Biota of the antarctic pack ice: R/V *Hero* cruise 77-5

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Between 22 October and 20 November 1977, we used National Science Foundation's R/V *Hero* to conduct studies of Antarctic seals in pack-ice areas of the Antarctic Peninsula. Our principal focus was on crabeater seals, but we also were interested in other pack-ice species, particularly leopard seals. Our work centered on (a) collecting female crabeater and leopard seals for reproductive material depicting various stages of the reproductive cycle, (b) documenting further the social structure and reproductive behavior of crabeater seals, (c) observing daily activity patterns and local movements of crabeater seals at fast-ice concentrations, and (d) investigating crabeater seal behavior at weaning and their interaction with leopard seals.

Tagging and immobilizing procedures were identical to those used in 1976. Individuals in the pack ice first were lightly sedated with Sernylan (Phencycledine hydrochloride) and then were bagged to facilitate handling. Seals on fast ice were bagged without drugging. The one Ross seal encountered during our cruise was alone on a small ice floe. It was easily bagged without drugging and permitted tagging and measuring with no struggle. All seals handled were identified, tagged, measured, and released without accidental mortality from handling.

Female seals were collected in order to gain better understanding of reproductive parameters. A total of 103 crabeater seals (96 females, 7 males) and 7 leopard seals (6 females, 1 male pup) were sacrificed. Individuals were chosen to provide a sample of seals from different age classes. The following specimens were collected from each individual: a lower jaw and toenail (to investigate aging), the reproductive tract (ovaries, uterus, and partial vagina for females), vaginal smear, and stomach contents. Skeletal material and pelts were taken from a selected few. Standard body measurements, body weight, and general condition of pelt were also noted. Examination of ovaries, uteri, and vaginas will provide information on age of first reproduction, pregnancy rates, and the timing of ovulation and birth. When this information is compared with data on age, length, girth, weight, and social group, we will have a much better understanding of how reproductive features of crabeater and leopard seals fit into their ecology and management.

Observations of the social structure and behavior during the pupping and breeding season substantiated data from previous years. The crabeater seal pupping period is from late September through mid-November. At that time, most mother-pup pairs are associated with an adult male (forming what we have termed a "family" group). Our observations of the social behavior of crabeater seals in fast-ice areas added considerably to our understanding of social events during the breeding season. A field party of 2 to 3 was maintained in a fast-ice area of Ezcurra Inlet, Admiralty Bay, King George Islands from 3 to 16 November. From our field camp we were able to observe interactions among crabeater seals and note the persistence of social bonds within the few family groups and mated pairs present in that area.

We also observed the transition from family groups to mated pairs. The key to this change apparently is the separation of the pup from its mother. We still do not know the mechanism for this separation: the male may finally chase the pup away, or the female may simply leave the pup, with the male following the female away. What does seem certain, however, is that the adult male in a family group remains as the male in a mated pair unless chased away by another male.

Our work in the pack ice over the last 2 years suggests that aggregations of nonbreeding crabeater seals in fast-ice bays are not uncommon. Therefore, tagging efforts in fast-ice areas were directed at estimating the numbers of seals present at different times of the day. There were marked differences in the timing of crabeater seal haul-out on the fast ice. Generally, early morning periods seemed to be most favorable for hauling out. However, weather patterns may have been equally important. When snowstorms or high winds developed, the majority of crabeater seals went into the water.

Because this year's cruise was made later than last year's, we encountered direct evidence of leopard seal predation on crabeater seal pups. In two instances we observed adult leopard seals eating crabeater seal pups. These observations, in conjunction with our previous observations that more than 80 percent of adult crabeater seals bear scars made by leopard seals, suggest that leopard seal predation may be an important factor limiting the survival of young crabeater seals.

Also related to the later timing of this year's cruise was our encounter of two female leopard seals with newly born pups of their own. Unlike mother and pup associations of crabeater seals, no adult male was hauled out on the ice nearby. We found these pairs on 7 and 13 November 1977. In each case the pup was measured and weighed—the first measurements of this sort of living leopard seal pups. The dates of our observation agree with the two previous sightings of living leopard seal pups in the Antarctic Peninsula area: M. A. McWhinnie and D. F. Parmelee (personal communication) each saw an adult leopard seal female with its pup in early November. Future research will attempt to determine the extent of the predatory interactions and timing between crabeater and leopard seals. It may be that leopard seals have a later pupping season than do crabeater seals.

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Terrestrial biology

Melting snow in the dry valleys is a source of water for endolithic microorganisms

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In the 1977-1978 austral summer season I continued a survey of endolithic microorganisms in the dry valleys of southern Victoria Land. The occurrence of endolithic blue-green algae as well as other photosynthetic and nonphotosynthetic microoganisms in a variety of rock types was described earlier from several localities (Friedmann and Ocampo 1976, Friedmann 1977).

There seems to be a morphological similarity between endolithic microbial growth forms in Antarctica and those occurring in hot deserts (Friedmann 1972, Friedmann and Galun 1974). In both, the porous rock shielded by a surface crust acts as a water trap that maintains an endolithic microscopic climate that is different from the outside environment (Friedmann 1971, Friedmann and Ocampo 1976). In hot deserts, the main water source of the endolithic environment appears to be dew (Friedmann, Lipkin and Ocampo-Paus 1977). The evidence presented here indicates that in the antarctic dry valleys melting snow plays a similar role.

Available information about snowfall in the dry valleys and the fate of snow on the ground is scarce. Several authors (Tedrow and Ugolini 1966, Bull 1966, and Horowitz *et al.,* 1972) indicate that snow in the dry valleys sublimes mostly without melting. Vishniac and Mainzer (1973) report that at least part of the snow may melt and is "the major source of moisture in the dry locales."

In the 1977-1978 austral summer season snow was relatively abundant in the dry valleys. During our stay in the Beacon Valley area light snow fell several times, and melting occurred during the subsequent sunny periods. Many small snow patches stayed permanently in the higher side valleys of Beacon Valley in contrast to our observations during the much drier 1976-1977 season.

On 29 December 1977 several-centimeter-deep snow covered the floor of the third lateral eastern side valley of Beacon Valley (figure 1). Snow was melting at the sunlit northern "warm" face of the sandstone boulders that showed the exfoliating weathering indicative of the presence of cryptoendolithic primitive lichens (Friedmann 1977). The rock surface often appeared to be saturated with water (figure 2). Snow patches were seen at the Beacon Valley floor although without the conspicuous melting observed at higher altitudes (figure 3).

These observations suggest that melting snow is a major, or perhaps exclusive, source of water for endolithic microorganisms in the antarctic desert. Like dew in hot deserts, meltwater is available only intermittently: endolithic microorganisms that rely on these water sources periodically undergo stages of desiccation. Although relevant weather data are not available, it appears likely that endolithic microorganisms of the antarctic cold desert are being moistened less frequently than those in hot deserts (Friedmann *et al.,* 1977).

Figure 1. Snow in the third eastern lateral valley of Beacon Valley, 29 December 1977. 14:00 hr.