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Title: Protocol for Aerial Censusing of Weddell Seals as an EMM Protocol

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ABSTRACT

Weddell seals (*Leptonychotes weddellii*) have proved to be an important predator of Antarctic toothfish (*Dissostichus mawsoni*). As there is no ecosystem monitoring program currently in place with respect to the Ross Sea toothfish fishery, we offer a means to begin such a program. Described are procedures, based on a 40-year data set from McMurdo Sound, to begin to monitor the population trajectories of Weddell seals along the Victoria Land coast, all of which likely forage in CCAMLR SSRU 88.1H and 88.1J.

SUMMARY OF FINDINGS AS RELATED TO NOMINATED AGENDA ITEMS

<i>Agenda Item</i>	<i>Findings</i>
EMM 07-x	The findings presented in this report apply to the monitoring of finfish fisheries in the Southern Ocean.

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PROTOCOL FOR AERIAL CENSUSING OF WEDDELL SEALS AS AN EMM PROTOCOL

SPECIES: Pinnipeds: Weddell seal (*Leptonychotes weddellii*).

PARAMETERS: Index to breeding population size

ASSOCIATED PARAMETERS:

Age structure; body mass.

AIMS:

To determine trends in the size of breeding colonies of Weddell seals in various locations, particularly those in a latitudinal gradient along Victoria Land (see Stirling 1969). These colonies are assumed to contain seals that feed on Antarctic toothfish (*Dissostichus mawsoni*) and the Antarctic silverfish (*Pleuragramma antarcticum*). This effort is intended to reflect changes in location and size of breeding colonies that might be impacted by commercial fish removals in the Ross Sea area. The seals range outward from colonies to at least 600 km during the non-breeding period). The seals' movements from the McMurdo Sound colonies easily cover SSRU 88.1H and 88.1J (Ainley et al. 2006). The movements of seals from colonies farther north in Victoria Land is not known, but based on proximity with little doubt cover these SSRUs as well.

DATA COLLECTION:

Aerial photography is the primary method proposed to measure abundance of Weddell seals during the pupping and breeding season. At this time, they tend to be concentrated in fast ice areas that border the Ross Sea (and other parts of Antarctica).

GENERAL PROCEDURE:

1. Long term data from studies in McMurdo Sound indicate that the most effective time for obtaining trend data from Weddell breeding and pupping colonies would tend to be the last week in November when ground counts have shown a peak in number of animals on the fast ice surface (Fig 1). For other areas of Antarctica, this optimum time may change slightly, but because this monitoring effort is directed toward establishing an index to abundance, it is probably more important to synchronize annually the time of the surveys. As information on changes in haul out patterns with latitude becomes available, perhaps changes in the timing of the surveys would be appropriate.

2. Use either a fixed wing aircraft or helicopter to overfly the haul-out area. Given the modern advantage of large-format, high-speed, digital cameras, and the success at photographing penguin colonies (a more difficult proposition, CCAMLR A3B), an altitude of 2000 ft would be sufficient. In Wagner Bay, Canada, to census Arctic ice seals where more than one species needs to be identified, an altitude of 500 ft and speed of 215 km/hr is used (I. Stirling, pers. comm.). Because of the clarity of image inherent with the large format, and the fact that only one pinniped species is present, altitudes in excess of the minima recommended here may also prove useable. Otherwise (if no digital is available) use at least a medium format camera, with a negative not less than 60 x 40

mm, and take high angle obliques through the open door of the aircraft. Fly over the area occupied by seals using parallel flight lines to ensure all are photographed, with each exposure overlapping the next by about 50%. As Weddell seals, generally, are distributed along tide cracks, such repeated flights probably may not be necessary.

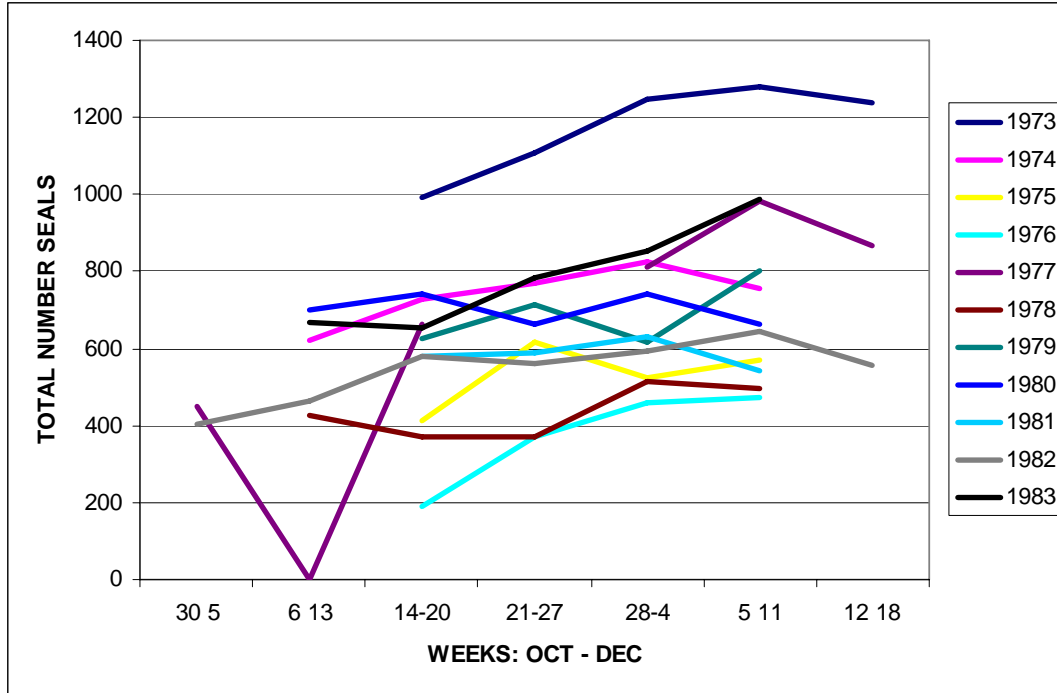


Figure 1. Results of weekly counts of seals hauled out in Erebus Bay, 1973-1983 (Siniff et al. unpubl. data)

3. In the laboratory, lay out prints to show the entire colony. Mark up the best section on each photograph so that the whole seal concentration is covered (avoid gaps or overlap). Enlarge the marked up sections to the optimum size and count under a magnification. This is best done by pricking through the photograph, with an electronic needle that activates a counter.

MANDATORY DATA:

1. From the photographs record the total number of animals in the selected colony, distinguishing between adults and pups.
2. Identify and date the set of negatives and the photo set.

HIGHLY DESIRABLE DATA: N/A

PROBLEMS TO BE CONSIDERED:

It is important that the same colony areas are counted annually. It is important also that approximately the same dates be flown for each colony area from one year to the next. If, in some areas data become available that document the timing of maximum haul out for the given colony, modification of flight timing might be appropriate. However, this

modification would complicate interpretations because corrections for previous annual flights would be necessary.

COMMENTS:

DATA PROCESSING AND ANALYSIS:

ANALYTICAL METHODS:

1. After one person has counted an entire group, subsamples containing a few dozen seals should be checked by additional counters, particularly in regard to separating adults from pups. The results from these sets of subsamples (at least 4) are then subjected to an analysis to determine the magnitude of individual counter differences. The differences found between counters could then be used to correct for counter bias.

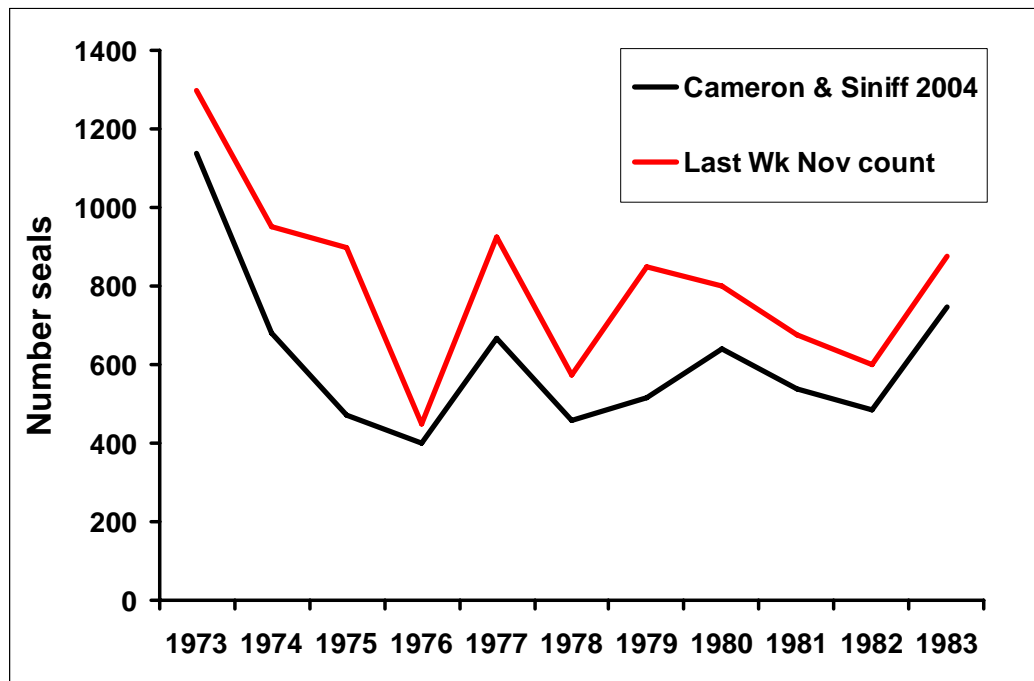


Figure 2. Comparison of counts of females made the last week of November with estimates of total numbers using mark-recapture techniques.

INTERPRETATION OF RESULTS:

The indices of abundance that will result from this effort will be influenced by many factors. The long term studies at McMurdo (see Fig 2) have shown considerable annual variation and some understanding of factors influencing the variance in these pupping colonies can be found in the literature suggested below. Certainly the condition of the fast ice in the vicinity of a colony influences the number of Weddells that return to a given pupping location. Weather conditions on the day of the photographic effort will affect the number of seals on the surface. It is certain that these index flights will reflect considerable annual variation at each colony location. The interpretation as to whether

changes in abundance are occurring will no doubt require several years for any significant trends in abundance to become measurable.

DATA REPORTING:

Data should be reported using the latest version of CCAMLR data submission forms (to be determined).

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