

Mechanism of sea turtles being hooked during longline fishing and its implications for injury and mortality: a brief analysis.

The capture of pelagic sea turtles during longline fishing is of increasing concern worldwide to conservationists and fishery managers. Many if not most of the turtles caught in this manner are still alive when brought on deck. However, the fishing line has often been reported extending well down the esophagus, with no hook visible. The usual practice is to cut the line as close to the mouth as possible and immediately release the turtle overboard. Although physically active when let go, the ultimate fate of these turtles, with the imbedded hook somewhere in the upper gastrointestinal (GI) tract, is unknown. Hard shelled sea turtles (Cheloniidae) are rugged individuals that can tenaciously cling to life after sustaining considerable internal and external damage from various sources. Injured, diseased, pollution-impacted, and debris entangled sea turtles have been known to remain alive for months prior to expiring.

Swallowing of the baited hook deep into the esophagus or stomach is hypothesized in this short essay as being the most probable manner of capture by longline, or any other fishery involving hook and line. Unpublished studies (F. White of Scripps) relating to esophageal pressure of sea turtles during the intake of food have shown that swallowing is facilitated by a powerful "hydraulic pump." When the esophagus relaxes, seawater along with the selected food is taken into the mouth and propelled down the esophagus. Once there, it is retained by esophageal papillae that are present in all species of sea turtles. Several forceful pumping cycles move the food along the esophagus into the stomach. Following each ingestion of seawater and food, a strong contraction of the esophagus expels the excess water. The result is separation of food from seawater. In the case of baited hooks, the "food" will usually be sucked in well past the horny structures of the mouth before the hook sets itself into soft tissue of the GI tract.

Perforation resulting from the hook's penetration could be expected to eventually result in both chemical and bacterial peritonitis and septicemia. However, another factor of potentially greater significant almost certainly comes into play. Once hooked, the turtle would struggle when reaching the limit of the attached line. The resulting stress on the GI tract would produce a damaging condition known as intussusception, or invagination (telescoping) of one segment of the GI tract into the other. Even greater stress would be expected to result when the longline is reeled in and any hooked turtle is dragged along through the water column and hoisted aboard. In addition to direct GI tract damage, all of the adjacent vital organs would be placed under stress that could result in hemorrhage.

Research on the above factors, as well as others, is clearly needed in order to adequately understand what happens to a sea turtle hooked by longline. At present there is sufficient cause for concern from a straightforward deductive logical appraisal of the situation, based on the limited information available. Research of this entire topic will be difficult in the laboratory due to the likely inappropriate nature of experimentally subjecting turtles to being hooked. Perhaps the most acceptable strategy would be to collect turtles actually captured by commercial longliners. They could then be clinically treated by veterinarians, while at the same time ongoing studies of damages involved. The logistics of collecting the turtles would not be easy, but nevertheless is within the realm of possibility.

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Dear George,

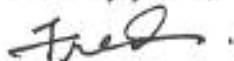
Thank you very much for your call and the reprints regarding the relationship of longline fishing and ingestion of baited hooks by marine turtles. I was especially impressed by the large annual captures (> 20,000) per yr. due to Spanish longline fisheries in the Western Mediterranean. The Aguilar, et al paper indicates a mortality of 20-30% (= approx. 5,000 deaths/yr). Do you have any feeling for the number of turtles caught on longlines world-wide?

I suspect that the "hydraulic pump" mechanism which I observed may be implicated in many of the deaths associated with longline fishing. It takes only a few "pump cycles" to propel a bolus from mouth to stomach. I can imagine that a hook attached to a longline on one end and a turtle gastrointestinal tract at the other could do great and potentially fatal damage.

Your call, and my reading of the materials which you sent, have given me the resolve to place the publication of these observations on the front burner. I hope to have a manuscript by early July, if not sooner. I will send you a draft and invite your comments, especially in reference to the longline problem as it relates to the hydrolics of deglutition.

With thanks for the nudge re: formalizing the observations on sea turtle swallowing.

Sincerely yours,



Fred N. White