

## CONTENTS

Page

PREFACE AND ACKNOWLEDGEMENT.

MAP OF SRI LANKA.

CHAPTER - 1. INTRODUCTION ..... 1 - 14

1.1 The increasing world demand for fish.

1.2 The dwindling supply of fish.

1.2.1 The general depletion of stocks  
in the oceans.

1.2.2 The 200-mile Exclusive Economic  
zone.

1.3 The future food supply.

1.4 Coastal aquaculture.

1.5 Advantages of Coastal aquaculture

1.5.1 Increased protein availability  
to rural areas and upliftment  
of rural economy.

1.5.2 Generation of employment  
opportunities in fishing  
and marketing.

1.5.3 Stabilising supply.

1.5.4 Improvement of quality.

1.5.5 Increase in growth rate.

1.5.6 Crop selectivity.

1.5.7 Crop rotation.

1.6 Problem areas in coastal aquaculture.

CHAPTER - 2. PROSPECTS OF COASTAL AQUACULTURE

IN SRI LANKA ..... 15 - 26

2.1 Present status of the fishing industry  
in Sri Lanka

2.1.1 Contribution to the G.N.P.

2.1.2 As a source of income

2.1.3 Export earnings

- 2.1.4 Fish imports
- 2.1.5 Per capita consumption
- 2.1.6 Income
  
- 2.2 Fish production and consumption
- 2.3 Protein requirements of Sri Lanka
- 2.4 Present status of coastal aquaculture
- 2.5 Resources
- 2.6 Problems in developing coastal aquaculture in Sri Lanka.

**CHAPTER - 3. GENERAL ASPECTS OF COASTAL AQUACULTURE..... 27-33**

- 3.1 Different types of coastal aquaculture.
- 3.2 Coastal aquaculture and bioeconomics.
  - 3.2.1 Overhead
  - 3.2.2 Control of Biological environment.
  - 3.2.3 Control of physical environment.
  - 3.2.4 Nutrition
  - 3.2.5 Hatchery operation and growth of crop.
  - 3.2.6 Harvesting.
- 3.3 Other factors influencing coastal aquaculture.
  - 3.3.1 Site selection
  - 3.3.2 Legal aspects
- 3.4 Presently cultivated species in coastal aquaculture.

**CHAPTER - 4. CULTURE OF CRUSTACEANS..... 34 - 71**

- 4.1 Prawn (Shrimp) Culture.
  - 4.1.1 Biology of prawns
  - 4.1.2 Food and feeding habits.
  - 4.1.3 Suitability of Shrimps for culture.
  - 4.1.4 Factors responsible for growth of prawns.

- 4.2 Technology of culture of shrimps
- 4.3 Comparative study of the present status of shrimp culture in different countries.
  - 4.3.1 Site selection
  - 4.3.2 Pond management
- 4.4 Shrimp culture technology in the Indo-Pacific region.
  - 4.4.1 Management in extensive and semi-intensive culture of prawns
  - 4.4.2 Paddy cum prawn culture.
- 4.5 Prawn culture technology in the U.S.A. and U.K.
- 4.6 Prospects of development in Sri Lanka
  - 4.6.1 Present status
  - 4.6.2 Future planning
  - 4.6.3 Resources
- 4.7 Economical aspects of prawn culture
- 4.8 Culture of lobsters
  - 4.8.1 Biology
  - 4.8.2 Culture technology
  - 4.8.3 Prospects of lobster culture in Sri Lanka
  - 4.8.4 Future prospects of lobster culture.
- 4.9 Culture of Crabs
  - 4.9.1 Biology
  - 4.9.2 Culture technology
- 4.10 Conclusion.

**CHAPTER - 5. CULTURE OF FIN-FISH ..... 72 - 83**

- 5.1 Milkfish culture
- 5.2 Life cycle of milkfish
- 5.3 Culture technology
- 5.4 Culture in Indonesia, Philippines and Taiwan.

- 5.4.1 Selection of site and construction of ponds
- 5.4.2 Collection of seed
- 5.4.3 Pond management
- 5.4.4 Production.
- 5.5 Milkfish culture in other countries
- 5.6 In Sri Lanka
  - 5.6.1 Seed resources in Sri Lanka
  - 5.6.2 Collection of fry
  - 5.6.3 Production rates
  - 5.6.4 Prospects of culture in Sri Lanka

**CHAPTER - 6 CULTURE OF MULLET & OTHER FIN-FISHES..... 84 - 98**

- 6.1 Mullet culture technology
- 6.2 Mullet culture in the Indo-Pacific region.
  - 6.2.1 Management of ponds
- 6.3 Mullet culture in the Mediterranean.
- 6.4 Prospects of Mullet culture in Sri Lanka.
- 6.5 Culture of other fin-fishes.
  - 6.5.1 Pearl spot (*Etropus suratensis*)
  - 6.5.2 *Megalops cyprinoides*
  - 6.5.3 *Lates calcarifer*
  - 6.5.4 Yellowtail culture in Japan
  - 6.5.5 Culture of eels
  - 6.5.6 Culture of Tilapia

**CHAPTER - 7. CULTURE OF OYSTERS..... 99 - 118**

- 7.1 Biology
- 7.2 Suitability for culture
- 7.3 Culture technology.
- 7.4 Oyster culture technology in Japan.

- 7.4.1 Spat collection
- 7.4.2 Hatchery Technology
- 7.4.3 Commercial culture to marketable size.
- 7.4.4 Harvesting and production
- 7.4.5 Problems in oyster culture
- 7.5 Culture of pearl oysters.
  - 7.5.1 Japanese pearl culture.
  - 7.5.2 Experimental and semi-commercial pearl culture in India.
  - 7.5.3 Prospects of pearl culture in Sri Lanka
  - 7.5.4 Prospects of oyster culture
  - 7.5.5 Pollution and oyster culture.

**CHAPTER - 8. CULTURE OF MUSSELS & OTHER MOLLUSCS..... 119-130**

- 8.1 Biology of mussel
- 8.2 Culture of mussels
  - 8.2.1 In Spain
  - 8.2.2 In France
  - 8.2.3 In Holland
  - 8.2.4 In the Philippines
  - 8.2.5 In India
- 8.3 Culture of other molluscs.
  - 8.3.1 Culturable resources in Sri Lanka
- 8.4 Culture prospects of molluscs in Sri Lanka



	<u>Page</u>
<b>CHAPTER - 9. <u>CULTURE OF SEaweEDS</u>.....</b>	<b>131 - 140</b>
9.1 Biology	
9.2 Use of seaweeds	
9.3 Culture technology	
9.3.1 Seaweed culture in Japan	
9.3.2 In China	
9.3.3 In India	
9.4 Prospects of culture in Sri Lanka	
 <b>CHAPTER - 10. <u>THE IMPACT OF COASTAL AQUACULTURE TECHNOLOGY</u></b>	
<b><u>ON THE RURAL ECONOMY OF SRI LANKA</u>.....</b>	<b>141 - 145</b>
10.1 Source of income	
10.2 Coastal aquaculture in the rural economy.	
 <b>CHAPTER - 11. CONCLUSIONS</b> .....	<b>146 - 150</b>
<b>REFERENCES</b> .....	

## LIST OF TABLES

	<u>Page.</u>
1.1 Annual world fish production .....	1
2.1 Daily per caput availability of fish .....	17
2.2 Fish production, Exports & Imports in .....	18
total consumption.	
2.3 Summary of food balance sheet 1976 .....	19
2.4 Area under Coastal aquaculture .....	22
2.5 Some lagoon and mangrove areas suitable for .....	22
culture in Sri Lanka.	
2.6 Brackish water culturable Resources of Sri Lanka....	23
4.1 Growth of some commercially important prawns .....	37
4.2 Fecundity of some cultivated shrimps .....	38
4.3 Prawn culture practices in the world .....	41
4.4 Hatchery tank management for <u>P. monodon</u> .....	46
4.5 Eye stalk ablation in <u>P. monodon</u> .....	54
4.6 Species composition of samples of penaeid.....	58
prawns from estuaries round Sri Lanka.	
4.7 Cultivated species of crabs in the Indo-Pacific.....	67
region.	
5.1 Status of milkfish culture in Indonesia, .....	74
Philippines and Taiwan.	
5.2 Maximum stocking rate of milkfish in Taiwan .....	77
6.1 Cultivated species of fin-fishes in the .....	84
Indo-Pacific region.	
6.2 Feeding schedule in intensively cultured fish .....	88
ponds in Hong Kong with mullet as the primary crop.	
7.1 The principal cultured species of oysters, .....	102
their distribution and characteristics.	
7.2 The production, value of lease and production.....	115
of pearl from pearl oyster fishing (Sri Lanka).	
7.3 Average yield of different methods of oyster .....	116
culture in 5 countries (meat weight).	

LIST OF TABLES CONTINUED

	<u>Page</u>
8.1 Cultivated species of molluscs ..... (excluding oysters).	119
8.2 Some important Lamellibranchiate fauna of ..... the estuarine and coastal areas in Sri Lanka.	129
9.1 Cultivated species of algae .....	134
9.2 Distribution of some important brown and ..... red seaweeds in Sri Lanka.	138
10.1 Population by sectors - Urban and rural .....	142

.....



## LIST OF FIGURES

	<u>Between pages.</u>
Fig. 1.1 Postulated dynamics of agriculture ..... and mariculture costs.	8-9
Fig. 2.1 The highly productive Negombo Lagoon ..... in Sri Lanka.	24-25
Fig. 2.2 Typical tide curves for Colombo, Galle ..... & Trincomalee in Sri Lanka.	25-26
Fig. 3.1 The six possible zones for sea farming ..... in coastal waters.	31-32
Fig. 4.1 Three prawns of commercial importance .....	34-35
Fig. 4.2 Diagrammatic representation of the ..... stages of a penaeid shrimp.	35-36
Fig. 4.3 Layout of a commercial prawn farm in Japan ....	45-46
Fig. 4.4 Model layout of a 10ha shrimp pond in ..... Philippines.	50-51
Fig. 4.5 Paddy-cum-prawn culture, Kerala, India .....	51-52
Fig. 4.6 Lobster culture, Vizhinjam, India .....	51-52
Fig. 4.7 Crab culture, Tuticorin, India .....	51-52
Fig. 4.8 Experimental prawn culture tanks at..... Central Institute of Fisheries Education, Bombay, India.	51-52
Fig. 4.9 A project on plankton culture in progress..... at the Brackish Water Fish Farm, Kakinada, India.	51-52
Fig.4.10 Abundance of penaeid prawn juveniles ..... in the Negombo Lagoon, Sri Lanka.	58-59
Fig.4.11 Brackish water Fisheries Experimental..... Station, Pitipana, Sri Lanka.	58-59
Fig.4.12 A series of ponds in Fig 4.9 .....	58-59
Fig.4.13 A single pond in Fig 4.10 enlarged .....	58-59
Fig.4.14 Hatching of <u>Penaeus merguensis</u> at the..... Central Institute of Fisheries Education, Bombay.	61-62

LIST OF FIGURES CONTINUED

Between pages.

Fig. 5.1	Life stages of milkfish .....	73-74
Fig. 5.2	Milkfish fry collection in Indonesia .....	75-76
Fig. 5.3	Construction of nursery ponds in Indonesia...	75-76
Fig. 5.4	A fry market in Java, Indonesia. ....	75-76
Fig. 5.5	Improved perrong - type tambak in Indonesia..	75-76
Fig. 5.6	Milkfish pond system in Philippines .....	75-76
Fig. 5.7	Types of fish pond layout in Philippines ....	75-76
Fig. 5.8	A large scale milkfish farm in Philippines...	75-76
Fig. 5.9	Harvesting milkfish in Philippines .....	75-76
Fig.5.10	Milkfish farm unit in Taiwan .....	80-81
Fig.5.11	Areas of occurrence of fry and adults of .....	81-82
	milk-fish in Sri Lanka.	
Fig.5.12	Abundance of milkfish fry in relation to ....	82-83
	salinity in Mannar, Sri Lanka.	
Fig.5.13	Lunar periodicity and abundance of .....	82-83
	milkfish fry in Mannar, Sri Lanka.	
Fig.6. 1	Life stages of mullet .....	86-87
Fig.6. 2	Double floating net cage for Yellowtail.....	94-95
	culture in Japan.	
Fig.6. 3	Distribution of feed and fertilizer in USSR..	95-96
Fig.6. 4	Fish disease Laboratory, Oregon, U.S.A.....	95-96
Fig.7. 1	Oysters grown on sticks in Australia.....	110-111
Fig. 7.2	Instruments used for transplantation .....	110-111
	of pearl oysters in India.	
Fig. 7.3	Raft culture of pearl oysters and mussels ...	110-111
	at Vizinjam, India.	
Fig.10.1	Distribution of fishermen, Sri Lanka ...	
Fig.10.2	Fishing households by sources of	
	income, Sri Lanka.	
Fig. 10.3	A portion of Negombo Lagoon, Sri Lanka.	
Fig.10.4	Negombo Lagoon, Sri Lanka.	