Soviet Biological Exploration in Antarctic Seas[1]

The word "Antarctica" is associated in our minds with a lifeless, icy desert. True, the people who have been there know its islands are inhabited by countless species of birds, as well as by penguins and seals; but few people know that under the thick ice which binds the sea for 10 to 11 months of the year, there is life — life which is hardly less diversified than in the tropical latitudes.

Information on the flora and fauna of the antarctic seas has been accumulating for a long time. Biologists have taken part in almost all the major antarctic expeditions. Since 1955, the Soviet Union has been studying Antarctica's animal life.

Hydrobiologists on board the diesel-electric ship *Ob* have sailed to all the southern seas and have established a network of stations, particularly in the Davis Sea, where the Mirny Observatory is located. Numerous samples have been taken at all depths below 50 metres. None were taken from shallower waters, that is, less than 50 metres in depth, because of the great risk of damaging the vessel in the coastal zone. The use of smaller boats which would have cleared the bottom would also have been dangerous because of the strong winds and heavy seas after ice break-up.

There was another obstacle: debris, carried by glaciers, is deposited below the submerged cliffs offshore to which many marine animals adhere; thus, the classic implements which the hydrobiologists use in their work aboard a ship (trawls, bottom scoops, dredges, etc.) bring practically no catch. This is unfortunate, because the investigation of shallow sea waters is of major interest. Here alone, enough light penetrates the water to allow the development of algae that are capable of converting inorganic substances into organic material.

The 11th Soviet Antarctic Expedition was the first in Soviet antarctic research to employ aqualungs in biological exploration. Such explorations were conducted from mid-December to March, during the antarctic summer 1966-67.

The special methods we employed were determined by the peculiar nature of our hydrobiological research. Instead of exploring the expanses of the ocean bottom, as had been the practice of all foregoing expeditions, we confined our observations to a limited area of shallow sea between the Haswell Islands near the Mirny Observatory.

Lightweight diving apparatus permitted us to observe animals in their natural environment, discover the nature of submarine communities, and collect specimens of the flora and fauna. All together, 144 dives were made.

In Antarctica, submersion conditions are quite different from those in warm seas. Water temperature here is not over –2°C. Divers have to put on thick woollen underwear or heat-insulating suits and these impede movement and make breathing difficult. Small amounts of water which get into the inhalation tubes and are easily blown out under ordinary conditions, here freeze quickly and cut off the air passage. However, swimming in antarctic water has its pleasant points too. The water is unusually transparent, and one can see at 30 to 40 metres' distance. In spite of a thick layer of ice and snow, it is sufficiently light even at a depth of 50 metres — the maximum depth of our observations.

Each diver submerged twice a day. In the first dive, he would descend to the maximum depth, through the almost lifeless upper zone where the ice during ebb tide crushes almost everything that lives. Further down, at a depth of 4 to 6 metres, he would reach a zone where there was more life. Usually, mobile forms capable of crawling from place to place were present there, among them sea urchins (echinoids), sea stars (asteroidea), and molluscs. At a depth of 15 to 20 metres, the diver would enter a zone in which soft corals cover the bottom like a continuous carpet and house dozens of animal species: worms, molluscs, crustaceans, and echinoderms. The low temperature of the water makes the animals rather sluggish and even the fish can be caught by hand. The anemones and tube worms have tentacles with which they catch their food. From a distance of a few metres, this zone looks like a dense forest of tentacles swaying in the current.

At a greater depth, sponges would begin to appear. That zone was the richest of all those explored. Each square metre of the sea floor yielded two or more kilograms of sponges.

At the same depth as the numerous species of sponges, we found bryozoans, worms, crustaceans, and echinoderms, including sea lilies (crinoids). Many of the specimens were enormous: there were sponges over a metre high, sea spiders (pycnogonids) the size of a large saucer, and Linnaeus worms half a metre long. One of these worms was put into a pail with a fish; two hours later the fish had disappeared — it had been devoured by the worm.

---

[1]Published through the courtesy of Novosti Press Agency.

On reaching the planned depth, the diver would begin his work: he would gather animals and plants, count their numbers in a quadrat, look for rare species, and take photographs.

A diver cannot work at great depths for long, as dissolved nitrogen gradually accumulates in his blood. To avoid the problem of having this nitrogen come out of solution and form bubbles in the blood during too rapid an ascent (the "bends"), the diver must be raised to the surface very slowly, and consequently the stock of air in the aqualungs must be carefully monitored.

The entire time of submersion was about 20 to 30 minutes. The next submersion by the same diver would be about an hour after the first. This time, he would not descend below 10 metres and would remain no longer than 40 minutes.

Work was often conducted directly under the lower ice surface, but this was not because of the problems of deep diving. Several years ago, antarctic explorers discovered on the underside of sea ice concentrations of microscopic algae which seemed to find most favourable living conditions there. Algae are the basic source of organic matter in polar seas. Our observations showed many animals in this sub-ice area 10 metres below the surface — particularly a great number of crustaceans and the young of some fish species. These areas attract them not only because of the abundance of food, but also because of the protection offered against carnivores. The lower surface of the ice is covered in winter by a thick layer of ice crystals — the so-called "intra-water" ice. These crystals form "ice flowers" where the animals can hide. In summer, the ice thaws, but in the lower layer there appear hollows and depressions connected by a network of channels where the animals can move and remain hidden. In February, that is at the close of the antarctic summer, the ice is broken up by winds, and drifts out into the sea. The annual cycle of the development of sub-ice fauna is a matter for future study.

Three months' work yielded extensive collections which were brought to the Zoology Institute of the U.S.S.R. Academy of Sciences in Leningrad. However, the main significance of the expedition was the opportunity afforded to study the communities of animals and the regularities of their distribution throughout the sea depths. Few such observations have been made in Antarctica.

Only after similar data for other areas of Antarctica are accumulated will we have the chance to undertake a serious study of the zoogeography of antarctic seas and to begin to compare life on both Poles of our planet in detail.

Another expedition to new, unstudied areas of Antarctica is planned. However, we may say already that the antarctic coast far surpasses the arctic coast, as regards both the wealth and variety of its fauna and the complexity and specific features of its communities.

Evgeni Gruzov
MASTER OF BIOLOGY

Observations on the Breeding Behaviour of Phalaropes

On 27 May 1967, I reached the settlement of Chesterfield Inlet (Igluliarjuk), Keewatin, Northwest Territories. No phalaropes were seen in the district until 13 June. On that day, red phalaropes *(Phalaropus fulicarius)* in considerable numbers and some northern phalaropes *(P. lobatus)* were seen at sea in the offing of, or flying over, one of the islets in the mouth of the inlet. During the next 10 days, phalaropes of both species used a mainland lagoon near the settlement, but their number here gradually declined and by the end of June they had deserted this locality completely.

Some northern phalaropes nested on the mainland and others of this species at least attempted to nest on Promise Island (Nannuyuma), where 5 pairs of red phalaropes nested and a sixth pair made a nest (but apparently no eggs were laid).

After the local spring passage, red phalaropes were seen only on Fairway (Pitiulaktok) and Promise islands. Breeding may well have taken place on Fairway, but a visit there at the appropriate time was not possible. The apparent definitive departure of the females from Promise Island after egg laying was observed on the night of 9-10 July. The newly hatched young of 1 pair still in the nest and guarded only by a male were found at this breeding station on 20 July. Three other males acted as if they had young hidden near the nests which were, by that time, empty. The eggs in the fifth nest had not hatched and this nest had evidently been deserted by the male. The 4 downy young found were weighed and banded.

Confirming my earlier observations on Wilson's phalarope,[1] no territorial behaviour was shown by red phalaropes on the mainland or on Promise Island. The association of red phalarope nesting with colonially breeding arctic terns *(Sterna paradisaea)*, reported by Løvenskiold,[2] as frequently observed in the Svalbard Archipelago (Spitsbergen), also applied to Promise Island.

Two instances of a brief but emphatic