its geological history (Thomson, 2004).

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