

Acoustic pingers: Prevention of fish catch depredation and dolphin entangling

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The ring seine operation is the most popular gear among traditional fishers of Kerala and has spread to other coastal states of India. Ring seining involves surrounding schools or other accumulation of fish with a net, impounding the fish by pursing the net from below, and drying up the catch by hauling the net so that the fishes are crowded in the bunt and can then be brailed out. In recent years the major problem associated with the operation of the ring seine is the attack of dolphins and other Cetaceans during the time of aggregation and brailing of the catch. In India, interaction between humpbacked dolphin and trawl/purse seine fisheries is common. During ring seine operation, it was observed that groups consisting of up to 30 animals congregate in the fishing area and surround the ring seine net and cause disturbance to fishing by preying on fishes from the net.

In order to prevent this disturbance, two types of measures are practised by the fishermen. Some fishermen use crackers to drive away the dolphins from their fishing area. However, fishermen are cautious to avoid causing physical injury to dolphins. Others patrol the fishing area in small boats. Boat anchors, tyres or hard objects covered with plastic operated from carrier vessels are some of the indigenous objects used by fishermen to drive away the dolphins from fishing grounds. This will lead to the death of the animal. In order to overcome this problem without harming marine Cetaceans, ring seine fishers of central Kerala have fabricated a new wall net known as Dolphin Wall Net (DWN) using locally available materials with low investment to prevent the damage caused by dolphins. Dolphin Wall Net is a 1000-1500 m long wall of netting framed with float line and steel rings hanging from the lower edge. The Dolphin Wall Net is made up of 300-400 mm high density polyethylene (HDPE) webbing of 1.5 mm diameter

and 25 meshes in depth. DWN is operated from the carrier vessel with an L_{OA} 9-13 m (Prajith *et al.*, 2014).

Fishers believe that dolphins come near the shore due to the scarcity of fishes in the sea. The major species occurring in the Cochin region are *Stenella longirostris* and *Sousa chinensis*. Other species are *Turisops aduncus*, *Delphinus capensis* and *Gampus gristeus*. Bottlenose dolphins are often victims as they come close to the fishing nets and get entangled. Humpback dolphins are the most common near shore Cetaceans found along the Indian coast (Dipani *et al.*, 2015). Once entangled in the fishing nets the animals suffocate and in an attempt to break loose they damage the nets and causes economical damage for the fishermen.

One solution to prevent this is the use of pingers. Pingers are devices that produces ultrasound which keep the bottlenose dolphins and porpoises away from the nets. Pinger is designed to work by emitting a sound wave signal beyond 70 kHz that is known to be in the best hearing range of most dolphin species. The signal acts as an alarm, and in some cases the pinger stimulates dolphins to use their echolocation which alerts them to the presence of the pingers and fishing nets. This sound wave is not audible to human beings, but it creates disturbance to dolphins and results in checking approach of dolphins near to fishing net. The dolphin pingers use re-chargeable battery.

Marine mammals have highly developed species-specific senses of hearing, which appear to influence the effectiveness of different types of acoustic devices (Kraus, 1999). A thorough review of marine mammal acoustics is given by Ketten (1998). Acoustic devices fall into two main categories: Acoustic Deterrent Devices (ADDs) and Acoustic Harassment Devices (AHDs).

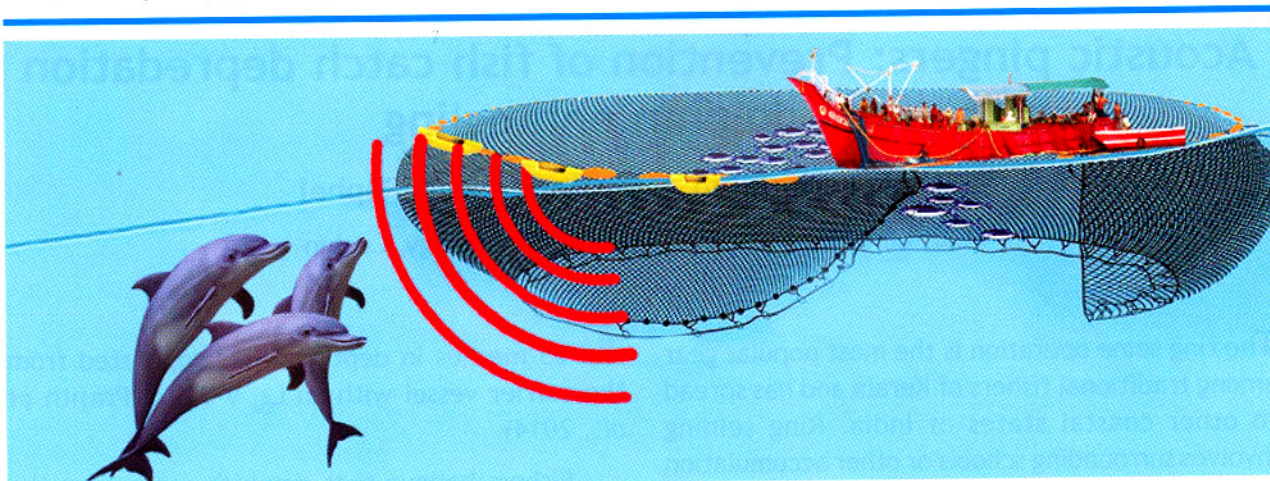


Illustration of how a pinger works

The use of pingers has become mandatory in the European Union in an attempt to limit Cetacean bycatch (Culik *et al.*, 2001). The standard pinger emits a signal of 10 kHz (with harmonics to at least 60 kHz) with a source level of 132 dB re 1 micro Pascal at 1 m, which is within the hearing range of most Cetaceans and Pinnipeds (Reeves *et al.*, 1996). Different pingers can emit sounds differently, with regular pulse intervals and random intervals or frequency sweeps. Pingers are often referred to as acoustic alarms, as they are designed to alert marine mammals of the presence of nets without causing pain or damage to the animal's auditory system.

Initiative by ICAR-CIFT

In order to avoid damage to Cetaceous fishes in net, ICAR-CIFT introduced Pinger in Kerala. A fishermen group from Chellanam fishing village, Kerala was associated with ICAR-CIFT for this operation. After the three month study it is observed that pingers were effective against dolphin attack.

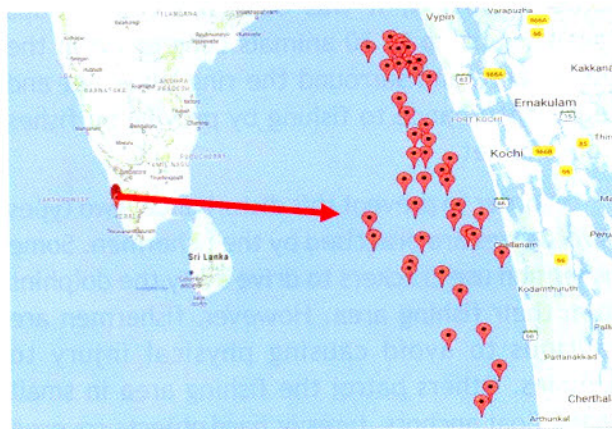
The pingers were deployed in a ring seine fishing vessel of 24 m length using fishing gear with a mesh size of 20 mm, hung length of 1010



Different types of acoustic pingers

m, hung depth 105 m and weight 2500 kg. A total of 44 fishing operations were carried out and the preliminary study showed a reduction in the marine mammal entanglement and depredation of the target fish caught (Fig. 1). Experiments on commercial seines are being continued with variable frequency devices.

The economic loss caused by dolphin attacks



Experimental locations

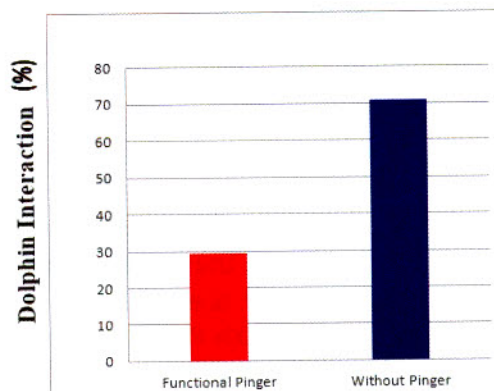


Fig. 1. Performance of ring seine with acoustic pingers

ranges from ₹10000-15000 per month and in some cases when the attack is severe, up to ₹ 300000/- is spent for repair. Loss of fishing days for repair is another associated loss.

Conclusion

Depredation by Cetaceans is a growing problem not only in ring seines but also in other fishing gears and have serious economic implications on fisheries. Several studies such as experimenting with other acoustic deterrent/ harassment devices and *in situ* underwater studies regarding the behaviour of depredating organisms are necessary to reduce the problem such as depredation. Pingers did not adversely affect fish catch. Nets equipped with functional pingers suffered less damage, both in terms of catch loss and net damage. In this scenario the use of pingers will help the fishermen to reduce Cetacean attack and incidental entangling in fishing net.

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Fuel saving through material substitution in trawls

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Fishing consumes 15 to 20 times more energy than it produces (Endal, 1980) and the average fuel consumption by the fishing industry is estimated at 15-21.5x10⁶ t (Thomson, 1988). Increased use of fuel intensifies the carbon foot print and green house gas effect which leads to global warming, climate change, etc. Fuel consumption assumes prime importance to fishermen due to hike in

operational costs apart from its environmental effects. According to Tyedemers *et al.* (2005), world fishery fuel consumption is 50 billion (5 x 10⁹) liters. There is an 8% increase in the contribution of fuel cost to the total operating expenses within a time of two years (Fødevareøkonomisk Institut, 2011). Annual fuel consumption of mechanized and motorized fishing