

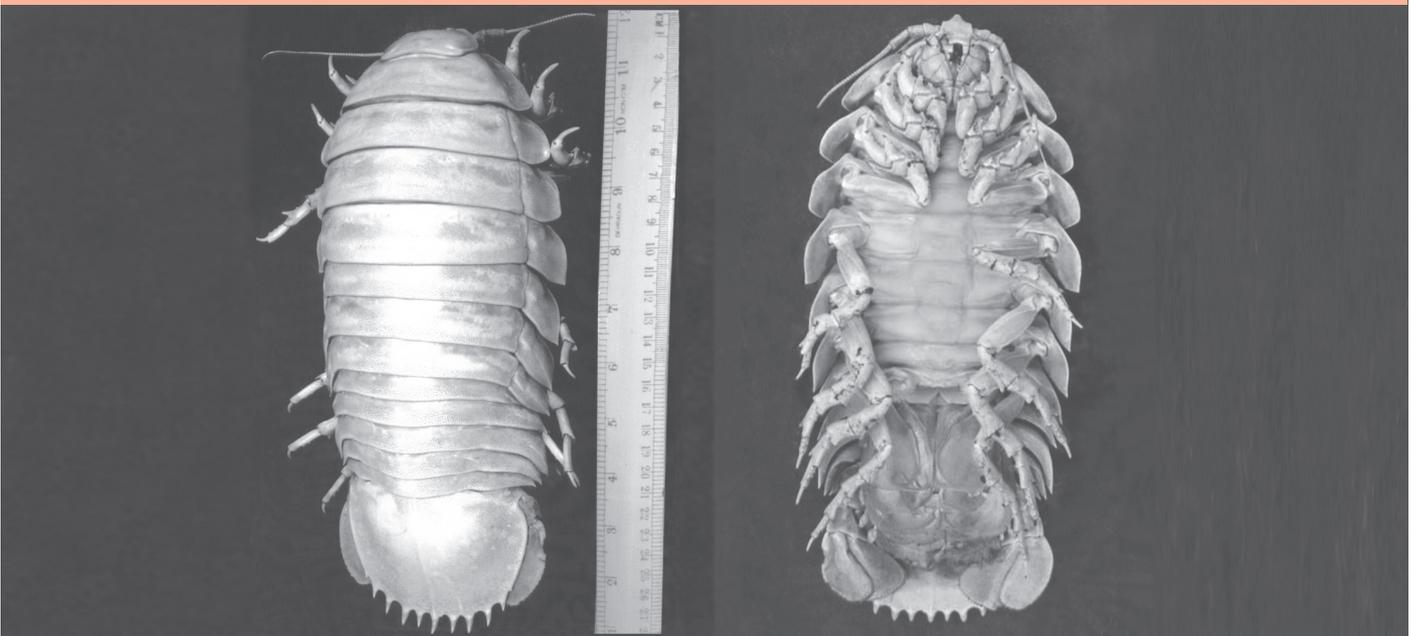
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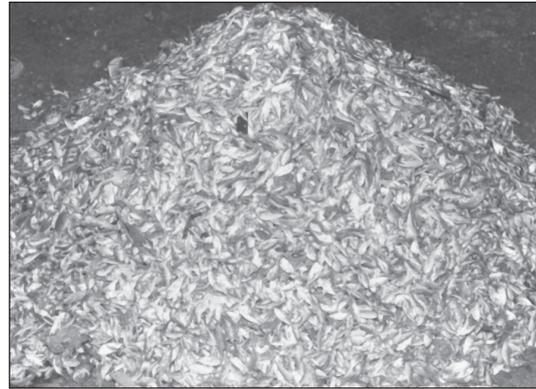
Impact of coastal bottom trawling on target and non- target resources along the south west coast of India

About 5800 small-mechanized trawlers (7 to 14 m overall length) regularly operate in the coastal waters of Karnataka, Kerala, Tamilnadu and Andhra Pradesh. The trawling is carried out almost throughout the year in the inshore water except for peak monsoon months. Their non-operation is chiefly due to the unfavourable

sea conditions or bans imposed by the governments as in Kerala, Tamilnadu, Andhra Pradesh or socially self-imposed ban as in Karnataka. Intense mechanized trawling in the coastal fishing grounds by using a trawl net of 30 m horizontal, 3-4 m vertical mouth opening, a cod end mesh of 18- 35 mm and a heavy tickler chain in



A heap of non-edible trawl by-catch at Neendakara, Kollam



A heap of young fishes caught by trawl net at Neendakara, Kollam

the foot rope, could scrap and trample a sea bottom of about 0.3 sq. km daily in 8 hours of trawling operations. These operations yield the target resources such as shrimps and cephalopods along with a non-target by-catch of heterogeneous species of ground /column fishes and non-edible benthic biota belonging to many taxa. In the region studied, stomatopods and non-edible biota together constituted about 12% of the total trawl landings.

The quality and quantity of the non-edible biota caught usually depend on the type of trawl nets operated such as shrimp trawl or fish trawl; the target groups like - shrimps, cephalopods or fin fishes; the time of operation say- day or night; the ground on which the net is dragged such as - muddy, sandy or rocky; the season such as - pre-monsoon, monsoon or post-monsoon; and the prevailing weather conditions like - calm or turbulent sea. Generally the non-edible fauna caught is rich, varied in species composition, and more abundant from muddy grounds than from sandy / rocky areas. Their landings are invariably more in the night-operated shrimp trawls than in the fish trawls.

The excessive fishing pressure exerted by the mechanized / motorized sector in a climatically limited coastal habitat up to a

depth of about 50 m have not only affected the sustenance of some easily vulnerable resources, but also challenged the very existence of some shell fishes, fin fishes and bottom organisms, including the biota which are non-edible to man but vital in the food web of all exploitable resources. By dragging the gear through the bottom benthic organisms are crushed, buried or exposed to predators and clouds of sediment arise. Alterations to the seabed biochemistry are also possible with an ultimate impact on the ecology. The mechanized bottom trawling especially with the objective to mass produce the target groups of export importance, has resulted in a disproportionate destruction of juveniles / sub adults/ of heterogeneous species of shrimps and fin fishes and a wide spectrum of bottom organisms, most of them having low or no edible or economic value. Finfish component has accounted for the major share in the shrimp trawl landings, which is caught unintentionally; and the unmarketable groups / species being a less priority item, is generally thrown away at sea often to save ship / boat deck space for targets. This post-harvest loss to the capture fisheries is a matter of grave concern to most of the nations; and as such a lot of thought, effort and action have gone into to recover and utilise the

by-catches. Developed nations have devised ways and means to reduce the by-catch: target ratio by modifying the gear and fishing technique. Quite a lot of work has been done in several countries to estimate the quality and quantity of wasted by-catch from trawlers and all efforts are tried to recover and utilize the enormous quantities of heterogeneous species. The Food and Agriculture Organization has conducted technical consultations on shrimp by-catch utilization in 1981 at which twenty countries have co-operated and discussed all problems connected with the above issue and have formulated specific recommendations.

But quite surprisingly, there has been no mention about the unintentional but damaging post harvest destruction of vast array of bottom inhabitants (invariably non-edible) of the coastal trawling grounds in any of the conferences, technical consultations and workshops organized by national and international governmental or non- governmental agencies.

The demand for targeted resources has paved way for indiscriminate bottom trawling along the coast with an ultimate result of massive wastage of low value, high volume bycatch including a wide spectrum of non-edible benthic biota. The

small cod end mesh of bottom trawlers has also exploited juveniles and sub-adults of commercial species in large quantities. So far no attempt has been made to estimate the quality and quantity of this wanton post harvest wastage of benthic biodiversity. Such information is essential to assess the impact of coastal bottom trawling on the habitat, its biota and its relationship with the fisheries. Hence a research project was initiated in 1994-95 based on data drawn from trawling centres such as Karwar (and Tadri), Mangalore (and Malpe), Cochin, Chennai and Kakinada with a view to solve some of the management problems connected with bottom trawling. The project " Investigations on the impact of coastal bottom trawling on demersal fishes and macro- benthos" intends to study the impact of coastal bottom trawling on the bottom habitat as well as resources and its effects on the sustainability of commercially important groups production; to develop suitable management options to curb recruitment hazards and habitat degradations and to study the rate of recolonisation of benthic biomass in relation to the availability and abundance of commercially important resources.

A study was conducted along the south west and south east coasts to estimate the

non-edible benthic faunistic components caught, landed and discarded by mechanized trawlers and motorized trawl net in shallow grounds. This seemingly unimportant catch of bottom non-edible organisms, though rarely fetches any economic returns, needs monitoring, estimation and periodic documentation in order to create awareness on the beneficiaries of the coastal fish wealth, about the seriousness of the biotic devastation and habit alteration / degradation.

Although the impact of bottom trawling on the resources has been felt at different parts along the Indian coasts, there was no serious attempt to monitor or estimate the magnitude of the problem. Study on the impact of fishing gear on habitat and resources are vital for formulating management strategies. The present account pertains to the impact of the gear along the south-west coast (Karnataka and Kerala) trawling grounds preferably on the non- target by catch.

Karnataka

For this investigation two major centres were selected from the state of Karnataka such as Karwar and Mangalore.

Karwar

Karwar with a coast length of 160 km is

known for rich pelagic fish resources besides a variety of demersals. Karwar and Tadri are the major trawl landing centres with an average (1994-2002) annual trawl catch of 11309t, shared at the rate of 51 and 49 % respectively. Small trawlers of the size 30-33' OAL with 33-47 HP engine fish in shallow grounds during day (Single Day Fleet) while medium size 42 -48'OAL with 98-110 HP engine operate in deeper grounds many days continuously (Multi Day Fleet) and landed 82 and 18 % respectively in the total trawl catch of Karwar. The single day fleet landed 61% of the catch at Karwar and 39% at Tadri with a cpue of 391 and 322 kg respectively. The target group (shrimp, cephalopod) formed 14% of the total catch and fin fishes 38% and non-target by-catch contributed 45% with no appreciable change between Karwar and Tadri with regard to single day fleet. The multi-day trawling was intense at Tadri (Dec.-May) with an annual average catch of 1873 t, whereas at Karwar the annual average catch was 164 t.

Mangalore

From the Mangalore - Malpe trawl landing base 752 SDF units operate with an average catch of 9299 t, shared by fin fishes (39%) crustaceans (shrimps & crabs), 13% and cephalopods (1%) and the

rest by non-target benthic biota (47%). The trawling by 623 MDF units landed an average catch of 4967 t, where fin fishes constituted 76%, crustaceans 5%, cephalopods 13% and the rest 6% by benthic biota. The young / juvenile fish by-catch was 1549 t in SDF and 9077 t in MDF forming 5 to 15% of total catch (SDF) and 5 to 28% (MDF) most of which are unmarketable and hence sold along with non edible biota. The major constituents were nemipterids, *Epinephelus* and lizard fishes in MDF ; while flat fishes, silver bellies and sciaenids dominate in SDF. By eighties and ninties the MDF units extended the fishing to deeper grounds up to 500 m during September - October to catch deep sea crustaceans.

The estimated by catch of non-edible benthic biota, a potential loss to food web and biodiversity in MDF decreased from 5549 t (1994-95) to 1866 t (2001-02); whereas in the SDF the landing ranged from 5208 t in 1997-98 to 2693 t in 1999-2000. This portion of the by-catch was represented by stomatopods (90%) in SDF and 83% in MDF. The other items were represented by gastropods (13 genera), bivalves, inedible crabs, fishes, echinoderms, jelly fishes, sponges and gorgonids.

Kerala

Cochin

From Cochin Fisheries Harbour base, one of the major fishing harbour of Kerala, about 200 small trawlers (8-14 m OAL and 45-120 HP) and 60 deep sea trawlers operate in the depth realm up to 100 m by the former and up to 500 m by the latter group of vessels at an annual average catch of 21,323 t by the small / medium trawlers, where fin fishes contributed 74% followed by the target groups (25%) shrimps and crabs (15%), cephalopods (10%) and only 1% by non-edible benthic biota. The latter group forms only a very negligible quantity as most of the vessels sort the catch in the vessel itself and discard the economically low value by-catch back to sea in order to save deck / fish hold space. This discard catch include a wide variety of benthic biota such as non-edible crabs, stomatopods, bivalves and gastropods, hermit crabs, echinoderms, gorgonids etc besides juveniles of shrimps and fin fishes of little or no market value. In the total discards, around 20 % is by juvenile fish / shrimp belonging to several genera.

Besides the above mentioned mechanized trawlers, an innovative dragger gear, mini trawl net (12.7 m two seam net) made of nylon webbing was introduced widely in

Cochin near shore areas. This gear is operated from dugout canoes(8.4 m OAL) locally known as 'murivallam' fitted with OB engines of 8-11 HP. The net is kept open with the help of two small size otter boards and dragged along the nearshore bottom targeting the coastward migrating shrimps (*P.stylifera*) and demersal fishes. The most damaging aspect of the gear is that it invariably catch large quantities of juvenile shrimps and fin fishes besides many benthic biota of no economic value but with many ecological values.

Experimental bottom trawling off Cochin along 15 - 30 m depth revealed that the percentage composition of fin fishes ranged from 51 - 98, crustaceans and cephalopods from 4.8 to 32.1 and benthic biota varied from 4 to 19.3 during different seasons.

Management

As most of the marine inhabitants dwell in a nearly common medium and most of them are migrants in the medium both vertically and horizontally in response to seasons / hydrography etc., a common management regime is highly imperative to protect and conserve the most susceptible fauna and flora through the impact of excessive human interactions and exploitations by trawlers. Innovations

and modernisation in the harvest sector often paved the way for technology creep in this sector leading to over capitalization and over exploitation of most wanted target resources besides a large quantity of by-catch of low or no- economic value. Some of the suggested management options for efficient and responsible management of trawl fishery are:

- 1) Uniform trawl ban (seasonal) and reduction of bottom trawl fishing pressure in coastal waters all along the south west coast.
- 2) Increase of cod end mesh size to 30-35 mm in shrimp / fish trawl net and introduction of by - catch extrusion device (BED) in trawlers wherever possible.
- 3) Promote multi-day trawling by medium range trawlers in mid shelf/ outer shelf.
- 4) Extension of fishing to deeper grounds using pelagic / midwater high opening trawls and with the aid of modern fish finding devices and other innovative means.
- 5) Discourage the spread of environment degrading fishing practice (like mini trawl) and use of tickler chain in the shallow shrimp/ fish nursery grounds by giving due consideration to the carrying

capacity of the habitats.

6) Encourage the utilization of non-conventional shell fishes/fishes either as a direct source or as value added products through the development of appropriate marketing strategies.

7) New research thrust in this direction is required for the quantification of trawl by-catch post harvest waste and for

developing improved selectivity by modifying the gear design, rigging and / or operation.

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