

## Behavior patterns of pilot whales and Risso's dolphins off Santa Catalina Island, California

Susan H. Shane

250 Cottini Way, Santa Cruz, CA 95060, USA

The behavior patterns of two squid-eating odontocetes, short-finned pilot whales (*Globicephala macrorhynchus*) and Risso's dolphins (*Grampus griseus*) are poorly known. Because these species are usually found fairly far offshore, extended studies of their behavior are rare. In what may be a relatively unusual circumstance, pilot whales and Risso's dolphins gathered in the nearshore waters of Santa Catalina Island, California, 40 km offshore of Los Angeles, to feed on spawning squid during the winter. The daily activity patterns of pilot whales and Risso's dolphins were recorded during a nine winter-long study (1983–91) at Catalina Island.

### Methods

Observations were made from a 5.1 m Boston Whaler with a 70 or 85 hp outboard engine. Two observers searched for marine mammals, typically circumnavigating the 33 km-long island at a distance of 0.4–1.6 km offshore. Boat speeds during searches were 15–25 km/hour. One observer scanned the inshore 180 degrees, while the second scanned the offshore 180 degrees. Field time at Catalina varied with 50–97 days spent searching during the first three winters (1983–5) and seven to eight days spent searching during the last six winters (1986–91) with one exception. Only three days were spent in the field in 1990. Further details on methods can be found in Shane (1994).

When pilot whales or Risso's dolphins were encountered, photographs were taken for individual identification, after which behavioral observations were initiated, if possible. The boat remained sufficiently distant from the animals so as to cause no apparent alteration in their behavior. Instantaneous sampling of the behavior (Altmann, 1974; Shane, 1990) of pods of each species every 5 minutes was conducted for sessions of 15 minutes or longer. Each record included the date, time, location, species, total number, number of calves, water depth, distance offshore, direction of travel and behavior. Behaviors included traveling (unidirectional movement), feeding (diving repeatedly in one

location and surfacing facing in varying directions), socializing (frequent body contact and surface displays such as breaching), resting (floating at the surface or moving forward very slowly), milling (moving in varying directions and remaining near the surface), not visible, and combinations of activities (e.g. travel/feed). Cetacean speeds included slow, regular and fast and were relative to the boat's idle speed of approximately 5.5 km/h which was designated 'regular'. Group geometry was categorized as 'oval' or 'line abreast' and further, as 'tight' (animals within one body length), 'loose' (whales greater than one but less than five body lengths apart), or 'widely dispersed' (greater than five body lengths apart). 'Mixed' geometry referred to groups which met more than one of the above criteria.

Twenty-five hours of instantaneous samples of behavior were collected during the 166.5 h spent observing pilot whales. Their behavior was visible and recorded in 315 of 326 instantaneous records. Nineteen hours of instantaneous samples were recorded of behavior during 41.5 h spent in contact with Risso's dolphins. Risso's dolphin behavior was visible in 234 of 238 records.

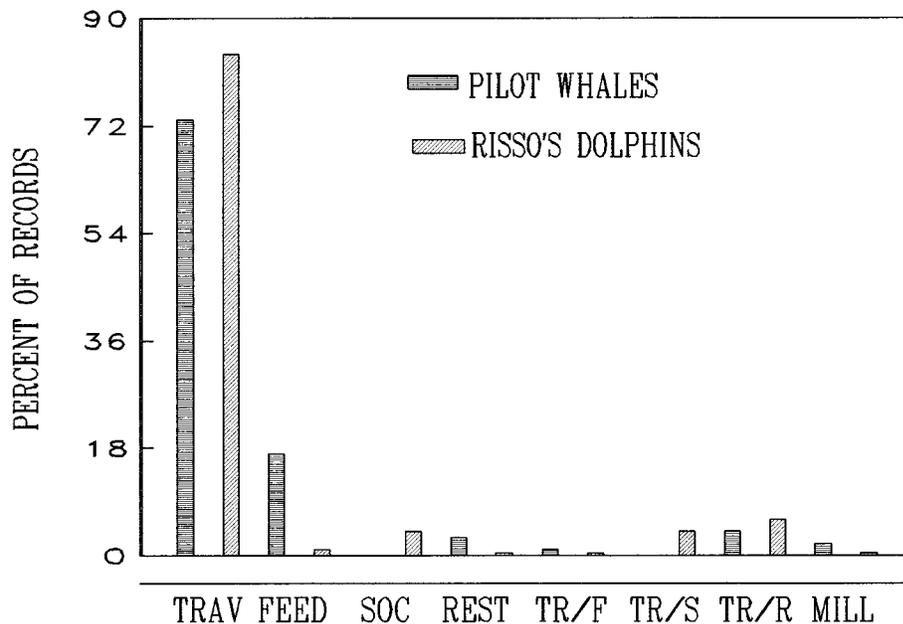
### Results

#### *Pilot Whales*

Seventy-three percent of the instantaneous records of pilot whale behavior (229/315) were of traveling (Fig. 1). Pilot whales spent 17% of the time feeding (53/315), while all other activities were recorded rarely. Pilot whales never were observed socializing.

Pod geometry varied according to behavior. Traveling pilot whales formed a tight oval 62% of the time, while moving in tight line abreast 15% of the time and mixed geometry 14% of the time ( $n=221$ ). When feeding, pilot whales usually were widely dispersed (56%) or in mixed geometry (40%) ( $n=45$ ).

Considering only the two most frequently-seen activities, pilot whales traveled in water averaging 32.8 m deep ( $\pm$  S.D.=18.57;  $n=148$ ) and fed in water averaging a depth of 43.7 m ( $\pm$  15.71;  $n=43$ ).



**Figure 1.** Behavior of pilot whales and Risso's dolphins recorded during instantaneous samples of pods every five minutes at Catalina Island, California. Data are presented as the percentage of records in which behavior was known ( $n=315$  for pilot whales;  $n=234$  for Risso's dolphins). Behaviors include: Trav=Traveling; Feed=Feeding; Soc=Socializing; Rest=Resting; Tr/F=Travel/Feed; Tr/S= Travel/Socialize; Tr/R=Travel/Rest; Mill=Milling.

Pilot whale speed varied with behavior, with 100% of feeding whales moving at regular speed ( $n=35$ ) and 61% of traveling whales moving at slow speed while 39% moved at regular speed ( $n=226$ ). All whales that were resting or travel/resting ( $n=18$ ) moved slowly.

#### *Risso's Dolphins*

In 84% (196/234) of the instantaneous records, Risso's dolphins were traveling (Fig. 1). Risso's dolphins were recorded feeding only 1% of the time (3/234), and other activities were nearly as rare. In contrast with pilot whales, Risso's dolphins socialized 4% of the time and travel/socialized an additional 4% of the time.

Sixty-seven percent of traveling Risso's dolphins formed tight ovals, while 22% were in mixed geometry, and 9% were tight line abreast ( $n=195$ ). Most Risso's dolphins (73% of 195 records) traveled at a distance of 0.64 to 2.4 km offshore. Risso's dolphins were seen at an average depth of 85.8 m ( $\pm 26.07$ ;  $n=143$ ) regardless of behavior. Traveling Risso's dolphins were seen in water averaging 87.1 m deep ( $\pm 27.43$ ;  $n=110$ ). While the sample size is very small ( $n=3$ ), it is interesting that, when feeding, Risso's dolphins were found in water with a mean depth of 58.9 m ( $\pm 5.37$ ). Travelling Risso's

dolphins moved at regular speed (57%) or at slow speed (41%) ( $n=196$ ).

#### Discussion

Traveling was the dominant behavior recorded for both species off Catalina Island. Pilot whales moved slowly (both traveling and resting) most of the time, and Risso's dolphins traveled slowly 41% of the time. Slow travel may be a slightly more aroused form of resting. Directional movement, essentially equivalent to traveling in my study, accounted for 78% of 195 5 min sessions in which the behavior of the long-finned pilot whale (*G. melas*) was recorded (Weilgart, 1985). Kruse (1989) found traveling to be the most frequently recorded behavior for Risso's dolphins in Monterey Bay, California.

At Catalina both species traveled back and forth parallel to the coast, typically remaining in one small area (a few kilometers) throughout the day. Both cetaceans tended to reside in the same area where market squid (*Loligo opalescens*), the most likely prey of both species (Seagars & Henderson, 1985; Sinclair, 1992; Kruse, 1989), were being caught throughout the field period each year (Shane, 1995). Such localized movements, similar to those reported for three pilot whales in

Alaska (Home, 1980), differ significantly from the long-distance travels reported for a satellite-tagged pilot whale in the Atlantic Ocean (Mate, 1989).

Feeding behavior was rarely observed in either species. The most likely explanation is that both species feed primarily at night, as did the pilot whale satellite-tracked by Mate (1989). Commercial squid fishing is conducted at night when squid are brought up to the surface by bright lights. Squid fishermen often reported that the cetaceans fed around their boats at night. The pod geometry of feeding pilot whales (widely dispersed or in mixed geometry) indicated that the animals fed individually rather than cooperatively, at least during the day. Pilot whales moved into deeper waters than usual to feed, while Risso's dolphins moved into shallower waters on the few occasions they were recorded feeding. Such movement suggests that market squid may be found in water about 40–60 m deep during the day. Market squid spawn (the activity which brings the squid to Catalina in winter) in shallow waters, three to over 36 m deep (Fields, 1965).

The absence of socializing, which includes mating, in pilot whales suggests that mating may be a highly seasonal, non-winter event in this population.

Both species tend to be found farther offshore and in much deeper water throughout most of their range than was observed during this study. For instance, in the central Mediterranean Sea, long-finned pilot whales were found in a mean depth of 2196 m and Risso's dolphins in a mean depth of 991 m (Notarbartolo di Sciara, pers. comm., Tethys Research Inst., Via Gusti 5, 20154 Milano, Italy). At Catalina Risso's dolphins were not seen in inshore waters until 1986 (Shane, 1995). Prior to 1986, there were only five sightings of Risso's dolphins, all greater than 0.8 km offshore and most ( $n=3$ ) more than 3.2 km offshore (no depth data were recorded). Therefore, the behavioral data presented here should be seen as applicable only to the inshore observations at Catalina Island.

In summary, the activity pattern that emerges from these data is that both pilot whales and Risso's dolphins probably feed nocturnally and rest diurnally while at Catalina Island in the winter.

### Acknowledgements

Numerous field assistants helped with the field work at Catalina Island (see Shane, 1994 & Shane, 1995). I am grateful to Guiseppe Notarbartolo di Sciara and an anonymous reviewer for insightful comments on the first draft of this paper.

### References

- Altmann, J. (1974) Observational study of behavior: sampling methods. *Behavior* **49**, 227–267.
- Fields, W. G. (1965) The structure, development, food relations, reproduction, and life history of the squid *Loligo opalescens* Berry. *Fish. Bull.* **131**, 1–108.
- Home, W. S. (1980) Pacific pilot whales: repeated, localized sightings in southeastern Alaska. *Wasmann J. Biol.* **38**, 18–20.
- Kruse, S. L. (1989) Aspects of the biology, ecology, and behavior of Risso's dolphins (*Grampus griseus*) off the California coast. M.S. Thesis, Univ. of California at Santa Cruz, Santa Cruz, CA, USA, 120 pp.
- Mate, B. (1989) Satellite-monitored radio tracking as a method for studying cetacean movements and behaviour. *Rep. Int. Whaling Comm.* **39**, 389–391.
- Sinclair, E. H. (1992) Stomach contents of four short-finned pilot whales (*Globicephala macrorhynchus*) from the Southern California Bight. *Mar. Mamm. Sci.* **8**, 76–81.
- Seagars, D. J. & Henderson, J. R. (1985) Cephalopod remains from the stomach of a short-finned pilot whale collected near Santa Catalina Island, California. *J. Mammal.* **66**, 777–779.
- Shane, S. H. (1990) Behavior and ecology of the bottlenose dolphin at Sanibel Island, Florida. In *The Bottlenose Dolphin* (eds S. Leatherwood & R. Reeves), pp. 245–265. Academic Press, San Diego.
- Shane, S. H. (1994) Occurrence and habitat use of marine mammals at Santa Catalina Island, California from 1983–91. *Bull. S. Cal. Acad. Sci.* **93**, 13–29.
- Shane, S. H. (1995) Relationship between pilot whales and Risso's dolphins at Santa Catalina Island, California. *Mar. Ecol. Prog. Ser.*
- Weilgart, L. S. (1985) Vocalizations of the North Atlantic pilot whale (*Globicephala melaena* Traill) as related to behavioral and environmental contexts. M.S. Thesis, Memorial University, St. John's, Newfoundland, 140 pp.

