

## **2006 Grand Prize Winner (\$25,000)**

### **Deterring Sharks with Magnets**

Michael Herrmann, United States

Mr. Herrmann's winning entry proposes a solution to reduce the bycatch of sharks on longlines, which has driven some shark species to the brink of extinction. Mr. Herrmann proposes taking advantage of sharks' unique biology in order to deter them from taking the bait of tempting hooks.

Sharks are able to detect magnetic fields using special organs located on their snouts, and research has revealed that some species of shark are repelled by strong magnetic fields. Mr Herrmann placed small magnets just above the hooks on a longline, and preliminary trials using nurse sharks and lemon sharks revealed this technique to be successful in keeping the sharks away from the bait. The target fish were unaffected by the magnets.

The judges voted to award Mr Herrmann the grand prize because the concept sets out a novel approach to reducing shark bycatch, is based on sensory perception and addresses a problem which affects shark populations around the world. It will also benefit fishermen who want to fish more selectively to avoid sharks - as they will catch more of their target fish and will avoid losing hooks and bait to sharks.

#### *Shark Bycatch*

Pelagic longlines are the most widespread fishing gear and bycatch on longlines is a serious threat to sharks. Earlier this month, the World Conservation Union announced that 20 percent of shark species are close to extinction. Bycatch is a major contributor to the decline of many shark species.

Longline fishing gear consists of baited hooks hanging from a long drifting line suspended from buoys that rest on the surface of the water. Often, sharks are attracted by the baited hooks that are meant to catch tuna or swordfish which is problematic for both the shark and the fisherman. If a shark is accidentally caught on a hook in such a fishery it is often injured or killed while waiting to be released or during release and the fisherman loses time, money and gear on something he or she did not want to catch.

#### *The Winner*

Michael M Herrmann is a Research Associate at SharkDefense LLC, an American organisation. An electrical engineer by training, he is currently researching the effects of permanent magnetic fields in elasmobranchs at the Bimini Biological Field Station, South Bimini, Bahamas. Mr. Herrmann has designed underwater video systems, repellent delivery systems, and radio-controlled devices for the purposes of shark repellent tests.

He oversees the capture, editing, and cataloging of all repellent testing conducted by

SharkDefense. Mr. Herrmann is also a licensed private pilot, holds the Prometric A+ Certification, and is a high-brown belt in Tae Kwon Do.

## **2006 Runner-Up Prize Winners (\$5,000 each)**

### **The Flying Bottlebrush (aka Carefree's Cunning Contraption)**

Chris Carey, New Zealand

Mr. Carey designed a device that attaches to the trawl warps (the cables that pull the nets through the water) in order to reduce the number of seabirds being killed or injured during trawl fishing. Skipper Carey's goal was to make the warp lines and the area around them highly visible so that sea birds will be able to see them even in the midst of a feathery feeding frenzy.

Using materials available on board any large fishing vessel, Mr. Carey's design consists of a rope that is clipped on to the warp line with purse seine clips and has stiff streamers made out of strapping tape that bristle out and make the rope look like a bottlebrush.

The bristles form a visible and safe 'no fly zone' around the warp line so sea birds will be able to see it coming and can move before getting struck and injured or killed. The design is easily deployed and has the potential to be adapted to fit trawlers around the world.

The judges voted to award Mr. Carey's invention a prize because it is simple and immediately available, there is little to no cost for extra equipment, there is no concern for loss of catch and the design is readily adoptable by fishermen whose fishery could be closed due to high levels of seabird bycatch.

#### *Seabird bycatch*

As Mr. Carey says, factory trawlers are the McDonald's of the sea. As they fish, offal is often discarded, which almost always leads to a sea bird feeding frenzy. Trawl nets are attached to the boat by two long cables on each side called "warps" and as the birds station themselves in the water directly behind the boat, they risk flying into or being hit by the trawl warp.

Although not all situations result in the death of seabirds, a large number are injured or drowned. Many thousands of seabirds, including many endangered species, may die this way each year.



Chris Carey with his contraption.

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A close view of the rope, which looks like a bottlebrush.

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The contraption keeps seabirds away from the warp line of a trawler.

© *Smart Gear / Chris Carey*

### *The Winner*

Chris Carey is a 50 year old fisherman who has had an extensive career at sea. He has worked on Japanese Pole vessels and trawlers, served as a scientific observer on foreign vessels working around New Zealand, worked on large US purse seiners and small, local purse seiners and served as an observer for the Inter American Tropical Tuna Commission.

He was a deckhand on a fresh fish vessel, 1st mate on a trawler and worked 15 years as skipper on various fillet factory trawlers in and around New Zealand.

### **The Flexigrid (aka The Fish Filter)**

[Kristian Zachariassen, Faroe Islands](#)

Mr. Zachariassen developed a flexible sorting grid built out of tubes and ropes. Inside a trawl net, the grid sorts the targeted fish from the unwanted fish and allows unwanted fish to safely exit the net. Bycatch larger than the targeted species can swim out of an opening in front of the grid rather than being herded into the cod end and kept.

Many trawlers already insert filter grids into their trawl nets to stop non-target fish getting into the end of the net. However, these are not always effective at reducing bycatch and they also lower fishing efficiency because the water flow through the grid is reduced.

The grids are also often extremely heavy and cumbersome. Mr. Zachariassen made a flexible grid which consists of small plastic tubes set on ropes. Because of the grid's flexibility, water flows through the net differently, and fewer fish become entangled in the net in front of the grid. Trials show the grid is effective at cutting bycatch of cod and saith by 95%, while the catch of the target fish (blue-whiting) is only reduced by 1%.



Mr. Zachariassen's design is a technique, known from fish farming, developed by Johnson Seafarms Ltd in Shetland, who originally created the Flexi-panel to size-sort salmon and trout in fish-gages. Mr. Zachariassen and his colleagues at the Faroese Fisheries Laboratory and the trawl factory Vonin Ltd., together with the pelagic trawlers Naeraberg and Christian i Gropinum, re-developed this panel to the flexible panel, also called the Flexi-grid.



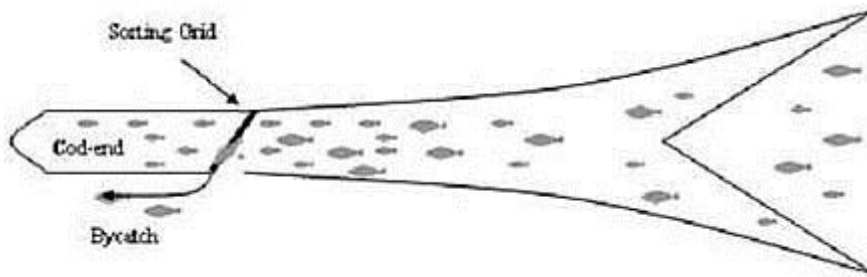
Flexi-grid by Kristian Zachariassen.

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A close-up view of the flexi-grid.

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A diagram showing how bycatch can escape through the flexi-grid in a trawl net.

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### *Non-target Fish Bycatch*

Oftentimes fishermen, especially in trawl fisheries, catch species of fish that they are not targeting. This unwanted catch is problematic for certain fish species that can not sustain high levels of mortality and for which fisheries sometimes have strict quotas. This unwanted catch is also a nuisance for the fishermen who don't want to waste net space and resources on fish they didn't want to catch.

### *The Winner*

Mr. Zachariassen is a former fisherman, and has spent last 10 years working at the Faroese Fishery Laboratory as a fishing technician. He started as a deckhand onboard longliners and sailed as mate and skipper on Faroese trawlers for 8 years until he joined the Faroese Fisheries Lab. His work focuses on selectivity devices and environmentally friendly fishing gear.