

Coordinated feeding by Atlantic spotted dolphins (*Stenella frontalis*) in the Gulf of Mexico

D. Fertl and B. Würsig

Marine Mammal Research Program, Texas A & M University, 4700 Avenue U, Building 303, Galveston, TX 77551-5923, USA

Summary

In 1986, Atlantic spotted dolphins (*Stenella frontalis*) in the Gulf of Mexico were observed and filmed while feeding in a coordinated manner on a school of clupeid fishes. Dolphins herded the fish into dense balls against the sea surface. While such feeding activity for other delphinid species has been well-described nearshore, our observations represent one of the first reports of coordinated feeding offshore.

Introduction

Dolphins can display a high degree of coordination among individuals while engaged in feeding maneuvers. Fish may be trapped against shorelines, driven and trapped between dolphin groups, encircled in both shallow and open waters, or chased or tossed onto beaches (e.g., Tayler & Saayman, 1972; Norris & Dohl, 1980; Würsig, 1986).

Coordinated feeding is often opportunistically sighted and difficult to describe, resulting in relatively few documented accounts, with the exception of some reported feeding episodes involving bottlenose dolphins (*Tursiops truncatus*) (Würsig, 1986; review by Shane, 1990), common dolphins (*Delphinus delphis*) (Gallo, 1991), dusky dolphins (*Lagenorhynchus obscurus*) (Würsig & Würsig, 1980), and killer whales (*Orcinus orca*) (Similä & Ugarte, 1993).

Accounts of dolphins feeding in open waters in a coordinated manner are not observed as often as nearshore, probably because fewer such offshore behavioral observations have been made. Springer (1957) and Siebenaler & Caldwell (1956) mentioned coordinated feeding by spotted dolphins (*Stenella plagiodon*=*S. frontalis*) on pinfish (*Lagodon rhomboides*) in the Gulf of Mexico, but no specific behaviors were noted. We present a description of a coordinated feeding event by Atlantic spotted dolphins in the Gulf of Mexico.

Observations

On 30 March 1986, at 1400 hr, a group of at least one hundred Atlantic spotted dolphins was observed (by research personnel from the U.S. National Marine Fisheries Service) feeding in a coordinated manner in the Gulf of Mexico (21°51.93' N, 85°57.83' W) in 40 m deep water. Calm, sunny weather, with a Beaufort Sea State of 0, facilitated detailed observations of the event. Video footage, on 1/2 inch VHS format, was taken from the bridge of the National Oceanic and Atmospheric Administration vessel *CHAPMAN*.

Dolphins approached the feeding area from various directions, swimming rapidly and porpoising free of the water (J. Watson, National Marine Fisheries Service, Pascagoula, MS, pers. comm. 1991). Birds can be seen in the early part of the video, and were identified to be either sooty (*Sterna fuscata*) or bridled (*Sterna anaethetus*) terns (D. Peak, University of Texas—Medical Branch, pers. comm. 1993). It is not clear from the video whether the terns were present during the entire feeding event. Prey appeared to be spatially distributed in schools over a large area (radius of the area, separation distance among schools, and quantity of prey are unknown). The group of dolphins was split into smaller sub-groups (sub-group sizes were not provided), each herding fish schools into tight balls. Only one dolphin sub-group was documented, since it was not possible to film all the isolated sub-groups simultaneously (J. Watson, pers. comm. 1991). Video analysis revealed that the focal sub-group (≤ 20 dolphins) was working a fish school into a tight ball that was approximately six meters squared. Fish were identified from video to be from the family Clupeidae, probably Atlantic menhaden, *Brevoortia* spp. (A. Landry, Texas A&M University at Galveston, pers. comm. 1993).

The focal-fish school was forced to the surface by a multi-tier formation of dolphins. Dolphins passed beneath the fish school, and expelled "bubble-bursts" which ascended at the perimeter and center

of the fish school. The bubbles appeared to have two functions: (1) to displace individual fish near the surface from their anti-predator schooling mode, and (2) the undertow of the bubble sucked sub-surface fish under, in essence, having a collapsing effect, that resulted in condensing and containing the fish school, possibly to maintain the spatial integrity of the fish school. Use of such "bubble-bursts" is exemplified by the observation of a single dolphin "bubble-bursting", while a conspecific fed on a fish isolated by the bubble.

While the majority of the dolphins in the focal sub-group worked to keep the fish together in a ball and near the water surface, individuals would take turns catching fish. It was not possible to determine if fish were taken in all passes through the fish school. The containment was very fluid and gave no detectable order of individual movement. Some dolphins passed through the edge of the aggregation, rolling on their sides in an arc towards the fish. Using the lighter underside of the body as a "flash" effect to scare the fish (Würsig *et al.*, 1990) and/or physical flanking kept the fish tightly together. A slight variation on this behavior consisted of dolphins gliding through the fringes of the fish school, and then becoming more active outside of the fish ball, with some splashing as the animals arced back towards the school. Other dolphins appeared to wait just below the surface, forming an underwater barrier and not passing through the fish school. When the school of fish started to split apart or moved in a different direction, some dolphins tail slapped or made small lunges that created splashes, which appeared to serve as a method to maintain the perimeter of the fish school.

Based on the degree of individual spotting (Perrin, 1969), the focal dolphin sub-group appeared to include animals of various ages, with juveniles and adults working together. It was not possible to determine whether some dolphins fed more frequently than others. Dolphins were frequently observed waiting their turn to make feeding passes, while probably working to not let the fish ball move downwards. A few distinctively pigmented or marked individuals were observed, but it was not possible to follow their movements for more than several seconds. Based on relative body size of the focal group, an apparent adult individual was observed tossing one fish at a time to the outskirts of the main activity. Each time, relatively young animals then swam to these fish and presumably ate them. This happened on three occasions; it is not known whether the adult and young animal were the same individuals each time.

The research vessel resumed course after approximately one hour, but the feeding behavior continued, with new dolphins arriving in the area (J. Watson, pers. comm, 1991).

Discussion

This event documents Atlantic spotted dolphins making coordinated foraging movements resulting in tightly herded fish balls. Prey containment was accomplished by the dolphins encircling, and diving underneath, the fish ball to confine prey to the water surface. Arcing, splashing, tail slapping, and "bubble-bursting" appeared to be part of a multi-faceted containment of fish.

Schooling by prey fishes may increase the ability of individual fish to survive predation (Neill & Cullen, 1974), while predators more efficiently capture schooling prey by schooling themselves (Major, 1978; Schmitt & Strand, 1982). Group foraging may occur either because greater benefits are possible than during solitary foraging, or because animals are constrained to group living for reasons other than finding food and thus must pursue prey together (Packer & Ruttan, 1988). For cetaceans, coordination with other animals while feeding on a prey school is believed to increase the feeding success of an individual (Würsig *et al.*, 1985; D'Vincent *et al.*, 1985). Further study documenting individual dolphin movements and behaviors during coordinated feeding bouts is needed.

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