BIODIVERSITAS
Volume 23, Number 12, December 2022
Pages: 6413-6419

ISSN: 1412-033X
E-ISSN: 2085-4722
DOI: 10.13057/biodiv/d231239

The prospects of business development in ornamental fish in Southeast Sulawesi, Indonesia

SUR MULYATI[1], TOMMY HERDIANTO[2], ACHMAD SUHERMANTO[3,♥], ACHMAD SOFIAN[4]

[1]SKIPM Kendari. Jl. Wolter Monginsidi No. 82A, Ranomeeto, Langgea, Kendari, Konawe Selatan 93563, Southeast Sulawesi, Indonesia
[2]Balai Besar KIPM Jakarta. Pajang, Benda, Tangerang 15126, Banten, Indonesia
[3]Politeknik Kelautan dan Perikanan Karawang. Jl. Lingkar Luar Tanjungpura, Karang Pawitan, West Karawang, Karawang 41315, West Java, Indonesia. Tel./Fax.: +62-271-637457 Ext. 129, ♥email: achmadsuhermanto@kkp.go.id
[4]Politeknik Kelautan dan Perikanan Sorong. Jl. K. Pattimura, Tj. Kasuari, Sorong 98411, West Papua, Indonesia

Manuscript received: 27 June 2022. Revision accepted: 13 December 2022.

Abstract. *Mulyati S, Herdianto T, Suhermanto A, Sofian A. 2022. The prospects of business development in ornamental fish in Southeast Sulawesi, Indonesia. Biodiversitas 23: 6413-6419.* Ornamental fish is a potential commodity necessarily optimized to improve the welfare of society. One of the Indonesian provinces producing diverse species of ornamental fish to export is Southeast Sulawesi. This study aimed to evaluate the ornamental fish potentials and create an evaluation possibly implemented as a consideration to determine business development strategies. The method was a case study, collected data through observation, interviews, literature study, and internal and external conditions were analyzed using SWOT analysis. The study analyzed the potential, trade, and strategy for business development in ornamental fish in Southeast Sulawesi. The study discovers that 38 species are traded, and nine of them are dominantly traded. Moreover, there are six main species potentially cultivated due to the demand and stable production; they are Betok Kupang *(Chrysietera cyanea)*, Capungan (*Apogon* sp.), Angel KKO (*Cirrhilabrus* sp.), Clown fish (*Amphiprion ocellaris)*, Keling Rub *(Cirrhilabrus* sp.), and Letter six *(Paracanthurus hepatus)*. The development of ornamental fish cultivation can be implemented with the S-O (strengths–opportunities) strategy that manages and protects the environment of ornamental fish, strengthens the capacity of fishers and stakeholders for environmentally friendly activities and export market orientation, and builds cooperation of fisherman, exporters, and stakeholders to develop business in ornamental fish by emphasizing local species with high economic values and market demands. These results can be a consideration in making decisions related to the development of ornamental fish.

Keywords: Economically, fisheries, potential, prospective, SWOT analysis

INTRODUCTION

Indonesia is an archipelago country of which two-thirds of the territory is oceans. The length of the coastline is 9,518 km; it is located in the Indo-Pacific region (Maulidia et al. 2019). Indonesia's geographical condition places it as one of the megadiverse countries (Chasanah 2008; Von Rintelen et al. 2017; Sofian et al. 2021). The territorial waters of Indonesia have the uniqueness and abundant diversity of ornamental fish for 240 species of marine ornamental fish and 226 species of freshwater ornamental fish (Ramachandran 2002; Khoironi and Saskara 2017). The Ministry of Marine Affairs and Fisheries has recorded that the wealth of fishery resources of Indonesia is at least 4,720 species of freshwater and marine fish; 650 of them are ornamental fish (MMAF 2019). Most of the ornamental fish trade comes from natural catches, this can trigger the risk of fish extinction (Fahmi et al. 2015). Due to environmental degradation and exploitation of nature, caused the limited species of ornamental fish that are commonly known such as the arowana (*Sclephages formosus*), botia (*Botia loach*), and rainbow papua (*Metalotaenia* sp.) are found in Indonesia (Blalalla). Therefore, Indonesia's ornamental fish is highly demanded by international market consumers (Ramachandran 2002). Some potential areas for producing ornamental fish are eastern Indonesia, which is famous for its coral triangle, including the waters of Southeast Sulawesi, North Sulawesi, Maluku and Papua (Sinansari and Priono 2019). The large territorial waters of Indonesia have great opportunities to export ornamental fish to big countries sustainably if the management is well done well. from upstream to downstream. The potential of biodiversity is necessarily optimized through sustainable management to create welfare for fishers who have been marginalized.

Aquatic ornamental fish can be utilized for their visual beauty, both in physical form, behavior, as well as colors and accessories in them. Ornamental fish are usually kept in aquariums to enjoy their beauty by all ages, reduce hypertension, stress, and anxiety (Anjur et al. 2021) and become one of the fishery commodities that can be an option in carrying out business activities (Sinansari and Priono 2019). The ornamental fish business has bright prospects because it has market opportunities both in the domestic and foreign markets (Wijaya and Huda 2021), generates foreign exchange for the country and as a source of employment (Anjur et al. 2021). The ornamental fish industry is a large-scale industry, with an estimated 53.3 million kg of ornamental fish traded at a value of US$15 billion (Sullivan 2014). Asian countries account for 51% of the global ornamental fish export market (Loh et al. 2020) and Singapore, with an area of only 721 m2, has an

excellent aquacultured ornamental fish industry and trade sector due to its management system, related distribution system among all sectors. Including cultivators, wholesalers and exporters so that this country becomes the largest ornamental fish exporter in the world (Yue 2019). Likewise, Malaysia can optimize the potential of ornamental fish so that it becomes the world's main ornamental producer and exporter by contributing 9% of global trade (Anjur et al. 2021).

Marine and freshwater ornamental fish is a primary fishery commodity with economically essential values. The development of the ornamental fish industry is highly potential because it involves more than 128 countries globally (Raja et al. 2019; Nuryanto et al. 2020). The world's ornamental fish industry, including export and import activities, generates approximately 333 million USD, and more than two billion live ornamental fish are traded (Willis and Bakuwel 2016; Satam et al. 2018; Raja et al. 2019). In 2016 the trade of freshwater ornamental fish contributed approximately 250 millions USD while the marine ornamental fish contributed the rest of the commodity (Willis and Bakuwel 2016). The main importers of world ornamental fish are US, UK, Japan, Germany (Yue 2019), Belgium, China and Australia (Sharma 2020). The Indonesian commodities of freshwater ornamental fish dominantly traded are tiger fish (*Puntigrus tetrazona*), sepat mutiara (*Trichogaster leeri)*, red rainbow (*Glossolepis incisus)*, belida (*Chitala lopis*), and balashark (*Balantiocheilos melanopterus*). Meanwhile, the marine ornamental fish is the pivotal commodity to decorate an aquarium and is widely traded worldwide, including in Indonesia. This study aimed to analyze the prospects of business development in ornamental fish in Southeast Sulawesi. The results of this study are expected to positively contribute to developing ornamental fishery sustainably to create society's self-reliance and livelihoods.

MATERIALS AND METHODS

The study was conducted in Kendari, Southeast Sulawesi, from January to July 2020. The research method employed was a case study. The data of potential ornamental fish were collected from the Fish Quarantine and Inspection Agency of Kendari from 2017 to 2019. Meanwhile, the data of trade flow and the business development strategies for ornamental fish in Southeast Sulawesi were collected through observation, interviews, and literature study. The respondents consisted of ornamental fish fishers, collectors, the Department of Fisheries and Marine of Southeast Sulawesi, the fishery extensions, the Fish Quarantine and Inspection Agency of Class I Kendari, and ornamental fish entrepreneurs.

The internal and external conditions of business development in ornamental fish were analyzed using SWOT analysis. SWOT analysis is a systematic identification of various factors related to internal and external conditions to determine strengths, weaknesses, opportunities, threats, and alternatives of a strategy (Nugroho 2017; Subaktilah 2018). The SWOT analysis was conducted in the following stages (Nugroho 2017; Subaktilah 2018; Wicaksono 2017): identifying internal and external factors, weighting factors from scale 1.0 (crucial) to 0.0 (not important), ranking each factor from scale 4 (high) to 1 (low), calculating the weighted values and rating values to obtain scores. The scores of each weighted factor varied from 4.0 (prominent) to 1.0 (weak). The assessment results were further analyzed descriptively to describe the environmental conditions and formulate the business development strategies for ornamental fish in Southeast Sulawesi. The weighted scores for each factor varied from 4.0 (prominent) to 1.0 (weak). The data was processed through the SWOT matrix to get an overview of the position of each factor and formulate strategies that can be carried out. Internal and external factors from stakeholders of the ornamental fish business to determine the strategic position for the development of ornamental fish business in Southeast Sulawesi.

RESULTS AND DISCUSSION

The potential of ornamental fish

Volumes of marine and freshwater ornamental fish transported domestically have significantly increased for each by 69.64% per year and 29.06% per year. Meanwhile, the volume of ornamental fish has increased by 27.51% per year. The ornamental fish transported in 2017 reached 23.32 million fish consisting of 20.61 million freshwater ornamental fish and 2.61 million seawater ornamental fish (MMAF 2018). Southeast Sulawesi is the fifth largest province supplying freshwater ornamental fish with 0.46 million fish or 2.24% of Indonesia's total ornamental fish production (MMAF 2019). Meanwhile, the result of marine ornamental fish commodity of this province, of which the most territory is the sea, is only 0.03% and places the eleventh rank of the provincial contributor to the national production of marine ornamental fish (MMAF 2018).

The potential geographical position of Southeast Sulawesi, at 38.140 km² (3.814.000 ha/25.7%) of land area and 110,000 km² (11.000.000 ha/74.3%) of sea area, has not been utilized optimally. This problem occurs because out of the 17 cities/regencies surrounded mainly by the sea, only three of them are the breadbasket of ornamental fish. They are Konawe (56%), South Konawe (39%), and Kendari (5%) (BPS-Statistics of Sulawesi Tenggara Province 2020). The high commerce values and the increasing market demands should trigger the utilization of potential natural resources by emphasizing the principles of usefulness and sustainability. The data of ornamental fish sent from Southeast Sulawesi to Bali and Java from 2017 to 2019 are presented in Table 1.

Southeast Sulawesi had produced 38 species of ornamental fish from 2017 to 2019. However, the volume of ornamental fish delivery to other areas likely decreased (Figure 1). This decline occurred along with the declining demands for ornamental fish worldwide, such as in the European Union as one of the export destinations of Indonesia (OATA 2018). The ornamental fish production depends on the request of ornamental fish exporters, and

thus, fluctuating productions of each species frequently occur. This study revealed that the stable production was only in Betok Kupang, ae Banggai Cardinal Fish, Angel KKO, Clown Fish, Dian Fish, Letter Six, Keling Red Head, Angel Pajamas, and Angel Napoleon. The data of the major commodities of 38 traded ornamental fish species are presented in Figure 2.

Indonesia's potential position of ornamental fish worldwide

Ornamental fish is a very promising commodity with high prices. This condition makes the ornamental fish a new mainstay of world trade. Indonesia, as a mega biodiverse country, should become one of the world's ornamental fish exporters. The Asian continent is the world's major ornamental fish exporter with a total export of US$ 197.7 million (Soni et al. 2021). Meanwhile, European countries, as the second major ornamental fish exporter, earn the balance of trade values for US$ 95.8 million. Singapore, Spain, Japan, Burma, and Indonesia are the world's top five ornamental fish exporters (Table 2) (Raja et al. 2019). The world trading data show that Singapore is the leading ornamental fish exporter for the European Union and occupies 20.2% of the market share or €14,983 and since the 1980s has become the world's largest exporter of ornamental fish (Ladisa et al. 2017), while Indonesia occupies the fourth position with a total of 12.1% worth €8,925 (Figure 3). Meanwhile, Indonesia occupies 12.1% of the market share or €8,925. The export market of freshwater ornamental fish to the European Union indicates that Singapore occupies 24.0% with a value of €14,852. In comparison, Indonesia occupies 7.7% and ranks fourth place with a value of €4,736. Indonesia's marine ornamental fish export to the EU ranks first with 34.3% or €4,189, followed by the United States, the Philippines, Sri Lanka, and Kenya. Indonesia's main countries of ornamental fish export in the EU are the United Kingdom, Germany, the Netherlands, France, and Belgium (OATA 2018).

The trade marketing of ornamental fish describes marketing channels of ornamental fish starting from manufacturers to consumers. Meanwhile, trade marketing of ornamental fish in Southeast Sulawesi starts from fishermen's catching fish in nature. Ornamental fishers are fostered by collectors and originally receive accommodation for operational activities. However, they can further finance their activities of catching ornamental fish. The whole results of fish catch are collected to collectors, then put in a fish tub. Collectors are a part of a company and function to collect, sort, and grade ornamental fish to send to exporters. Fish in the tub are separated by types, sizes, and health conditions. Then, the fish are transported to exporters in Denpasar (Bali) and Banten. The data show that 79.59% of Southeast Sulawesi's ornamental fish is delivered to Bali while the rest of the commodity is sent to Banten (MMAF 2018). The trade of ornamental fish in Southeast Sulawesi is presented in Figure 4.

SWOT analysis

The results of assessing internal factors presented in Table 3 show the strength of 2.163 and weaknesses of 0.791. Meanwhile, Table 4 shows that the results of assessing external factors show the opportunity of 2.045 and the threat of 0.894. Internal factors signify that the business development in ornamental fish in Southeast Sulawesi has greater strength values than weakness values.

Table 1. List of economically important ornamental fish in Southeast Sulawesi, Indonesia

Trading name	Scientific name
Angel Batman	*Pomacanthus imperator*
Angel Doreng	*Centropyge* sp.
Angel Maria	*Centropyge aurantius*
Angel Model	*Centropyge bispinosus*
Bluester	*Chrysiptera springeri*
Keling Rub	*Cirrhilabrus* sp.
Mandarin Fish	*Synchiropus splendidus*
Naso Bali	*Naso hexacanthus*
Panther	*Pseudochromis* sp.
Anemon Pelet Warna	*Heteractis magnifica*
Betok Kupang	*Chrysietera cyanea*
Capungan	*Apogon* sp.
Angel KKO	*Cirrhilabrus* sp.
Clown Fish	*Amphiprion ocellaris*
Betok Biru	*Pamacentrus pavo*
Dian Fish	*Cirrhilabrus* sp.
Letter six	*Paracanthurus hepatus*
Roket Biasa	*Ptereleotris* sp.
Udang Hias (Api)	*Lysmata* sp.
Goby kuning	*Gobiodon okinawae*
Ikan Gagak Hidung Panjang	*Oxycirrlitus typus*
Bintang Laut	*Asteroidea* sp.
Keling Kepala Merah	*Coris* sp.
Angel Piyama	*Euxiphipops navarchus*
Bima Panther	*Pseudochromis* sp.
Mandarin Fish	*Siniperca chuatsi*
Angel Napoleon	*Pomacanthus* sp.
Udang Hias (Api)	*Lysmata debelius*
Angel BK	*Centropyge bicolor*
Angel Tompel	*Euxiphipops* sp.
Manny Banded Angelfish	*Centropyge* sp.
Anemon Pelet Warna	*Heteractis magnifica*
Triger Strip	*Balistoides* sp.
Attenia	*Oxycirrhitus typus*
Bintang Biru	*Linkia* sp.
Samadar Cicit	*Siganus vulpinus*
Kepe-kepe	*Chaetodon* sp.
Botana	*Acanthurus* sp.

Note: Fish Quarantine and Inspection Agency of Kendari (2020)

Table 2. Top five ornamental fish exporting countries in the world

Countries	Export value (US$)
Singapore	42,974,938
Spain	39,562,418
Japan	33,107,482
Burma	32,055,278
Indonesia	24,641,463

Note: Raja et al. (2019)

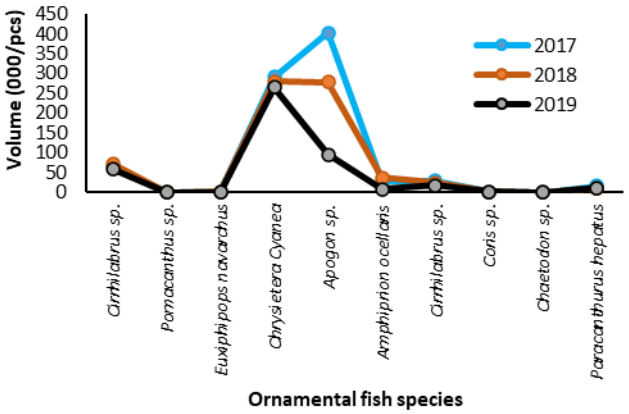


Figure 1. Domestic volume total of shipments of ornamental fish from Southeast Sulawesi (Fish Quarantine and Inspection Agency of Kendari (2020))

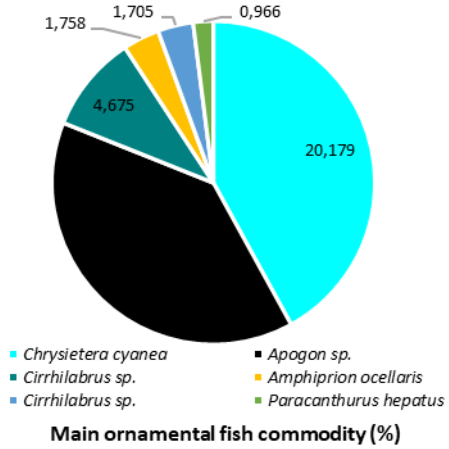
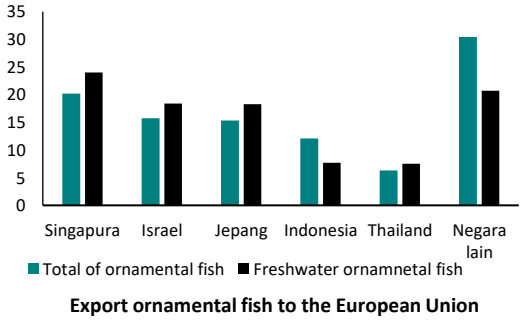
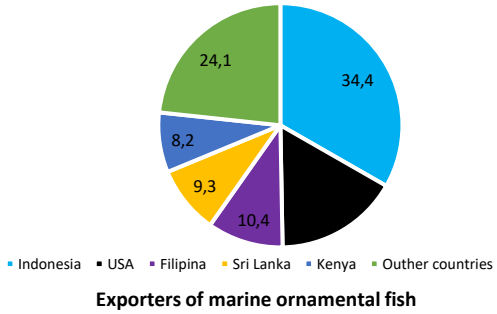


Figure 2. The main commodity for ornamental fish is sent out of the region



A



B

Figure 3. Total exports of ornamental fish, A. freshwater ornamental fish and B. Marine ornamental fish to the European Union (OATA, 2018)

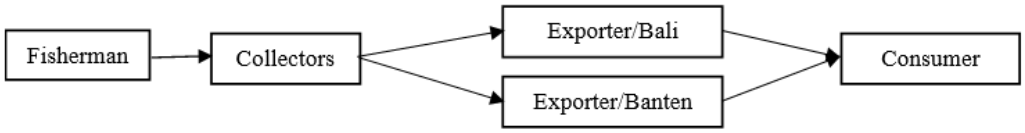


Figure 4 Ornamental fish trading system in Southeast Sulawesi, Indonesia

Table 3. Analysis of the internal factors

	Strengths (S)	**Weight**	**Rating**	**Score**
1	The conformity of the environment and resources for fish business	0.110	4	0.440
2	The knowledge and competence of ornamental fisherman or fish farmers	0.110	4	0.440
3	Economic and export values of ornamental fish	0.110	4	0.440
4	Possibility of SMEs and household to run ornamental fish business	0.105	3.86	0.404
5	The diversity of ornamental fish species in Sulawesi	0.110	4	0.440
Total strength score		0.545		2.163
	Weaknesses (W)			
1	Catching as the primary sources of ornamental fish	0.094	1.857	0.175
2	The decreasing delivery volumes of ornamental fish to another area	0.099	1.714	0.171
3	The lack of government supports and community	0.084	1.714	0.144
4	The limited or absent aquaculture production of ornamental fish	0.094	1.571	0.148
5	The absent joint ventures of ornamental fish entrepreneurs.	0.084	1.833	0.154
Total weakness score		0.455		0.791
Total (strength and weakness)				2.954

Table 4. Analysis of the external factors

	Opportunities (O)	Weight	Rating	Score
1	Availability of ornamental fish resources from nature	0.085	4	0.341
2	International market demands for ornamental fish	0.112	4	0.448
3	The cooperative relationship between the fishermen/farmers and local exporters	0.112	4	0.448
4	Indonesia's position as the world's top five ornamental fish exporters	0.101	3.57	0.362
5	The presence of ornamental fish exporters	0.112	4	0.448
Total opportunity score		0.522		2.045
	Threats (T)			
1	Pressures on the habitat of ornamental fish	0.080	1.86	0.148
2	The absent markets center for ornamental fish in Southeast Sulawesi	0.099	2	0.199
3	Insufficient ornamental fish contests or exhibitions in Southeast Sulawesi	0.087	1.83	0.160
4	More minor transportation supports	0.106	1.83	0.194
5	Competitive pricing	0.106	1.83	0.194
Total threat score		0.478		0.894
Total (opportunities and threats)				2.940

Moreover, the external factors of business development in ornamental fish in Southeast Sulawesi have greater opportunity values than threat values. Based on the calculation results presented in Tables 3 and 4, the strength values are higher than the weakness values with a difference of (+)1372. Besides, the opportunity values are higher than the barrier values with a difference of (+)1.151. Based on the factor identification, the position in the SWOT diagram describes that the business development in ornamental fish in Southeast Sulawesi is potentially conducted.

Business development in ornamental fish

The strategy requires careful consideration based on the measurable assessment. The SWOT analysis provides a reference for understanding the internal and external environment. The ability to understand the internal environment becomes a decisive factor in formulating advantages against competitors. Meanwhile, the ability to understand the external environment will be a basic consideration to develop the ornamental fish business. The SWOT analysis results show that the business development in ornamental fish in Southeast Sulawesi is in quadrant I, as presented in Figure 5.

The business development in ornamental fish is in quadrant I, has more excellent opportunities than threats, and performs greater strength than weakness. These positions provide the right space to increase efforts to develop business in ornamental fish using the Strength–Opportunity (S-O) strategy (Table 5). The strategy directs the efforts made to optimize the strengths and exploit the existing opportunities. Moreover, the category contains various alternative strategies that utilize opportunities to empower the strengths or advantages (Sari and Oktafianto 2017).

Indonesia is an ornamental fish exporter and has exported ornamental fish commodities since 2001 (Wood 2001; Khoironi and Saskara 2017). Southeast Sulawesi is one of the ornamental fish producers who dominantly send to Bali and Banten. The ornamental fish exported chiefly contributes to the country's foreign exchange. Unfortunately, the current production of marine and freshwater ornamental fish commodities in Indonesia has not been optimal. In fact, if the ornamental fish is appropriately managed, it offers great potential to improve Indonesians' welfare. The potential for the development of Indonesian ornamental fish is very prospective when compared to Singapore, Malaysia, and Thailand because of lower operating costs, available labor and land for cultivation, and international trade connections (Yue 2019).

Indonesia, as one of the world's biodiversity centers, periodically attempts to increase its production capacity. MMAF (2021) released data that the national production of ornamental fish risen from 1.19 billion fish in 2017 to 1.22 billion fish in 2018. Moreover, the production grew by 1.28 billion fish with a trade balance value of USD19.81 billion in 2019. Approximately 90% of the traded freshwater ornamental fish comes from aquaculture while the rest of traded fish is from the catch in nature; on the contrary, 10% of the marine ornamental fish is cultivated, and 90% of it is caught in nature (Willis and Bakuwel 2018). The ornamental fish trade constantly grows and mainly depends on the catch in nature. The sustainable ornamental fish trade is necessarily conducted, and cultivation becomes the best alternative because it guarantees quality, quantity, and sustainability (Pouil et al. 2020). As the principal capital to increase the production of ornamental fish, natural and human resources are necessarily optimized by utilizing cultivation technology, capital, and markets.

Figure 5. SWOT diagram for ornamental fish business development in Southeast Sulawesi, Indonesia

Table 5. Strategies S-O

Strengths (S)	Opportunities (O)
The conformity of the environment and resources for fish business	The abundant availability of ornamental fish resources from nature
Knowledge and competence of ornamental fishers/fish farmers	International market demands for ornamental fish
Economic and export values of ornamental fish	The cooperative relationship between fishers/farmers and local exporters
Possibility of SMEs and household to run ornamental fish business	Indonesia's position as the world's top five ornamental fish exporters
The diversity of ornamental fish species in Sulawesi	The presence of ornamental fish exporters
The Strength–Opportunity (S-O) Strategy	
Managing and protecting the environment as the habitat of ornamental fish	
Strengthening the capacity of fishers and stakeholders to conduct environmentally-friendly activities and export orientation	
Building cooperation of fishers, exporters, and stakeholders to develop ornamental fish business	
Emphasizing local species with high economic values and market demands	

In conclusion, Southeast Sulawesi has the potentials to be a producer of various ornamental fish species with export values. The study reveals that 38 species are traded, and nine of them are dominantly traded. Moreover, there are six main species potentially cultivated due to the demand and stable production. They are *Chrysietera cyanea*, *Apogon* sp., *Cirrhilabrus* sp., *Amphiprion ocellaris*, *Cirrhilabrus* sp. and *Paracanthurus hepatus*. The ornamental fish cultivation can still be developed using the S-O strategy to redirect several efforts to optimize the strengths and exploit the existing ornamental fish export market. The intended efforts include (1) managing and protecting the environmental habitat of ornamental fish, (2) strengthening the capacity of fishers and stakeholders for environmentally friendly activities and export market orientation, and (3) building cooperation of fishermen, exporters, and stakeholders to develop business in ornamental fish by emphasizing local species with high economic values and market demands.

ACKNOWLEDGEMENTS

The authors are very grateful to the Fish Quarantine and Inspection Agency of Kendari. The authors declare no conflict of interest.

REFERENCES

Anjur N, Sabran SF, Daud HM, Othman NZ. 2021. An update on the ornamental fish industry in Malaysia: *Aeromonas hydrophila*-associated disease and its treatment control. Vet World 14 (5): 1143. DOI: 10.14202/vetworld.2021.1143-1152.

Badan Pusat Statistik [BPS]. 2020. Sulawesi Tenggara dalam angka. [Indonesian]

Chasanah E. 2008. Marine biodiscovery research in Indonesia: challenges and rewards. J Coast Dev 12 (1): 1-12.

Fahmi M, Ginanjar R, Kusumah RV. 2015. Keragaman ikan hias di lahan gambut Cagar Biosfer Bukit-Batu, Propinsi Riau. Pros Sem Nas Masy Biodiv Indon 1 (1): 51-58. DOI: 10.13057/psnmbi/m010108. [Indonesian]

Khoironi FE, Saskara IAN. 2017. Analisis pengaruh kurs dollar, inflasi, dan produksi terhadap ekspor ikan hias di provinsi bali. E Jurnal EP Universitas Udayana 6 (3): 337-36. [Indonesian]

Ladisa C, Bruni M, Lovatelli A. 2017. Overview of ornamental species aquaculture. FAO Aquac Newsl 56: 39.

Loh R, Vukcevic J, Bastos G. 2020. Current status of aquatic veterinary services for ornamental fish in Australasia. N Z Vet J 68 (3): 145-149. DOI: 10.1080/00480169.2020.1718564.

Maulidia M, Dargusch P, Ashworth P, Ardiansyah F. 2019. Rethinking renewable energy targets and electricity sector reform in Indonesia: A private sector perspective. Renew Sust Energ Rev 101: 231-247. DOI: 10.1016/j.rser.2018.11.005.

Ministry of Marine Affairs and Fisheries [MMAF]. 2018. https://kkp.go.id/kkp/bkipm/artikel/6157-peta-lalulintas-ikan-hias-2018.

Ministry of Marine Affairs and Fisheries [MMAF]. 2019. https://kkp.go.id/djpb/artikel/12566-kkp-serius-garap-potensi-budidaya-ikan-hias-nasional.

Ministry of Marine Affairs and Fisheries [MMAF]. 2021. https://kkp.go.id/djpb/artikel/26251-kkp-budidaya-ikan-hias-tingkatkan-pendapatan-masyarakat-di-tengah-pandemi.

Nugroho BD, Hardjomidjojo H. 2017. The strategy for the development of freshwater consumption fish and freshwater ornamental fish in the poikandu partner group in bogor regency. Manajemen IKM: Jurnal Manajemen Pengembangan Industri Kecil Menengah 12 (2): 127-136. DOI: 10.29244/mikm.12.2.127-136. [Indonesian]

Nuryanto A, Bhagawati D. 2020. Evaluation of conservation and trade status of marine ornamental fish harvested from Pangandaran Coastal Waters, West Java, Indonesia. Biodiversitas 21 (2). DOI: 10.13057/biodiv/d210212.

Ornamental Aquatic Trade Association LTD [OATA]. 2018. EU Ornamental Fish Import & Export Statistics 2017, (Third Countries & Intra-EU Community trade).

Pouil S, Tlusty MF, Rhyne AL, Metian M. 2020. Aquaculture of marine ornamental fish: overview of the production trends and the role of academia in research progress. Rev Aquac 12 (2): 1217-1230. DOI: 10.1111/raq.12381.

Raja K, Aanand P, Padmavathy S, Sampathkumar JS. 2019. Present and future market trends of Indian ornamental fish sector. Intl J Fish Aquat Sci 7 (2): 6-15.

Ramachandran A. 2002. Freshwater Indigenous Ornamental Fish Resources in Kerala and Their Prospects for International Marketing. In: Boopendranath MR, Meenakumari B, Joseph J, Sankar TV, Pravin P, Edwin L (eds.). Riverine an Reservoir Fisheries if India. Central Institute of Fisheries Technology and Society of Fisheries Technologists, India.

Sari DP, Oktafianto A. 2017. Determination of Business Strategy Using SWOT Analysis and IFAS - EFAS Matrix on CV. Dinasty. Seminar Nasional IENACO. [Indonesian]

Satam SB, Sawant NH, Ghughuskar MM, Sahastrabuddhe VD, Naik VV, Pagarkar AU, Chogale ND, Metar SY, Shinde KM, Sadawarte V R, Sawant A N, Singh H, Sawant PA, Patil VK, Rane D, Haldankar PM, Bhattacharyya T. 2018. Ornamental fisheries: a new avenue to supplement farm income. Adv Agric Res Technol J 2 (2): 193-197.

Sharma M. 2020. Ornamental fish rearing and breeding-a new dimension to aquaculture entrepreneurship in Himachal Pradesh. Intl J Fish Aquat Stud 8 (2): 157-162.

Sinansari S, Priono B. 2019. Opportunity and business challenge of marine ornamental fishes in Indonesia as a potential commodity of fisheries. In IOP Conf Ser: Earth Environ Sci 230 (1): e012067. DOI: 10.1088/1755-1315/230/1/012067.

Sofian A, Suhermanto A, Saidin S, Sayuti M, Novianto D, Widyasari F. 2021. Environment and morphometric of sea hare *Dolabella auricularia* from shrimp pond, Sorong, West Papua, Indonesia. Biodiversitas 22 (2): 983-987. DOI: 10.13057/biodiv/d220254.

Soni M, Qureshi QA, Mishra M, Nishad CS, Chhaba B, Das SA. 2021. Common *Aeromonas* infections in ornamental fishes: a review. In Biol Forum–Intl J 13 (2): 433-439.

Subaktilah Y, Kuswardani N, Yuwanti S. 2018. SWOT analysis: Internal and external factors in the development of a brown sugar cane business (Case Study at UKM Bumi Asih, Bondowoso Regency). Jurnal Agroteknologi 12 (02): 107-115. DOI: 10.19184/j-agt.v12i02.9276. [Indonesian]

Sullivan ME. 2014. Fishing For Answers: Improving welfare for aquarium fish. [Doctoral dissertation]. University of Western Australia.

Von Rintelen K, Arida E, Häuser C. 2017. A review of biodiversity-related issues and challenges in megadiverse Indonesia and other Southeast Asian countries. Res Ideas Outcomes 3: e20860. DOI: 10.3897/rio.3.e20860.

Wicaksono A. 2017. Marketing strategy using SWOT analysis without industrial scale at PT X in Jakarta. Jurnal Manajemen Industri dan Logistik 1 (2): 192-201. DOI: 10.30988/jmil.v1i2.19. [Indonesian]

Wijaya RA, Huda HM. 2021. Potential and problems of ornamental fish farming development in Depok City (case study: neon tetra, cardinal and red nose ornamental fish farmer in Bojongsari District). In IOP Conf Ser: Earth Environ Sci 718 (1): 012072. DOI: 10.1088/1755-1315/718/1/012072.

Willis S, Bakuwel P. 2018. Update on the ornamental aquatic export industry 2016: trade data and conservation. OFI Journal 86: February 2018.

Wood E. 2001. Collection of Coral Reef Fish for Aquaria: Global Trade, Conservation Issues and Management Strategies. Marine Conservation Society, United Kingdom.

Yue G. 2019. The ornamental fish industry in Singapore. J Fish China 43 (1): 116-127. DOI: 10.11964/jfc.20180911442.