
EFFECT OF BOTTOM TRAWLING ON PHYSICO-CHEMICAL PARAMETERS, BENTHOS AND FISH FAUNA OF MANGALORE COAST, KARNATAKA STATE

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Introduction

Trawling, the most efficient method of catching fish world over is also found to be the most important human caused physical disturbance on the world's continental shelves and hence the physical destruction of ecosystems. Trawl gears often catch additional untargeted organisms, which are generally not commercially valuable and subsequently discarded dead or alive. Effect of trawling has been studied world-over in the last few years but relatively few studies have been conducted in the Indian waters. Habitat disturbance by otter trawling is probably one of the most significant threats to marine benthic biodiversity. A study has been carried out to assess the short and long term effects of bottom trawling on benthic communities in the inshore bottom habitat off Mangalore coast by which an area of the sea bottom is disturbed by fishing gear and the post-disturbance impact on the biota is compared and to assess the quantity of discards, incidentals and juvenile fishes which otherwise form the non-target groups in the commercial trawling. The study was funded by DOD through the OSTC on marine benthos of Cochin University.

Methodology

Experimental otter trawling was carried out for 11 months (May 2001 -November 2002) off Mangalore coast to evaluate its immediate effect on physicochemical parameters of seawater. Five stations (1-5) with increasing depths (10m, 20m, 30m, 40 m and 50m) were selected for the study using a systematic BACI (Before After and Control Impact) design. Trawling impact on the changes in salinity, temperature, dissolved oxygen, total suspended solids and nutrients (nitrite, nitrate, phosphate and silicate) were assessed. Temperature, salinity and pH were similar before and after trawling. The results indicate that TSS at surface and bottom waters increased immediately after trawling which was prominent at the shallow stations with significant difference ($P < 0.05$) at 20 m depth station. Changes in nutrient load by trawling were occasionally observed. Trawling had



only a minor effect on transparency, dissolved oxygen and nutrients. Multivariate analysis (PCA) also revealed minor impact on the physico-chemical parameters due to trawling. The quantity of bycatch and discard was estimated from the landings of multiday fishing trawlers (MDF) at fisheries harbours and using the data collected onboard single-day fishing trawlers (SDF) for the period 2001-02.

Impacts

- Significant changes were observed after trawling in organic Carbon, which indicates that there are changes occurring after trawling.
- The texture was found to be silty-clay at all depths before and after trawling. However, it was seen that the percentage of clay reduced at all depths after trawling, and increase in percentage of sand and silt was seen during after trawling.
- The total biomass of macro benthos increased at all depths after trawling. There was decrease in biomass of most groups at 10 m but the biomass increased at 30, 40 and 50 m depths. Average numeric density show significant increase at 10 m, 30 m, 40 m and 50 m.
- The dominant group among macro benthos was bivalves, the numerical density of which increased at all depths after trawling. Among groups the numerical density of gastropods decreased at 10 m, increased at 20 m, 40 m and 50 m. Other groups which show increase in numerical density were polychaetes, and echinoderms.
- The total biomass of meiofauna increased at 10, 20, 30 m depths whereas it decreased at 40 and 50 m depths. The groups present were foraminifera, nematodes, polychaetes, harpacticodes, gastrotrichs, ostracods, copepods, turbellarians and bivalves. The numerical density also increased at 10, 20 but decreased at 30, 40 and 50 m. Numerical density of foraminifera increased at 10 and 20 but fell at 30, 40 and 50 m whereas the polychaetes decreased at 10-40 m depths but increased at 50 m. The other groups which show decrease are copepods, nematodes and polychaetes.
- The biodiversity indices based on abundance in macro benthos showed reduction at 10 & 20 m depth stations off Mangalore. Similarly biodiversity indices based on abundance of meio benthos has also recorded significant reduction at most of the stations.
- The Taxonomic Distinctness (TD) calculated from the presence/absence data of macro benthos also showed reduction at all depths. This indicates the negative impact of trawling on the biodiversity and taxonomic diversity on benthic organisms. The impact may be direct mechanical impact on the biota or indirect impacts such as habitat destruction or degradation of the community structure. The evidence of impact was clearly visible from shallow stations (10-30 m).

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- The quantity of bycatch generated by trawling along Karnataka coast was estimated as 56,035 t in 2001 and 52,380 t in 2002 forming 54 % and 48 % of total trawl catch respectively. The quantity of discards was estimated as 34,958 t in 2001 (34 % of total trawl catch) and 38,318 t in 2002 (35 % of total the trawl catch).
 - In MDF, 33,098 t of bycatch was landed annually and in SDF the quantity was 21,109 t. About 30 % of total catch from MDF was discarded (21,336 t) whereas it was about 44 % from SDF (15,301 t).
 - The most dominant group among bycatch was stomatopods in SDF forming over 39 % followed by finfishes (36 %) while finfishes formed the dominant group in MDF (69 %).
 - Catch rate of discards ranged from 7.5 kg/ h to 27. 0 kg/ h in SDF and from 2.0 kg/ h to 16.7 kg/ h in MDF.
 - The discarded catch in MDF consisted of 53 species of fishes (23 species always discarded), 12 crustaceans (6 species always discarded), 27 molluscs(22 species always discarded) and 7 other invertebrates (all discarded).
 - In the SDF, 53 species was seen in the landings and 60 in discard. The catch rate of discards was high during monsoon in MDF and pre-monsoon in SDF.
 - Juveniles of various groups constituted an important bycatch of trawl fishery of Karnataka forming about 15.9 % of the total catch in SDF and 23.5 % in MDF at catch rate of 7.8 kg h⁻¹ and 9.4 kg h⁻¹ respectively. Juveniles in general constituted 36 % of bycatch in SDF and 78 % in MDF.
 - Bottom trawling annually removes 14,400 t of juveniles of finfishes, 2,448 t of shrimps, 1,673 t of cephalopods and 1,702 t of crabs besides 4,059 t of juveniles of other groups from Mangalore coast alone.