

be linked to interactions between breeding habitat geomorphology and changing patterns of snow deposition. A key implication of the latter observation in particular is that the availability and quality of the nesting habitat is an important additional source of local variability in penguin populations. This suggests that by understanding how variability in the landscape affects demography, it may be possible to tease apart the potential effects of human activity. Efforts to examine these interactions in the Palmer Station area have led to the following conclusions:

1. Studies that do not consider a potential landscape effect on Adélie Penguin demography are not likely to yield data useful for assessing the impacts of human activity associated with tourism, research or commercial fishing.
2. Tourism has not had a measurable impact on Adélie Penguin populations in the Palmer Station area.
3. Some types of research, and particularly research that requires repeated measurements based on invasive techniques such as serial blood sampling, conflict with efforts to minimize human impacts on Adélie Penguin populations.

## 9. LESSONS LEARNED FROM OTHER RESEARCH

**Weddell Seal Research in the Ross Sea.** The Weddell Seal population in the McMurdo Sound area of the Ross Sea has been studied since the early 1960s. Since 1973, all pups born in the area have been tagged. This has created a population of known-aged individuals that, aside from its value in documenting population demography, has assisted in designing and interpreting the results of physiological, genetics, and behavioral studies. The Weddell Seal's life history pattern is tailored for such studies, since the animals are philopatric, often returning to the same pupping and breeding colony each year. Thus, individual life histories can be recorded over time and a history of individual exposure to human disturbance can be documented in the database.

Over the years, individuals in this population have been handled for the attachment of tags and remote sensing devices, to take blood samples for physiology and genetic studies, and in the course of other investigations where manipulation of individuals for experimental purposes was necessary. In preparation for this workshop, the database was examined by Dr. Donald Siniff, University of Minnesota, to look for evidence of possible disturbance-related effects on the population, particularly possible effects of blood sampling which can be a very disruptive activity.

In the analysis, several possibilities were examined. The annual return rate to colonies of animals from which blood samples had been taken was contrasted with return rates for animals that had not been