MARINE BIODIVERSITY CONSERVATION AND MANAGEMENT

Edited by

N.G. Menon and C.S.G. Pillai

ICAR

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

TATAPURAM P.O, COCHIN-682 014

1996

IV. THE GORGONID RESOURCES AND THEIR CONSERVATION IN INDIA

P.A. THOMAS
Central Marine Fisheries Research Institute, Cochin-682 014

Indiscriminate fishing and export of gorgonids during the period 1975 to 92 have depleted many of our erstwhile rich and also several other potential beds of the resource along the east and west coasts of India.

INTRODUCTION

The gorgonids, popularly called seafans are marine, sessile coelenterates with matted colonial skeleton and living polyps. The skeleton has an outer cortex which is highly coloured with loosely scattered calcareous spicules and an inner medulla or axila skeleton made of calcareous or horny matter. The total number of gorgonids hitherto recorded from the Indo-Australian region is approximately 408, though many species are subject to taxonomic emmendations. About 214 species of this group are recorded from the Indian Ocean including Red Sea, Seychelles, Chagos, Maldives, Sri Lanka, southeast coast of India and the Malay Archipelago.

RESOURCES AND THEIR VALUE

Gorgonids have been objects of attraction since time immemorial and they were collected as curios. But the demand was minimum and the value thus realised was not very significant. But the realisation of the biomedical value of this curious animals, such as prostaglandins, suddenly made them raw material for intensive biochemical research in several parts of the world, including India and the demand increased. With the dawn of seventies several countries started import of gorgonids from India and large scale exploitation started at several localities at Indian shores. A qualitative analysis of the various species that find export market indicates about 22 species belonging to 7 families and 15 genera as follows.

LIST OF SPECIES SUPPORTING GORGONID FISHERY IN INDIA

Order Gorgonacea Kmx.

Suborder Scleraxonia Studer

Family Anthothelidae Broach

1. *Solenocaulon tortuosum* Gray

Family Subergorgiidae Gray

2. *Subergorgia suberosa* (Pallas)
3. *S. reticulata* (Ell. & Sol.)

Suborder Holaxonia Studer

Family Plexauridae Gray

4. *Plexauroides praelonga* (Ridley)

Family Paramuriceidae Bayer

5. *Muricella umbraticoides* (Studer)
6. *M. complanata* Wright & Studer
7. *Thesea flava* Nutting
8. *Echinomuricea indomalaccensis* Ridley
9. *E. indica* Thomson & Simpson
10. *Echinogorgia reticulata* (Esper)
11. *E. flora* Nutting
12. *E. complexa* Nutting
13. *Heterogorgia flabellum* (Pallas)

Family Gorgoniidae Lmx

14. *Leptogorgia australiensis* Ridley

Family Gorgonellidae Val.

15. *Ellisella andamanensis* (Simpson)
16. *E. maculata* Studer

17. *Nicella dichotoma* (Gray)

18. *Juncella juncea* (Pallas)

19. *Gorgonella umbraculum* (Ell. & Sol.)

20. *G. rubra* (Thomson & Henderson)

21. *Scirpearia filiformis* Toepl.

Family Isididae Lmx.

22. *Isis hippuris* Lin.

Gorgonids exported from India are commercially classified under 4 heads or 'types':- 'black': 'red'; 'flower' and 'monkey tail'. This classification is based mainly on colour and body form and no generic affinity, whatsoever, is taken into consideration.

The total estimated quantity of gorgonids exported to various countries during the period 1975 to 92 is 106 t valued at 35.6 lakhs rupees (MPEDA Statistics of marine product export 1983-92). The export figure given above however, does not reflect the total quantity really exploited for undersized specimens are discarded in large quantities in many centres. The maximum quantity exported amounted to 21.8 t in 1976 and the minimum was only 134 kg in 1992, a clear indication of the declining trend in this valuable resource. The price structure per kg exported also fluctuated from Rs. 1.8 in 1976 to Rs. 204.6 in 1991.

DEPLETORY TREND NOTICED IN INDIAN GORGONID BEDS

The absence of any stock assessment prior to the commencement of the commercial exploitation of Indian gorgonids makes the actual assessment of the damage caused to the gorgonid beds by indiscriminate fishing rather complicated. During 1975-84 period as much as 80.6 tonnes have been exploited from India (unfortunately there exists no record on the discarded undersized specimens at various centres).

When commercial exploitation of gorgonids started in 1975 the specimens fished out were much larger, characteristic of any virgin bed and 10 to 15 of them made 1 kg, but by 1983 to 84 period the condition changed and the average size of specimen started showing a decreasing trend resulting in the dominance of smaller specimens numbering 40 to 50 per kg. (Thomas and Rani Mary George, 1987).

During the formative stage of the fishery, specimens were plenty and fishermen could collect as much as a canoe-load within a couple of hours. The returns were also good; a total of about Rs. 1000 per trip. This situation prompted many fishermen to take up gorgonid collection as full time avocation. At Tuticorin alone as many as 30 crafts, each with a complement of 4-8 crew members, were regularly engaged in collections. Gradually this situation changed and the fishermen had to toil for hours together, that too in different spots, to obtain a good harvest. Thus 4-8 crew members/canoe became less economical, and fishermen started prefering canoes with 2-4 crew. The lure for extra money made chank/mussel pickers to collect gorgonids as and when available.

The above situation, no doubt, affected the income and price structure of this commodity in foreign market. Side by side some importing countries started imposing size regulations, atleast in a few commercially important species. This led to a total reorientation of the gorgonid fishery in many centres in the following lines:

a) Fishermen started exploiting distant areas in search of larger specimens and

b) Fishing exclusively for gorgonids gave way to stray collections brought ashore by trawlers, chank and mussel pickers.

A detailed survey on 'type'-wise depletion of gorgonids in three major centres of Gulf of Mannar, viz, Rameswaram, Kelakarai and Tuticorin indicated that:

1. 'Black' and 'Red' types were the first to be exported from India and these 'types' started showing the signs of depletion first. Both these types had heavy demand in foreign market and had almost the same price structure.

2. 'Flower' and 'Monkey tail' types were exported only in stray numbers as they had poor demand. No depletory trend could be noted in these types.

3. Catch was dominated by smaller specimens with very poor returns; some were even rejected in the landing centre itself.

The decrease in the gorgonid export from India during 1983 to 86 period may be said to be a direct result of this depletory trend. As

merchants found it difficult to cope with the increasing demand, they deputed their representatives to all nearby landing centres to collect any small quantity brought ashore by local fishermen during their daily trips. Gorgonid fishing thus spread to different areas along the east and west coasts of India, and especially along the southwest coast the rocky inshore realms off Muttom, Colachal and Enayam were found rich in 'Black' type gorgonids. But within 2 to 3 years this area got depleted, and this was evident from the sudden fall of catch/boat from 10.7 kg in 1991 to 3.5 kg in 1992. Likewise there were attempts in different areas along the east and west coasts of India during 1989 to 1992 period for unexploited grounds, and this has resulted in a sudden spurt in the export from India. But these areas also proved unproductive in due course. It may, hence, be concluded that indiscriminate fishing and export of gorgonids during the period 1975 to 92 have depleted many of our erstwhile rich and several other potential beds along the east and west coasts of India.

SELECTIVE DEPLETION OF THE STOCKS

Analyses of data collected from a few centres in the Gulf of Mannar showed that all species were not depleted in the same rate, but only a few, which were esteemed much in foreign market, suffered the maximum.

Since fishing pressure in excess, on any particular species, can lead to the depletion of that species, and the preference of fishermen to any particular species (or type) is directly related to its higher market value, selective fishing often prove detrimental to the point of conservation. This aspect has been studied in depth during a survey conducted in 1980 to 82 period, and a centre-wise list of species which indicates a) clear cut sign of depletion, b) no sign of depletion and c) exploitation could be further intensified, was published by Thomas and Rani Mary George (1987).

It was also suggested in the above paper that a total ban on the collection of such species showing clear cut sign of depletion would considerably help in restoring the stock position. To avoid a drastic cut in the quantity of gorgonids exported consequent on the ban of 4 species falling under categories 'b' and 'c' (Thomas and Rani Mary George, 1987) was also suggested. Based on an investigation on the

growth rate in various species of gorgonids from other countries, it was also suggested to restrict the export to an arbitrary working figure of 1 tonne annually. Fixing a minimum size for each species at which their exploitation could be commenced was also suggested in the above paper as a precautionary measure. The need for exploring the possibilities of isolating and synthesising various chemicals with biomedical properties was also suggested by Thomas and Rani Mary George (1987).

MEASURES FOR CONSERVATION

At present, while harvesting gorgonids, the specimens are removed totally from the substratum, and this means total destruction of the colony. Gorgonids are known to possess tremendous regenerating capacity. Hence only parts of a specimen leaving atleast a small part *in situ* to regenerate and form a colony, may be collected.

The present status of our information on the growth, regeneration and reproduction in gorgonids is scanty. What little information available on the above aspects from other parts of the world may provide us with some clue in conserving these rare and chemically potential resources of our seas in a better way.

A clear cut estimation of growth in gorgonids is quite difficult because of their nonisometric patterns. Increase in height, in many cases, should be supplemented with adequate data on increase in width. Kinzie, who made detailed studies on *Plexaura homomalla* (Esper) from the Caribbean, came to the conclusion that the average growth/year is about 2 cm, and increase in the number of tips (of branches) is 14.2/year.

The basic principle involved in the judicious exploitation of any resources is that the quantity removed from the stock through fishing/natural mortality should be equal to the weight added to the stock every year by growth and induction of new individuals.

In order to find out the possible relationship of growth with increase in weight added to the stock every year, the rate of growth noted in *P. homomalla* (i.e., 2 cm/year) is considered the same for Indian species (of 'black' type), and the weight of a peripheral zone of 2 cm of a specimen measuring 17 cm in height was calculated, and its percentage in total weight of the specimen was found to be 22. This

percentage may vary according to the size and growth-form of the species concerned, and hence this relationship may be worked out for the respective species.

In the light of the above observations it is necessary to adopt a method of harvesting parts of the spacemen weighing about 22% of its total weight instead of removing it totally. The 'stump' left out *in situ* may regenerate and regain its original size within a few months. Hence the present system of harvesting should be replaced by a method of cutting and removing branches (Conservative pruning) which is more scientific from the point of view of conservation.

CONSERVATIVE PRUNING - SOME GUIDE LINES

Since species comprising each 'type' from a polypyletic assemblage of body-form and growth rate, the method of pruning should suit well to the species in question. The following patterns of pruning are recommended for various growth-forms prevalent in Indian gorgonids (Fig. 1).

A. Planar-reticulate growth-form

Most of the species falling under 'black' type and a few of the 'red' type come under this category (Thomas and Rani Mary George, 1987).

Active growth in all these species takes place along the periphery in radial planes. The area just inner to it has less active growth. Such specimens may be pruned along their outer margin as shown in Fig. !B, removing a zone of 2 cm in width along the outer edge of the lamella.

The wrong way of pruning such a species is indicated in Fig. 1C. In this case the cut passes through both 'agz' and 'lagz'. Regeneration actively takes place at 'agz' while the ends of branches of 'lagz' remain stumpy or malformed.

B. Planar non-reticulate growth-form

This growth-form is typical of 'flower' type gorgonids. Here, branches may be arranged in one plane or in a bushy manner and seldom show signs of fusion. Hence one or more branches from such a colony may be removed leaving a small branch (preferably terminal) to grow and form future colony.

The pattern illustrated in fig. 1E may also be employed in pruning any such specimen. But the main disadvantage with this method is that the branches, being free, may fall apart making their retrieval rather difficult underwater.

C. Filiform growth-form

Specimens falling under 'monkey tail' type exhibit whip-like pattern. The total length of the body may be up to 2m in some cases. While harvesting, 2/3 to 1/2 the total length could be removed from the specimens.

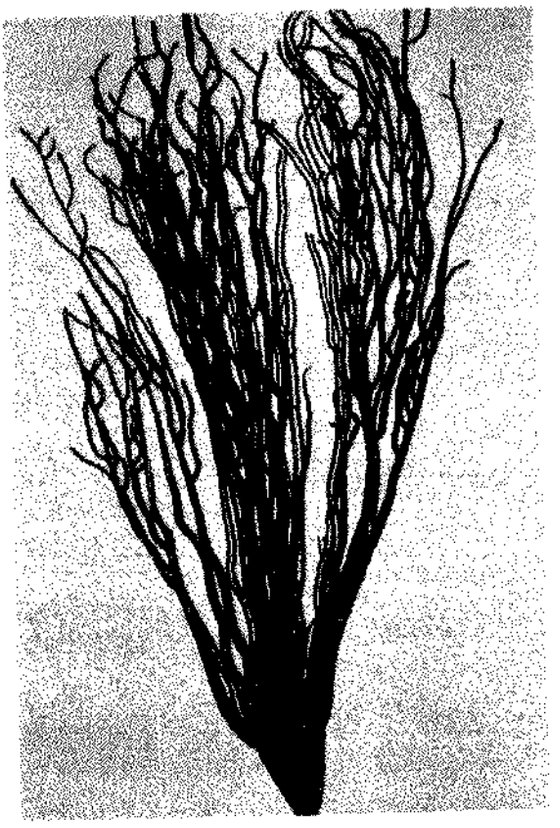
An added advantage with this method is that the 'stump' may, in the process of regeneration, produce several branches adding considerable weight to the harvestable stock.

Conservative Pruning - A Better Replenishment Strategy

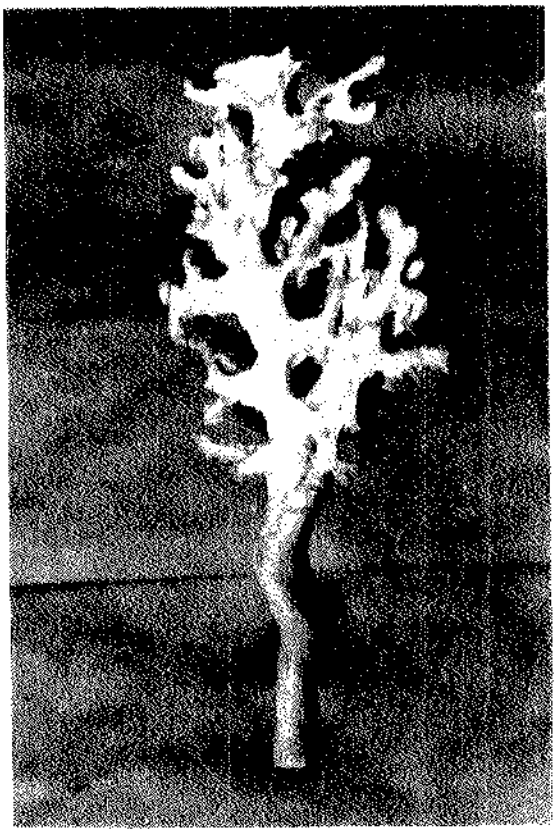
From observations made in the past on reproduction on gorgonids it is evident that both male and female gametes are born by the same polyp. After fertilisation and subsequent developments a planula emerges from the egg, and this swims freely in water and finally attaches itself to any hard object forming a colony. The number of eggs produced per polyp may vary considerably, 6 to 10 in some while 3 to 6 in others. At an average of 5 larvae per polyp the total number of larvae produced/colony/breeding season may come to several millions.

With an average export of 5.9 tonnes/year for the period 1975 to 92, total number of colonies removed from our beds (average, 40 colonies/kg) may be well imagined. The total loss of larvae, at the rate of several millions/colony/year, and the same when considered in a cumulative manner for the period 1975 to 92, may give a clearer picture of the onslaught made to Indian gorgonid beds due to indiscriminate fishing and export.

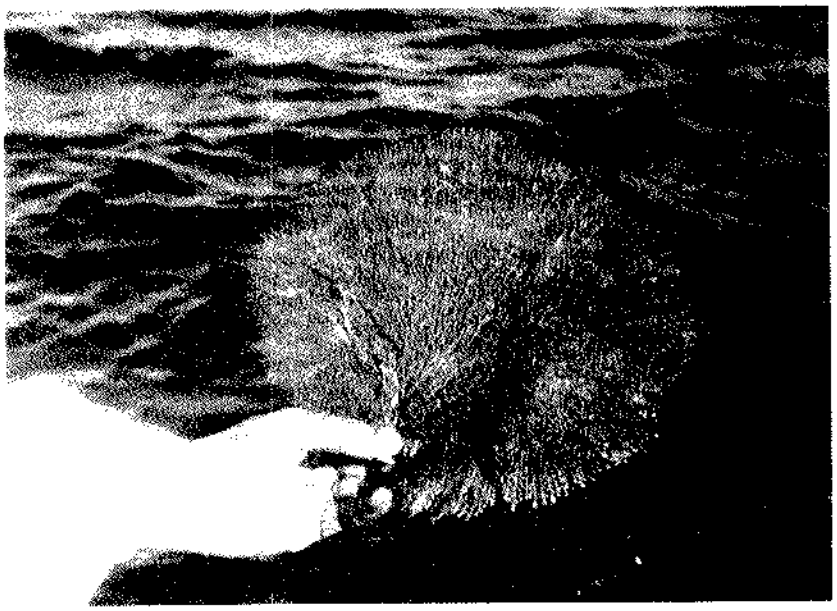
It is true that all the larvae produced may not reach adulthood in an environment where competition is too severe, but in the present context the production of larvae has been considerably reduced year after year in all our rich beds due to the fishing of larger colonies which are in their reproductive phase, and this, no doubt, affected the recolonisation.



Subergorgia suberosa



Solenocaulon tortuosum



Gorgonella umbraculum

While pruning any specimen, following any of the method mentioned earlier, a part of the specimen is left untampered; the polyps present at the 'stump' may reproduce constantly and the larvae, thus released, may help in replenishing the beds. Hence pruning, besides providing a known quantity of 'source material' for R & D purpose, will also help in replenishing the beds atleast to a minimum level.

RECOMMENDATIONS

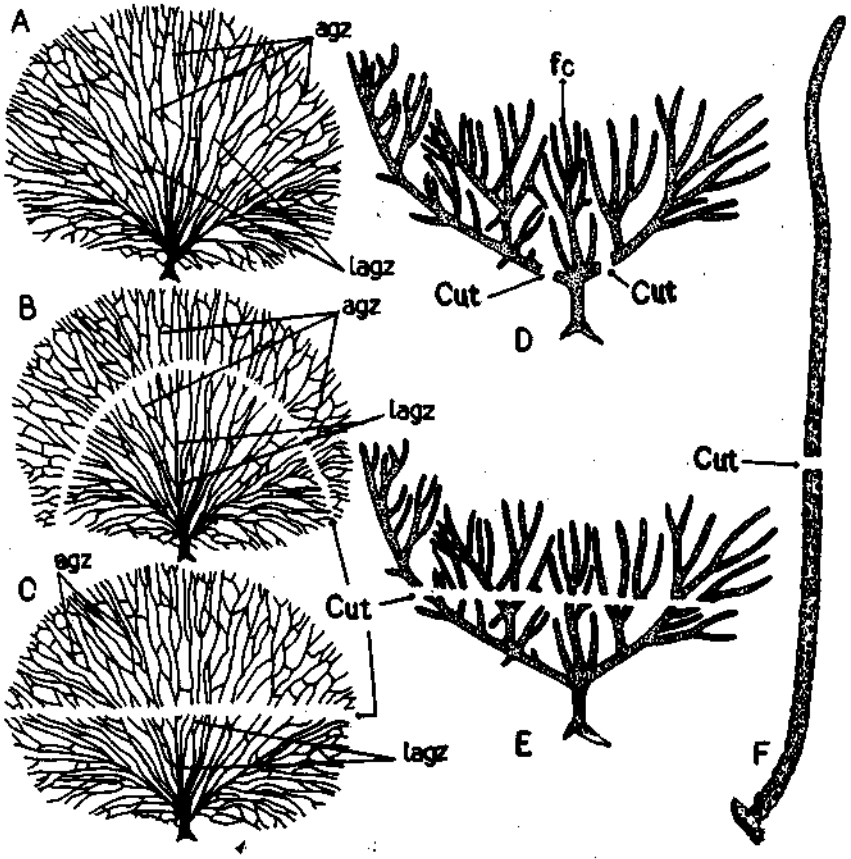
1. It is true that many of our erstwhile rich gorgonid beds got depleted as a result of indiscriminate fishing during the period 1975 to 92. It would be worth considering in this context to enforce a total ban on the export of this commodity from India.

2. Gorgonids, thus conserved through a total ban on their export, may be utilised only for R & D purposes by various laboratories in India. The total quantity of material, thus harvested, should not go beyond an arbitrary working figure of 1.18 tonnes which is 20% of the annual average export figure calculated for 1975 to 92 period.

3. The availability of different species of gorgonids may be assessed both in time and space. More emphasis may be given to the study of biodiversity in this group since no serious work has been done in the past, in India.

4. Measures may be taken to evaluate the chemical composition of the various species available in our seas. The bio-active properties of the various chemicals, thus isolated, may be tested thoroughly and standardised.

5. Since an assessment of the stock position, collection of material, chemical extraction, refinement, standardisation etc. require a multi-disciplinary approach, a nodal Institution may be established in India by pooling the personnel now available in the various scientific Institutions.



Different methods of pruning:

A - Planar reticulate growth-form showing different growth zones; agz-actively growing zone; lagz-less actively growing zone.

B - Correct method of pruning a specimen of this type

C - Wrong way of pruning a specimen of this type

D - Planar non-reticulate growth-form. Here two branches are cut and the terminal branch is retained to form the future colony (fc)

E - Planar non-reticulate growth-form. Here tips of branches are removed.

F - Filiform growth-form. Here a major portion of the whip-like body may be harvested leaving 1/3rd to 1/2 the length of the specimen.