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REMORAS

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Remora, suckerfish, diskfish, and sucker are some of the names describing eight species of marine fishes in the Family Echeneidae (= Echenedidae) (Fischer, 1978; Nelson et al., 2004). Remoras inhabit tropical and subtropical waters worldwide, except for the whitefin sharksucker (= whitefin remora, *Echeneis neucratoides*), which is restricted to the western Atlantic Ocean (Fischer, 1978).

I. Remora Biology

Remoras use a suction disk to attach to sharks, rays, bony fishes, sea turtles, cetaceans, sirenians, and ships and other floating objects (O'Toole, 2002). When attached to these hosts, remoras appear to swim upside down, but the disk is really on top of their head. The oval-shaped disk is a modified dorsal fin that has split and flattened to form a series of transverse, plate-like fin rays (disk lamellae) resembling slats of a venetian blind (Britz and Johnson, 2012) (Fig. 1). A strong vacuum is created between the remora's disk and its host when the fin rays are lifted (Fulcher and Motta, 2006). Small tooth-like projections of mineralized tissue from the dorsal pad lamella, known as spinules, increase the remora's resistance to slippage and, thereby, enhance friction that maintains attachment to a moving host (Beckert et al., 2015).

The tenacity with which remoras attach to their hosts is best illustrated by the practice of sea turtle fishing by fishermen in the Caribbean and off China and northern Australia (Gudger, 1919), and in Yemen and Kenya, where it continues to this day. A fisherman ties a line around the tail of a remora and throws the fish into the water. The remora tightly attaches itself to a turtle, and the remora and its "catch" are then hauled ashore.

Suspected benefits to the remora's association with their hosts include transportation, protection from predators, increased courtship/reproduction potential, enhanced respiration, and expanded feeding opportunities (Fertl and Landry, 1999; Silva and Sazima, 2003). Remoras opportunistically feed on parasitic copepods (that constitute the bulk of their diet), zooplankton and smaller nekton, food scraps from meals of their hosts, and sloughing epidermal tissue and feces of the host (Cressey and Lachner, 1970; Williams et al., 2003).

II. Marine Mammal Hosts

Adult remoras typically attach to the body of a marine mammal (Figs 2 and 3). At least three remora species utilize marine mammals as hosts: Whalesucker (*Remora australis* = *Remilegia australis*), sharksucker (*E. naucrates*), and whitefin sharksucker (Fertl and Landry, 1999; Williams et al., 2003). Remoras associate with at least 20 cetacean and two sirenian species [dugong (*Dugong dugon*) and West Indian manatee (*Trichechus manatus*)]. The whalesucker has most often been collected and identified from cetaceans; hence, its common name (Rice and Caldwell, 1961; Fertl and Landry, 1999). The sharksucker has also been collected from common bottlenose dolphins (*Tursiops truncatus*) (Fertl and Landry, 1999, 2002; Noke, 2004). Two species of remora have been collected from West Indian manatees; these were positively identified as the whitefin sharksucker and sharksucker (Williams et al., 2003).

To what degree a remora might irritate its host is uncertain. A remora may slide all over its host's body, possibly tickling the animal. Animals observed with remoras sliding over their bodies sometime will jerk and even roll over (Ritter, 2002; Ritter and Brunnschweiler, 2003). Dolphins of various species leap with remoras attached to them, perhaps to dislodge the "hitchhiker" (Fish et al., 2006; Weihs et al., 2007). There are also reports of dolphins dislodging remoras from themselves or their calves and then biting them (Wedekin et al., 2004). Large remoras or multiple remoras on the same host may produce a hydrodynamic drag. The remora's suction mode of attachment in some cases may leave a temporary mark resembling the disk imprint. There are two photo-documented observations of bottlenose dolphins (*T. truncatus*; Hawai'i and

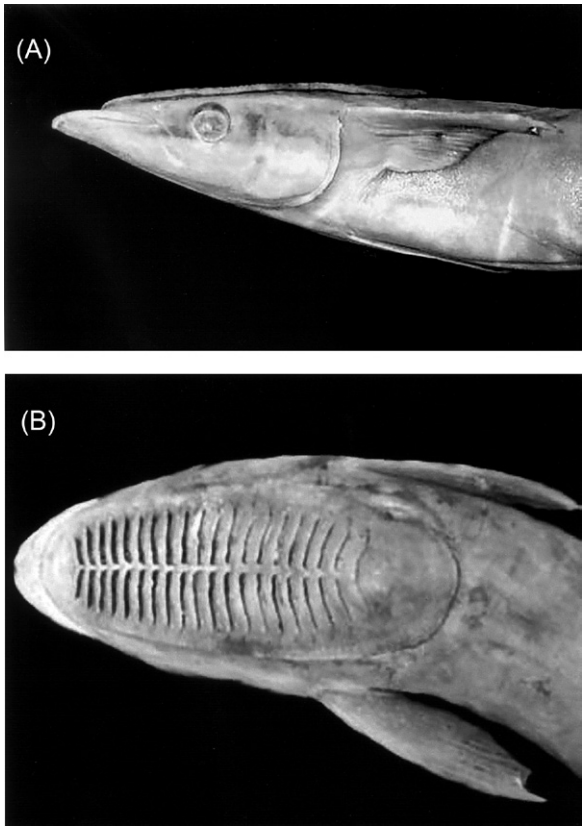

Figure 1 *(A) Lateral and (B) dorsal view of the head of a remora, with suction disk visible (Photo by W.H. Dailey).*

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Figure 2 *Remoras on a killer whale (*Orcinus orca*) in Hawaiian waters. © Annie M. Gorgone/Cascadia Research.*

Figure 3 *Sharksucker (*E. naucrates*) attached to a West Indian manatee (*T. manatus*) off Aguadilla, Puerto Rico (Photo by Edwin Rivera-Colon, La Casa del Buzo).*

Réunion Island, both in 2017) bleeding from a remora's attachment site to the host (near the base of the dorsal fin of one individual and in the area where the pectoral fin meets the body of the other individual). Nonetheless, most wounds attributed to remoras are likely caused by cookiecutter sharks (*Isistius brasiliensis*) or Pacific lampreys (*Lampetra tridentate* = *Entosphenus tridentatus*) that actually bite or rasp their prey or host.

III. Problems With Remora Identifications

The whalesucker's preference for cetaceans leads many observers to assume that any remora spotted on a cetacean is this species. Most remora-marine mammal associations described in the literature are based on visual or photographic observations of a remote, free-swimming host and its passenger(s) rather than specimens collected from strandings or whaling victims. Host records determined from remote observations should be considered problematic, as the identification of remoras to species is difficult without the actual specimen in hand (Fertl and Landry, 1999; Sazima, 2006).

The whalesucker and other host-specific remoras are typically pelagic forms with a specialized morphology consisting of large disks, short stout bodies, and reduced fin size (when compared to those of inshore counterparts) (Fertl and Landry, 1999). More commonly reported remoras are slender-bodied, inshore forms, such as the sharksucker, that are least particular about their hosts. The possibility that small, slender remoras, as well as more stocky remoras photographed on cetaceans, may represent different life history stages of one species further complicates positive identification from afar.

See Also the Following Articles

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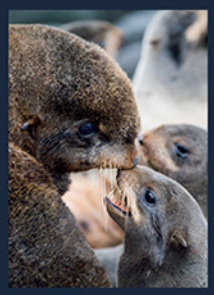

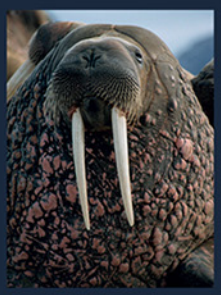


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