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Ministry of Fisheries, Animal Husbandry and Dairying
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AQUACULTURE DIVERSIFICATION IN INDIA: PRIORITIZED INDIGENOUS FISH/ SHELLFISH SPECIES FOR IMMEDIATE THRUST

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SEPTEMBER 2024

Aquaculture Diversification in India: Prioritized Indigenous Fish/ Shellfish Species for Immediate Thrust

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पंचायती राज मंत्री एवं
मत्स्यपालन, पशुपालन एवं डेयरी मंत्री
भारत सरकार
Minister of Panchayati Raj and
Minister of Fisheries, Animal Husbandry and Dairying
Government of India

MESSAGE

It is with great enthusiasm that I share the release of the special edition publication, **"Aquaculture Diversification in India: Prioritized Indigenous Fish/Shellfish Species for Immediate Thrust,"** by the Department of Fisheries, Ministry of Fisheries, Animal Husbandry, Dairying, Govt of India on the occasion of the 4th Anniversary of the Pradhan Mantri Matsya Sampada Yojana (PMMSY). This publication stands as a testament to the remarkable advancements in the Fisheries and Aquaculture sector in India, driven by the transformative initiatives of the Government of India.

India has firmly established itself as a leader in the global fisheries landscape, ranking among the top nations in capture fisheries and fish farming. The sector is advancing rapidly, playing a crucial role in ensuring food and nutritional security, generating employment, and contributing significantly to export earnings.

Our country is richly endowed with diverse fisheries resources and indigenous fish species, presenting tremendous potential to be harnessed for the benefit of the riparian and coastal population. Over the past decade, the Government of India has undertaken a series of transformative measures to develop the sector holistically, prioritizing the welfare of fishers and fish farmers. India's notable achievements include being the top inland capture fish producer and the second-largest aquaculture fish producer globally.

The focus of the Government has been on promoting species diversification, enhancing indigenous species with regional importance, and conserving traditional species. This special edition publication will provide invaluable insights into these areas, offering a comprehensive overview of the sector's growth trajectory and future prospects.

I believe this publication will serve as an essential resource for fish farmers and other stakeholders, policymakers, researchers, and enthusiasts alike, offering comprehensive overview of the sector's growth trajectory and future prospects. As we continue to pursue our vision of a self-reliant India, we remain committed to advancing our fisheries sector and creating a brighter future for all.

Congratulations to the Department of Fisheries, GoI, on this significant milestone, and I look forward to the continued progress and success of our fisheries sector.

(Rajiv Ranjan Singh)

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Prof. S.P. SINGH BAGHEL
MINISTER OF STATE FOR
FISHERIES, ANIMAL HUSBANDRY &
DAIRYING AND PANCHAYATI RAJ
GOVERNMENT OF INDIA

MESSAGE

I am immensely pleased to know that a special edition on *"Aquaculture Diversification in India: Prioritized Indigenous Fish/Shellfish Species for Immediate Thrust"* is being launched as part of the celebration of the fourth anniversary of the flagship scheme of the Government of India- the Pradhan Mantri Matsya Sampada Yojana (PMMSY). This publication marks a significant milestone in our journey to advance the fisheries sector, providing valuable insights and information on the remarkable progress and achievements of PMMSY.

The sustainable development of both inland and marine fisheries and aquaculture is crucial for addressing the growing global demand for fish products and ensuring food security. To meet these challenges, it is imperative that we focus on expanding, intensifying, and diversifying our fisheries and aquaculture practices. This includes both horizontal expansion by broadening the geographical reach of aquaculture activities and vertical expansion by enhancing the productivity and efficiency of existing operations. Diversification of species and the introduction of new species are central to this strategy, alongside addressing critical gaps in the supply of quality broodstock, seeds, and species-specific feeds.

I am pleased to see that the Department of Fisheries, Government of India, has produced this important book with the aim of increasing production, productivity, and species diversification in aquaculture. This publication will serve as an invaluable resource for stakeholders across the sector, from fish farmers and policymakers to researchers and enthusiasts.

I extend my heartfelt appreciation to everyone who has contributed to the creation of this noteworthy publication. Your efforts are instrumental in advancing our goals and supporting the growth of India's fisheries and aquaculture sector.

(Prof. S. P. Singh Baghel)

एडवोकेट जॉर्ज कुरियन
Adv. GEORGE KURIAN

राज्य मंत्री
मत्स्यपालन, पशुपालन एवं डेयरी और
अल्पसंख्यक कार्य मंत्रालय,
भारत सरकार
MINISTER OF STATE FOR
FISHERIES, ANIMAL HUSBANDRY & DAIRYING AND
MINORITY AFFAIRS
GOVERNMENT OF INDIA

Message

I am very happy to note that a special publication titled *"Aquaculture Diversification in India: Prioritized Indigenous Fish/Shellfish Species for Immediate Thrust"* is being published by the Department of Fisheries. This significant release comes at a crucial time as we celebrate the strides made under the Pradhan Mantri Matsya Sampada Yojana (PMMSY) and introduce the new sub-scheme, Pradhan Mantri Matsya Kisan Samriddhi Sah Yojana (PM-MKSSY), launched in February 2024. This new initiative aims to further bolster aquaculture development across the country.

Fisheries and aquaculture are vital to our nation's food security, nutrition, and employment, supporting the livelihoods of nearly 30 million people. To enhance fish production, exports, and infrastructure, the Government of India is implementing PMMSY throughout all States and Union Territories. A key challenge in this development is ensuring the availability of quality broodstock and seed, which are essential for the successful cultivation of fish species. High-quality of seed with respect to growth rates, disease resistance, and overall productivity is crucial for the sector's success.

The Department of Fisheries, through PMMSY, is addressing this challenge by establishing new hatcheries, improving existing technologies, and developing species-specific feeds. The release of this special edition is a testament to these efforts, highlighting the importance of indigenous species within our ecosystem and their potential benefits for sustainable aquaculture and biodiversity conservation.

This publication serves as a valuable resource for researchers, policymakers, and fisheries enthusiasts, offering insights into the role of indigenous fish species in enhancing aquaculture and conserving biodiversity.

I extend my sincere appreciation to the editorial team for their dedication and hard work in bringing this edition to fruition. Your contributions are instrumental in advancing our understanding and supporting the continued growth of India's fisheries sector.

(George Kurian)

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Secretary

मत्स्यपालन, पशुपालन और डेयरी मंत्रालय
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Department of Fisheries
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Foreword

It gives me immense pleasure to launch the booklet titled "Aquaculture Diversification in India: Prioritized Indigenous Fish/Shellfish Species for Immediate Thrust," published by the Department of Fisheries, Government of India. Our nation is fortunate to possess a rich aquatic heritage, with a diverse array of fish species that are essential to our ecosystems, economies, and cultural fabric.

In this publication, you will find a wealth of information on various indigenous fish species, including their regional and economic significance, as well as the importance of their conservation and sustainable management. Our aim is to heighten awareness about these valuable species and encourage their integration into existing aquaculture systems.

As we strive towards sustainable development and environmental stewardship, it is crucial that we recognize and support our native fish species. I hope this booklet will serve as a valuable resource and inspire collective action to safeguard and promote our indigenous fish species for future generations. I am confident that it will be a key tool for disseminating information on the potential economic value of these species to all stakeholders.

I would like to extend my heartfelt appreciation to Dr. J. K. Jena, Deputy Director General (FS), ICAR, and his team of scientists for their insightful suggestions and contributions to this initiative. My best wishes go out to all stakeholders and readers as we embark on this journey to protect and advance our aquatic heritage.

(Dr. Abhilaksh Likhi)

Contents

INTRODUCTION

India's diverse aquatic ecosystems, spanning from the Himalayan rivers to the coastal waters of the Indian Ocean, harbour a wealth of Indigenous fish species that are integral to the country's ecological balance and cultural heritage. The promotion of these indigenous species is essential not only for the sustainability of fisheries but also for enhancing food security, supporting local economies, and conserving biodiversity. As the country seeks to address the growing demand for fish products and tackle environmental challenges, the strategic promotion of native fish species offers a pathway to achieve these goals while preserving the country's rich aquatic heritage.

The Department of Fisheries, Government of India through its existing schemes of the Pradhan Mantri Matsya Sampada Yojana (PMMSY), the new sub-scheme Pradhan Mantri Matsya Kisan Samridhi Sah-Yojana (PMMKSSY), and Fisheries and Aquaculture Infrastructure Development Fund (FIDF) is working to bridge the gap in the supply of quality and affordable seed and feed and dissemination of technical knowledge through training and workshops to the masses. The PMMSY is a comprehensive scheme designed to drive the growth and sustainability of the fisheries sector in India. Its primary objectives are to enhance aquaculture productivity, improve the livelihood of fishers, and ensure the sustainable use of aquatic resources. The scheme focuses on several key areas: expansion of aquaculture, diversification of species, and genetic improvement. These efforts are instrumental in the productive utilization of land and water resources, which are vital for the sector's growth. The Indian Council of Agricultural Research (ICAR) plays a crucial role in the promotion and conservation of indigenous fish species in India. ICAR, through its various research institutes, conducts extensive research on indigenous fish species, including studies on their biology, breeding habits, and habitat requirements. ICAR is also involved in efforts to conserve endangered and threatened indigenous fish species by developing and implementing strategies for habitat protection, breeding programs, and genetic conservation.

Indigenous fish species, also known as native or local species, are those that have evolved and adapted to specific geographical regions and aquatic environments. In India, these species include a wide variety of freshwater, brackishwater and marine fishes, each with unique ecological roles and economic importance. Over 2800 indigenous fish and shellfish species have been identified, of which 917 species are from freshwater, 394 species are from brackishwater and 1548 species are from marine (ICAR-NBFGR).

The country over these years has developed breeding and seed production technologies for over 80 commercially important fish/shellfish species. However, the aquaculture production of the country is largely contributed by a few selected species. The three major carps viz., rohu *(Labeo rohita)*, catla *(Catla catla)* and mrigal *(Cirrhinus mrigala)*, and the giant freshwater prawn *(Macrobrachium rosenbergii)* form the mainstay of Indian freshwater aquaculture. As a result, out of the 10.40 million tonnes of fish produced in the country from freshwater aquaculture, more than three-fourth is contributed by Indian major carps. In brackishwater aquaculture, the bulk of the present production, however, is contributed by a single exotic shrimp species *(Penaeus vannamei)* with a small contribution by the indigenous black tiger shrimp *(Penaeus monodon)*. Mariculture in the country is still in its infancy.

To provide a fillip to aquaculture diversification in the country a necessity is felt to prioritize potential indigenous fish species with aquaculture importance in freshwater, brackishwater, and marine environments. The following indigenous species are prioritized initially based on their economic relevance and regional importance.

1. Fringed-lipped carp *(Labeo fimbriatus)*
2. Olive barb *(Systomus sarana)*
3. Pengba *(Osteobrama belangeri)*
4. Striped murrel *(Channa striata)*
5. Pabda *(Ompok spp.)*
6. Singhi *(Heteropneustes fossilis)*
7. Asian seabass *(Lates calcarifer)*
8. Pearlspot *(Etroplus suratensis)*
9. Pompano *(Trachinotus spp.)*
10. Mud crab *(Scylla serrata)*

The above selected species are regarded as excellent candidate species for aquaculture, and their breeding, mass-scale seed production technologies and grow-out farming practices are already available. The farming technologies of these species, however, need to be disseminated through extensive training and demonstrations, requiring special focus. These species reflect a deep connection between communities and their aquatic environments and promote preserving cultural heritage. These species are not only culturally significant but also crucial for the sustenance of local communities, as they are highly valued in local and regional markets. They form an important part of the diet of millions of people and can contribute significantly to aquaculture production and income.

There is often a lack of awareness and technical knowledge about the benefits of promoting indigenous fish species. This gap hinders the efforts to integrate these species into aquaculture systems. Educating stakeholders and providing training on the benefits and techniques for breeding, seed production and grow-out culture practices of the indigenous species therefore is essential. As India continues to navigate the complexities of fisheries management and environmental sustainability, the promotion of these indigenous fish species offers a promising path forward. By leveraging the unique ecological, economic, and cultural values of these species, India can achieve a more balanced and sustainable approach to aquaculture and fisheries, ensuring the long-term health and prosperity of the aquatic resources.

The ambit of this booklet encompasses a thorough documentation of the key ten indigenous fish species found across the country. It aims to provide an initial understanding of these species, including their breeding practices, seed production and farming. By providing some salient aspects of these species, the book seeks to facilitate the large-scale adoption of their commercial seed production and grow-out farming.

Fringed-lipped carp *(Labeo fimbriatus)*

General Information

- Fringed-lipped carp, although distributed all over India, it is especially found in the Godavari, the Narmada, and the Mahanadi river systems. However, its population has found to be declined in recent years in these water bodies.
- A herbivorous fish, feeding on diatoms, green algae, aquatic vegetation, insects, and decayed organic matter.
- The species does not naturally spawn in confined waters as in Indian major carps. It spawns during rainy months.
- Its moderate growth and high consumer preference make it a preferable culture species.

Breeding, Seed Production and Grow-out Technologies

- The mass-scale seed production and grow-out production technologies have been standardised by ICAR-CIFA, Bhubaneswar.
- Induced breeding and seed production technology is similar to that practiced for Indian major carps.
- The species can form an important component in the grow-out polyculture of Indian major carps. It shows compatibility with catla and rohu. Though it exhibits a certain degree of competition with mrigal, the biomass yield is unaffected if incorporated in the Indian major carp-based polyculture systems.
- It is a slow-growing species that attains 500-600 g in the 1st year and over 1.0 kg in the 2nd year in the culture system. Inter-cropping of minor carps (Fringed-lipped carp, Olive barb and Silver barb) at 10,000 fingerling/ha in the initial six months along with the three Indian major carps (10,000 fingerlings/ha) has shown over 20% higher yield and over 30% higher net profit (B:C ratio at 1.36) in one year compared to the IMC-based culture (10,000 fingerlings/ha, B:C ratio at 1.32).
- It is an ideal species for effective utilization of seasonal ponds.

Seed Availability

- Seeds of this species are available in Karnataka, Odisha and West Bengal.
- Hatcheries in West Bengal and Odisha are now producing seed for local supply.

Potential/Target State

- Karnataka, West Bengal, Odisha and eastern States.

Compiled by: Dr. P. C. Das, Dr. S. P. Kamble and Dr. H. S. Swain, ICAR-CIFA, Bhubaneshwar

Olive barb *(Systomus sarana)*

General Information

- Once distributed widely in the natural waters in all eastern riverine systems, the poor seed survival and over-exploitation have reduced its natural population.
- With propagation efforts in the culture system in the last decade, the IUCN status of the species has improved from vulnerable to the least concerned category.
- It is an omnivorous fish and mostly dwells in the marginal area of ponds.
- It commands high consumer preference and has good culture potential.

Breeding, Seed Production and Grow-out Technologies

- The mass-scale seed production and grow-out technologies have been developed by ICAR-CIFA, Bhubaneswar.
- It breeds during monsoon season and induced breeding and seed production technology is similar to that of Indian major carps. As eggs need substratum for attachment, aquatic weed or synthetic twines are used for egg attachment.
- The species can be incorporated as a component in the major carp-based polyculture system.
- It is a marginal dweller and shows compatibility with catla and rohu in the culture system. Though it shows a certain degree of competition with mrigal, the biomass yield of the species is unaffected if incorporated in IMC polyculture.
- Though it is a slow-growing species, that grows up to 300-400 g in the 1st year, it can be stocked at higher density to yield more biomass.
- Inter-cropping of minor carps (Fringed-lipped carp, Olive barb and Silver barb) at 10,000 fingerling/ha during the initial six months of culture along with the three IMC at 10,000 nos/ha has shown over 20% higher yield and over 30% higher net profit (B:C ratio at 1.36) compared to the one-year culture of only IMC (10,000 nos/ha, B:C ratio at 1.32).

Seed Availability

- Seed of this species is available in Odisha, West Bengal, Tripura, Assam, and Bihar. Hatcheries in West Bengal and Odisha are now producing seed for local supply.
- Since the fish is an auto-breeder in captive conditions, natural recruitment also takes place in ponds if suitable condition prevails during monsoon.

Potential/Target State

- West Bengal, Odisha, Assam, Tripura, Bihar, Chhatisgarh and eastern states.

Compiled by: Dr. P. C. Das, Dr. S. P. Kamble and Dr. H. S. Swain, ICAR-CIFA, Bhubaneshwar

Pengba *(Osteobrama belangeri)*

General Information

- Pengba, the State fish of Manipur, is endemic to the Loktak lake of Manipur.
- It commands a prime place among food fishes in north-east India, especially in Manipur.
- Assessed as a 'Near Threatened' species according to IUCN status.
- It is an omnivore, feeding mainly on zooplankton and algae in the juvenile stage and macro-vegetation in the adult stage.
- It grows to a size of 400–500 g in a year in climatic conditions of Manipur but has also shown impressive growth in higher temperature regimes in ponds of plains.

Breeding, Seed Production and Grow-out Technologies

- Its mass-scale seed production and grow-out farming protocols have been standardised, and culture practices are being propagated through seed supply and technology support in West Bengal and Odisha by ICAR-CIFA, Bhubaneswar.
- Induced breeding and seed production technology is similar to that practiced for Indian major carps.
- In fingerling rearing and grow-out production systems, it is compatible with the three Indian major carp species.
- Ponds stocked additionally with pengba at 20% level (1300 fingerling/ ha) of the Indian major carps at a density of 6500 fingerling/ha yielded over 25% higher biomass in a six-month culture period.
- At present, pengba is increasingly being adopted as a component species in the major carp polyculture system in West Bengal, Odisha, and other eastern States.

Seed Availability

- While Pengba seeds are available in Manipur, the hatcheries in West Bengal and Odisha are now producing seed.

Potential/Target State

- North-eastern States, West Bengal, Odisha, Bihar, Jharkhand, and other regions across the country.

Compiled by: Dr. P. C. Das, Dr. S. P. Kamble and Dr. H. S. Swain, ICAR-CIFA, Bhubaneshwar

Striped Murrel *(Channa striata)*

General Information

- A high-value foodfish species with substantial medicinal properties and fetches Rs. 350-700/kg.
- High growth rate, less intramuscular bones, unique taste, high consumer preferences, and year-round market demand make it an important candidate species for aquaculture. It is also suitable for high-density farming due to its air-breathing ability.
- The declined production in capture fisheries in recent years has led to a greater need to increase its aquaculture production.

Breeding, Seed Production and Grow-out Technologies

- Packages of practices for seed production and culture for striped murrel have been developed by the ICAR-CIFA, Bhubaneswar which are disseminated to the farmers through training and demonstration.
- Induced breeding is undertaken by hormone injection to both males and females. Hatching occurs within 22-24 hours and yolk-sac is absorbed in 72 hours. The fish can spawn 3-4 times in a year.
- It is suitable for culture in ponds as well as for high-density culture in concrete tanks and recirculatory systems. An average production level of 5 tonnes/ha/yr at a stocking density of 10,000-15,000 fingerlings/ha in the pond culture system has been demonstrated.

Seed Availability

- Striped murrel hatcheries are available in certain states like Telangana, Andhra Pradesh, Tamil Nadu and Odisha. Several seed suppliers are also known to collect the seeds from the wild, wean them on artificial feed, and supply them to the farmers.

Potential/Target State

- Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Odisha, West Bengal, Bihar, Chhatisgarh, Kerala, Maharashtra, Uttar Pradesh, Assam and other states.

Compiled by: Dr. Rajesh Kumar and Dr. J. Debbarma, ICAR-CIFA, Bhubaneshwar

Pabda *(Ompok bimaculatus)*

General Information

- The butter catfish *(Ompok bimaculatus)* and pabda catfish *(O. pabda)* are popularly known as 'pabda'.
- They are highly preferred in West Bengal, Assam and Tripura, and fetch Rs. 400 to 1000/kg due to their distinct taste, shiny appearance, soft flesh, less spine content, and high levels of polyunsaturated fatty acids.
- The butter catfish grows larger than pabda catfish and has been identified as a promising candidate for freshwater aquaculture.
- The butter catfish is the state fish of Tripura.

Breeding, Seed Production and Grow-out Technologies

- The butter catfish is widely distributed across major river systems, reservoirs, and other water bodies, making it suitable for farming in a wider geographical area.
- Induced breeding, mass-scale seed production, and grow-out culture technologies of both species have been developed by ICAR-CIFA, Bhubaneswar.
- Induced breeding can be performed through artificial fertilization and semi-artificial methods. The commercial hormone is administered intramuscularly at a rate of 1.5-2.0 ml/kg for females and 0.5-1.0 ml/kg for males.
- Apart from pond-based systems, the species is also being integrated into different aquaculture systems, including inland cages, biofloc aquaculture systems, and recirculating aquaculture systems in several states.
- Due to high demand, the culture of pabda has recently expanded to various parts of the country.

Seed Availability

- Seeds are available in West Bengal, Assam, Odisha, and Tripura.

Potential/Target State

- West Bengal, northeastern states, and various other regions across the country.

Compiled by: Dr. Arabinda Das and Dr. Ajmal Hussan, ICAR-CIFA, Bhubaneshwar

Singhi *(Heteropneustes fossilis)*

General information

- Singhi or stinging catfish is widely distributed in the Indian water bodies.
- The fish is in high demand because of its therapeutic value, selling at Rs. 300-400/kg in the domestic market. The air-breathing nature of the fish helps it to be sold in live conditions.
- The suitability of its farming at high density makes it a potential species for aquaculture diversification.
- This omnivore is a monsoon breeder and has a growth potential of more than 200 g.

Breeding, Seed Production and Grow-out Technologies

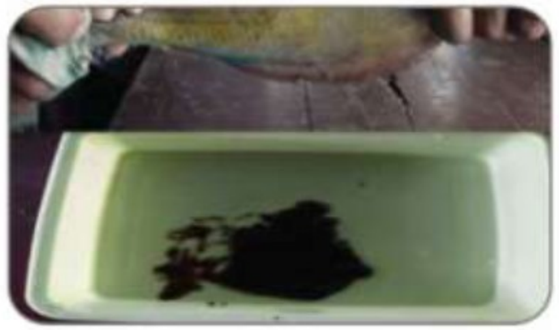
- Captive seed production of the species is undertaken by sound brood care in captivity. The females alone are injected and stripped eggs are fertilized with the milt solution and incubated in the flow-through hatchery for hatching.
- The larvae are reared at a density of 3000-5000/m^2 for 12-13 days in the hatchery.
- Stocked at 5-10 g fingerlings the fish grow to about 80-100 g during one-year culture period and with production levels of about 2-3 tonne/ha.

Seed Availability

- Farmers from West Bengal, Assam and Odisha are supplying seed to meet the domestic demand.

Potential/Target State

- Throughout the country



Compiled by: Dr. S. K. Sahoo, ICAR-CIFA, Bhubaneshwar

Asian seabass *(Lates calcarifer)*

General Information

- Asian seabass is popularly known as Bhetki in many parts of India and is considered an important foodfish due to its white tender meat and fetching Rs.500 to 600/kg in the domestic market.
- The fish can withstand a wide range of salinity from 0 to 40‰ and is highly suitable for farming in pond, cage, and recirculatory aquaculture systems (RAS).
- Under culture conditions, seabass can attain a growth of 1.0 kg in 6-8 months with formulated feed.
- The availability of hatchery seed, cost-effective feed, and ready market favour the farmers to choose seabass as the preferred fish for farming in the brackishwater aquaculture sector.

Breeding, Seed Production and Grow-out Technologies

- Comprehensive technology packages have been developed for seed production, nursery rearing, and grow-out culture (pond and small volume cage) of seabass by the ICAR-CIBA, Chennai.
- The fish attains maturity first as male when it is less than three years of age and subsequently, it changes to female. Induced breeding is undertaken with hormone injections to both males and females, the latter, however, are given two injections.
- The fry are cannibalistic and hence require regular grading during the seed-rearing phase.
- Seabass can be farmed not only in brackishwater and freshwater ponds but also in open-sea cages, brackishwater low-volume cages, and tank-based RAS.
- The benefit-cost ratio estimated for nursery rearing and grow-out culture is 1.56 and 1.69 respectively.
- Presently, farming is being undertaken in coastal areas of Andhra Pradesh followed by West Bengal, Kerala, Karnataka, Maharashtra, Tamil Nadu, Goa, Odisha, and Gujarat.

Seed Availability

- Presently a total of nearly 20 million seabass seed (fry and fingerlings) is produced annually by the hatcheries (private and Govt.) and the seed is being supplied to the farmers for culture.

Potential/Target State

- All the ten maritime states and inland saline areas viz., Haryana, Punjab, Uttar Pradesh, and Rajasthan.

Compiled by: Dr. M. Kailasam and Dr. K. K. Lal, ICAR-CIBA, Chennai

Pearlspot *(Etroplus suratensis)*

General Information

- Pearlspot, the state fish of Kerala, has high market demand on the west coast, especially in Kerala fetching a market price of Rs. 350-400 per kg. In recent years the species has witnessed increased market demand in most states.
- Its demand as a popular ornamental fish is on the rise. It fetches a price of Rs.10-12 (1-inch size) in the ornamental trade.
- The species is highly suitable for polyculture systems. Its integration into rice-fish and prawn-fish farming is found to enhance productivity, making it a promising aquaculture species.

Breeding, Seed Production and Grow-out Technologies

- A modular system for pearlspot seed production in RAS system has been developed by ICAR-CIBA, Chennai where four portable tanks @ 1000 1 capacity each are interconnected and a pair of brood fishes are maintained in each tank for breeding.
- Using this system, 4000 larvae can be obtained in 30-day' intervals. A total of 4.0 lakh larvae can be obtained by operating 10 such RAS-based breeding units every month.
- Being euryhaline, pearlspot can be farmed in varying salinity of 0-30‰. However, the best growth rate is obtained in the brackishwater condition with a salinity of 10-15‰.
- Pearlspot is widely farmed in Kerala, a few places in Andhra Pradesh, Karnataka and Goa, and is majorly traded in Kerala due to high market demand.
- Farming is done both in the ponds and small volume cages installed in the estuaries, creeks and backwaters. The fish grows to 250 g in an 8-10 months period which is the preferred size for marketing.
- In the pond, polyculture is adopted by stocking pearlspot along with milkfish, grey mullet, and shrimp species. Periodical harvesting is carried out by selecting larger-sized fish. Presently about 2,000 tonnes/annum of pearl spot is being produced.

Seed Availability

- Seed is presently produced in a few hatcheries in Kerala and Tamil Nadu. Traders are also found to collect seeds from nature, especially from backwaters, lagoons and estuaries in Kerala, Odisha, and West Bengal.

Potential /Target State

- Kerala, Goa, Karnataka, Andhra Pradesh and Gujarat.

Compiled by: Dr. Dani Thomas and Dr. K. K. Lal, ICAR-CIBA, Chennai

Pompano *(Trachinotus mookalee and T. blochii)*

General information

- Indian pompano *(Trachinotus mookalee)* and Silver pompano *(T. blochii)* are two important marine fish species, which possess high potential for mariculture and coastal aquaculture.
- Ease of breeding and seed production in confined systems, ready acceptance of formulated feeds, good growth with a high feed conversion efficiency and adaptation to various farming methods, including cages, coastal ponds, and RAS make them preferred species for culture.
- Due to their white, high-quality meat and good taste, they are in great demand both domestically and internationally.

Breeding, Seed Production and Grow-out Technologies

- Technologies for bloodstock development, captive breeding and large-scale seed production have been developed by ICAR-CMFRI, Kochi.
- For induced breeding, the matured males and females are given only a single dose of hormone injection. Spawning occurs after 36-38 hours of injection.
- Greenwater technology is used for indoor larval rearing for about three weeks.
- The species exhibit excellent growth performance in different farming systems such as marine cages, coastal cages and ponds. Stocked at 10 g the fish attain a market size of 800 g within 7-8 months, with a feed conversion ratio (FCR) of 1.5.
- Production levels of about 18 kg/m^3/crop in marine cages and 0.95 kg/m^3/crop in pond culture are obtained under grow-out production systems. The fish fetches a farm gate price of Rs. 400/kg with a production cost of about Rs. 260/kg
- The species are farmed in nearshore and offshore cages throughout the coasts. Presently Indian Pompano is also farmed in coastal ponds of Andhra Pradesh and Karnataka.
- The cost-benefit ratio in RAS-based nursery rearing has been worked out as 1.28, in marine/coastal cage-based grow-out farming as 1.30 and in coastal pond-based grow-out farming as 1.18.

Seed Availability

- ICAR-CMFRI possesses hatcheries of Indian pompano and Silver pompano at its Vishakhapatnam and Vizhinjam centers, respectively.
- The seed production technology has already been transferred to private hatcheries in Andhra Pradesh, Karnataka, and Kerala which have initiated their seed production.

Potential/Target State

- All coastal states/UTs of the country.

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Mud Crab *(Scylla serrata)*

General Information

- The mud crab is an immensely popular large crab species because of its high consumer preference, price, and established market.
- Its grow-out culture (from instar 1 to marketable crab) and fattening (soft-shell crab to hard-shelled crab), lean crab ~50 g to marketable sized crab, crab with immature ovary to crab with gravid ovary, and soft-shell crab production are becoming viable business opportunities in India.
- ICAR-CIBA, Chennai has made significant strides in developing culture technologies for mud crabs, including hatchery, nursery, grow-out phases, polyculture and integrated multi-trophic aquaculture.
- These advancements address challenges such as the longer hatchery phase and delicate post-larvae, paving the way for successful and efficient mud crab aquaculture.

Breeding, Seed Production and Grow-out Technologies

- Seed production technology has been standardized, achieving a survival rate of over 30% from zoea 1 to the megalopa stage.
- Nursery rearing standardized with a survival of 87% from megalopa to first instar.
- Multi-phased culture system with three months of the nursery (0.03 g to 50 g), three months mid grow-out (50-300 g), and three months of final grow-out (300 to 1000 g), has been developed to circumvent long culture duration and optimize the economy. The cost-benefit ratio was assessed as 1.84.
- At present crab farming is undertaken in about 3500 ha with production of about 4000 tonnes.

Seed availability

- One research hatchery at ICAR-CIBA, Muthukadu and one semi-commercial hatchery at RGCA, Sirkali, Tamil Nadu have been procuring seeds of mud crab. Another private hatchery has also started its operation in collaboration with ICAR-CIBA in Andhra Pradesh.

Potential/Target State

- Andhra Pradesh, Gujarat, Karnataka, Kerala, Odisha and West Bengal.

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