

Salient Achievements of XI Plan

- Impact of climate change on Indian marine fisheries studied. Studies have shown that sea surface temperature has increased by 0.2 to 0.3°C along the Indian coast in the last 45 years, and is projected to increase by 2.0 to 3.5°C by 2099. The projected sea level rise is 30 cm in 50 years. These changes are likely to influence the structure and function of marine ecosystems. Coral bleaching is likely to be an annual event in the future and the model shows that reefs would soon start to decline and become remnant between 2050 and 2060 in the Indian seas. The distributional boundary of the oil sardine and Indian mackerel has extended to northern and eastern latitudes, contributing to fisheries in the last two decades. (Ref: Vivekanandan, 2011. Climate change and Indian marine Fisheries, CMFRI Marine Fisheries Policy Brief -3, CMFRI Special Publication No. 105).
- Prepared draft document on **Marine Fisheries Policy brief for Tamil Nadu**. Time series data on total marine fish landings and fishing effort expended in terms of hours of operation during 1990-2008 for Tamil Nadu was used to estimate the parameters of the non-equilibrium Schaefer's surplus production model through Bayesian estimation approach using WinBUGS computer software. The estimate of potential yield for Tamil Nadu based on the analysis is 4, 89, 300 tonnes. The total potential yield was then distributed among the different groups based on the average catch during 2006-2008. To calculate the maximum sustainable fleet size for different fleets to harvest to the potential yield level, catch and effort of different fleets during 2006-2007 was considered and the fleets were grouped into three groups based on the percentage of demersals, large pelagics and small pelagics in the catch during this period. The total potential yield was then distributed among the fleets based on the average catch during 2006-2008 and the catch per unit and catch per hour were calculated for different fleets. For the final calculation of fleet sizes for each fleet information on average number of trips and hours of operation per each trip was used. The recommended number of trawlers (both multi-day and single day) is 4,333, against the existing fleet size of 5300. Likewise, optimum fleet size of gillnetters fitted with outboard motors is 12,689 units as against the present size of 22,478 units.
- **Marine Fisheries Policy draft of Gujarat depicts the following :** Recent trends in production levels indicate that the fishery has reached an asymptotic level of production. The catches of many resources are exhibiting declining trends. The fate of the fishery in future will be governed by the production of the smaller pelagic resources such as mackerel, horse mackerel, anchovies, shads and scads and coastal tunas (Table 6). The abundance of these resources are highly variable and climate driven and hence mechanism for sustainable exploitation of these resources are required. Estimation of Maximum Sustainable Yield (MSY) (Gulland, 1979) to exploit these resources sustainably are crucial for proper planning and development, but is a challenging task

requiring vast data inputs. Fishes exploited exclusively by trawlers viz., ribbonfishes, lizardfishes, bull's eye and sciaenids are overexploited indicating that the stocks are under higher fishing pressure than the sustainable level warranting immediate reduction in fishing effort (Table 6). Similar scenario exists in the dol net fishery for Bombay duck. Measures have to be taken for their judicious exploitation on a sustainable basis by reducing the fishing pressure so as to bring the catch to MSY levels. There is however ample opportunity to improve the gillnet fishery of coastal tunas viz., longtail tuna, skipjack tuna and oriental bonito and smaller pelagics viz., mackerel, horse mackerel, anchovies, shads and scads along the Saurashtra coast.

- Studies on Carbon sequestration potential of Indian sea weeds initiated. Preliminary experiments show that at the rate of 8 mg CO₂/g/h, 2.6 lakh tonnes of macroalgae are estimated to absorb 9,052 t of CO₂ per day. Among the selected seaweeds, the green alga *Ulva lactuca* was found to have higher sequestration potential compared to the red alga *Gracilaria corticata* and the brown alga *Sargassum polycystum*. Experiments on *Kappaphycus alvarezzi* are in progress.
- Field Guide for identification of Indian Marine Mammals prepared. Marine Mammal Atlas prepared as VCD and released (2007).
- Prepared a status paper on marine fish stocks assessment status in India and published as a Working paper of FAO. Also developed a sustainability index of marine fish stocks of India.
- Inventorying of estuarine, coastal and marine biodiversity of Karnataka in a GIS platform carried out for the Karnataka Biodiversity Board. Species assemblage in the coral reef ecosystem of Netrani island off Karnataka along the southwest coast of India studied and published.
- Resource characteristics of major demersal resources viz., elasmobranchs, catfishes, groupers, flatfishes, nemipterids, silverbellies, pomfrets, lizardfishes and bull's eye studied in detail all along the Indian coast.
- Stock assessment studies and biological characteristics of major fishery resources of Gujarat coast completed.
- An Atlas on Elasmobranch fishery resources of India prepared (CMFRI Special Publication No. 95).
- National plan of action for sharks prepared and submitted to Environmental Ministry.
- A study on the reef fishery of the South India is being conducted; the comparative study on the occurrence of fishes on the west coast, east coast and Andaman waters showed that the west coast showed abundance in the major families like Carangidae and Serranidae. A rapid survey was conducted to assess the species diversity, composition and abundance of reef fishes in **Andaman Islands** for a period of two months. About 14 sites were covered which included North, Middle & South Andaman and also Little & Great Andaman Islands. A total of 101 species of fish belonging to 65 genera under 37 families were recorded in Andaman Islands. A rapid survey was

conducted to assess the species diversity, composition and abundance of reef fishes in **Lakshadweep Islands** for a period of two weeks. Artisanal monsoon fishery was studied during the period. A comparative study on the occurrence of fishes showed that west coast showed abundance in the major families like Carangidae wherein 42 species were recorded. However some families were represented only in the East coast.

(Project : Bioinventorisation of Coral Fishes Of South India With Special Reference To Threats And Conservation Measures – Funded by Ministry of Environment and Forests PI: Smt. Rekha J. Nair).

- The project on establishment and characterization of cell lines from selected marine food fish and ornamental fish envisages developing *in vitro* cell lines from potential marine food fish species such as cobia, *Rachycentron canadum* honey comb grouper, *Epinephelus merra*; the rabbit fish, *Siganus canaliculatus*, and also from the marine ornamental fish *Dascyllus trimaculatus* (three spot damsel). Various tissues such as heart, kidney, gill, fin, spleen, brain, liver and caudal peduncle of *D. trimaculatus*, *R. canadum*, *E. merra* and *S. canaliculatus* were evaluated for developing cell lines by both explant method and trypsinisation (enzymatic dissociation). In *D. trimaculatus*, three cell lines have been developed from the fin and caudal peduncle tissues which have reached passages ranging from 88 to 92 till date. These cell lines have also been successfully cryopreserved, with appreciable recovery rate (85%). A total of 6 cell culture systems have been developed from *Rachycentron canadum* (from brain, heart, fin and caudal peduncle tissues) which are at passage levels varying from 19 to 47. Nine successful cell culture systems have been developed from *E. merra*. Tissues from spleen, liver, heart, fin, gill, caudal peduncle and brain developed good monolayers which are currently being passaged and reached passages ranging from 20 to 35. From *S. canaliculatus*, one cell culture system initiated from trypsinised fin is at passage level 11.

(Project: Establishment and characterization of cell lines from selected marine food fish and ornamental fish - Funded by Department of Biotechnology, PI: Dr. K.S. Sobhana)