SPANISH PROJECT ON ANTARCTIC BENTHOS: IMAGING METHODS

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1. GENERAL INFORMATION (POSTER 1)

INTRODUCTION

Spanish studies on Antarctic Benthos started on 1987, after the ANTARTIDA 8611 Expedition. Though this survey was directed to evaluation of fisheries resources in Scotian Arc archipelagos, almost 500 kilogrammes of invertebrates were caught and shared out among Spanish Benthologists.

Our country develop actually a National Research Project on Antarctic Benthos, coordinated by the Instituto Español of Oceanografía, that involve more that 40 researchers belonging to 22 Centers.

All benthic groups belonging to macro and meiofauna are being studies. The Project, that will finish in September 1997, have included the carrying out of two Surveys in the South Shetlands area and have been financed by the Antarctic National Programme.

THE SURVEYS

**BENTART 94** and **BENTART 95** Surveys have been carried out on board Oceanographic Spanish Vessel “HESPÉRIDES”, during austral summers 1994 and 1995 (Fig. 1).

First survey, **BENTART 94**, was developed in February 1994. Its objective was the prospection of bottoms and benthos of South Livingstone shelf, as soon as to tune up of techniques and equipments.

415 miles of echo sounder profiles and 94 benthic and oceanographic sampling stations were made between 24 and 440 meters depth (50 Van Veen stations, 28 with anchor dredge and 17 rock trawls) (Fig. 2).

**BENTART 95** survey was carried out in January - February 1995 in South off Livingstone, Deception Island and a transect at the same geographical longitude covering from Drake Passage to Antarctic Peninsula. Priority was the sampling in South Livingstone and inner Deception.

Basic activity of the survey was the indirect sampling for quantification of infauna and epibenthos with special attention to suprabenthos, meiofauna and demersal fishes.

A total of 265 operations in 31 stations were made between 35 and 1000 meters depth (Fig. 3). These including CTD and sediments sampling, Van Veen and box corer dredgings and trawls with Agassiz, rock dredge and suprabenthic sledge.

Epifauna was sampled between 40 and 1000 m depth in 24 trawls with an Agassiz gear on soft bottoms and 8 with rock dredge on hard substratum.
**IMAGING METHODS**

Underwater photography and filming in scuba diving, and ROV filming are used in both surveys with very different results.

1. **UNDERWATER PHOTOGRAPHY IN SCUBA DIVING**

During **BENTART 94** were realised 13 diving stations between 9 and 36 meters in Sur and Falsa Baies (Fig. 2). In addition three more, away the study area, were made in Deception, Anvers and Adelaida Islands for filming and collecting biological samples.

Our lack of experience on Antarctic diving don’t us allowed to apply a methodological sampling.

The scuba diving objective during **BENTART 95** was taking of methodological photographs and samples.

16 scuba diving was carried out for sampling 8 transects, between 0 and 15 meters, obtaining 238 pictures that are being processed by mean of Image Analysis for to characterize vertical distribution of benthic communities.

2. **FILMING IN SCUBA DIVING**

During the immersions was also filmed the bottom benthos with a autonomous video camera.

The equipment used was a HY-8 SONY 3 CCD VX1 camera and AMPHIBICO PRO 3 CCD housing. Minimum sensibility of camera is 4 LUX at f 2.8.
Fig. 2. Study area and stations placing during BENTART94 Survey
Fig. 3. Study area and stations placing during BENTART95 Survey
The scarce visibility (around one meter) and water cloudiness produced by the presence of soft bottoms, don’t allowed us to obtain more and better images. Due to we employ a blue-water correction filter instead of the lights.

Three hours and 90 minutes of filming about underwater work and benthic communities have been respectively obtained during BENTART'94 and BENTART'95.

3. UNDERWATER ROV FILMING

During the Spanish Surveys an underwater vehicle (ROV) was used for to film the epibenthos.

In the first Survey, the ROV happened an accident at third immersion that wasn’t possible to continue the work.

A total of 13 immersions were carried out during BENTART'95 between 15 and 112 meters depth. We have obtained four hours and half of video record.

THE FUTURE

Our idea for the future is to continue working on Antarctic Benthos. We are already preparing a new Project for 4 years which will include two Surveys with the same methodology, indirect sampling and Imaging techniques. We think in the Bellinghausen Sea such as possible study area.

This Project will presented for its approval and financing to Antarctic National Programme in October.

By the moment we are oppened to any idea or suggestion.

2. UNDERWATER PHOTOGRAPHY IN SCUBA DIVING (POSTER 2)

INTRODUCTION

A methodology directed to optimize the yield of diving sampling have been used for covering study during Antarctic Survey BENTART'95.

Due to riskiness, in Antarctic waters isn’t possible to carry out frecuent divings neither to remain in the bottom sea for sufficient time for to realize an exhaustive sampling.

We assume the impossibility to obtain a significant number of samples in which all species are presents. Only the species wich can be identifies to the naked eye were, therefore, took into account.

Although this method don’t allow a total description of the system, it provide a quantificable information about the dominant organisms.

MATERIAL
* The scuba equipment consisted in wet suites of variable volume VIKING and integrated mask AGA-DIVATOR.

* Photographies were realized with a NIKONOS V camera, UW-NIKKOR wide-angle lens (15 mm) and NIKON SB 102 flash. Diaphragm aperture was in all cases 4 and distance from camera to quadrat between 50 and 70 centimeters.

* The film used was EKTACHROME 100 ASA.

* The time of inmersions was aproximately between half hour and 40 minutes. The visibility was poor, between 0.5 and 2 m, due to the water cloudiness.

**METHOD DESCRIPTION**

**SAMPLING**

Sampling consist in to photography surfaces wich area is knew using a rectangular "quadrat" of 50 x 80 cm (0,4 m²). The “quadrat” was dropped at random on bottom 10 times in each bathimetric sampling point.

Three photographycal series were obtained to 15, 10 and 5 meters depth in each transect. At different depths were took, at least, 10 photos, wich summarized 34 photographies by transect.

The work team was composed by two divers who maked the photos and others two for samples collecting.

On hard and difficulty botoms the transect are previously marked during a first diving by a rope from 15 meters level to seashore.

Biological samples were took at each depths for determination and identification of species in photographies.

We have always worked on horizontal lighthed for comparative reasons.

**SAMPLING PROCESSING**

Each slide was separately proccesed in the Laboratory of Marine Biology of Sevilla University.

The contour of colonies are marked and digitalized by mean a videocamera coupled to computer. The analysys is made through the spetial softhware IMAGO, program developped by the research group “Intelligent Systems of Artificial Vision” of Cordoba University. This program is available in the Electronic Microscopy Service of Sevilla University.

**RESULTS AND CONCLUSIONS**

During BENTART 95 Survey, 238 photos were obtained in 16 scuba diving carried out for sampling 8 transects (Fig. 4).
Three transects were made in south of Livingstone (Hannah Point, Raquelia inlets an Miers Bluff Point); three, in Deception (Telephone and Whalers Baies and
Neptune Bellows; one, in Mikkelsen Harbour, in Trinity Island, an other one in Fildes Baie, in King George Island.

The described method have proved it usefulness for the study and tracking of covering on surfaces, both, artificial as naturals, although if the communities are very richs it's possible to loss some information due to the difficulty for to determine “de visu” species, particularly in colonial organisms.

3. UNDERWATER ROV FILMING (POSTER 3)

EQUIPMENT AND CHARACTERISTICS

The ROV used during BENTART 94 and BENTART 95 was a HYBALL model from the Hydrovision brand (Aberdeen, Scotland, U.K.) (Characteristics in Annex).

The vehicle has a dimensions of 535 mm X 650 mm and a weight of 41 kg.

It can be operated below 300 meters and carry four thrusters that allowed vertical, lateral and rotational movements through 360 degrees, controlled from the surface unit joystick.

The maximum speed of the ROV is 4 km/h. The power requirements are 240 to 110 volts single phase A/C , 50/60 Hz and 2,5 kw.

The vehicle is equipped with a low light CCD colour video camera with a wide angle auto iris lens and a low light monochrome camera. A still camera may be mounted on the standard chassis of the ROV.

The video picture is sent to the surface unit by an umbilical cable and is displayed on an integral 15” colour monitor. Status information of the dive can be displayed along the bottom of the upper portion of the monitor screen.

Images were recorded by means of a BETACAM SP SONY 35 P magnetoscope.

Umbilicals of 100 and 400 meters were utilized for coastal or deepest stations (weight in water of the umbilical: 1,26kg/100 m).

METHODOLOGY

During BENTART 94, the HYBALL, operated from the Hesperides deck, happened an accident that caused the ROV flooding at third immersion.

During BENTART 95, after the year before experience, ROV was operated from a pneumatic boat supplied with a 270 V, 4 kw gasoline portable powered generator.

In each dive, ROV was directed at low speed at a height of 1 m over the bottom. Pictures of the general community structure were recorded. Periodically the ROV was immovilized on the bottom to record static pictures of a portion of the community or characteristical species.

LIMITATIONS OF THE EQUIPMENT

The use of this Hydrovision ROV has provided to have some limitations:
* the marine currents have a negative effect on ROV handling, being very difficult to operate with strong currents.

* the boat must be anchored to avoid the problem of the wind drift. Nevertheless, the umbilical may get hooked up with the anchor rope.

* the umbilical deployed on the bottom can catch on rocks or on other prominent objects.

* on mud bottoms, the thrusters can remove the sediment producing cloudiness water.

* the marine currents make necessary the deployment of a great umbilical length, reducing the maximum depth the ROV can reach. Ballasting the umbilical with a weight of 10-15 kg may avoid this problem but limits the ROV's mobility.

RESULTS

A total of 13 successful dives were carried out on different sites between 15 and 112 meters depth: 8 in Livingston South (Miers Bluff and Hannah Points, Walker bay and Raquelia Islets); two, in Deception island (Telephon Bay and outer zone) and other two in Trinity Island (Mikkelsen Harbor) (Fig. 6).

We have obtained four hours and half of video record. A summary of this video material is available for the Workshop in 7 tapes (one by each work zone). These video records are being analyzed at the Animal Biology Department in Barcelona University.

OBJECTIVES OF THIS WORK

The objectives that we follow are:

* to characterize the different bottom communities.

* to identify the dominant species of each community.

* imaging analyses of the frames to search the covering percentage of zoological groups or species on the bottom, the density and diversity of invertebrates and their variation in relation with
Fig. 6. ROV stations during BENTART95 Survey