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**PELAGIC PREDATOR ASSOCIATIONS:
TUNA AND DOLPHINS IN THE EASTERN TROPICAL PACIFIC OCEAN**

by

Michael Scott, Susan Chivers, Robert Olson, Kim Holland

ABSTRACT

The association of yellowfin tuna and spotted dolphins in the eastern tropical Pacific Ocean (ETP) has been exploited by tuna fishermen and has intrigued scientists for decades, yet we still have questions about what the benefits of the association are, whether it is obligatory or permanent, why the species associate most strongly in the ETP, and why the tuna associate primarily with spotted dolphins. Two main hypotheses, invoking benefits due to feeding and reducing predation, have been proposed to explain the bond. Three studies examined these questions: a simultaneous tracking study of spotted dolphins and yellowfin tuna, a food-habits study, and a study of the oceanographic features that promote the bond. Eleven spotted dolphins were radio-tagged and six tuna were sonic-tagged, resulting in three simultaneous tracks of 1, 8, and 31 h. These tracks demonstrated that the association was neither permanent nor obligatory. Stomachs were examined from 225 spotted and 175 spinner dolphins, and 1,619 yellowfin tuna, collected during 79 purse-seine sets on tunas associated with dolphins. The food habits and the tracking data together demonstrated that spotted and spinner dolphins are primarily nighttime feeders, while the tuna are primarily daytime feeders. Data from observers on purse-seine vessels provided estimates of the percentage of dolphin herds associated with tuna to examine the spatial and oceanographic patterns of the bond. Spotted dolphin herds carried tuna 43% of the time (34,590 sets/81,300 sightings) and the association was most prevalent where the warm mixed layer was shallow (less than ~45 m) and the oxygen concentration below the mixed layer was extremely low. Only 20% of the spinner dolphin herds carried tuna (2,811 sets/14,218 sightings), but interestingly, their association was more common in areas where the mixed layer was less than ~25 m deep. The association is most prevalent in the ETP probably because the oxygen minimum layer in the ETP is the most hypoxic and extensive in the world. The tuna are largely restricted to the mixed layer due to the hypoxic waters below and typically swim near the thermocline; spinner dolphins swim near the surface, while spotted dolphins swim deeper, at depths of 15-20 m. It appears that the bond is most stable when the difference in swimming depths between dolphins and tuna is ≤ 25 m. The most parsimonious explanation for the daytime aggregation of spotted dolphins and yellowfin tuna is that one or both species reduce the risk of predation by forming large, mixed-species groups.