



REVIEW

Corollary of Marine Eco-system Sustainability by Addressing the Issues of Bycatches

Pramod Kumar Pandey* **Biswajit Lahiri** **Amitava Ghosh**

College of Fisheries, Central Agricultural University (Imphal), Lembucherra, Tripura, India

ARTICLE INFO

Article history

Received: 31 November 2019

Accepted: 28 December 2019

Published Online: 28 February 2020

Keywords:

Marine eco-system

Bycatch and discards

Sustainability

Marine fisheries

ABSTRACT

The issue of bycatch in the fisheries sector has been a major concern for the marine biologists over few decades in terms of conservation of marine eco-system and sustainability of the fisheries sector and marine biodiversity. As far as the concept of Bycatch is concerned, these are the unwanted species having less commercial importance, which in most of the cases disposed into the seas onboard or are caught during fishing. The article discusses the social, economic, cultural, and environmental impacts in addressing the issue of bycatch. The concern regarding bycatch is relatively new in the horizon in Indian perspective though it is often considered a major issue faced by developed nations since long. The problem of bycatch poses a serious threat to livelihoods and food security as it acts as a precursor to depletion of the food sources for local consumption with adverse social, economic, cultural, and environmental impacts. The adverse effects of by-catch can be mitigated through commercialisation of bycatch and making profits from the sale of bycatch, opening up of new markets for bycatch species or products, uses of bycatch as fishmeal and application of bycatch reduction devices (BRDs). Reorientation of the present monitoring system to collect fisheries data, strengthening technical know-how, bringing effective policy intervention, efficient co-management, and sincere and honest efforts in reducing bycatch and discards may provide a considerable impact towards sustainability of marine eco-system.

1. Introduction

The issue of sustainability in fisheries has become a global concern and ecosystem-based approaches are getting wider recognition through-out the world^[1,3,8]. The issue of bycatch in the fisheries sector has been a major concern for the marine biologists over few decades in terms of conservation of marine eco-system and sustainability of the fisheries sector. Heavy commercial fishing creates disequilibrium not only in terms of the catch of targeted species, but it also encompasses other species, which are

incidentally caught along with the targeted species. The concept of bycatch can be stated as catching of non-targeted species having less commercial importance, which in most of the cases disposed into the seas onboard or at fish landing centres. It is estimated that 7.3 million tonnes of the catch are globally discarded as bycatch per annum^[4] and 16.7 million tonnes in world shrimp fisheries. The term 'discards' is synonymously equated with the word 'bycatch' in different countries which describes a portion of the targeted catch that is discharged on boards or at landing cen-

*Corresponding Author:

Pramod Kumar Pandey,

College of Fisheries, Central Agricultural University (Imphal), Lembucherra, Tripura, India;

Email: pkpandey_in@yahoo.co.uk

tres. There are different impacts of by-catch can be seen in the fisheries sector which are: overexploitation of target and non-target fish stocks, the environmental damage caused by fishing gears which are lost or discarded, “ghost fishing” and pollution as a consequence of discards, as well as the “carbon footprint”. There are various effects on the function of the marine ecosystem due to removal of some species as a consequence of bycatch. The decrease in numbers of several predatory species such as dolphins, sharks and sea snakes may lead to sudden rise in populations of various prey species, whereas population of predatory species may decrease if there is a sudden decrease of prey species including many sea birds and marine mammals ^[5,9].

The article discusses the social, economic, cultural, and environmental impacts in addressing the issues of bycatch.

2. Impacts of Bycatch in Biodiversity

Threats of bycatch are perceived to be a major issue concerning marine biodiversity. However, the real magnitude of this problem is masked by the different estimates which may be misleading ^[5]. It may be introspected that, further in-depth study in the same line can reveal some additional facts.

The concern regarding bycatch is relatively new in the horizon in Indian perspective though it is often considered a major issue faced by developed nations since long ^[7].

The issue of bycatch became relevant in India after independence due to gradual mechanisation of fisheries sector due to introduction of trawl fisheries, which made a drastic change in fishing behaviour. Trawl fisheries were mainly driven by demands from export markets in comparison to artisanal fisheries, as it is prominent in different parts of the world. Trawl fisheries resulted in the capture of a large number of non-target species as bycatch which unfortunately the largest share of the catch. There is a compulsion to the fishers as they have limited space available for storing the bycatch as the major storage spaces are occupied by commercial catches. As a result of this fishers have to discard the whole quantity of bycatch altogether. In tropical countries like India with diverse characteristics of fisheries and social groups, the problems of bycatch are perceived to be the utmost factual and normative and the stakeholders frequently seek the in-depth implications of bycatch so as to bring equity and justice in fisheries. The problem of bycatch poses a serious threat to livelihoods and food security as it acts as a precursor to depletion of the food sources for local consumption with adverse social, economic, cultural, and environmental impacts. As delineated by Gibinkumar ^[2], the followings are some of the direct/indirect impacts of bycatch-

2.1 Environmental Impacts

Apart from impacts on fish populations, the upwelling of benthic organisms to the surface can cause habitat modifications. The reduction of oxygen level in water bodies due to the decomposition affects the benthic community. Discards may have positive effects on the scavengers’ populations, by making inaccessible food available with minimal efforts or otherwise. Habitat modification resulting from discards may at times be confused with habitat modification resulting from the fishing gear itself or with unobserved fishing mortalities because habitat and individuals can be damaged but not brought to the surface. Thus the extent of discards versus gear induced mortalities may be difficult to quantify.

2.2 Economic Impacts

Economic impacts though have got much significance, is one of the least discussed and studied aspects of bycatch. Following are the classifications of the economic impacts:

- (1) Mortalities of commercially important economic species during discard of bycatch
- (2) Economic losses due to additional expenses associated with catching, sorting, and discarding of unwanted catch, higher fuel consumption, greater wear and tear of the fishing system, and as well as the associated opportunity costs.
- (3) Costs associated with monitoring, surveillance, and control for reducing discards.

2.3 Socio-cultural Impacts

Socio-cultural impacts of bycatch are difficult to quantify as the significance of conservation of marine biodiversity equilibrium and management of commercially important fish stocks in the maintenance of livelihoods of the poorest sections of the fishing community, is having a relatively higher level of difficulties.

3. Possible Solutions

Though the problems and issues of bycatch are relevant in a global perspective, the thrusts towards reducing its impacts in the marine ecosystem have been seen as in the nascent stage. The following probable solutions are being discussed herewith to derive a concrete comprehension to get rid of the menace of bycatch, especially associated with the marine fisheries.

3.1 Endowing a Commercial Value to Bycatch

There is a silver lining as the positive trends of bycatch commercialisation are being noticed amidst the ongoing

practice of discarding bycatch, even for some protected species. This trend is also conspicuous even in trawl fisheries. There is an utmost need for adoption of this trend in India due to the following reasons:

3.1.1 Diminishing Returns from Target Catch

Due to overfishing and depletion of target stocks near the shoreline in India, there is a considerable reduction in the profit margin for the fishing industries. To compensate for the reduction of profit margin, fishers are being compelled to sell the bycatch, which was earlier discarded. It is also beneficial for livelihood and food security, and sustainability of the marine ecosystem.

3.1.2 Emerging Markets for Selling of Bycatch Products

There is a changing pattern in food habit in India are being noticed. Increasing market demand for seafood provides a clear indication of this changing food habit. Thus, it helps to explore the marketing opportunity by utilizing the bycatches as potential target catch.

3.1.3 Uses of By-catch as Fishmeal

There is a prevalent practice of discarding bycatches at landing centres and seas, which is detrimental to the marine ecosystem. But presently by and large the major portion of trash fishes are being landed by trawlers, are being dried up for use as a fish meal in aqua and poultry industries.

3.1.4 Reluctance in the Usage of Bycatch Reduction Devices (BRDs)

There are several instances of reluctance in the usage of Bycatch Reduction Devices by fishing communities in different parts of the world. As an example, adoption of Turtle Excluder Devices (TED) faced strong resistance from some coastal states of India due to loss of other valuable fishes in the process of conserving endangered species of olive ridley turtle which is often discarded as bycatch^[6]. Thus, commercialization of bycatch becomes more pertinent as an alternate solution for the adoption of BRDs as an innovation.

3.2 Reorienting the Present Monitoring System for Collection of Fisheries Data

For coping up with the loopholes in the present mechanism of fisheries data generation that only enumerates the fisheries data generated in landing sites but not taking into account the catches that are discarded onboard. It cer-

tainly gives the incomplete figures of bycatch and lot of endangered marine species are being pushed to the level of extinction without any clues, which is a tremendous threat to the marine ecosystem and biodiversity. Thus, it demands a reorientation of the present monitoring system for collection of error-free fisheries data.

3.3 Development and Adoption Relevant of Technological Innovations in Bycatch Reduction

It is allegedly said that the using bycatch reduction devices like, TEDs, SONAR etc. reduce the quantity of targeted catch, which resulted in the non-adoption of these devices. Hence, it is introspected as a need of the hour to strengthen the innovation development process for the conservation of marine ecosystem in general, and addressing the issues of bycatches in particular to make it more compatible with the demand of fishers.

3.4 Policy Implications

There are several rules, regulations and laws framed by different nations all over the world to address the issue of bycatch for the conservation of the marine ecosystem. But the lack of uniformity in the rules, regulations and laws is posing a major hindrance in implementation and enforcement. Even the honest intention by the different nation for implementation of laws is not at all conspicuous with their existing efforts. Moreover, lack of implementation and enforcement of rules and regulations and weak monitoring system in the Exclusive Economic Zone (EEZ) in addressing the issue of bycatch made it more complex. Thus, a global policy formulation, enforcement and strategy for surveillance is required to address the issue.

4. Conclusion

Hence, bycatch and discards are the common problems faced by all fisheries stakeholders globally, and it is a major component of the negative impacts of fishing in marine ecosystems. It is an extremely complex set of scientific and ecosystem-based issue and includes many economic, political, and moral factors. Bycatch is recognized as unavoidable in any kind of fishing, but the quantity varies according to the gear operated. Bycatch quantity also varies. Thus, efficient management in reducing bycatch and discards, and sincere and honest efforts to address the issue may provide a considerable impact towards sustainability of marine eco-system.

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