Antarctic Science 17 (1): 71–72 (2005) © Antarctic Science Ltd Printed in the UK DOI: 10.1017/S0954102005002452

Possible food caching and defence in the Weddell seal: observations from McMurdo Sound, Antarctica

S.L. KIM[1], K. CONLAN[2], D.P. MALONE[1] and C.V. LEWIS[3]

[1]*Moss Landing Marine Laboratories, 8272 Moss Landing Rd, Moss Landing, CA 95062, USA*
[2]*Canadian Museum of Nature, P.O. Box 3443, Station D, Ottawa, ON K1P 6P4, Canada*
[3]*University of California, Berkeley, Dept. of Integrative Biology, 3060 VLSB #3140, Berkeley, CA 94720-3140, USA*
skim@mlml.calstate.edu

Received 10 May 2004, accepted 13 September 2004

On the basis of observations of Weddell seals (*Leptonychotes weddellii* Lesson) made in the course of studying shallow-water benthic communities in McMurdo Sound, Antarctica, we suggest that caching and/or defence of uneaten food may be a strategy practiced by this animal. Such a phenomenon is uncommon but taxonomically widespread among vertebrates. Depending on circumstances, it is termed hoarding, caching, or storage and may be short- or long-term, include defence of the resource, or have other variable expressions, with the common threads being deferred consumption and deterrence of consumption by others (Vanderwall 1990). Many vertebrate taxa exhibit hoarding behaviour, including rodents (e.g. Sciuridae), carnivores (e.g. Canidae, Felinidae) and birds (e.g. Corvidae, Picidae). No form of food caching, to our knowledge, has ever been reported in a wild pinniped.

In the first instance, at Cape Armitage (77°51.22'S, 166°39.79'E) on 25 October 2002, we observed a large white mass on the sea-floor at 10–15 m depth. Upon closer investigation, we were approached by a Weddell seal (a young animal about 2 m in length), which at first just swam unusually close to the divers. When we attempted to pick up what proved to be a carcass of an Antarctic toothfish (*Dissostichus mawsoni* Norman), the seal became aggressive, zooming to within 0.5 m of the diver nearest to the carcass, blowing bubbles towards her face, and making a threatening facial display (mouth open, lips pulled back). The other diver videotaped the encounter. We deduce that the seal brought the carcass to the area: toothfish are deep dwelling species (> 300 m as adults) and the carcass was approximately 1 m long, mostly consumed but clearly not a carcass from fish researchers who dispose of their wastes nearby (i.e. it was not filleted). It is also unlikely that the carcass just drifted into the area; currents here are generally moving southward and westward, not eastward from deep to shallow water, and are relatively slow (Barry & Dayton 1988). The behaviour of this seal may be termed possible food caching and resource defence.

In the second instance, on 17 November 2003, we drilled a hole in the sea ice to deploy instruments at 77°52.342'S, 166°42.376'E, over approximately 100 m of water. The thick layer of brash ice and the low air temperatures required that we clear the holes every 1–2 days to prevent instruments from freezing in place. It is usual for Weddell seals to use these instrument holes for breathing or haulout, keeping at least a small area unfrozen. On 18 November 2003, we approached the hole and noted the breathing sounds of a Weddell seal. When we were able to see down into the hole, we saw four dead bald rock cod (*Pagothenia borchgrevinki* Boulenger), each approximately 20 cm long, on the surface of the brash ice layer. The seal, a small individual, exhibited usual behaviour in a hole, appearing to breathe for about 30 sec every few minutes (approximately six breaths per surfacing). We watched the seal for about 20 min, but then had to clear the hole of ice to begin our work. We moved the fish to a lip on the edge of the hole, chipped the frozen layer (< 20 cm thick) free to the edges of the 1.2 m diameter hole, dipped out the ice and floating brash out until the hole was clear, and then returned the fish to the water surface. The seal paid no attention to the fish, and finally, we removed the fish from the hole and they were then taken by a south polar skua (*Stercorarius maccormicki* (Saunders)). Skuas are avid scavengers that often frequent cracks and seal haulout areas, waiting for potential food such as placental material from birthing female seals.

Pagothenia borchgrevinki is a small fish species that lives near the under-ice surface (Eastman & DeVries 1985). Weddell seals feed on them by blowing bubbles into the loose unconsolidated brash and frazil on the ice undersurface to startle the fish, and then catch them (Davis *et al.* 1999). The position of the four dead fish at the surface of the brash layer in the hole indicated that they were placed there, as the consistency of brash would not allow them to float to the surface unassisted. Moreover, each fish had abdominal cuts suggestive of seal tooth marks.

Both fish species are a normal part of the Weddell seal diet (Dearborne 1965, Testa *et al.* 1985). The behaviours of the seals described herein appear to be simple food caching; the continued presence of the seal near the toothfish carcass included aggressive defence (see Vanderwall 1990). Such behaviour is regularly observed among cats, but has never been reported in a wild pinniped. One possibility is that smaller prey at the surface (and out of the reach of other seals) are not protected as aggressively as large prey in the

Fig. 1. Weddell seal with a stash of bald rock cod in a hole drilled through the sea ice near McMurdo Station. The fish were removed from the surface of the brash ice that filled the hole and placed on the edge by researchers clearing the hole for instrument deployment. Digital image taken by Dan Malone 2003.

water where other seals may find and consume them. Our behaviour as we investigated the toothfish carcass seemingly was similar to that of a potential competitor, and this may have elicited the seal's response.

Food caching among vertebrates occurs in anticipation of periods when food will be more difficult to find (Vanderwall 1990). Weddell seals, in order to pup and breed, congregate in large numbers during spring where persistent tide cracks give them access to the ice surface for reproductive purposes (Stirling 1971, Kooyman 1981) as well as to the water column for opportunistic feeding. These persistent tide cracks are limited in occurrence and distribution, and fish become depleted by the seals in their vicinity (Testa *et al.* 1985). Especially in regard to a toothfish, which can weigh up to 100 kg, consumption may not be immediate or entire when one is caught. Therefore, given the apparent difficulty in finding a fish, temporary caching (and defence) for future consumption is consistent with the behavioural ecology of this seal.

Prey caching by Weddell seals likely provides food resources for other species. Food cached below water will undoubtedly attract scavengers such as amphipods (*Orchomenella* (*Orchomenopsis*) *pinguides* Walker, *Abyssorchomene plebs* Hurley), seastars (*Odontaster validus* Koehler) and nemertean worms (*Parborlasia corrugatus* McIntosh), as well as other seals that could compete for the food. A seal that is maintaining close contact with the cached item will disturb seastars and nemertean worms but would not necessarily dislodge lyssianasid amphipods. Once a seal is finished with a carcass, the carcass would provide a concentrated organic source in an otherwise food-poor region (Dayton *et al.* 1986). We have observed that piles of seal faecal material, collecting under the most frequently used tidal cracks, attract high numbers of seastars and nemerteans, and may provide an important food source to the benthic community and an indirect but straightforward linkage between pelagic and benthic ecosystems.

Acknowledgements

We are grateful to David Ainley and Bob Hofman for comments that substantially improved the manuscript. Susan E. Townsend provided council on caching behaviour in mammals, as did Ed Hendryks in regard to amphipod natural history. Field assistance was provided by Rob Robbins, John Oliver, Jim Oakden, Andrew Thurber, Aaron Carlisle, Jennifer Fisher, and Jonna Engel. We thank NSF (OPP-0126319) and the Zaches Foundation for funding and the US Antarctic Program for logistic support.

References

Barry, J.P. & Dayton, P.K. 1988. Current patterns in McMurdo Sound, Antarctica and their relationship to local biotic communities. *Polar Biology,* **8**, 367–376.

Davis, R.W., Fuiman, L.A., Williams, T.M., Collier, S.O., Hagey, W.P., Kanatous, S.B., Kohin, S. & Horning, M. 1999. Hunting behavior of a marine mammal beneath the Antarctic fast ice. *Science*, **283**, 993–995.

Dayton, P.K., Watson, D., Palmisano, A., Barry, J.P., Oliver, J.S. & Rivera, D. 1986. Distribution patterns of benthic microalgal standing stock at McMurdo Sound, Antarctica. *Polar Biology*, **6**, 207–213.

Dearborn, J.H. 1965. Food of Weddell seals at McMurdo Sound, Antarctica. *Journal of Mammalogy*, **46**, 37–43.

Eastman, J.T. & DeVries, A.L. 1985. Adaptations for cryopelagic life in the Antarctic notothenioid fish *Pagothenia borchgrevinki*. *Polar Biology*, **4**, 45–52.

Kooyman, G.L. 1981. Weddell Seal *Leptonychotes weddellii* Lesson, 1826. *In* Ridgway, S.H. & Harrison, R.J., *eds*. *Handbook of marine mammals,* vol. 2. *Seals*. London: Academic Press, 275–296.

Stirling, I. 1971. Population dynamics of the Weddell seal in McMurdo Sound, Antarctica, 1966-68. *Antarctic Research Series*, **18**, 141–163.

Testa, J.W., Sinniff, D.B., Ross, M.J. & Winter, J.D. 1985. Weddell seal – Antarctic cod interactions in McMurdo Sound, Antarctica. *In* Seigfried, W.R., Condy, P.R. & Laws, R.M., *eds*. *Antarctic nutrient cycles and food webs*. Heidelberg: Springer, 561–565.

Vanderwall, S.B. 1990. *Food hoarding in animals*. Chicago, IL: University of Chicago Press, 445 pp.

https://doi.org/10.1017/S0954102005002452 Published online by Cambridge University Press