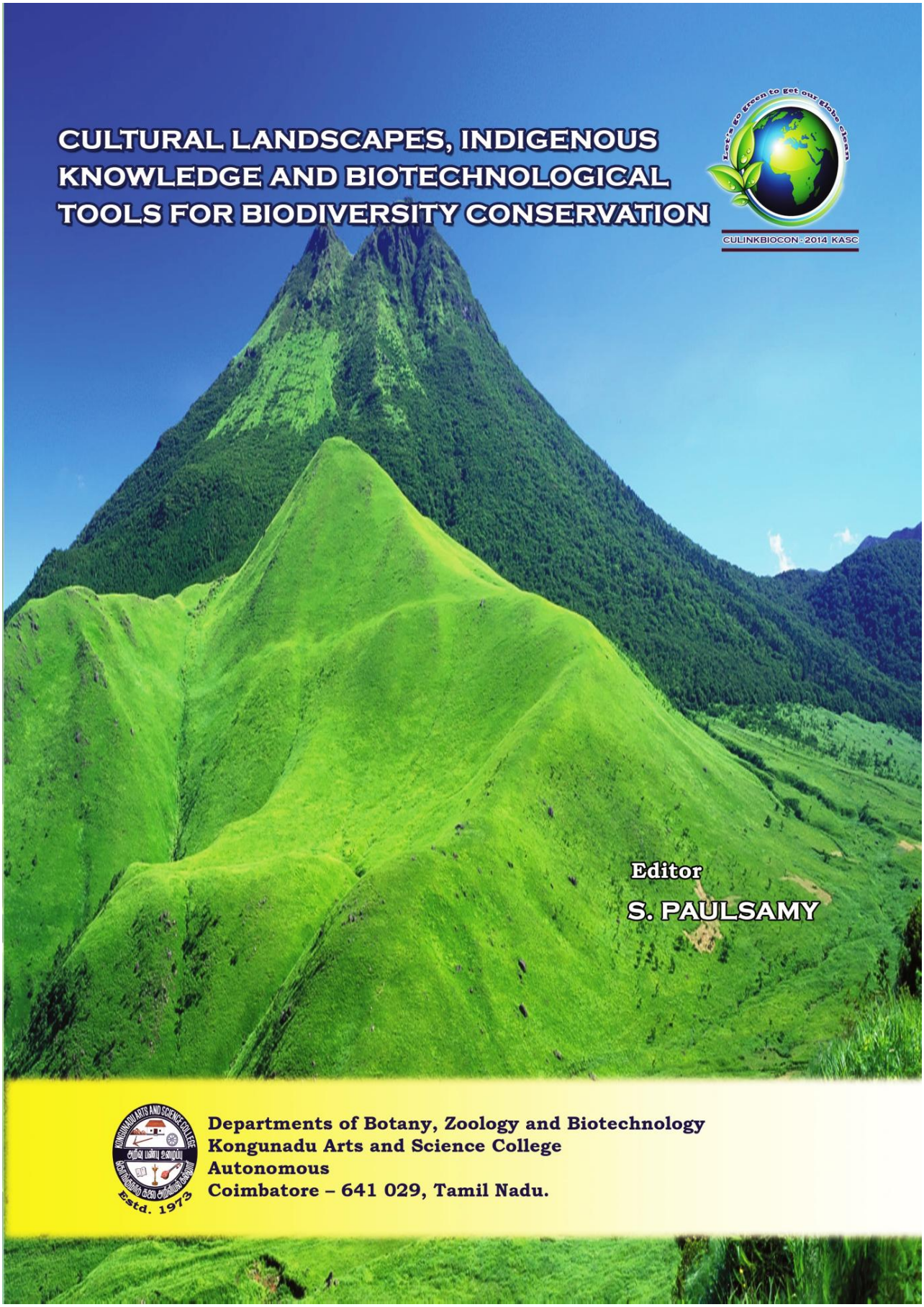
CULTURAL LANDSCAPES, INDIGENOUS KNOWLEDGE AND BIOTECHNOLOGICAL TOOLS FOR BIODIVERSITY CONSERVATION

CULINKBIOCON - 2014 KASC



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Cultural landscapes, Indigenous knowledge and Biotechnological tools for Biodiversity Conservation

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TRADITIONAL KNOWLEDGE AMONG FISHERS OF COASTAL TAMIL NADU WITH SPECIAL REFERENCE TO CLIMATE CHANGE

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ABSTRACT

The traditional knowledge is an excellent tool for understanding extreme events related to climate change. The Tamil Nadu fishers have extensive traditional knowledge related to climate change. Five hundred fishers were selected in different coastal villages by using of a random sampling method, and the data were analysed by using of Garrett's method. The present study, the fishers opined that the wind seed and water current are the most important climatic factors for determining fish abundance and catch. These factors have undergone changes over the years. Water temperature changes indicate less fish catches, but when the warm water is present constantly, sardine fishes and seerfish catches are heavy. When the wind blows from southern direction they are able to predict the availability of squids. This preserved Indigenous traditional knowledge will be helpful for predicting climate variabilities related to fisheries.

Keywords: Climate Change, Traditional Knowledge, Fishers perceptions.

1. INTRODUCTION

Climate change is a global phenomenon. The main characteristics of climate change include rising temperature, changes in rainfall pattern, sea level rise and increased intensity and/ or frequency of extreme events (Singh and Srivastava, 2010). Fisheries is affected by inter and intra-annual climate fluctuations. According to the Intergovernmental Panel on Climate Change (IPCC), warming will have a negative impact on several marine living resources (IPCC, 2007; Vivekanandan, 2011). Marine fishers have traditional knowledge to predict climatic variabilities and the extreme events which affect fisheries.

The Indigenous technical knowledge also referred to as local or traditional knowledge is the cumulative body of knowledge generated and evolved over a long period of time, and generations of experience[4]. It includes the skills, beliefs, norms, practices and behaviour patterns handed down from one generation to the next (Matowanyika *et al.*,1994). The coastal fishers share the information from one generation to another within the community (Teiwaki,1998). Many studies have reported the indigenous knowledge available on fish habitats, migratory patterns, and proper timing of fishing (Charnsnoh, 1998), fish resource management (Berkes, 1993) traditional fishing methods (Dutta and

Bhattacharjya), and fish behaviour and harvesting (Tuara, 1995). This traditional knowledge has evolved over many years. This knowledge is essential to them since their livelihood directly depends on availability of fish resources, Fisher's knowledge could be applied for predication of fish abundance.

The available Indigenous knowledge can be effectively used for understanding climate change related to fisheries issues (Salick and Ross). The Tamil Nadu fishers have extensive traditional knowledge in gear and craft design, fish behaviour, identification of fish shoal, and prediction of oceanographic parameters such as weather, wind, rainfall, cyclone, and tide level.

2. STUDY AREA

Fig. 1 Map of the study area

Tamil Nadu has coastal length of 1,076 km with 1.70 lakh marine fisher families spread in 591 fishing villages of 13 coastal districts. The present study was conducted by interviewing 500 fishers selected by using random sampling method in coastal villages of Thiruvallur, Chennai, Kanchipuram, Cuddalore and Kanyakumari districts (Fig. 1).

3. METHODOLOGY

The data were collected from February, 2011 to February 2012, with the help of structured interview schedule. To validate the findings of the study, workshops and group level meetings were conducted in villages with community leaders and traditional knowledge holders, to record their past experiences and present strategies related to climatic events, and obtain their feedback on future planning in relation to climate change in marine fisheries.

The interview schedule was prepared to know (i) the perception of fishermen on the climatic and oceanographic parameters that are changing over the years, (ii) the importance of climatic and oceanographic parameters to fisheries, (iii) the major problems facing fisheries, (iv) opinion about different climatic parameters, and (v) Traditional knowledge (ITK) of marine fish and climatic natural disaster.

After the survey, the fishermen perception of climatic factors, constraints in fisheries and attitude towards the climatic parameters were analysed using Garrett's ranking technique (Kumar and Kumar, 2008) in the following manner:

$$\text{Percentage position} = \frac{100\,(R_{ij} - 0.50)}{N_j}$$

Where,

Rij= Rank given for the i^{th} item by the j^{th} individual, and

Nj= Number of items ranked by the j^{th} individual.

The percentage position of each rank was converted into scores using Garrett table. Scores of individual respondents were added together and were divided by the total number of respondents for whom scores were added.

4. RESULTS AND DISCUSSION

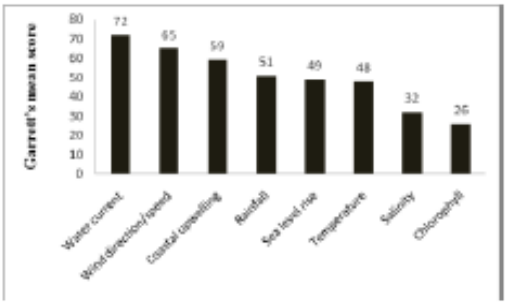
Most of the fishermen were of the opinion that among eight parameters, wind speed and direction have changed over the years, followed by seawater temperature (Table 1).

Table 1 Fisher's perceptions on the changes in and oceanographic climatic parameters

Factors	Garrett's mean score
Wind direction/speed	65
Water temperature	60
Current	58
Rainfall	57
Sea level rise	56
Coastal upwelling	52
Salinity	32
Chlorophyll	22

In an earlier report, Vivekanandan *et al.* (2010) has reported that the fishermen specified maximum importance to wind direction and speed as the drivers of fish abundance and availability, followed by rainfall and temperature. Accordingly, the present results also indicated that wind direction/ speed is the climatic parameter which has most significantly changed over the years followed by temperature and current. The Garret score shows that coastal upwelling, salinity and chlorophyll were not perceived to have changed significantly). However, Riedlinger, 2001(Riedlinger and Berkes, 2001) reported that the results would not be same in all geographical locations.

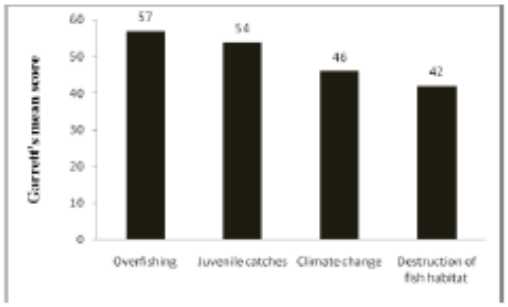
Fig. 2 Fisher's perceptions on the importance of climatic and oceanographic parameters to fisheries



Several climatic and oceanographic parameters are drivers of fish abundance. Among the eight parameters, the fishermen attached maximum importance to water current and wind direction of speed (Fig. 2). The water current and wind have direct relationship. The fishers predict that when the wind is more, the water current will be fast. The fishers have observed that strong wind and fast water movement are not suitable for fish catch.

As water current and wind, which are important drivers of fisheries, have changed over the years, the fish catches have been affected.

Fig. 3 Fishers perceptions on major problems facing fisheries



The fishers opined that major causes for decline in fish catch are overfishing, juvenile catch, climate change and destruction of habitat. The Garret mean score showed that overfishing was a prime constraint for decline in fish catch followed by juvenile exploitation (Fig. 3). In previous studies, Vivekanandan *et al.*, 2010 also reported that overfishing was the major constraint to fishers of India. Similar results obtained in the present study indicate that the fishermen are faced the same problem along the entire Indian coast.

Table 2 Opinion about different climatic parameters

Climatic parameters	Percent of respondents
Prepared to take natural disaster-related insurance	97
Regularly read or watch newspapers, radio, T.V, any other bulletins	100
Taking any precautions based on information	87
Change/increase any disease occurrence	94
Change in the type and quantity of fish available	84
Changes in potential fishing areas	84
Migration of fish species to other places	53
Migration from other places in your areas	51
Changes in craft and gear in the last 10 years	95

Information on the response mechanism to natural disasters might help adapt to future extreme events (Sethi *et al.*, 2011) (Sethi *et al.*,2011). The fishers suggest safe exit as the best adaptation option for any weather related problems. Majority of fishers is interested to take weather- related insurance with their own money. About 97% of fishers were willing to take insurance related to natural disaster (Table 2). All fishermen listen to and follow daily weather bulletins in the media. All the fishers were regularly getting weather related information from different sources such as newspaper, radio and T V. and 87% followed weather warnings.

A natural disaster has other consequences as well, specifically the spread of communicable diseases such as malaria, dengue fever and diarrhoeal disease (Easterling, 2000) Diarrhoeal disease has particularly serious implications as a consequently of contaminated water supplies which is caused by flooding (Hales *et al.*, 2003) About 94% of respondents opined increased disease occurrence among the fishers. About 84% of fishers stated that fish availability and potential fishing areas have changed from earlier years.

About 53% of respondents stated that fish migration pattern has changed. Green *et al.* (2010) have reported that due to climate change flora and fauna distribution have changed, and fish are taking different

migration routes, and migrating to new territories frequently. The fishing gear and craft design adopted by fishers have changed according to distribution and availability of fishes, as indicated 95% of fishers.

Indigenous Traditional knowledge (ITK) of marine fish and climatic natural disaster

The coastal fishers have indigenous knowledge on fishing and fish processing, and perceptions of the effect of watercolour, wind direction, lunar cycles, and tidal fluctuations on fish catch. The fishers get early warning by observing unusual sounds from the sea due to changes in water current, direction and speed of wind, and unusual behaviour of fishes. Birds also help in the assessment of climatic variations (Aparna Pareek and Trivedi, 2011). In addition, the fishers predict that cloud formation in the north its leads to storm, and heavy catch. In earlier studies (Santhanam, 2005) has reported that the fishers predict and foretell rains based on mainly movement of clouds, colour of clouds, direction and intensity of winds. This skill help them to plan their fishing operations, fish availability, time of fishing accessibility to fishing grounds, etc.

Before entering into the sea for fishing, they are able to predict whether the fish catch would be less or heavy, which is based on current direction. They believe that if the water current direction (tender vellam) is from south to north, there will be heavy fish catch. When the water current from north to south (Vanni vellam), the fish catch will be less. If the wind direction is towards the east there will be no fish catch. During new moon and full moon, the fish catch will be less since during this period the sea water current will be very fast and the sea will be rough. Northeast wind (Kunnu Vaddai) is an indicator of natural disaster such as storm and cyclone.

The sea status always changes from transparent (clear) to turbid water. When the water is transparent, they believe that the fish catch will be less, and during turbid, there will be heavy catch. When sailing toward the fish catch, if the seawater colour is black or green, the fish catch will be heavy. In the shallow region, if the sea condition is rough, the fish catch is heavy, and when the deep sea is calm they stated that the fish catch will be heavy. Water temperature changes are indicators of less fish catches, but presence of warm water indicates abundance of sardine and seerfish . Moreover, when the wind blows from southern direction they are able to predict the availability of squids, and if red rings appear in the sea it is an indicator of availability of tuna and shrimps. Water current driven by the wind is the natural phenomenon, but the slow water movement accompanied by bad odour is due to dead fish, which is indicator of fish absence. Whenever more number of sea snakes is found in fishing ground, fish catch is poor. Based on water colour, they can predict which type fishes are available in the ground. Black colour of water indicates the presence of mackerel and sardine, white colour indicates the presence of pomfret, and dark blue colour indicates probability of heavy catch.

5. CONCLUSIONS

Based on experience, the fishers have sound knowledge of marine climatic conditions. The fishers of preserved ITK'S for understanding impact of climate change on marine fisheries. The traditional knowledge showed there is based mainly on the water current, wind direction/ speed, cloud movement, water sound, and colour of the water. They use these parameters for prediction of climate varailability, natural disaster and fish availability. Due to changing climate, they find it difficult to predict fish availability. Majority of fishers are depending on mass media communication to get climate linked information. If the prediction is uncertain, their catches are affected. We have articulated the baseline information of fisher's traditional knowledge, fisher's perceptions on the changes in oceanographic and climatic parameters and, their constraints, It would be helpful for climate adaptation. However, preserved knowledge needs the scientific validation, and validated knowledge could be disseminated for public use.

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REFERENCES

Aparna Pareek and Trivedi PC. (2011). Cultural values and indigenous knowledge of climate change and disaster predication in Rajasthan, India. *Indian Journal of Traditional Knowledge* **10**(1):183-189.

Berkes, F. (1993). Traditional Ecological Knowledge in Perspective. In: Inglis J.T. (ed) Traditional Ecological knowledge: Concepts and Cases. International Program on Traditional *Ecological Knowledge and International Development Research Centre*, Ottawa, Canada.

Charnsnoh, P. (1998) Saviours of the Sea (translated and edited by Suntaree Kiatiprajuk). Trang: Yadfon Foundation.

Dutta, R and Bhattacharjya, B.K . (2009). A traditional fishing method of Assam for catfishes using duck meat as an attractant. *Indian Journal of Traditional Knowledge.* **8**(2): 234-236.

Easterling, D.R. (2000) Climate Extremes: Observations, Modeling, and Impacts, Science, **289**: 2064-2074.

Grenier, L. (1998). Working with Indigenous Knowledge: *A Guide for Researchers. International Development Research Centre,* Ottawa, Canada.

Hales S, Edwards SJ & Kovats RS. (2003). Impacts on health of climate extremes, In: Climate Change and Human health Risks and Responses, edited by Mc Michael AJ, Chambell Lendrum CF, Corvalan CF, Ebi KL, Githeko AK, Scheraga JD& Woodward A.

(World Health Organization, Geneva),.

IPCC, (2007) Climate Change. Impacts, Adaptation and Vulnerability, The working Group II: Contribution to the Intergovernmental Panel on Climate Change Fourth Assessment Report, Cambridge University Press, Cambridge.

Kumar, J. and Kumar P.K. (2008). Contract Farming: Problems, Prospects and its Effect on Income and Employment. *Agricultural Economics Research Review*, **21**: 243-250.

Matowanyika, JZZ,, Garibaldi, V. and Musimwa, E. (1994). Indigenous Knowledge Systems and Natural Resources Management in Southern Africa, Harare, IUCN Regional Office for Southern Africa Regional Social Policy Service.

Raygorodetsky G, (2010). Indigenous knowledge of a changing climate, climatic change, **100**: 239-242.

Riedlinger D. and Berkes F. (2001) Contributions of traditional knowledge to understanding climate change in the Canadian Arctic. *Polar Record*, **37**: 315-328.

Salick, J. and Ross N. (2009). Traditional Peoples and climate change: Introduction, *Global Environ change*, **19**: 137-1, 39.

Santhanam, R. (2005). Available in the web source. http://www.ser.org/iprn/earth-in-transition/eit-conference-proceedings; http://www.pdfio.com/k-397537.html, as on date: 29.11. 2012.

Sethi, S.N, J.K Sundaray, A. Panigrahi and Subhash Chand (2011). Prediction and management of natural disasters through indigenous Technical Knowledge, with special reference to fisheries. *Indian Journal of Traditional Knowledge*. **10**(1):167-172.

Singh, R.K. and Srivastava, R.C. (2010). Grassroots biodiversity conservators of Arunachal Pradesh: national recognition and reward, *Current Science* **99**(2): 162.

Teiwaki, R. (1988). Management of Marine Resources in Kiribati. University of the South Pacific, Suva, Fiji.

Tuara, P.N. (1995). The Role of Women in the Management of Pacific Island Inshore Fisheries. In Dalzell P. and Adams T. J. H. (eds): South Pacific Commission and ForumFisheries Agency Workshop on the Management of South Pacific Inshore Fisheries: Manuscript Collection of Country Statements and Background Papers Volume II,.

Vivekanandan, E, N.G.K. Pillai, K.S. Mohamed, J. Jayasankar, V.V. Singh, Joe Kizhakudan and R. Jeyabaskaran (2010). Impact, adaptation and vulnerability of Indian marine fisheries to climate change, Annual Report 2009-10. Central Marine Fisheries Research Institute, Cochin, 169.

Vivekanandan, E. (2011). Marine Fisheries Policy Brief-3; Climate change and Indian Marine Fisheries. CMFRI Special Publication, **105**: 1-97.