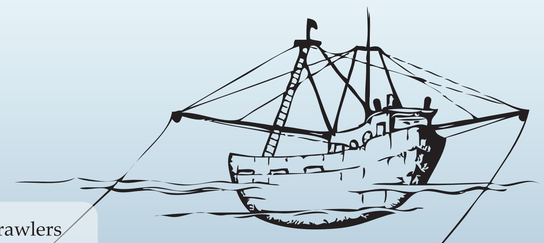
SHRIMP TRAWLING IN KINO BAY: ECOLOGICAL AND ECONOMIC CONSIDERATIONS

THE *TRUE* COST OF SHRIMP

The Mexican shrimp fishery is highly valuable both economically and socially; an estimated 190,884 fishers are directly employed and another 573,000 have jobs indirectly relating to the industry. The problem, however, is that shrimp trawling is the most environmentally destructive fishing method that exists in the world today, contributing to extensive habitat loss and waste of hundreds of thousands of tons of bycatch every year.

- Sonora is the largest producer of shrimp from aquaculture and the second largest producer of shrimp from trawling in Mexico.
- The Mexican shrimp fishery began in the 1920s and 1930s from the Port of Guaymas, Sonora with 20 foreign operated converted sardine boats. Exclusive shrimp fishing rights were allocated to Mexican boats in the 1940s. By the 1970s foreign investment enabled the expansion of the shrimp fishery in multiple ports in the Gulf of California. The number of shrimp boats in the GOC reached its peak with approximately 3000 boats in 2002.
- As of 2014, approximately 925 trawlers operate in the Gulf of California. Kino Bay is an important shrimp fishing area supporting 10-40 trawlers nightly from September through March. The number of trawlers operating in the GOC is decreasing due to government management programs.
- Due to expanding export markets since the 1990s, most trawled shrimp is exported to the United States.
- Management tools used in the fishery include a seasonal closure (summer), depth restrictions (> 5 fathoms only), the mandatory use of Turtle Exclusionary Devices (TEDs), and a boat buy-out program to reduce fleet size.
- In an effort to document effects of shrimp trawling on the region of Kino Bay the Prescott College Kino Bay Center collected and analyzed data from 95 trawl sets on 11 boats over 23 nights between 2003 and 2013.



BOAT: The otter trawlers used in the Gulf of California range from 18 to 23 meters in length and are outfitted with 220 to 620 hp motors.

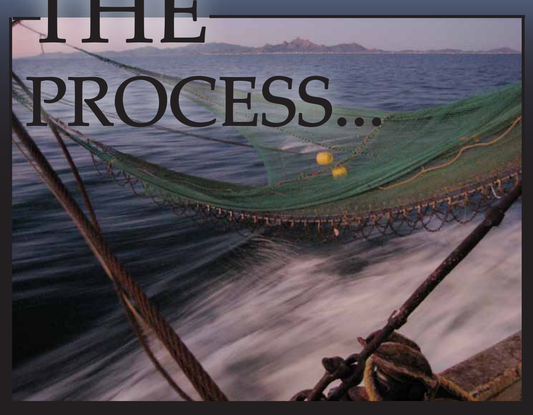
HULL: Can hold up to 100 tons and has onboard refrigeration.

CHANGO: A smaller yet identical net which lies between the two large nets. Its contents determine when the best time is to haul up the large nets.

OTTER BOARDS: Two heavy wooden boards that hold open the mouth of the nets.

NETS: Two 40-45 feet wide cone-shaped nets with broad mouths and a mesh size of 2.25 that open horizontally and taper back into the cod-end that collects the catch. There are floats on the top part of the mouth in order to keep it open and suspended; conversely there are chains that run along the bottom.

THE PROCESS...



ONE: SETTING THE NETS
The nets and otter boards are dropped to a depth of 3-60 fathoms and are dragged for 1.5 - 4.5 hours each set. Each boat does 2-6 sets per night.

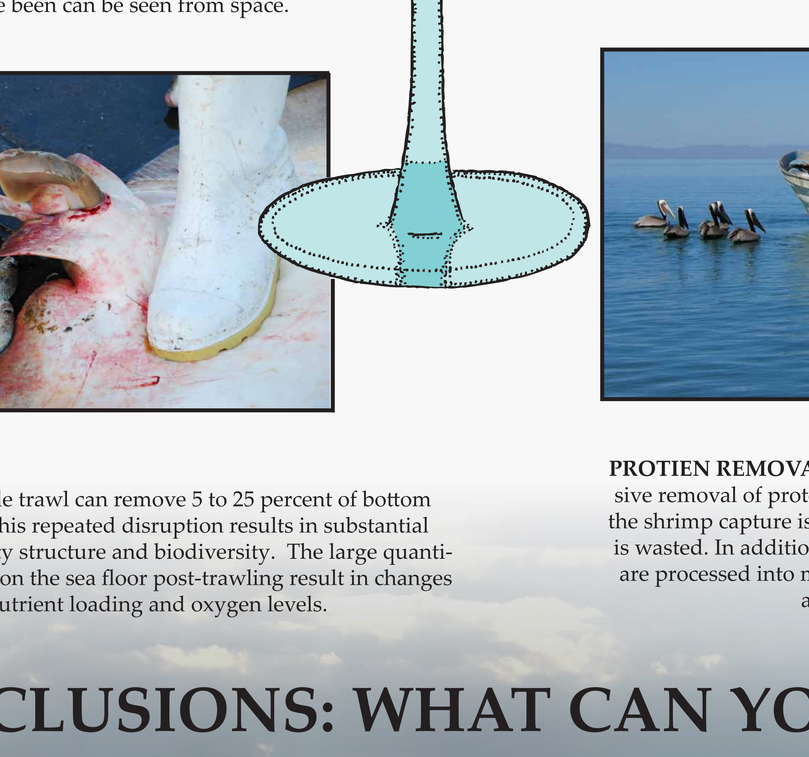
TWO: HAULING IN AND SORTING THE CATCH
The winch pulls up the nets and the catch is released onto the deck. Estimated weight of one set ranges from 150-1000 kg. The crew immediately begins sorting the target species from the by-catch, tossing shrimp into baskets.

THREE: DISCARDING BY-CATCH
A small percentage of the remaining by-catch is retained but the majority is shoveled off the deck. Mortality rates are high due to physical damage and predation by scavengers such as sea lions, gulls, and pelicans that surround the trawler.

FOUR: PROCESSING
The shrimp are immediately de-headed, flash-frozen, and stored in the refrigerated hull below where they remain for up to 15 days before returning to port. Upon arrival, the shrimp are further processed for export.

ECOLOGICAL IMPACTS

BYCATCH: Trawling results in high rates of by-catch, defined as the incidental capture of non-target species. Much of what is caught as bycatch is not utilized and is throw back into the sea dead or damaged. By-catch rates in the Kino Bay Region average 86.08%, with 196 species including sensitive species such as elasmobranchs (sharks, skates, and rays), sea turtles, sea birds, and juvenile fish, eight of which are listed as protected, threatened, or endangered. This means, for every one kilo of shrimp caught, there are almost nine kilograms of by-catch. Our study concludes that 29,128 MT of bycatch resulted from the Sonoran trawled shrimp catch of 4,712 MT reported by SAGARPA in 2011.



HABITAT: The physical process of bottom trawling involves dragging fishing gear across the ocean floor. Each trawler disrupts approximately 1K² each night resulting in a complete removal of benthic communities and essential habitat. Sediments are suspended in the water column which increases the turbidity of the water, decreases sunlight and primary production, smothers benthic life, and may resurface previously buried pollutants. The impact is so profound, that the ensuing plume been can be seen from space.

REPRODUCTION: Shrimp trawler by-catch contains many juveniles that have not yet had a chance to reproduce. Certain groups of animals including sharks, rays, skates, and halibut are particularly vulnerable due to their biology. For example, some by-catch species like the Shovelnose Guitarfish, *Rhinobatos productus*, do not attain sexual maturity until relatively late in life and have a long gestation period and low fecundity resulting in few young. Gravid females utilize the shallow, sandy habitat along the Sonoran coast for nursing grounds which coincides spatially and temporally with shrimp trawling.

ECOSYSTEM: A single trawl can remove 5 to 25 percent of bottom dwelling organisms. This repeated disruption results in substantial changes in the community structure and biodiversity. The large quantities of decaying biomass on the sea floor post-trawling result in changes in organic nutrient loading and oxygen levels.

SOCIO-ECONOMIC IMPACTS

EXPORT-DRIVEN ECONOMY: Strong export markets, consumer demand and open trade policies create strong incentives for shrimp fishing. Shrimp is the most highly valuable export fisheries product in Mexico valued at over $325 million USD in 2011. Over 90% of shrimp exported from Mexico goes to the United States. While shrimp trawling in Mexico provides many jobs, the majority of the money attained from the product itself does not stay in Mexico; the highest profits end up at the end of the chain-of-custody, benefiting the importing country.

COMPETITION: The ecologically wasteful shrimp trawling fleet is negatively impacting the marine ecosystem that the local communities depend on for their livelihood. Trawlers and local small-scale fishers directly compete for at least 54 different commercial species resulting in diminished income and food source. Mortality of juveniles, gravid females and commercially viable species result in present and future economic loss to small-scale fishers. Additionally, small-scale fishers report that trawlers oftentimes break active gillnets left in the sea overnight which is costly, in time and in money, to repair.

PROTIEN REMOVAL: Shrimp trawling results in a massive removal of protein for local communities. Almost all the shrimp capture is exported and almost all the by-catch is wasted. In addition, large amounts of fish like sardines are processed into meal to feed aquaculture shrimp that are then exported.

JOBS: In addition to the almost 200,000 jobs directly created by the shrimp fishery annually, local black market economies have arisen to commercialize some bycatch species.

CONCLUSIONS: WHAT CAN YOU DO?

The recent emergence of shrimp farms worldwide has been fueled by the increasing demand for shrimp and although it may seem to be a good alternative, its impacts are different but are just as damaging as trawling. Because they require a lot of land, shrimp farm facilities are responsible for vast mangrove deforestation and oftentimes expel excess nutrients and antibiotics contributing to oxygen-depleted ocean water. Both shrimp trawling and farming are driven by the power of the consumer; the most influential thing you can do is to make responsible, informed choices at supermarkets or restaurants and encourage others to do the same.

Additionally, you can voice support for:

- The required use of by-catch reduction devices such as TEDs (turtle exclusion devices)
- The creation of new marine protected areas closed to trawlers
- The improvement of, and the design of new, fishing technology
- The use of shrimp pots; an existing form of harvesting shrimp sustainably
- The creation of economic alternatives for fishers
- And it always helps to share your knowledge and spread the word!

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