

Exploring the "Hitch-Hiking" Behaviour of Remoras

What is Hitch-Hiking?

Hitch-hiking refers to remoras attaching to large marine animals, such as sharks, turtles, whales, and billfishes.

- The adhesion is facilitated by a structure called the adhesion disc (Friedman et al., 2013).
- The disc is resistant to slippage and allows the remora to cling onto and detach from a host whenever needed.



"Sharksucker (Echeneis naucrates). Taken at Ras Mohamed in Red Sea, Egypt" by Iilithlita

Why do remoras attach, and what's in it for the hosts?

This interaction is a mutualistic relationship which means both organisms benefit. Some of the benefits for the remora include:

- Increased locomotive efficiency
- Reduced cost of foraging
- Increased likelihood of finding mating partners (Flammang et al., 2020).
- Helps avoid predation
- The primary benefit offered to the host in this interaction is that the remoras consume parasites that may be attached to their skin (Cohen, 2020).



Image obtained from: <https://www.sciencefocus.com/news/remoras-reveal-how-they-stay-stuck-under-the-sea/>

Can Remoras Attach to any Organism?

Some remoras are able to attach to various hosts whereas some attach to a specific host. The factors that determine which host is appropriate include:

- The roughness of the host skin
- Host specialization
- Hydrodynamic regime (Kenaley et al., 2019)



Whale shark and remora by Wikimedia Common

Where on the host do remoras bind?

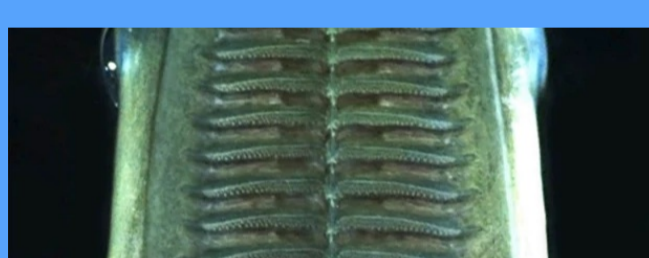
- Remora primarily attach to regions where the drag would be the lowest. They want to minimize the hydrodynamic drag experienced by the host as much as possible because when drag increases, the host would be slower. This is a disadvantage when it must escape from predators (Sazima and Grossman, 2006).
- They also prefer the ventral side of the host to avoid predation from sea birds (Flammang et al. 2020).

Fun fact: Remoras do not have a swimming bladder, they use the adhesion disk as their main mode of transportation.

What structures allow for attachment?

There are three major elements of the adhesion disk: the lamellae, spinules, and fleshy lip.

- Lamellae create a suction seal and help bind to the host. They rotate from a flat to erect position when adhering to host surfaces (Gamel et al. 2019).
- The spinules are responsible for increased friction on rough host surfaces (Beckert et al., 2015). By increasing friction, the remoras are less likely to slide off
- The fleshy lip creates a tight suction with the host surface



The top of a remora's head by Wen Li/Beihang University

How do remoras obtain food?

Remoras scavenge on the leftovers from the host's food

- The further the food falls, the more likely the remora is to detach and scavenge for these particles.
- If the food particles are not distributed too far from the host, the remora will remain attached (Sazima and Grossman, 2006).
- They are able to detect food because there is an increased sensitivity to mechanical stimuli on the anterior end of the adhesion disc (Cohen et al., 2020).

Conclusion

- Hitch-Hiking is a symbiotic interaction that has many benefits for both species
- The three key elements involved in adhesion are lamellae, spinules, and the fleshy lip of the adhesion disc
- Remoras attach to areas where drag is minimized
- Future research can be directed towards cranial vasculature which may be related to the equalization of pressure in lamellar compartments (Flammang and Kenaley, 2017).

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