AQUACULTURE EXTENSION MANUAL NO. 73 JUNE 2023

NURSERY AND GROW-OUT CULTURE OF Snubnose Pompano

(Trachinotus blochii, Lacepede)

IN MARINE CAGES

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Southeast Asian Fisheries Development Center
AQUACULTURE DEPARTMENT
Tigbauan 5021, Iloilo, Philippines
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For comments and inquiries:

Training and Information Division
SEAFDEC Aquaculture Department
Tigbauan 5021, Iloilo, Philippines

(63-33) 330 7030
(63-33) 330 7031
devcom@seafdec.org.ph, aqdchief@seafdec.org.ph
www.seafdec.org.ph

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Foreword

Pompano is known for its exceptional taste and texture. Recognizing the potential of pompano farming, the Southeast Asian Fisheries Development Center/Aquaculture Department (SEAFDEC/AQD) has been doing research on the snubnose pompano since 2007, beginning with the development of its breeding and seed production technologies.

Since then, SEAFDEC/AQD has made significant progress in developing breeding, seed production, nursery, and grow-out techniques. Studies have also been done, and science articles published, on aspects of pompano health, nutrition, and feed development.

These research findings have been compiled and shared with stakeholders through previous publications, including the manual on cage nursery culture in 2012 and the manual on hatchery seed production in 2014.

Against this backdrop, I am pleased to introduce another aquaculture extension manual, "Nursery and Grow-out Culture of Snubnose Pompano (*Trachinotus blochii*, Lacepede) in Marine Cages." This guide serves as an invaluable resource, encompassing key aspects such as species biology, site selection, cage design and construction, stocking strategies, rearing techniques, and economic considerations.

Furthermore, together with this manual, SEAFDEC/AQD also produced another publication titled "Nursery and Grow-out Culture of Snubnose Pompano (*Trachinotus blochii*, Lacepede) in Brackishwater Ponds." These latest publications collectively provide farmers with the necessary knowledge to cultivate snubnose pompano in both marine cages and brackishwater ponds, offering different farming approaches.

I hope that these manuals, based on research and field trials, will contribute to the success of fish farmers, industry stakeholders, and enthusiasts, promoting the growth and success of pompano aquaculture.

Dr. Sayaka Ito
Deputy Chief, SEAFDEC/AQD

About the Manual

This manual, titled "Nursery and Grow-out Culture of Snubnose Pompano (*Trachinotus blochii*, Lacepede) in Marine Cages," includes culture methods and good practices that are the product of research done at the Aquaculture Department of the Southeast Asian Fisheries Development Center. The manual also tackles practical techniques useful to fish farmers interested in raising pompano in marine cages.

Main sections included in this manual: 1. Biology, 2. Site Selection, 3. Cage Design and Construction, 4. Stocking of Fish, 5. Rearing (Nursery and Grow-out), and 6. Economics.

Contents

1 Introduction

In the Philippines, the development of aquaculture technologies for fish species with significant economic value has been spearheaded by the Aquaculture Department of the Southeast Asian Fisheries Development Center (SEAFDEC/AQD). An emerging fish species for aquaculture in the country is the snubnose pompano (*Trachinotus blochii* Lacepede), also known as “pompano,” “damis lawin,” or “apahan.” Pompano can be reared in floating net cages and is a good substitute for grouper, snapper, and other high-value fish species. Furthermore, it can be fed with a formulated feed without difficulty and exhibits disease resistance. Consumers are attracted to the meat quality of pompano. However, the availability of this species in the market is still limited since its breeding and culture technology has not yet been widely disseminated in the country

Through years of research, SEAFDEC/AQD has created the pompano breeding, hatchery, and grow-out methods. The sustainable farming of pompano in the country is made possible and supported by these technologies. This manual offers a practical technique that fish farmers can use to raise pompano in marine cages.

2 Biology

General Features

- **Body shape:** The shape is commonly fusiform, displaying a typical oval shape, and elongated towards the posterior end.

- **Color:** Head and body are usually silver and dark blue gray at the top. The snout and lower half of the body of adults is oftentimes golden orange. The fins are golden yellow with dusky tips while the pectoral fins are darker with fish greater than 75 cm. The second dorsal fin is dark and the fin lobe is dusky orange. The anal fin has a dusk orange hue.

- **Other features:** The snout is broadly rounded. Both jaws have bands of small villiform teeth.

Figure 1. Snubnose pompano, *Trachinotus blochii*

Pompano belongs to the family *Carangidae*, which is considered a broad class of predatory pelagic fishes extensively scattered worldwide. The species of the genus *Trachinotus* are mostly considered excellent food fish and are listed in commercial fisheries indices. In their natural environment, pompanos feed on small shrimps, crabs, amphipods, and other benthic invertebrates. They require an energy-rich diet to support their high metabolic demand activity (*i.e.* continuous swimming in the wild and in captivity). They have a short digestive tract which translates into a short retention time, thus the ingredients used in the diet formulation should be highly digestible.

Pompanos are found in coastal (as adult) and brackishwater (as larvae and juvenile) habitats. Due to their relatively efficient growth, superior meat quality, and capacity to easily adapt to formulated feeds, pompanos are considered a suitable species for commercial aquaculture.

3 Site Selection

Physical, biological, meteorological, and social components should be considered when selecting a location for the cage farming of pompano.

1. **Accessibility**

   Road leading to the site should be convenient to transport cage construction materials, feeds, and fingerlings.

2. **Physico-chemical attributes**

   - Coves, bays, or any sheltered body of water should be selected. This will serve as a protection during adverse weather conditions.
   - Water depth of at least 10 m during the lowest low tide with favorable water exchange to ensure an ample amount of oxygen in the fish cage site.
   - Optimal range of water parameters are: salinity (25–33 ppt.), pH (7.5–8.3), dissolved oxygen (4–8 ppm), temperature (26-32 °C) and ammonia nitrogen (<0.02 mg/L).
   - Depth of area should be >10 m
   - Annual meteorological data in the vicinity (*e.g.* sea surface temperature – 27–32 °C, precipitation – 0–20 mm/day and water current – 0–2 m/sec)
   - The area should be free of waste run-off from industrial, agricultural, and domestic origins that can cause adverse water conditions.
   - The location should be away from river mouths that can cause abrupt changes in salinity, temperature, and turbidity brought about by upstream runoff.
   - The cages should not be located near coral reefs and sea grass areas in order to preserve the ecological biodiversity of an area.

3. **Fry and feed availability**

   The operator should ensure that sustainable, affordable, and quality fry can be conveniently obtained. Cost-efficient feeds should also be readily available in the area.

4. **Local and national policies**

   Mariculture areas are designated through municipal and provincial ordinances based on their economic, social, and environmental viability. The management of mariculture parks are governed by the guidelines set by the Bureau of Fisheries and Aquatic Resources (BFAR).

5. **Community**

   Cage operation should not extremely disrupt activities of nearby communities.

4 *Cage Design and Construction*

The design and construction of a floating marine cage will depend on the location, target production, duration and financial capability of the operator. This manual will highlight the operation of a small-scale pompano cage culture.

Framework

A bamboo cage module (10 m x 10 m) can be divided into four compartments of 5 m x 5 m grow-out cages (**Figure 2**) or 16 compartments of 2 m x 2 m nursery cages (**Figure 3**). For accessibility, the framework is fitted with catwalks on the perimeter (**Figure 4**).

Figure 2. A 10 m x 10 m modular cage divided into four compartments - 5 m x 5 m grow-out cages or 16 compartments - 2 m x 2 m nursery cages

Figure 3. Bamboo divisions to accommodate 2 m x 2 m nursery net cages

Figure 4. Catwalk frameworks in the perimeter for accessibility during feeding and monitoring

Netting Materials

In order to ensure that fry or fingerling will not be able to escape the net enclosure, the net mesh size is selected with reference to the size of the fish.

For the construction of a 2 m x 2 m x 3 m nursery net, the materials needed are; B-net double width (0.5 cm mesh size) (**Figure 5A**) and common materials such as nylon thread, PE rope #10 and evelon cord (**Figure 5B**). For one unit of nursery net, the B- net is cut into 4 - 2 m x 3 m (wall panels) and 1 - 2 m x 2 m (floor panel) which will then be mended by a sewing machine (**Figures 6A and 6B**). The operational dimension of the net is 2 m x 2 m x 2 m (8 m^3).

The fabrication of a 5 m x 5 m x 4 m grow-out net requires; polynet #14 (1.2 cm mesh size) (**Figure 7A**), PE rope #10, nylon line (160 lb), evelon cord and fishing net needle (**Figures 7B, 7C, and 7D**). For one unit of grow-out net, the polynet #14 is configured into 4 – 5 m x 4 m (wall panels) and 1 – 5 m x 5 m (floor panel). The nylon twine and PE rope is inserted in the net to support the net frame and is then sewn using an evelon cord (**Figure 8**). As a provision for attachment to the bamboo framework, an eyelet in every corner of the net is fabricated (**Figure 9**). The grow-out net is fabricated to be similar to an inverted mosquito net (**Figure 10**). The operational dimension of the net is 5 m x 5 m x 3 m (75 m^3).

Replacement nets for nursery and grow-out operations should be constructed for use during net maintenance in case of excessive biofouling or net damages.

Nets are tied at every corner of the bamboo frame (**Figure 11**). In order to secure the fish stocks, a double net configuration is followed using the grow-out net as the main enclosure.

So as to widen the opening of the net, sinkers are installed in every corner (**Figure 12**).

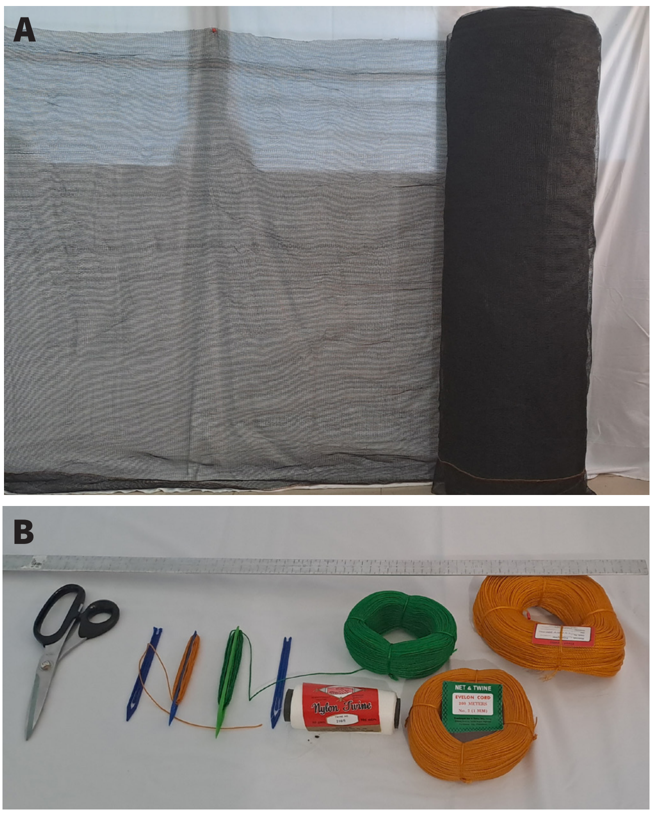

Figure 5. Materials essential for nursery net construction (**A**) B-net, 0.5 cm mesh size (**B**) common materials (nylon thread, evelon cord, PE rope #10, nylon line, and fishing net needle)

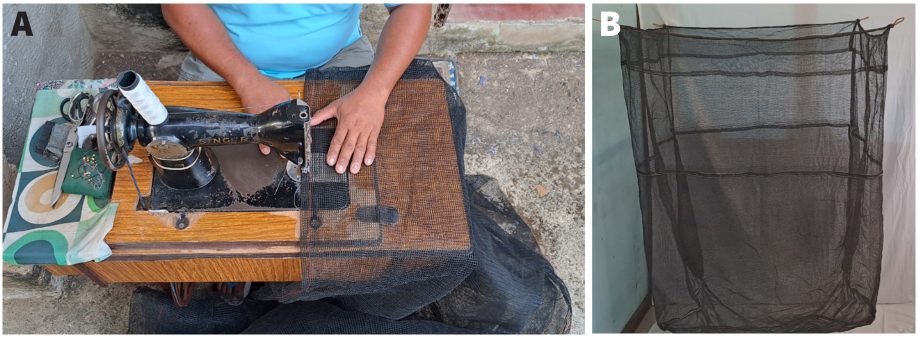

Figure 6. Mending of B- nets using a sewing machine (**A**) and attachment of PE rope #10 in every corner of a 2 m x 2 m x 3 m nursery net (**B**).

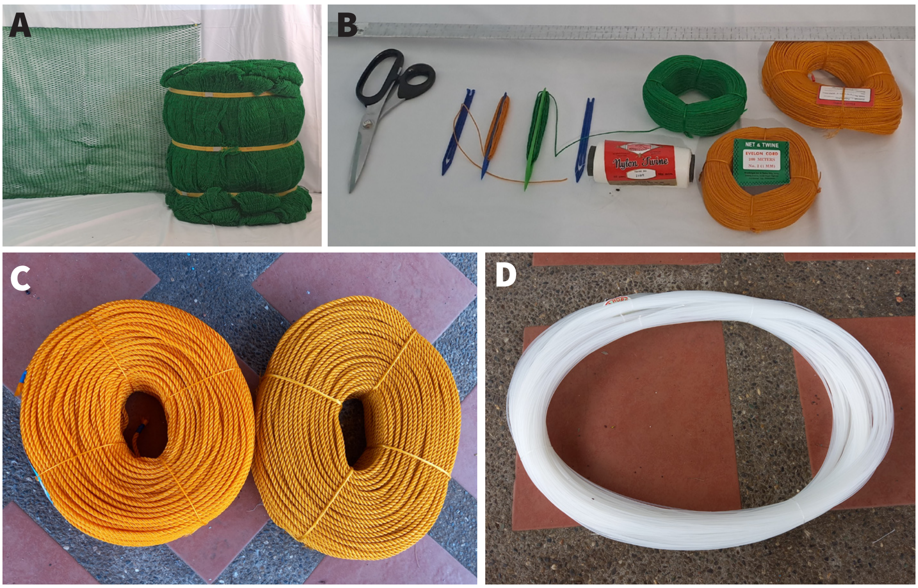

Figure 7. Materials essential for the fabrication of grow-out net (**A**) Polynet #14, PE, (**B, C, D**) common materials (nylon thread, evelon cord, PE rope # 10, nylon line, and fish net needle)

Figure 8. Attachment of polynet #14 to PE rope #10 using a nylon line as a guide

Figure 9. Fabrication of an eyelet in every corner of the net as a provision for attachment to the framework

Figure 10. Completed 5 m x 5 m x 4 m net for grow-out operation

Figure 11. Main netting (green) and B-net (black) attachment to the cage framework for nursery cage operation

Figure 12. Sinkers are installed in the corner and border of the net to allow an even opening of the net

Floats

Recycled plastic drums (220 liters, 935 mm x 581 mm, 24 pcs.) are utilized as floatation devices (**Figure 13**). To ensure enhanced buoyancy, drums are filled with compressed air through a tire valve and then thoroughly sealed with marine adhesive epoxy (**Figure 14**).

Figure 13. Plastic drums as floatation devices to stabilize the net cage

Figure 14. Plastic drums with tire valves for filling in of compressed air

Mooring devices

Prefabricated concrete blocks can be used as anchors of fish cages (**Figure 15**). A water depth to length of rope ratio of at least 1:3 at high water spring tide will provide the cage structure leeway during tidal variations. A 10 m x 10 m cage module requires no less than four concrete blocks weighing 0.5–1 ton each.

Figure 15. Concrete block as mooring/anchor device to stabilize the position of the cage

An illustration showing the completed net cage module is presented in **Figure 16**.

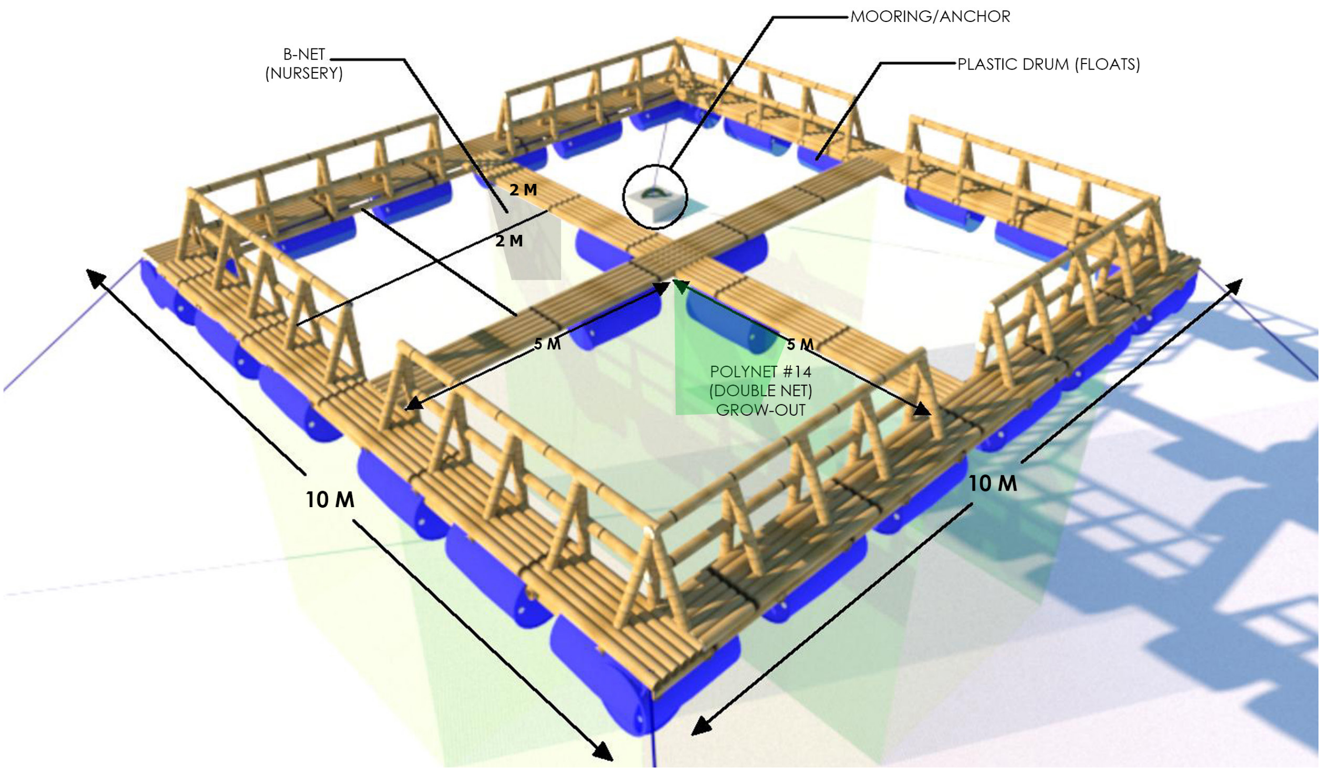

Figure 16. An illustration of a 10 m x 10 m cage which can accommodate four - 5 m x 5 m x 4 m grow-out cages, or 16- 2 m x 2 m x 3 m nursery cages

5 *Stocking of Fish*

Selection

Pompano fry should show no signs of physical deformities and disease symptoms (*e.g.* viral nervous necrosis and sea lice infection). Stocks should be homogenous in size (1-g body weight or 1.5-inch body length) to avoid cannibalism between fry as well as to ensure even sizes of fish during harvest. As much as possible, animals should be weaned to feed on formulated feeds prior to stocking in cages.

Packing and transport

Animals should not be fed 24 hours prior to packing. From the hatchery tanks, fish are harvested, counted, and settled in aerated baskets overnight prior to packing and transport early the following morning (**Figure 17**).

Figure 17. Pompano fry are conditioned overnight in aerated baskets in preparation for packing

Double-layered 20 in x 30 in plastic bags are used to pack 150–200 pompano fry. The bags should be filled with oxygen and sea water (7 L) at a volume ratio of 3:1. This packing density can sustain the fish for 8–12 hours of transport (**Figure 18**). Ice tubes (250 g) wrapped in paper are inserted between the outer and inner plastic bags to reduce water temperature. The plastic bags are then packed in styroboxes (**Figure 19**).

Figure 18. Packing of pompano fry in double plastic bags filled with water and oxygen

Figure 19. Plastic bags packed in styroboxes for an extended transport duration

6 *Rearing (Nursery and Grow-out)*

Nursery

Pompano fry are stocked in 2 m x 2 m x 3 m nursery nets at a stocking density of 100 fish per cubic meter. To reduce stress, opened plastic bags are buoyed onto the water and acclimated by gradually introducing ambient seawater (**Figure 20**). For the purpose of acclimation, water parameters (salinity, temperature, pH, and dissolved oxygen) should be checked prior to stocking.

Pompano fry are reared in the nursery phase until they reach an average body weight of 60 g (≈ 80 days of culture).

Figure 20. Release and stocking of pompano fry in nursery cages

During the nursery phase, artificial illumination can be installed in the floating cages (**Figure 21**). This will attract several zooplanktons (*i.e.* copepods, small shrimp, fish larvae, and worms) during nighttime which will serve as a supplemental food for the pompano. This method will reduce the cost of feeding formulated diets during the nursery phase.

Grow-out

Pompano fingerlings are transferred to grow-out nets at a stocking density of 45 fish per cubic meter (**Figure 22**) and reared until they attain a body weight of 330–350 g (≈130 days of culture).

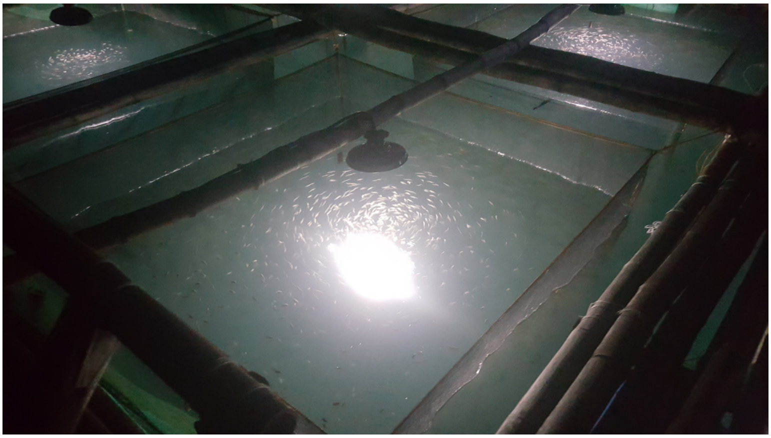

Figure 21. Artificial illumination in nursery cages to attract zooplanktons as supplemental feed for pompano

Figure 22. Sorting and transfer of pompano juveniles from nursery to grow-out cages

Feeds and feeding management

The nutrient profile of feeds should meet the requirement of pompano (**Table 1**). Feed rations are divided into four portions (0800, 1100, 1400, and 1700) for the nursery and three parts (0800, 1300, and 1700) during the grow-out phase. Unlike other cultured fish, pompano should not follow an *ad libitum* feeding regimen as they tend to continue eating even when full. Recording of the total feed consumed is vital as this information can provide accurate values when calculating performance parameters after harvest (**Table 2**).

Table 1. Nutrient and amino acid requirements of *Trachinotus* spp.

Nutrient	Levels
Protein	39.5–42.7 % [1]
Lipid	5.7 % [2]
DP / DE[3]	23–25 mg/kJ [2]
Amino acids	
Methionine	1.19 % [1]
Lysine	2.4–2.45 % [1]
Taurine	1–1.5 % [1]
Arginine	2.73–2.74 % [2]
Leucine	2.9–3.2% [2]
Isoleucine	4.0 % [2]
Valine	1.9 % [2]
Histidine	1.61 % [1]
Phenylalanine	1.15 % [2]
Threonine	1.39 % [2]
Tryptophan	0.13 % [2]

[1]*Trachinotus blochii*
[2]*Trachinotus* spp.
[3]Dietary protein to dietary energy ratio

Table 2. Daily feeding record of pompano cultured in floating net cages

Date	Cage No.	Feed ration	Time					Total	Remarks
			0800	**1100**	**1400**	**1700**	*Nursery*		
			0800	**1200**	**1700**		*Grow-out*		

Sampling of stocks

In order to monitor fish performance parameters (per cent weight gain, specific growth rate and feed conversion ratio) a sample size of 5 % of the total stocks is weighed in bulk periodically (every 30 days) to monitor fish growth (**Figure 23**). Sampling data will then be analyzed for the prevailing average body weight of the fish. The average body weight is calculated using the equation below:

$$\text{Average body weight (ABW)} = \frac{\text{total weight of fish sampled}}{\text{total number of fish sampled}}$$

Growth of pompano from nursery to grow-out weighed every 30 days is illustrated in **Figure 24**.

Figure 23. Periodic weight sampling of fish stocks to monitor growth and feed efficiency

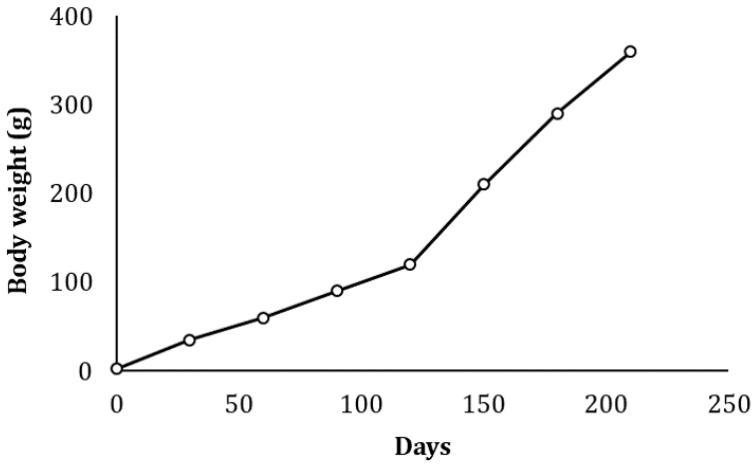

Figure 24. Growth of pompano from nursery to grow-out in floating cages for 210 days

To optimize feed efficiency, the feeding ration is adjusted after determining the average body weight and survival of the current stock (**Table 3**). Feed rate recommendations serve as a guide to improve nutrient efficiency of feeds and may be adjusted based on the prevailing condition of the fish and the environment (*i.e.* feeding is adversely affected during inclement weather conditions). Feed requirement is calculated using the formula:

$$\text{Feed requirement} = \frac{(\text{no. of stocks} - \text{mortality}) \times \text{fish mean body weight} \times \text{feeding rate}}{1{,}000}$$

Feed stocks should be kept in a cool and dry storage facility to prevent spoilage and extend their shelf life. The nutrient availability and palatability of the diets are highly likely compromised with the growth of molds.

Monitoring

Disease and parasitic outbreaks in fish should be closely monitored. Pompanos are often beset with sea lice (*Caligus* spp.) especially during the broodstock phase. Although rarely observed during grow-out operation, this infestation can be remedied by subjecting the fish stocks to a freshwater bath for 5–10 minutes (**Figure 25**).

Net cages should be inspected regularly for tears to prevent the escape of stocks. The replacement of nets with excessive attachment of biofoulers is necessary to facilitate efficient water exchange and reduce the weight of the cage which can compromise its structural integrity. Biofouling communities can be a vector of pathogenic microorganisms that can spread diseases between wild and cultured animals. Water parameters such as dissolved oxygen, salinity, pH, temperature, and turbidity should also be closely monitored.

Table 3. Adjusted feed rate for pompano based on average body weight

Fish weight (g)	Feed rate (% body weight)	Size	Phase
1–20	10–8	Mash	Nursery
21–45	7–6	Crumble/Starter	Nursery
46–75	6–5	Starter	Nursery/Grow-out
76–105	6–5	Starter/Grower	Grow-out
106–180	5–4	Grower	Grow-out
181–260	4–3	Grower/Finisher	Grow-out
261–350	3–2	Finisher	Grow-out

Figure 25. Freshwater bath of pompano infested with sea lice, *Caligus* spp.

Harvest

Fish stocks can be harvested when they attain a marketable size of 350 g (**Figures 26 and 27**). To maintain optimum fish quality, pre-chilled seawater is used to immediately reduce the flesh temperature of the fish. Prepared in a chilling tank, the recommended ice-to-fish ratio is 1:1 (by weight) (**Figure 28**). The chilled fish are packed in Styrofoam boxes with sufficient ice (*i.e.* 1:1 ratio). An arrangement of a layer of crushed ice in the bottom of the container and in between rows of fish should be followed (**Figure 29**).

Figure 26. Harvesting of marketable size fish using scoop nets

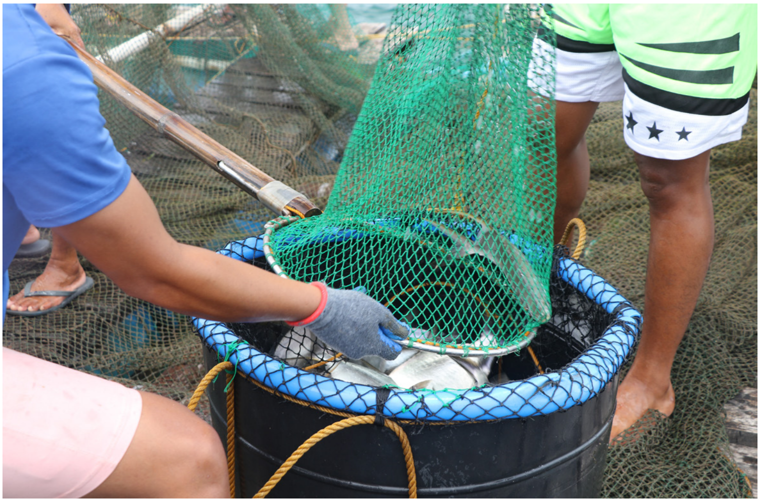

Figure 27. Harvesting of marketable size fish using scoop nets

Figure 28. Chilling tank filled with ice slurry during harvest in order to maintain optimum fish quality

Figure 29. Packing of pompano in Styrofoam boxes

Calculating fish performance parameters after every harvest is critical in every cage aquaculture production. These data will allow farm operators to re-evaluate their general operating protocol especially feed management. The performance parameters data should be recorded thereafter (**Table 4**). The following fish performance parameters are computed using the equations below:

$$\text{Weight gain (\%)} = \frac{\text{final weight - initial weight}}{\text{initial weight}} \times 100$$

$$\text{Specific growth rate} = \frac{\ln(\text{final weight}) - \ln(\text{initial weight})}{\text{no. of days}} \times 100$$

$$\text{Feed conversion ratio} = \frac{\text{total feed intake}}{\text{final biomass - initial biomass}}$$

$$\text{Survival (\%)} = \frac{\text{no. of stocks final}}{\text{no. of stocks initial}} \times 100$$

Table 4. Sampling record of performance parameters of pompano cultured in floating net cages

Sampling period	Cage No.	Days of Culture	ABW (g)	Mortality	Total feed intake	FCR	SGR

7 Economics

The cost of materials and labor for cage and net construction for nursery and grow-out operation is shown in **Table 5**. In **Table 6**, the technical information essential for pompano nursery and grow-out operation in marine cages which is projected to operate for five years is presented.

From the items shown in **Table 5**, **Table 7** presents a set of investment items for a 1-cage and 4–cage operation, their corresponding cost, and annual depreciation given the economic life of each item. It is assumed that a 10 % cost reduction due to economies of scale is achieved in a 4–cage operation.

Table 8 shows the comparative cost and return analysis of culturing pompano in a 1–cage and 4–cage operation. The 4–cage operation suggests a more profitable and efficient setup.

Tables 9-a and **9-b** outline the financial investment analysis for a 5-year operation of a 1–cage and 4-cage grow-out culture of pompano. The discounted economic indicators point out the viability of both operations, while at a 10 % discount rate, the 4-cage operation is evidently more viable than the 1-cage setup.

This economic analysis demonstrates the profitability and viability of pompano production in marine cages.

Table 5. Cost of materials and labor for cage and net construction

	Quantity	Units	PHP
Fabrication of 2 x 2 x 3 m nursery nets (20 units)			
B-net double width	3	rolls	15,000
Nylon twine 210/2	3	spools	150
PE rope #10	3	rolls	1,560
Evelon cord #2	2	rolls	140
Sinker	20	pcs	400
Labor	20	days	9,000
SUBTOTAL			***26,250***
Fabrication of 5 x 5 x 4 m grow-out nets (12 units)			
Polynet #14	10	bales	91,000
PE rope #10	4	rolls	2,080
Nylon line, 160 pounds	5	kg	1,600
Evelon cord #2	48	rolls	3,360
Fishing net needle	10	pcs	120
Labor	12	days	12,000
SUBTOTAL			***110,160***
Fabrication of mooring lines			
PE rope 28 mm	1	roll	12,000
Portland cement	5	bags	1,125
Sand and gravel	1.5	m^3	1,800
Marine plywood 3/8	1	pc	700
Lumber 2 x 2 x 10	2	pcs	300
CW nails, 1 ½ and 3 inches	1	kg	70
Labor	1	day	1,000
SUBTOTAL			***16,995***
Construction of a 1-unit 10 x 10 m bamboo floating cage with four compartments			
Bamboo, full length	60	pcs	8,400
Plastic drums, 200-liter capacity	24	pcs	36,000
Nylon line, 160 pounds	15	kg	4,800

	Quantity	Units	PHP
PE rope #10	2	rolls	1,040
Marine epoxy, quart	2	sets	1,380
Labor	15	days	21,000
SUBTOTAL			***72,620***
TOTAL			**226,025**

Table 6. Technical information in pompano cage operations

Project duration (year)	5
Culture period (day, nursery to grow-out)	220
Cage size (5 m x 5 m x 3 m)	75
Stocking density (pcs/m^3)	45
Number of fingerlings stocked per unit (pc)	3,375
Number of pompano at harvest per crop per cage (pc)	3,038
Survival rate (%)	90
Average body weight, final (g)	350
Average body weight, initial (g)	1
Total weight gain (kg)	1,061
Total feed consumed (kg)	2,428
Feed conversion ratio	2.29
Volume of harvest per crop per cage (kg)	1,063
Number of cages	4
Volume of harvest from 4-cage operation per crop (kg)	4,253
Number of crops per year	1
Farm-gate price of pompano (per kg)	350

Table 7. Investment items, costs, depreciation, and re-investment requirements in a 1-cage & a 4-cage operation

Investment Items	Total Cost (PHP)	Economic Life (Year)	Annual Depreciation Cost (PHP)	Reinvestments on Year 3 (PHP)
Cages, bamboo, and floaters	12,905	2.5	5,162	12,905
Labor cage fabrication	5,250	2.5	2,100	5,250
Nets	32,851	5	6,570	
Labor net fabrication	5,500	5	1,100	
Total, 1 cage operation	56,506		14,932	18,155
Total, 4-cage operation*	203,423		53,756	65,358

*10 % cost reduction due to economies of scale

Table 8. Cost and return analysis of monoculture of pompano in a 1-cage and a 4-cage operation

	Price/ unit	Units/ cage	1-cage operation	4-cage operation	
	PHP		PHP/cage	PHP/cage	PHP/4-cage
Revenue					
Gross sales, pompano, 350 g per piece	350	1,063	372,094	372,094	1,488,375
Cost					
A. Variable Cost					
Pompano fingerlings	10	3,375	33,750	32,063	128,250*
Feeds	80	2,435	194,797	184,951	740,227*
Harvesting cost (PHP 5,000/crop for 1-cage, PHP 15,000 for 4-cage)	5,000	1	5,000	3,750	15,000
1 operator for 1 cage (PHP 5,000/mo), 1 operator & 1 aide for 4-cage (PHP 7,500/mo)	5,000	7	35,000	13,125	52,500
Materials and supplies, 1-cage (PHP 1,000/mo), 4-cage (PHP 2,000/mo)	1,000	7	7,000	3,500	14,000
Maintenance and repairs (3 % for 1-cage, 5 % for 4-cage of investment costs per year)			1,695	2,543	10,171
SUBTOTAL			***277,130***	***239,931***	***959,724***
B. Fixed Cost					
Depreciation costs			14,932	13,439	53,756
Business license & other permits, PHP 5,000/yr			5,000	1,250	5,000
Opportunity cost of own capital, 2.5 % interest/ annum			1,413	1,271	5,086
SUBTOTAL			***24,246***	***18,572***	***74,287***
TOTAL COST			**301,376**	**258,503**	**1,034,011**

	Price/ unit	Units/ cage	1-cage operation	4-cage operation	
	PHP		PHP/cage	PHP/cage	PHP/4-cage
Economic Indicators					
Net income per year (gross revenue – total cost)			70,718	113,591	454,364
Return on investment (ROI, %) (net income/investment cost) x 100			139.1 %	223.4 %	223.4 %
Payback period, years [investment cost/ (annual net income + annual depreciation)]			0.66	0.40	0.40
Unit variable cost (PhP/kg) (total variable cost/total production)			261	226	226
Break-even price (Php/kg) (total cost/total production)			283	243	243
Break-even volume of production (kg/crop) (total cost/selling price)			861	739	2,954

*5 % cost reduction in 4-cage operation

Table 9-a. Financial Investment Analysis of a 1-cage pompano monoculture operation

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Gross Income (PHP)*	0	372,094	379,536	387,126	394,869	402,766	1,936,391
Investment Cost (PHP)	56,506			18,155			74,661
Variable and fixed cost less depreciation		286,444	289,308	292,201	295,123	298,075	1,461,152
Total cost investment and operating costs**	56,506	286,444	289,308	310,356	295,123	298,075	1,535,813
Net income including earnings from depreciation	(56,506)	85,650	90,227	76,770	99,745	104,692	400,578
Net Present Value (NPV)	(51,369)	70,785	67,789	52,435	68,127	71,506	260,669
Internal Rate of Return (IRR, %)							152.0 %
Discounted Benefit-Cost Ratio (DBCR)							1.24

*****2 % annual increase in sales value due to several factors such as improved operations and skills, higher survival rate, and probable price increase

******1 % annual increase in cost due to probable increase in prices of materials and labor

Table 9-b. Financial Investment Analysis of a 4-cage pompano monoculture operation

	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Gross Income (PHP)*		1,488,375	1,518,143	1,548,505	1,579,475	1,611,065	7,745,563
Investment Cost (PHP)	203,423			65,358			268,781
Variable and fixed cost less depreciation		980,255	990,058	999,958	1,009,958	1,020,057	5,000,286
Total cost investment and operating costs**	203,423	980,255	990,058	1,065,316	1,009,958	1,020,057	5,269,066
Net income including earnings from depreciation	(203,423)	508,120	528,085	483,189	569,518	591,008	2,476,497
Net present value (NPV)	(184,930)	419,934	396,758	330,025	388,988	403,666	1,649,021
Internal Rate of Return (IRR, %)							251.3 %
Discounted Benefit-Cost Ratio (DBCR)							1.45

*2 % annual increase in sales value due to several factors such as improved operations and skills, higher survival rate, and probable price increase

**1 % annual increase in cost due to probable increase in prices of materials and labor

8 References

Berry, F. and E.S. Iverson. 1967. Pompano: Biology, Fisheries and Farming Potential. Proceedings of the Gulf and Caribbean Fisheries Institute 19: 116-128.

Cruz-Lacierda, E.R., Pagador, G.E., Yamamoto, A. and Nagasawa, K., 2011. Parasitic caligid copepods of farmed marine fishes in the Philippines. Diseases in Asian Aquaculture VII. Selangor, Malaysia: Fish Health Section, Asian Fisheries Society, 385.

Ebeneezar, S., Vijayagopal, P., Srivastava, P.P., Gupta, S., Varghese, T., Prabu, D.L., Chandrasekar, S., Varghese, E., Sayooj, P., Tejpal, C.S. and Wilson, L., 2019. Dietary lysine requirement of juvenile Silver pompano, *Trachinotus blochii* (Lacepede, 1801). Aquaculture, 511, p.734234.

Ebeneezar, S., Vijayagopal, P., Srivastava, P.P., Gupta, S., Varghese, T., Prabu, D.L., Chandrasekar, S., Varghese, E., Tejpal, C.S., Anikuttan, K.K. and Sayooj, P., 2020. Optimum dietary methionine requirement of juvenile silver pompano, *Trachinotus blochii* (Lacepede, 1801). Animal Feed Science and Technology, 268, p.114592.

FAO 2023. Cultured Aquatic Species Information Programme (CASIP). Fisheries and Aquaculture Division [online]. Rome.

Fermin, A.C. and Seronay, G.A., 1997. Effects of different illumination levels on zooplankton abundance, feeding periodicity, growth and survival of the Asian sea bass, Lates calcarifer (Bloch), fry in illuminated floating nursery cages. Aquaculture, 157(3-4), pp.227-237.

Gaitan, A. G., Toledo, J. D., Arnaiz, M. T., Ayson, E. V. D. J., Altamirano, J. P., Agbayani, R. F., Salayo, N. D., & Marte, C. L. 2014. Milkfish *Chanos chanos* cage culture operations. Tigbauan, Iloilo, Philippines: Aquaculture Department, Southeast Asian Fisheries Development Center.

Garcia, L.M.B., Hilomen-Garcia, G.V., Celino, F.T., Gonzales, T.T. and Maliao, R.J., 2012. Diet composition and feeding periodicity of the seahorse *Hippocampus barbouri* reared in illuminated sea cages. Aquaculture, 358, pp.1-5.

Hardy, R.W. and Kaushik, S.J. eds., 2021. Fish nutrition. Academic press.

Hauville, M.R., Zambonino-Infante, J.L., Bell, G., Migaud, H. and Main, K.L., 2014. Impacts of three different microdiets on Florida Pompano, *Trachinotus carolinus*, weaning success, growth, fatty acid incorporation and enzyme activity. Aquaculture, 422, pp.268-276.

Huang, Z., Lin, H.Z., Peng, J.S., Tan, X.H., Zhou, W.C., Zhou, C.P. and Lei, M.H., 2015. Effects of dietary isoleucine levels on the growth performance, feed utilization, and serum biochemical indices of juvenile golden pompano, *Trachinotus ovatus*. Israeli Journal of Aquaculture-Bamidgeh, 67, pp.1-9.

Huang, Z., Tan, X.H., Zhou, C.P., Yang, Y.K., Qi, C.L., Zhao, S.Y. and Lin, H.Z., 2018. Effect of dietary valine levels on the growth performance, feed utilization and immune function of juvenile golden pompano, *Trachinotus ovatus*. Aquaculture Nutrition, 24(1), pp.74-82.

Jayakumar, R., Nazar, A. K. A., Tamilmani, G., Sakthivel, M., & Gopakumar G., 2014. Farming of silver pompano *Trachinotus blochii* in coastal aquaculture ponds [Brochure]. Kochi, India: Central Marine Fisheries Research Institute.

Jobling, M., 2016. Fish nutrition research: past, present and future. Aquaculture international, 24(3), pp.767-786.

Ladja, J. M., Opiña, N., Catacutan, M., Vallejo, E., & Cercado, V., 2012. Cage nursery of high-value fishes in brackishwater ponds: seabass, grouper, snapper, pompano. Tigbauan, Iloilo, Philippines: Aquaculture Department, Southeast Asian Fisheries Development Center.

Lazo, J.P., Davis, D.A. and Arnold, C.R., 1998. The effects of dietary protein level on growth, feed efficiency and survival of juvenile Florida pompano (*Trachinotus carolinus*). Aquaculture, 169(3-4), pp.225-232.

Lin, H., Tan, X., Zhou, C., Niu, J., Xia, D., Huang, Z., Wang, J. and Wang, Y., 2015. Effect of dietary arginine levels on the growth performance, feed utilization, non-specific immune response and disease resistance of juvenile golden pompano *Trachinotus ovatus*. Aquaculture, 437, pp.382-389.

Mamauag, R.E.P. and Ragaza, J.A. 2023. Histidine requirement of snubnose silver pompano, *Trachinotus blochii*. Animal Feed Science and Technoloogy:115690.

Mamauag, R.E.P., Catacutan, M.R., Coloso, R.M., Erazo-Pagador, G., Mallare, M. and Ragaza, J.A., 2021. Dietary taurine in practical diet for two sizes of snubnose silver pompano, *Trachinotus blochii*. Aquaculture Nutrition, 27(6), pp.2231-2239.

Mamauag, R.E.P., Ragaza, J.A. and Nacionales, T.J., 2021. Performance, digestibility efficiencies, gut and liver morphologies of snub nose pompano *Trachinotus blochii* fed spray-dried haemoglobin meal as protein substitute for fishmeal. Aquaculture Research, 52(11), pp.5849-5856.

Palma, P.A., Beluso, L.A.A., de Jesus-Ayson, E.G.T. and Cruz-Lacierda, E.R., 2022. Seasonal population dynamics of *Lepeophtheirus spinifer* and *Neobenedenia* sp. coinfecting snubnose pompano (*Trachinotus blochii*) breeders in marine cages in the Philippines. Veterinary Parasitology, 302, p.109656.

Prabu, D.L., Ebeneezar, S., Chandrasekar, S., Kalidas, C., Kavitha, M., Vijayagopal, P., Anikuttan, K.K. and Jayakumar, R., 2022. Evaluation of a modified feeding strategy on the growth, metabolism and feeding economics of Snubnose Pompano *Trachinotus blochii* (Lacepede, 1801) in a recirculatory system. Animal Feed Science and Technology, 290, p.115348.

Reyes, O. S., de Jesus-Ayson, E. G. T., Pedroso, F. L., & Cabanilla, M. I. C., 2014. Hatchery production of snubnose pompano *Trachinotus blochii* Lacepede. Tigbauan, Iloilo, Philippines: Aquaculture Department, Southeast Asian Fisheries Development Center.

Sun, J.L., Liu, Y.F., Jiang, T., Li, Y.Q., Song, F.B., Wen, X. and Luo, J., 2021. Golden pompano (*Trachinotus blochii*) adapts to acute hypoxic stress by altering the preferred mode of energy metabolism. Aquaculture, 542, p.736842.

Surtida, M. B., 2000. The pompano. SEAFDEC Asian Aquaculture, 22(3), 27.

Tan, X., Lin, H., Huang, Z., Zhou, C., Wang, A., Qi, C. and Zhao, S., 2016. Effects of dietary leucine on growth performance, feed utilization, non-specific immune responses and gut morphology of juvenile golden pompano *Trachinotus ovatus*. Aquaculture, 465, pp.100-107.

Tutman, P., Glavić, N., Kožul, V., Skaramuca, B. and Glamuzina, B., 2004. Preliminary information on feeding and growth of pompano, *Trachinotus ovatus* (Linnaeus, 1758)(Pisces; Carangidae) in captivity. Aquaculture International, 12(4-5), pp.387-393.

Weirich, C.R., Riley, K.L., Riche, M., Main, K.L., Wills, P.S., Illán, G., Cerino, D.S. and Pfeiffer, T.J., 2021. The status of Florida pompano, *Trachinotus carolinus*, as a commercially ready species for US marine aquaculture. Journal of the World Aquaculture Society, 52(3), pp.731-763.

Wu, Y., Han, H., Qin, J. and Wang, Y., 2015. Effect of feeding frequency on growth, feed utilization, body composition and waste output of juvenile golden pompano (*Trachinotus ovatus*) reared in net pens. Aquaculture Research, 46(6), pp.1436-1443.

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About the Authors

Dr. Roger Edward P. Mamauag started his career with SEAFDEC/AQD in 1997. He is currently a scientist and the head of the Technology Verification and Extension Division. He earned his Ph.D. in Fisheries Science from Kagoshima University.

Mr. Dan D. Baliao is the current chief of SEAFDEC/AQD, a position he has held since 2017. He has previously held various research and administrative positions at SEAFDEC/AQD in 1979–1986 and 1996–2013. He earned his Master of Science in Fisheries (major in Aquaculture) degree from the University of the Philippines in 1978.

Dr. Leobert D. de la Peña has been with SEAFDEC/AQD from 1987. He is currently a scientist and the head of the Research Division. He earned his Ph.D. (Fish Pathology) degree from the Hiroshima University Graduate School of Biosphere Sciences.

Mr. Michael B. Tesorero is a graduate in Bachelor of Science degree in Marine Biology at the Iloilo State College of Fisheries. He joined SEAFDEC/AQD in 2001 and presently a technical assistant at Iganng Marine Station.

Mr. Mateo Paquito R. Yap is currently the station head of the Igang Marine Station. He earned his Bachelor of Science in Commerce Major in Accounting from the University of San Agustin and joined SEAFDEC/AQD in 2002.

Mr. Rheniel Dayrit has been with SEAFDEC/AQD since 2016 and is currently a technical assistant at the Technology Verification and Extension Division. He earned his Bachelor of Science in Economics degree from the University of the Philippines Visayas in 2016.

ABOUT SEAFDEC

The Southeast Asian Fisheries Development Center (SEAFDEC) is a regional treaty organization established in December 1967 to promote fisheries development in the region. The member countries are Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Viet Nam.

The policy-making body of SEAFDEC is the Council of Directors, made up of representatives of the member countries.

SEAFDEC has five departments that focus on different aspects of fisheries development:

- The Training Department (TD) in Samut Prakan, Thailand (1967) for training in marine capture fisheries
- The Marine Fisheries Research Department (MFRD) in Singapore (1967) for post-harvest technologies
- The Aquaculture Department (AQD) in Tigbauan, Iloilo, Philippines (1973) for aquaculture research and development
- The Marine Fishery Resources Development and Management Department (MFRDMD) in Kuala Terengganu, Malaysia (1992) for the development and management of fishery resources in the exclusive economic zones of SEAFDEC member countries, and
- Inland Fishery Resources Development and Management Department (IFRDMD) in Palembang, Indonesia (2014) for sustainable development and management of inland capture fisheries in the Southeast Asian region.

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- Develop managerial, technical and skilled manpower for the aquaculture sector
- Produce, disseminate and exchange aquaculture information

AQD maintains four stations: the Tigbauan Main Station and Dumangas Brackishwater Station in Iloilo province; the Igang Marine Station in Guimaras province; and the Binangonan Freshwater Station in Rizal province. AQD also has an office in Quezon City.

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