Biological and geological sampling in the Antarctic Peninsula area

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The Instituto Brasileiro de Estudos Antarticos was invited to participate in 1973–1974 U.S. Antarctic Research Program activities in the Antarctic Peninsula area. My work was associated with that of Dr. Jere H. Lipps, University of California, Davis, who studied the biology and ecology of shallow-water benthic foraminifera.

In addition to collecting ostracods and other biological specimens near the Beagle Channel Island, Tierra del Fuego, Argentina, I collected biological and geological materials near the following Antarctic Peninsula locations: Deception Island (58 sites on the island, including Port Foster, Whalers' Bay, Collins Point, Telefon Bay, Fumarole Bay, and Neptune Bellows, and 50 sites around the island); Livingston Island (seabottom sampling at False Bay and sampling of ice, rocks, and lichens from the island), King George Island (seabottom sampling); Elephant Island (seabottom sampling). My work was conducted from aboard R/V *Hero*. Fossils were collected at Hope Bay on the return trip home aboard MS *Lindblad Explorer*.

During sampling we were unable to determine the pH value of clay picked up from the seabottom, the water temperature at the sampling point, the water salinity at or near the sampling point, or the amount of light on spots of algae collected. Hopefully these determinations can be made in future studies.

The following materials were collected for later analysis in Brazil:

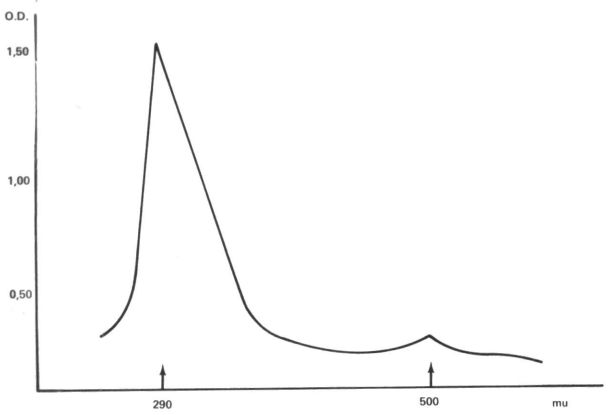

Figure 1. Algae analysis (phycobilins) of *Pantoneura plocamioides*. Optical density is plotted against absorption wavelength.

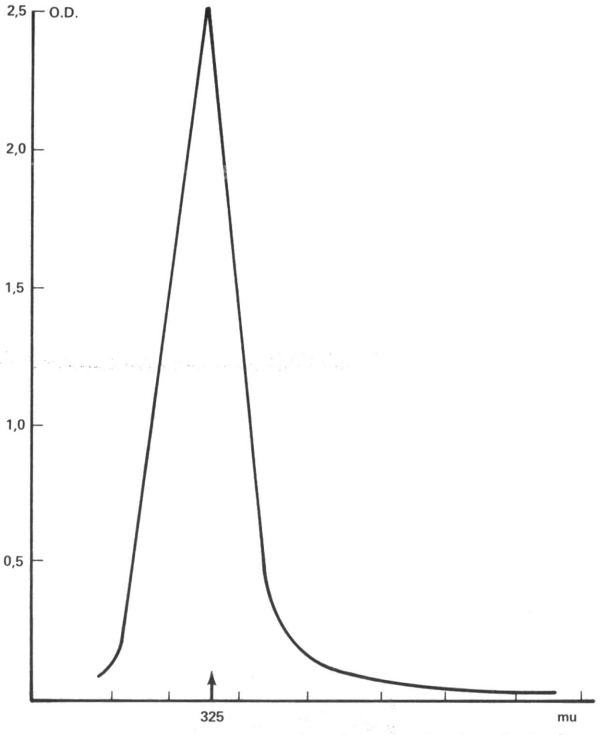

Figure 2. Algae analysis (phycobilins) of (?) *rhodophycea*. Optical density is plotted against absorption wavelength.

(1) seawater from different depths (around and near Deception Island), to determine the oxygen^{18}/oxygen^{16} content (Centro de Energia Nuclear na Agricultura, Piracicaba, Sao Paulo);

(2) ice, also to determine oxygen^{18}/oxygen^{16} content (Centro de Energia Nuclear na Agricultura, Piracicaba, Sao Paulo);

Maximum absorption of non-antarctic algae phycobilins compared to maximum absorption of antarctic algae phycobillins (Haxo and Norris, 1955).

Algae	Chromoprotein	Maximum absorption (mμ)
Rhodymena perforata	R-phycoerithrin	497, 537, 564
Porphyra perforata	R-phycoerithrin	497, 562
Phormidium persicinum	C-phycoerithrin	560
Porphyra perforata	R-phycocianin	555, 617
Lyngbya lerhemii	C-phycocianin	620
Porphyridium cruentum	Allophycocianin	650
Antarctic algae		
Pantoneura plocamioides	R-phycoerithrin	290, 500
(?) *rhodophycea*	R-phycoerithrin	325
Delisea pulchra	R-phycoerithrin	300

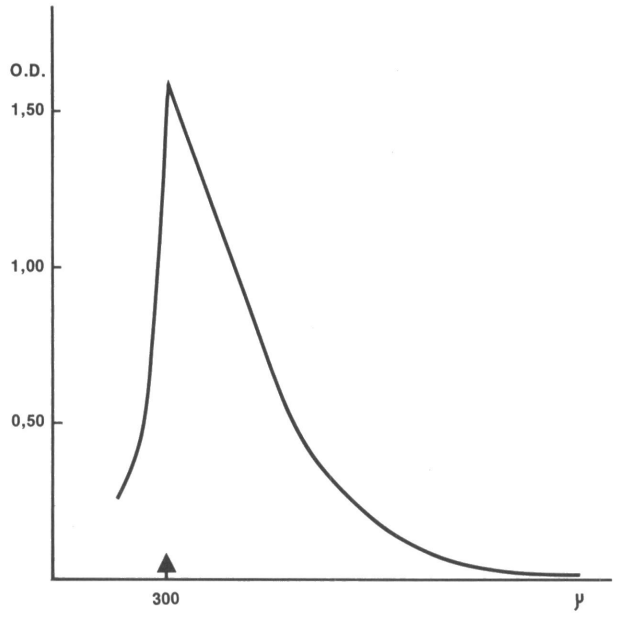

Figure 3. Algae analysis (phycobilins) of *Delisea pulchra*. Optical density is plotted against absorption wavelength.

(3) rocks (volcanic and others) from several islands and from the continent, itself (Museu Nacional, Rio de Janeiro);

(4) ice fish, rock fish, and krill (Museu Instituto Brasileiro de Estudos Antarticos).

A lack of foraminifera samples made it impossible to conduct analyses in the field. Therefore my studies at the Palmer Station biological laboratory concentrated on algae. I noticed a strong and odd odor from a special algae, classified by Dr. Ted deLaca as *Delisea pulchra*. An extraction of that smell was done with warm air (about 40°C.); the odor was extracted on acetone (due to the lack of ether). The extract was dried overnight and solubilized with acetone to 1 milliliter. Since the Palmer laboratory had no thin layer chromatography system, I did not have enough time to run a complete paper chromatogram; this should be done in order to properly identify the substance(s) responsible for the algae's toxic (?) self-protective (?) smell.

Since I was intrigued by the luminosity of antarctic seas, my interest in energy uptake by photosynthetic organisms became stronger upon examining algae samples collected by scuba divers. I established the following procedures for this investigation:

(1) collect algae in seawater about 24 meters deep, near Palmer Station;

(2) classify the samples as either (a) *Pantoneura plocamioides,* (b) (?) *rhodophycea,* or (c) *Delisea pulchra;*

(3) place about 30 grams of each in Erlenmeyer flasks with 100 milliliters of water;

(4) boil for 3 hours;

(5) centrifugally separate the color extract;

(6) note reactions to confirm the presence of phycobilins (with ammonium, color becomes bluish-yellow; with hydrochloric acid, color intensity decreases; with tannic acid, a brownish blue complex is formed);

(7) run the sample on the Beckman DB spectrophotometer to determine absorption curves.

In the three figures, showing results of the above procedures, optical density (OD) is plotted against absorption wavelength. The peaks are very specific for the antarctic algae, probably due to algae adaptation to an environment in which light of low wavelength is predominant. It is useful to compare the value I obtained with results for non-antarctic algae (table).

Phycobilins are accessory pigments synthesized exclusively by some algae for the photosynthetic system II whose function is the generation of oxidizing power as a prerequisite for the photoevolution of oxygen. They are non-metallic pigments in which an open tetrapirrolic chain (related to bile pigments) is associated with a specific protein (molecular weight 275,000). The more common are phycobilins on red (R-rhodophyta) and blue (C-cyanophita) algae.

These preliminary findings suggest that antarctic algae phycobilins and the strong smell of some antarctic algae probably have some ecological meaning and deserve careful attention, particularly when com-

Reference

Haxo, F., and P. Norris. 1955. Comparative studies of chromatographically separated phycoerytrins and phycocyanins. *Archives of Biochemistry and Biophysics,* 54(1): 162–173.

Argentine Antarctic Institute activities at Palmer Station

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During the 1973–1974 austral summer, from January 8 to February 15, 1974, we conducted biological research at Palmer Station and aboard R/V *Hero*. This research, to determine growth parameters and to analyze trophic relationships of benthic fishes from the Antarctic Peninsula area, is part of the Argentine Antarctic Institute's (IAA) Bioantar program.

About 1,200 specimens were collected and put in formalin. Of this number, 808 specimens were meas-