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PREDICTING RESPONSES OF ANTARCTIC SEALS TO ENVIRONMENTAL CHANGE

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In this paper we consider how the four species of Antarctic pack-ice seals might respond to climate change, an analysis complementary to several papers that have discussed climate-change effects on Antarctic birds. Our predictions are based on knowledge of seal life histories and how traits will respond to predicted changes for Antarctic ecosystems. Weddell seals require stable fast ice areas during the reproductive season. The increased instability of this habitat likely will affect successful pup rearing and survival of post-weanlings. However, the recent calving of large ice shelf sections in the Ross Sea has caused a mini-Rapid Climate Change Event in the McMurdo Sound area (2000-2005), and from this event new insights are available on seal response to fast ice characteristics. Increased fast ice has had negative effects, including the possibility of isolating breeding groups similar to what has been documented at nearby White Island. Two of the remaining seal species, Crabeaters and leopards, occupy the pack ice year around, depending on this environment for pupping and breeding. They differ in diet, however, the crabeater a euphausiid specialist, while the leopard's diet is catholic depending on prey availability. Initial trends in the populations of these species would reflect the abundance of food. Krill abundance is related to pack ice extent (greater in cold, windy conditions), thus the potential for food shortages would cause reduction in rates of reproduction and juvenile survival. However, important to the pack-ice species are the few pack-ice 'refugia' that persist year round. Warming winter temperatures would cause the pack ice to shrink in extent and persistence, and increase competition for haul out areas in late summer. Finally, Ross seals use the pack ice for breeding and pupping in the spring, but then inhabit ice-free, pelagic waters thereafter. With a reduced ice field, there likely would be competition among all three pack-ice species for breeding habitat space. Reduced ice might initially also expose these seals to predation from killer whales and leopard seals. The Ross seal is a cephalopod specialist; thus, food shortages may not be a direct problem. initially.