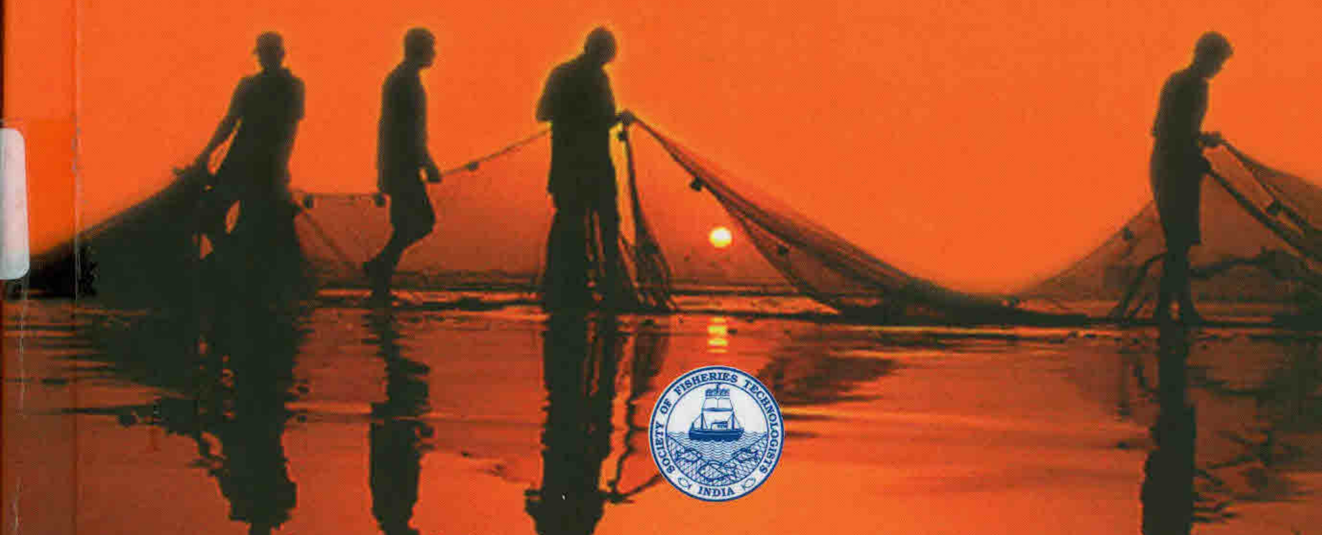
Coastal Fishery Resources of India

Conservation and Sustainable Utilisation



Society of Fisheries Technologists (India)

Cochin ◆ India

Coastal Fishery Resources of India: Conservation and Sustainable Utilisation

Proceedings of the National Seminar on Conservation and Sustainability of Coastal Living Resources of India, 1-3 December 2009, Cochin

Organised by

Society of Fisheries Technologists (India), Cochin
and
Centre for Ocean and Environmental Studies, New Delhi

In association with

Ministry of Earth Sciences (New Delhi)
Central Marine Fisheries Research Institute (Cochin)
National Institute of Oceanography (Goa) and
Central Institute of Fisheries Technology (Cochin)

MoES

ISBN: 978-81-901038-7-9

Published by

Society of Fisheries Technologists (India)
P.O. Matsyapuri, CIFT Junction, Cochin - 682 029, India

URL : www.fishtech.org
Phone : 91 (0)484-2666845
Fax : 91 (0)484-2668212
Telegram : FISHTECH / MATSYAOUDYOGIKI
E-mail : cift@ciftmail.org
enk_ciftaris@sancharnet.in

Citation:

Rao, G.S. (2010) Current status and prospects of fishery resources of the Indian continental shelf, In: Coastal Fishery Resources of India: Conservation and Sustainable Utilisation (Meenakumari, B., Boopendranath, M.R., Edwin, L., Sankar, T.V., Gopal, N. and Ninan, G., Eds.), p. 1-13, Society of Fisheries Technologists (India), Cochin

Cover design: Vineethkumar, P., CIFT, Cochin

Printed at PAICO, Cochin - 682 035, India

Coastal Fishery Resources of India

Conservation and Sustainable Utilisation

Editors

B. Meenakumari
M.R. Boopendranath
Leela Edwin
T.V. Sankar
Nikita Gopal
George Ninan

Society of Fisheries Technologists (India)
P.O. Matsyapuri, CIFT Junction, Cochin - 682 029, India

2010

Developments in Fish Processing Technology

T.K. Srinivasa Gopal
Central Institute of Fisheries Technology
P.O. Matsyapuri, CIFT Junction, Cochin-682 029, Kerala, India
E-mail: tksgopal@gmail.com

Introduction

The growth rate of Indian marine products industry has been showing an upward trend in recent years in terms of quantity, while it has not been so encouraging in terms of unit value realisation. This is due to the failure of the industry to diversify its products and markets in tune with the changing market trends. The industry still remains mainly shrimp oriented because it is more lucrative. Even though the export of fish is high, the value realisation is less compared to shrimp. India exports mainly whole fish and shellfish, which is processed into several high value products in the importing countries and are re-exported at a very high price. It is noticed that the catches from the capture fisheries are on the decline. Hence it is necessary to conserve the harvested catch judiciously and to increase the production through culture to meet the growing demand for fish. Value addition and introduction of new types of products from low cost fishes is the only solution to the problem. Present market trends reflect a rapidly growing demand for ready to cook and ready to serve convenience products. Value addition can increase considerably the unit value of fish products and, hence, it is necessary to adopt modern technologies in processing of value added fish products and ensure food safety by adopting HACCP and ISO 9000 series. The increased demand for fish has prompted the development of many new preservation techniques which can be adopted by the fish processing industry without sacrificing safety, quality, shelf life and consumer satisfaction. The recent developments in handling, product development, packaging, preservation and storage of fish and fish based products are briefly reviewed in the following sections.

Chill storage

Chilled storage in different containers has been practiced in the case of fish and fish products for a long time. Modified atmosphere (MAP) or controlled atmosphere storage by the application of CO_2 at concentrations in the range of 50-100% to fresh fish in chilled condition is a recent introduction which substantially increases the shelf life (Wolfe *et al.*, 1976; Gee and Brown, 1978; Fey and Regenstein, 1979; Martin, 1981; 1982)

Fig. 1: Modified atmosphere packaging equipment

In MAP fish and fish products are packed in an atmosphere of carbon dioxide and other gases like oxygen and nitrogen. The modified atmosphere retards the growth of microorganisms and reduces the rancidity in fatty fishes. Hence MAP chilled fish has an extended shelf life of 10 days or more depending on the species. Central Institute of Fisheries Technology (CIFT), Cochin, has standardized the optimum concentration of gases in MAP for different products to get maximum shelf life and retention of quality. The concentration of carbon dioxide varies from 40 to 80%. The studies on *Catla catla* fillets, whole pearlspot, dressed pearlspot, seer fish steaks etc. gave encouraging results (Gopal *et al.*, 1986; 1990; 1996). The threat of botulism, due to the presence of non-proteolytic psychrotrophic *Clostridium botulinum* types B, E and F has been reason for caution in expanding this technology. MAP can be effective if used in conjunction with packaging materials of correct O_2 and CO_2

permeability characteristics. Properties required may not be found in one polymer, hence laminated films are used.

Active packaging changes the condition of the package to extend the shelf life or to improve the safety while maintaining quality of the foods (Vermeiren *et al.*, 1999; Rooney, 1992; Ahvenainen, 2003). There are two types of active packaging systems, *viz.*, scavenging systems (absorbers) and releasing systems (emitters). Scavenging systems remove undesirable compounds such as oxygen, excessive water, ethylene, carbon dioxide, taints and other specific food compounds. Releasing systems actively add compounds to the packaged food such as carbon dioxide, water, antioxidants or preservatives. Most important active packaging concepts includes: O_2 and ethylene scavenging, CO_2 scavengers and emitters, moisture regulators, anti-microbial packaging, antioxidant release, release or adsorption of flavours and odours.

The commercial use of atmosphere modifiers and Oxygen scavengers in particular, with fish products has been mostly limited to the Japanese market and to dried seaweed, salmon jerkey, sardines, shark's fin, rose mackerel, cod, squid or smoked salmon products. These ambient stored products have low water activity (less than 0.85) and so the microbial deterioration is not shelf-life limiting. Here the oxygen scavengers prevent oxidative reactions, discolouration and inhibit mould growth (Brenzon and Saguy 1998; Gill and MacGinnis, 1995; Smith *et al.*1995; Mohan *et al.* 2008). Other commercial products stored in active packages are fresh yellowtail, salmon roe, and sea urchin. They are stored at super chilling conditions. Here the oxygen scavenger primarily prevent oxidation and discolouration and inhibit bacterial growth to a lesser degree. Different Oxygen scavengers are chosen dependent on the amount of Oxygen to scavenge (pack size and material) and water activity of the product. Oxygen scavengers for high water activity foods react faster compared to scavengers for dry foods but in general the absorption is slow and exothermic. The use of Oxygen absorbers (Ageless SS-100) had only a marginal effect on microbial growth in packages of fish products compared to effect obtained by MAP.

In MAP combined with active packaging partial vacuum is created in the package as a result of dissolution of CO_2 into the product and removal of O_2 using O_2 scavengers. In such cases, simultaneous release of CO_2 from inserted sachets is desirable. Such systems are based on either ferrous carbonate or a mixture of ascorbic acid and sodium bicarbonate (Rooney, 1995). The commercial CO_2 emitters usually contain