

Diving Depths of the Weddell Seal

Abstract. *Dives as deep as 350 meters have been recorded for the Weddell seal in the waters of McMurdo Sound, Antarctica. It is suggested that Weddell seals possess a well-developed navigational system which enables them to swim long distances under thick ice shelves where light and breathing holes are limited.*

The depths to which most species of seals dive have generally been inferred from the presence of drowned seals in fishing nets set at known depths and from the finding of seals caught accidentally on hooks of set lines (1). However, diving depths for the bladdernose seal, *Cystophora cristata* (Erxleben), and the grey seal, *Halichoerus grypus* (Fabricius), have been measured by attaching to the seals capillary tube manometers (2). An estimate of diving depths for Weddell seals was determined by assuming that a mature male dived to 95 m while swimming under an ice barrier to reach an isolated crack in an ice shelf (3). Diving depths reported in this paper have been measured by a depth recorder attached to the backs of Weddell seals, *Leptonychotes weddelli* (Lesson).

The extreme south end of McMurdo Sound is an excellent area in which to observe the behavior of Weddell seals. The Ross Ice Shelf bounds that part of the sound and forms a barrier to further southern movement of the seals, while the sea ice has many cracks through which seals can leave the water. During November seals gather in small rookeries near these cracks and remain in the immediate vicinity until the sea ice breaks up in February or March. This area (77°54'S, 166°40'E), approximately 3 km south of the U.S. base at McMurdo Sound, can easily be reached on foot or by surface vehicle.

On 13 November 1962, a mature female, lying on the ice near a crack, was roped and a Tsurumi Seiki depth recorder with a range of 0 to 500 m was fixed to her back with strips of rawhide. After 2 days the seal was recaptured and the smoked-glass slide, on which the depths had been registered, was replaced. After another 2-day period the depth recorder was removed and attached to a second mature female. Three 48-hour series of dives were obtained for the second seal. Depths of dives for both seals are listed in Table 1.

The record of depths for any 48-hour period shows that the seals were swimming in both shallow and deep water, but not at the greatest depths (500 m) possible in this part of McMurdo Sound. Although the slide recorded only two or three deep dives, it indicated numerous shallow dives at approximately the lower edge of the ice shelf.

These recordings may explain in part how Weddell seals have reached many inland cracks in the Ross Ice Shelf. During the summer of 1958–59, Weddell seals were reported in the vicinity of tidal cracks near White Island which is 22 km inland on the ice shelf (4). In the summers of 1961–62 and 1962–63 several seals were observed, 58 km back from the leading edge of the ice shelf, in a tidal crack at the foot of the Koettlitz Glacier. During the month of April 1962 the Koettlitz Glacier tidal crack froze and there was no evidence that any seals remained in the area with the onset of winter. Weddell seals have also been observed in a large rift near Roosevelt Island (79°30'S, 162°W). This rift is approximately 32 km back from the leading edge of the ice shelf and is about 30 km long. The widest part of the rift is about 1.5 km and the walls are sheer cliffs. The bottom is filled with sea ice in which there are many seal holes (5). The shelf ice in this area is approximately 200 m thick, but the evidence that the Weddell seal can dive to depths of 350 m supports the thesis that seals could enter this rift by swimming under the ice shelf. Conditions encountered by seals diving under the ice shelf can hardly be suitable for visual navigation; light does not penetrate the

Table 1. Depths for 48-hour series of dives.

Slide No.	Dives (m)		
	Maximum	Mid-water	Shallow*
<i>Animal No. 1</i>			
407-A	335	285	25
407-B	350	320	20
<i>Animal No. 2</i>			
408-A	320		20
408-B	305		20
408-C	295	235	25

* Several dives were made in each instance.

thick ice, and cracks through which seals can surface for air are limited. Furthermore, it has been estimated that Weddell seals can swim only 2.2 km in an average dive of 10.5 minutes (6). If Weddell seals are to enter the rift successfully by swimming the 32-km distance under the ice shelf, then they must possess a well-developed navigational system to enable them to find open cracks along the route.

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References and Notes

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Maternal Deprivation: Its Influence on Visual Exploration in Infant Monkeys

Abstract. *Visual exploration was studied in maternally reared and maternally deprived monkeys. When an animal pressed a bar an opaque screen was raised providing a brief view of either of a pair of stimuli. Subjects reared by their mothers pressed more to see animate than inanimate objects. With increasing age, the number of bar-pressing responses decreased for an adult female stimulus, increased for an age peer and for food, and remained low for geometric forms and an empty chamber. Maternally deprived subjects established uniformly low response levels to all stimuli.*

Butler (1) has shown that adult monkeys, placed inside a small dimly lighted chamber, will persistently open a hinged wall-panel for no incentive

other than the opportunity to observe briefly various objects placed outside the chamber. It has been demonstrated further by Harlow (2) that young