

Artificial Light Fishing and its Impacts

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SUMMARY

Artificial light fishing is the process of fishing with the use of artificial lights to attract and catch the aquatic species. Several gears like purse seine, set nets, squid jiggling, longline are employed with lights for fishing. However light fishing has both advantages and also drawbacks. Positive benefits can include increases in catch rate, reductions in bycatch, and savings in energy, while negative effects can include ecological costs, overfishing, increased bycatch, production of plastic and marine litter, and greenhouse gas emission. This paper explains about light fishing and its impacts to the environment.

INTRODUCTION

The use of artificial light in fishing operations is a technique to attract and aggregate fish and eventually capture them. In various fishing gears such as hooks, gill net, purse seine, beach seine, cast net artificial lights are used to catch fish. Today, the use of artificial light in commercial fishing plays a very important role in contributing to the total catch yield and economy of many industrialized fisheries. In most cases, fishing vessels employ lights at the surface of the boat. Mostly squids are lured by using artificial lights. Artificial lights not only concentrate pelagic species, but also aggregate demersal fish and crustaceans. Up to 95% of the world squid catch uses artificial light. However, using artificial light in commercial fishing applications appears to produce various positive impacts it also produces negative impacts.

Behaviour of fish to light

For most aquatic vertebrates, vision is a key sensory organ. Many fish and crustacean species have the capability to recognize color, with a wide spectrum of color sensitivity and resolution. Understanding the behavioural responses of commercially important species toward artificial light is an important step in the development of efficient and sustainable fishing technology. There are four common patterns of movement in response to light; called phototaxis, photokinesis, aggregation, and vertical diurnal migration

Phototaxis: It is the bodily movement of animals in response to artificial light, either toward the source of light (positive phototaxis) or away from it (negative phototaxis).

Photokinesis: It is the movement, or lack of movement, in response to light.

Aggregation: Animals form a group or cluster in response to light.

Vertical diurnal migration: Animals move up and down in the water column in response to the light.



Figure 1: Light fishing boat and aggregation of fish towards light

Positive impacts of light fishing

Fishing with light has become one of the most advanced, efficient, and successful methods for capturing commercially important species. Some of its positive impacts are listed below

Increased catch rate

Fishing with light is one of the most widespread fishing techniques, producing high catch rates, and contributing a significant amount of product to the total global catch of marine fish. Squid jigging with lights produces high catch of squids, catch rate of sword fishes increases when lightsticks are used and using underwater lights in set nets significantly increased annual catches of all fish species.

Reduced bycatch

Unwanted bycatch and the subsequent discard of non-targeted fish is a global challenge. Recently, artificial lights have been evaluated as a potential method to eliminate bycatch. This includes the use of low-powered LED lights to reduce bycatch of small fish in bottom trawls, reduce bycatch of juvenile fish in groundfish trawls, reduce bycatch of turtles in gillnets. The use of LED lights reduced bycatch of sea turtles in pelagic gillnet fisheries is now widely applied worldwide.

Reduced fuel consumption

It has been reported that application of LED lights in fishing operations has been shown to significantly reduce fuel consumption. Therefore, it is recommended to use LED lights for fishing. Studies showed that purse seine vessels equipped with LED light reduced fuel consumption by 77%, with no significant change in catch rate. Use of solar-powered LED lights as an alternative to fuel-based lighting can be an alternative choice.

Negative Impacts

Although the positive contributions of artificial light in commercial fishing are undeniable, the argument that artificial light also produces negative effects is growing.

1. Ecological effects

Light pollution can produce negative effects on marine animals and is considered a threat to biodiversity. In the presence of lights, sea turtles get disoriented which makes them easy targets for predators. Feeding of predators increased when artificial lights were used because of abundance of prey in the illuminated area, making predators to easily identify their prey than in dark conditions. Thus, aquatic ecology gets affected.

2. Overfishing effects

Light fishing leads to aggregation of all fishes even juvenile fishes in the illuminated zone. This leads to overfishing which can lead to the depletion of the fisheries resources

3. Bycatch effects

In longline fisheries, chemical lightsticks play a very important role in attracting target species. These lightsticks may stimulate bioluminescent gelatinous prey, increasing the attraction of sea turtles to the baited hooks. Most commonly bycatch species unintentionally caught during fishing with light operations include marine mammals, turtles, birds and invertebrates.

4. Greenhouse gas effects

Like most of the mechanized fishing operations, fishing with artificial light contributes to greenhouse gas emissions. In the case of operating the additional generators onboard the vessel to produce the required electricity for lights, it results in the unintended by-product of CO₂ emissions. This results in global warming.

5. Plastic and litter effects

Marine litter is a global problem with diverse and complex impacts. Litter from chemical lightsticks is considered the largest source of plastic waste from underwater fishing lights that could affect the environment and human health. These lightsticks have a short lifespan, which works 12 hr and are non-reusable. After a single day of operation, thousands of spent lightsticks are discarded at sea and constitute a potential toxicant to marine flora and fauna and result in marine litter pollution. Finally, to limit production of plastic waste and litter from the use of fishing lights, it is necessary to adopt and enforce regulations on their use, handling, and disposal.

CONCLUSION

In the case of fishing with lights, several governments have enacted management measures to limit competition among fishermen, limit fishing effort, manage overfishing, and mitigate environmental impact.

Strengthening monitoring, control, and surveillance of light fishing activities would be advisable and necessary. Educating and improving the awareness of fishermen in environmentally safe and friendly use of artificial light should be done. Thus, environment friendly light fishing has to be encouraged in the future and restrictions and regulations has to be followed strictly for promoting eco-friendly light fishing.

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