

MapGES / ATLAS Project: August 2018 Cruise on board of R/V Arquipélago

(21th to 24th of August 2018; Faial to Santa Maria)

CRUISE REPORT *Date: 14/09/2018*



*A new Vulnerable Marine Ecosystem (VME) area with one of the densest aggregations of *Dentomuricea cf. meteor* known in the Azores (left) found in the southern part of Mar da Prata with the new low-cost, custom-made drop-down camera system. The great potential of the new deep-water Baited Remote Underwater Video equipment (BRUV) for monitoring fish stocks was proven. Some large wreckfish *Polyprion americanus* (right) were caught on the BRUV system at Dom João de Castro seamount.*

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Objectives: to explore seamounts of the Azorean archipelago to better understand the distribution patterns of large VME species and commercial fishes. Namely, the cruise aimed to (i) map benthic communities inhabiting unexplored seamounts and banks in the Central (Dom João de Castro) and Eastern (Alcatraz and Mar da prate) part of the Azores Region, (ii) identify new areas that fit the FAO vulnerable marine ecosystems definition; and (iii) determine distribution patterns of deep-sea benthic biodiversity in the Azores. The results of this cruise will also contribute to identify the environmental drivers that determine the spatial distribution of deep-sea benthic biodiversity in the Azores region. It will also provide valuable information in the context of Good Environmental Status (GES), Marine Spatial Planning (MSP) and provide new insights on how to sustainably manage deep-sea ecosystems. The devices used in this survey correspond to low-cost custom made video platforms designed to operate between 200 and 500 m depth.

Vessel: N/I Arquipélago

Chief scientist: Telmo Morato

Scientific team: Telmo Morato, Marina Carreiro-Silva, Carlos Dominguez-Carrió, Gerald H. Taranto, Luis Rodrigues, Joana Brito and Sérgio Gomes

Main achievements:

1. Testing of custom made low-cost video platforms (drop-down and BRUV) in order to identify pros and cons to continue improving its design
2. Exploration of 3 seamounts from which there is currently very scarce information with 11 drop-down camera deployments
3. Identification of 4 new VME areas with large aggregations of coral and sponge species
4. Identification of the densest aggregation of *Dentomuricea* cf. *meteor* known so far

Cruise summary:

The main objective of the August 2018 MapGES cruise was to characterize the main megabenthic assemblages dwelling between 200 and 500 m depth using a low-cost, custom-made drop-down camera system (Fig. 1, left). The drop-down system designed and developed at IMAR is capable of working at depths of 600 m with a live-view signal sent to surface, for navigation purposes. Operators were therefore aware at all times of the position of the device with respect to the seabed and the characteristics of the area explored, minimizing the risk of becoming entangled around rocks or crevices. The drop-down system used in this cruise was equipped with two action cameras, which provided a stereoscopic image, allowing for very post-processing accurate measurements of the organisms. It was also equipped with external batteries that feed the cameras and the lighting system, in order to maximize the amount of bottom time available in each deployment. Finally, the drop system was furnished with one low cost depth (maximum 1000m) and temperature (-2°C to 35°C) sensors capable of recording environmental data every second. To reduce the cost of the video systems, they were not equipped with USBL positioning and therefore its location was inferred (with error) from the GPS position of the boat. The depth sensor data was then used to correct the displacement between the system and the boat. The drop-down camera system was deployed at the shallow point of the transect and drifted with the research vessel towards the deepest point.

Together with the drop-down system, a Baited Remote Underwater Video equipment (BRUV) was also developed at IMAR, with the objective of evaluating the fish community living in each of the areas explored. The BRUV was also equipped with two action cameras, lighting, and temperature and depth sensors, and incorporated a bait box, used to attract fish (but also other) species to the cameras (Fig. 1, right). The BRUV and the drop-down system were designed to be completely interchangeable, sharing the same steel structure and most of its electronic components. Due to logistic issues, the operations planned for the BRUV were cancelled on the second day of the cruise, and the remaining time focused on exploring the seabed using the drop-down system. The BRUVs were deployed for 1.5 hours at around 500m.

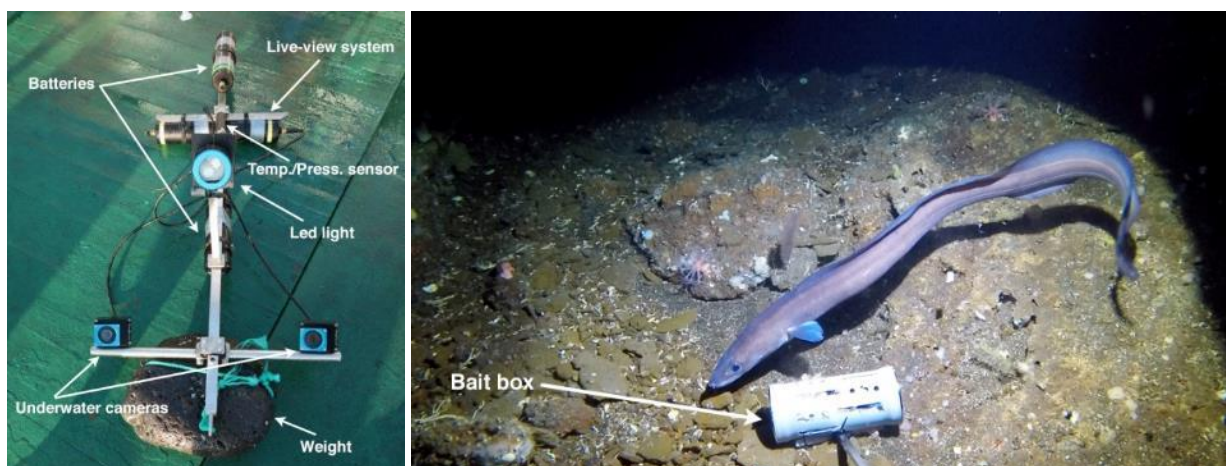


Fig. 1. Left: Configuration of the drop-down video system with live view used during the cruise, with two action cameras set to obtain stereo images, which will enable us to obtain measures of the observed organisms. Right: Underwater image obtained from the BRUV system used, which uses the similar configuration as the drop-down system.

The MapGES cruise spanned for a total of 4 days, in which 3 different areas were explored by means of visual methods: Dom João de Castro, Alcatraz and Mar da Prata seamounts (Fig. 2). A total of 14 deployments were made, including both the drop-down system and the BRUV (Table 1). Four deployments of the drop-down system were carried out in Dom João de Castro seamount, four more in Alcatraz seamount, and three in the southern part of Mar da Prata seamount. Only three BRUVs were conducted; all in Dom João de Castro seamount. Both devices had never been used in an oceanographic cruise before, so the mission was also

planned as a testing ground, with the idea of identifying pros and cons of the design and the way we used each of the devices to improve their performance. With this information in hand, both devices will soon be amended for the following cruises, mostly with the idea of increasing the stability of the live view, the light intensity, and reducing their propensity of getting entangled around fishing lines.

Table 1. GPS positions of the different drop-down and BRUV deployments carried out during the MapGES cruise in Dom João de Castro, Alcatraz and Mar da Prata seamounts.

St.	Instr.	Date	Start Time	End Time	Start Latitude	Start Longitude	End Latitude	End Longitude	Depth (m)
1	BRUV	21/08/18	12:10	14:17	38° 14.044' N	26° 37.960' W	38° 14.002' N	26° 37.895' W	580
2	BRUV	21/08/18	14:56	17:04	38° 14.319' N	26° 35.566' W	38° 14.183' N	26° 35.481' W	546
3	Drop	21/08/18	15:16	16:40	38° 14.107' N	26° 35.350' W	38° 13.964' N	26° 35.111' W	263-308
4	Drop	21/08/18	17:41	19:03	38° 12.672' N	26° 34.277' W	38° 12.258' N	26° 33.934' W	275-477
5	BRUV	22/06/18	07:40	10:15	38° 11.695' N	26° 35.537' W	38° 11.690' N	26° 35.282' W	566
6	Drop	22/06/18	08:24	08:50	38° 12.601' N	26° 36.086' W	38° 12.632' N	26° 35.932' W	220-249
7	Drop	22/08/18	09:06	09:41	38° 12.492' N	26° 36.231' W	38° 12.611' N	26° 36.140' W	330-260
8	Drop	22/08/18	11:24	12:40	38° 14.050' N	26° 37.705' W	38° 14.092' N	26° 37.402' W	340-394
9	Drop	22/08/18	15:10	15:51	38° 13.633' N	26° 13.058' W	38° 13.701' N	26° 12.940' W	450-480
10	Drop	22/08/18	17:36	18:05	38° 13.819' N	26° 13.118' W	38° 13.697' N	26° 13.279' W	399-416
11	Drop	22/08/18	18:30	19:14	38° 13.907' N	26° 13.055' W	38° 13.974' N	26° 13.112' W	505-560
12	Drop	23/08/18	08:18	08:57	37° 08.553' N	25° 39.329' W	37° 08.622' N	25° 39.462' W	NA
13	Drop	23/08/18	09:35	10:45	37° 10.054' N	25° 38.138' W	37° 10.129' N	25° 38.205' W	NA
14	Drop	23/08/18	11:10	11:31	37° 08.704' N	25° 38.585' W	37° 08.772' N	25° 38.628' W	NA

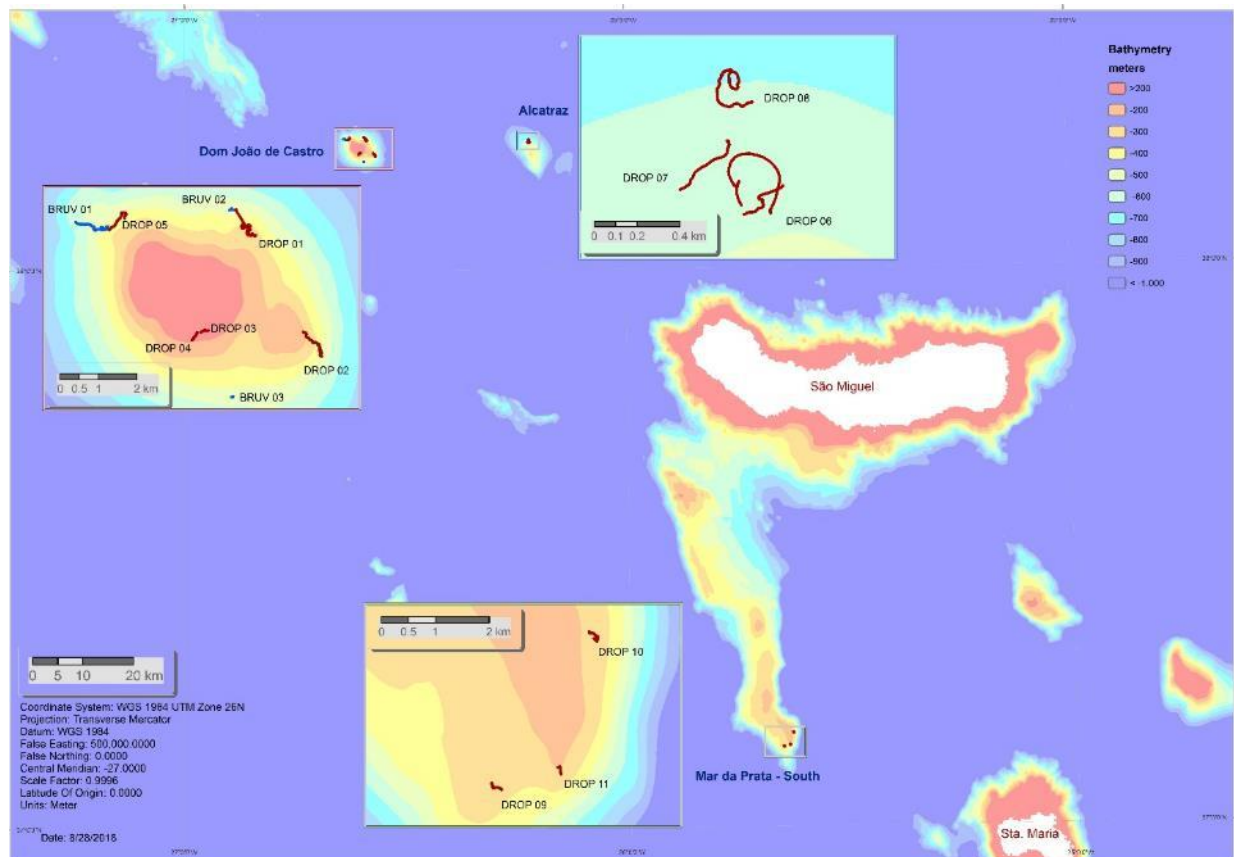


Fig. 2. Location of the deployments performed during the August 2018 MapGES cruise between Faial and Santa Maria islands on board of R/V Arquipélago.

21/08/2018 – Dom João de Castro Seamount

We left Horta harbour at 01:30. After sailing the whole night and most of the morning, we arrived at Dom João de Castro seamount after lunch. Two drop-down camera deployments were accomplished during the first day, at depths of ca. 300-500 m, together with two BRUVs at 500 m depth (Fig. 3). Both drop-down dives occurred in areas of large rocky outcrops dominated by the gorgonian species *Callogorgia verticillata*, observed forming dense aggregations, in which some very large colonies were observed (Fig. 4). Not many colonies showed signs of fishing impacts, although there was a considerable number of small fishing lines laying over the seabed or entangled around rocks (Fig. 5). The whip coral *Viminella flagellum* and the large hydrozoan cf. *Lytocarpia myriophyllum* were also observed as accompanying species in the *Callogorgia* forests, but never seen forming dense patches. Quite a few encrusting and erect sponges were also observed in areas of hard substrates. The most commonly observed fish species were *Helicolenus dactylopterus*, *Pontinus kublii* and *Conger conger*. This area may fit the FAO criteria and definition of vulnerable marine ecosystems.



Fig. 3. The vessel's crew deploying the drop-down camera system (left) and controlling its depth using a hydraulic winch. The configuration of the system on the vessel proved successful from day 1.



Fig. 4. Dense aggregations of large *Callogorgia verticillata* colonies observed in Dive 1 (top images) and Dive 2 (bottom left), at approximately 300 m depth. Aspect of the bottoms with sponges observed in Dive 2 (bottom right).

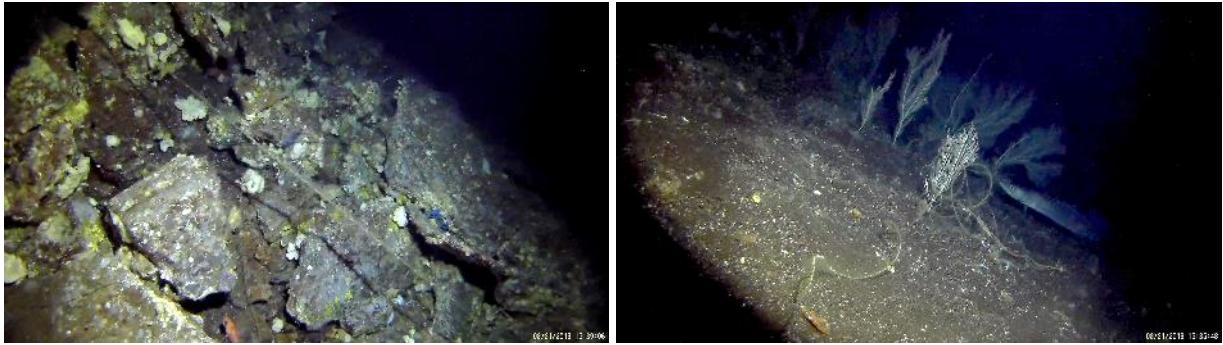


Fig. 5. Two examples of the fishing lines observed during Dive 1 at Dom João de Castro seamount.

The two BRUVs deployed at Dom João de Castro seamount at 500 m depth provided little information. The first deployment proved unsuccessful due to the implosion of the deep-sea buoys that were used to keep the structure in an upright position, and the BRUV was found laying on its side over the seabed for the entire deployment. Only one fish species was observed in the first deployment, *Helicolenus dactylopterus* (Fig. 6). With new buoys installed, deployment 2 worked correctly, although no fish specimens could be observed in the images of this second attempt.

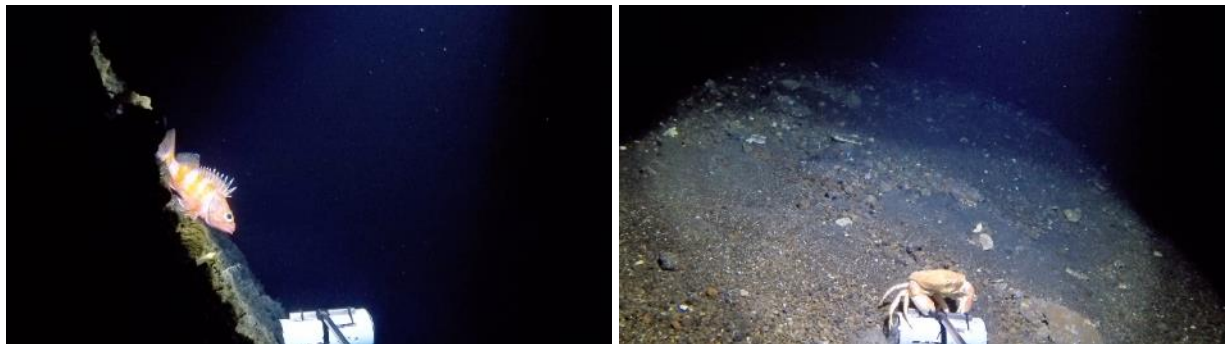


Fig. 6. Images from deployment 1 (*Helicolenus dactylopterus*, left) and deployment 2 (cf. *Chaveon affinis*, right) of the BRUVs performed at Dom João de Castro seamount.

22/08/2018 – Dom João de Castro and Alcatraz Seamount

Three more drop-down deployments were successfully carried out at Dom João de Castro during day 2. Dive 3 and Dive 4 occurred in areas of sands and gravels, with few megafauna organisms observed, besides some encrusting sponges. Dive 5 started with an area of gravels with large boulders colonized by sparse colonies of *Callogorgia verticillata*, cf. *Lytocarpia myriophyllum* and *Viminella flagellum* surrounded by a large number of colourful encrusting sponges (Fig. 7). Towards the end of the dive, the habitat shifted to areas of smaller boulders with only some small sponges attached to them.



Fig. 7. Images from Dive 4 (left) and aspect of the benthic community observed in Dive 5 (right), with the presence of the gorgonian *Callogorgia verticillata* and the large hydrozoan cf. *Lytocarpia myriophyllum*.

One BRUV was also deployed in Dom João de Castro seamount during the second day of the cruise, again at 500 m depth. The images obtained during this deployment showed a wide range of fish species, some of which of very large sizes, such as *Conger conger* and a group of *Polyprion americanus* (Fig. 8). Towards the end of the deployment, two large crabs appeared in the images attracted by the bait.

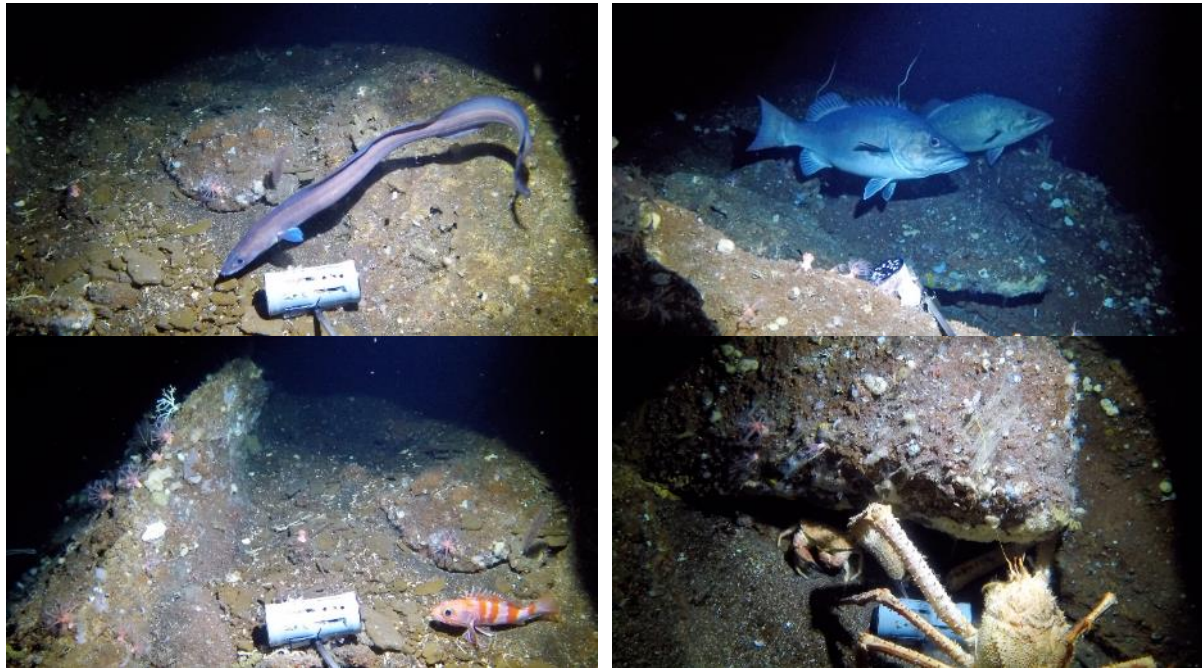


Fig. 8. Images recorded during the deployment of the BRUV at Dom João de Castro seamount, where different species could be identified: *Conger conger* (top left), *Polyprion americanus* (top right), *Helicolenus dactylopterus* over a seabed dominated by *Anthomastus* cf. *agaricus* and *Corallium johnsoni* (bottom left) and the crustaceans cf. *Chaceon affinis* and a massive unidentified spider crab (bottom right).

After sailing during lunchtime, the work of day 2 continued on Alcatraz seamount, a small and relatively deep seamount east of Dom João de Castro where very little information of its benthic communities is currently available. In Dive 6, the drop-down system landed in an area of rocky outcrops characterized by the presence of very tall *Viminella flagellum* colonies (Fig. 9). One of the main issues that complicated the correct development of the drop-down deployments during this cruise was the presence of lost fishing gears over the seafloor. The number of lines in Alcatraz seamount was very high, and some of them were seen floating at a certain distance from the bottom. It was during Dive 6 when the drop-down system got caught in a very thick longline that was possibly abandoned very recently after getting entangled on a rock (Fig. 10). It took the vessel crew quite a long time and effort to get the system back to the surface (Fig. 11). Luckily, no damage was produced to the cameras, the lightning system, sensors, and the umbilical, so the remaining dives could be carried out as planned after the recovery.

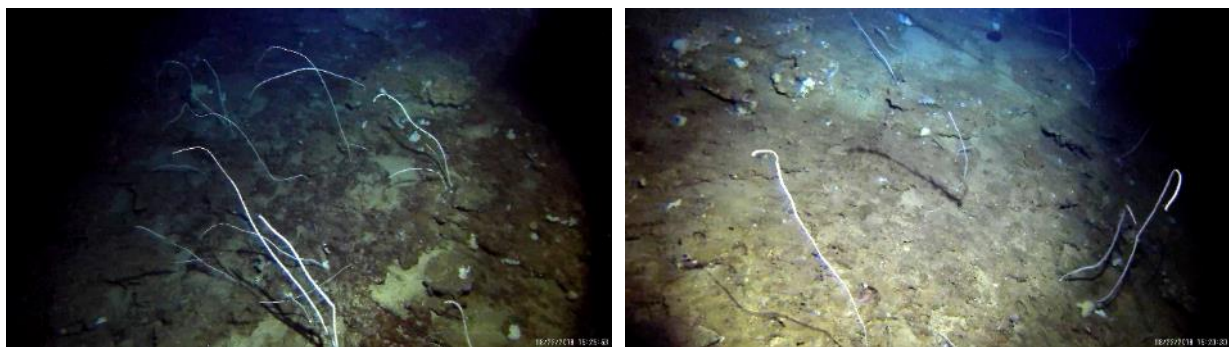


Fig. 9. Dive 6 was characterized by the presence of large colonies of the whip coral *Viminella flagellum*.

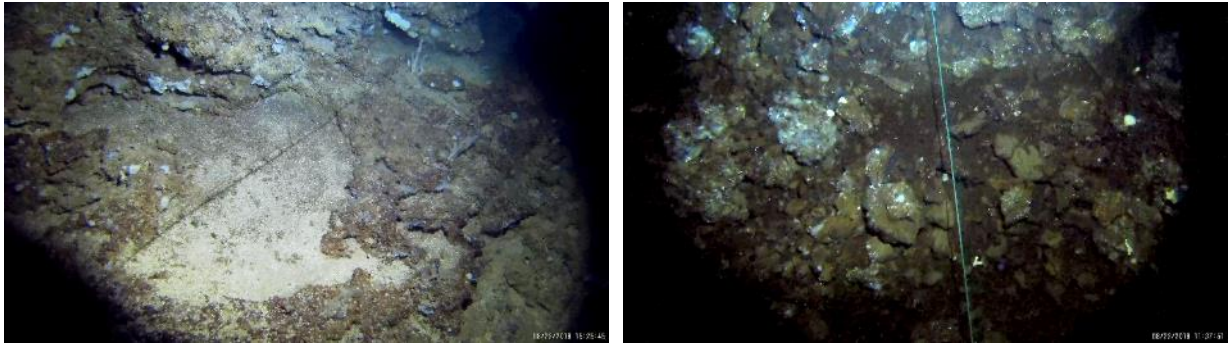


Fig. 10. Two examples of the longlines that could be observed during Dive 6 performed at Alcatraz seamount. The drop-down system got entangled in the longline shown on the right image, which seemed to be abandoned fairly recently.



Fig. 11. State of the drop-down system when it arrived to the surface after getting entangled in a very thick longline during Dive 6 (left). The vessel crew managed to recover a huge amount of this long line after disentangling it from the camera system (right).

Dive 7 was performed in an area of large rocky outcrops with the highest diversity of megafauna species observed for the Alcatraz seamount so far (Fig. 12). Several large sponge species were observed during the whole deployment (e.g. *Leiodermatium pfeifferae*, *Leiodermatium lynceus*, cf. *Petrosia*, cf. *Characella pachastrelloides*, cf. *Neophrissospongia nolitangere*), always accompanied by sparse colonies of the whip coral *Viminella flagellum*. A few sea urchins of the species *Echinus melo* could also be observed. Towards the end of the dive, the drop-down system got caught again in a small fishing line. Luckily, the line provided no resistance during the recovery and the drop-down system arrived on deck with no issues to be reported. Dive 8, the last deployment of the day, was carried out a bit further north from the position of the other 2 dives. In this case, the area explored was characterized by the presence of what seemed to be large sub-outcropping rocks, with a similar species composition to that of Dive 7. The density of organisms was, however, much lower.

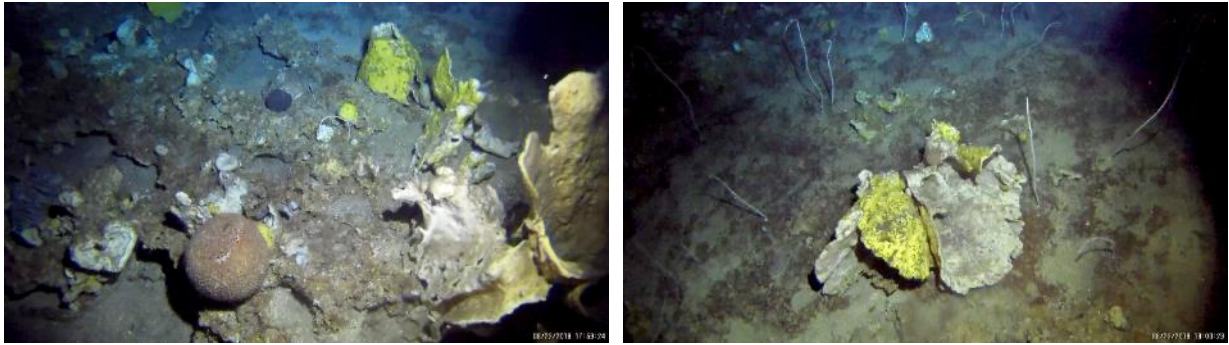


Fig. 12. Deployment 7 and 8 of the drop-down system discovered the presence of aggregations of very large erect sponges in Alcatraz seamount, which were accompanied by colonies of the whip coral *Viminella flagellum*.

23/08/2018 – Mar da Prata Seamount, southern sector

After sailing during the night, the third day of the cruise aimed to explore Mar da Prata seamount. This area is known for its high fishing pressure, so after the experience of the previous day, the team decided to work on the southernmost part of the seamount, where less fishing activities are known to occur. Dive 9 was performed over a flat area, aiming to gain depth as the boat drifted. A change in the conditions of the sea made the drop-down system to drift towards the west, covering only areas of sand and fine gravel with no organisms to be reported. After recovering the system, areas of harder substrates were targeted in order to explore more diverse habitats. Dive 10 landed in an area of sands with boulders, but rapidly shifted to large outcrops characterized by large sponges and gorgonians of the species *Viminella flagellum* (Fig. 13).

Dive 11 was planned in an area that, according to the bathymetry available, seemed to have a rough topography. The guessed seemed to pay off, and the images recorded showed an area with the highest densities of gorgonians recorded so far (Fig. 14). The rocky outcrops were characterized by the yellow sea fan *Dentomuricea cf. meteor* in very high numbers, accompanied by the sea whip *Viminella flagellum*. This is probably the densest aggregation of *Dentomuricea cf. meteor* known so far in the Azores. As the drop-down system was sorting rather well the roughness of the seafloor, a long line appeared in the image and made the team abort the dive and start bringing the system to surface (Fig. 15). Unluckily, this time the recovery of the structure was not as simple as in the previous day, and after the crew trying to get the system disentangled, it arrived on deck with some of its parts missing: a camera housing (with its camera inside) and its external battery, two of the lights and their respective external batteries and the depth and temperature sensor (Fig. 15, right). Due to the pressure put on the rope to get the system disentangled, the umbilical also showed some signs of damage, especially in the first 200 m.

After evaluating the difficulties of continuing with the cruise with the live view system in a bad shape, the team decided to head to Porto da Vila harbour in Santa Maria island to repair the system and leave it ready for the next cruise that also required to make use of it.

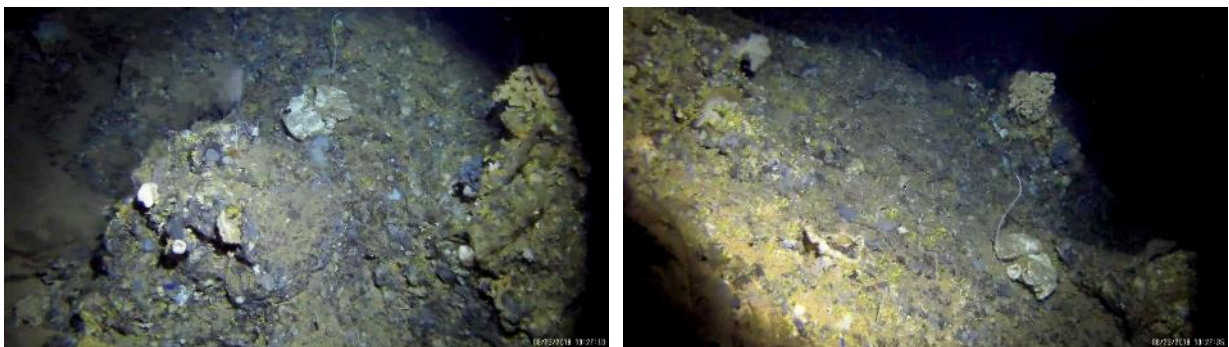


Fig. 13. Images recorded during Dive 10 in areas of rocky outcrops dominated by large sponges.

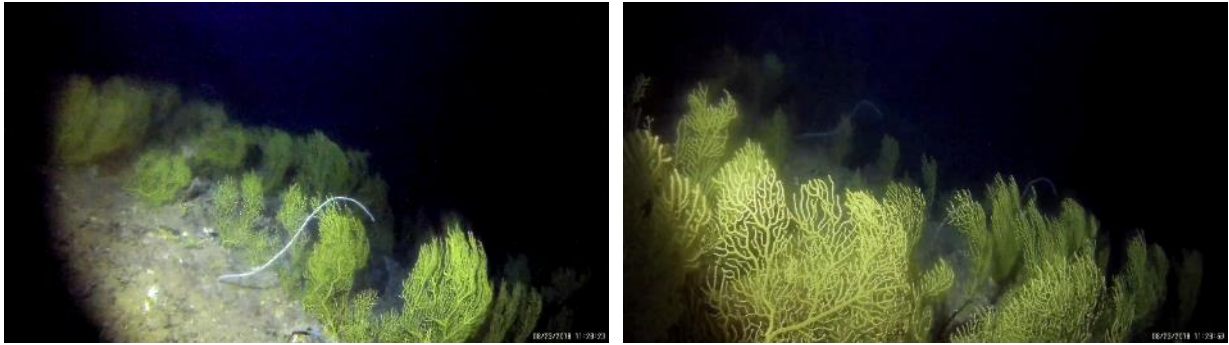


Fig. 14. Dense aggregation of the gorgonian *Dentomuricea* cf. *meteor* observed along the whole Dive 11.



Fig. 15. Long line where the drop-down system got entangled (left) and state of the system after being recovered from the fishing line, with one camera housing and two lights missing (right).

24/08/2018 – Santa Maria

Day 4 was spent in the Porto da Vila harbour in Santa Maria island, where the live-view system was repaired, so the next research team could make use of this technology during their cruise, starting just 3 days after the end of MapGES cruise.