Diversity and Conservation Status of Ornamental Fish in Bandung, West Java, Indonesia

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ABSTRACT

Indonesia is a rich area in biodiversity and several fish populations are potential to ornamental fish development. Ornamental fish development is one of the interesting commodities because it has a broad market share both locally and export. Increased demand for ornamental fish in the market leads breaders or traders who make ornamental fish as a potential commodity and it can impact on fish conservation. However, the potential of ornamental fish had not been properly recorded so that mapping needs to undertake. This study aims to know the diversity of fish which traded and the condition of business actors, especially in the Tegallega ornamental fish market, Bandung. The research was conducted through interviews and direct observations in the field from January to February 2018. The results showed that there were 55 species of fish belonging to 27 Families; the most popular fish is Goldfish (Carassius auratus). Two species including to Endangered (EN) category, one species including to Vulnerable (VU) category, 24 species including to Least Concern (LC) category, three species including to category of Data Deficient (DD), and nine species including to category of Not Evaluated (NE). This data can be used to be more information about the conditions of ornamental fish commodities for businessman, fisheries services, academics, and management strategies by goverment regarding ornamental fish.

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Introduction

The increasing demand for ornamental fish, both domestic and international markets, has made more farmers and traders make ornamental fish a mainstay commodity, and has the potential to improve the national economy and support Indonesia's national fisheries development (Kusrini, 2010). The value of Indonesian ornamental fish exports in 2015 reached USD 19.7 million and became the fifth largest exporter in the world (Pemerintah Provinsi Jawa Barat, 2017).

To supply the needs of ornamental fish both domestic and international markets, it can be done by cultivation and catching

from nature. In Indonesia, trade in ornamental fish comes from native Indonesian fish as well as from outside the Indonesian territory that has been successfully introduced and cultivated in Indonesia. Dee et al., (2014) and Wood (2001) state that Indonesia has consistently been a major suplier of marine ornamental and top exporter of coral reef wildlife for over 30 years. However, the demand for high ornamental fish commodities can affect the existence of ornamental fish populations, especially those captured from nature, as is the case to bala shark (*Balanteocheilos melanopterus*), pygmy loach (*Botia sidthimunki*) and Arowana (*Scleropages formosus*) (Ng & Tan, 1997). To conserve and sustainable exploited the fish population, measures should be adopted to protect this natural resourch.

One of the government programs currently being carried out is the development of the ornamental fish industry. However, data on ornamental fish commodities in Indonesia is still very limited, especially for information about domestic ornamental fish marketing data is still not available (Kemenko Kemaritiman, 2017). Several studies related to ornamental fish have been carried out in Indonesia, as well as by Lunn & Moreau (2004), Madduppa et al., (2014) and Genisa (1999) which focus on a list of fish that have the potential to have economic value and list of fish in river ecosystem (Paujiah et al. 2013; Samitra & Rozi, 2019). In addition, Muchlisin (2017) studies the potential of fish for aquaculture development programs. The research discusses how the composition of fish species traded and how its conservation status has never been reported. Therefore it is necessary to map the potential of ornamental fish, its conservation status and business actors such as one of them is in the Tegallega ornamental fish market, Bandung City. The Tegallega ornamental fish market located in Bandung City, West Java province is one of the strategic areas. Geographically, the ornamental fish market is located at 6°56'14 "LS and 107°36'07" BT. With these geographic conditions, this area is suitable to be used as the development of the ornamental fish business.

Information about ornamental fish commodities can be started from data collection of ornamental fish species. Furthermore, this information can be used for analysis such as determining the status of fish conservation as bases data for making decision in fisheries management. Therefore, this study aims to evaluate the composition of ornamental fish species and their conservation status in the Tegallega ornamental fish market area of Bandung City by interviewing and direct observation.

Materials and Methods

This research was conducted in two stages, namely field research in January - February 2018 followed by observations in the laboratory in March-May 2018. Field research was conducted in the Tegallega Market area, especially in the places of sale of ornamental fish. Administratively, the Tegallega Ornamental Market is located on Jl. Peta, No. 40, Pelindungan Hewan, Astanaanyar, Bandung City, West Java.

Reseach Procedure. This research was conducted using survey research methods (non-experiment), in the form of interviews for collecting information / data regarding the trade activities of ornamental fish in the Tegallega market. Data collected include types of fish traded, conservation status and social demographic conditions of business actors. Fish identification was carried out in the Integrated Laboratory, UIN Sunan Gunung Djati Bandung by using identification books as well as Kottelat et al. (1993) and Nelson (1994). Fish samples are then preserved for long periods of time using Alcohol 70%.

Data analisys. The data were tabulated using Microsoft Excel program to determine the composition of the fish species. Furthermore, the analysis of the conservation status of the fish samples is done by evaluating the conservation status

contained in the web directory of IUCN (www.iucn.org). In addition, an evaluation based on additional information from fish base data and publication information as well as the latest information was clarified by taxonomists from LIPI.

Results and Discussion

The results of this research consist of the composition of the ornamental fish species that were traded, the status of its conservation and the shipment area of the fish. In addition, the social demographic conditions of traders are described as supplementary data.

Demography Social Condition of Ornamental Fish Trader

The fish trader in the Tegallega market consist of 24. This number is categorized into four level of age. The first level is age of 20-30 year (three of man and one of women). The second level is age of 31-40 years with total 14 (11 of men and three of women). The thrid level is age of 41-50 year with three people of man and the end level is age of 51-60 years with total is three of men.

The experiences of this trader ornamental fish have varieted for each trader (Figure 1). The busines actors of ornamental fish have varieted modal by year to year for starting of ornamental fish business. The business fund that used in the year of 1990-1995 around of Rp. 0-Rp.10.000.000, in the year of 1996-2000 around of Rp. 0-Rp.15.000.000, in the year of 2001-2005 around of Rp. 0-Rp.50.000.000, in the year of 2006-2010 around of Rp. 0-Rp.30.000.000 and in the year of 2011-2015 around of Rp. 0-Rp.20.000.000.

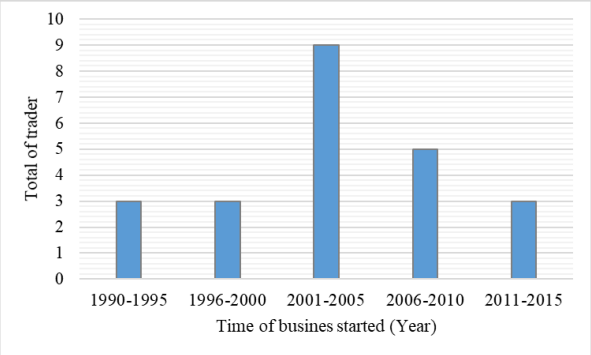

Figure 1. Total of ornamental fish trader based on time of business started

The Diversity and Conservation Status of Ornamental Fish

The diversity and conservation status of ornamental fish from Tegallega market based on IUCN Red List of Threatened Species (IUCN, 2015) can be seen in the Table 1.

Tabel 1. The diversity and conservation status of ornamental fish that sold in the Tegallega market (EN=Endangered; VU=Vulnerable; LC= Least Concern; DD=Data Deficient; NE=Not Evaluated)

No.	Local name	Species	Sender area	Conservation Status (IUCN)
1	Bala shark	*Balantiocheilos melanopterus*	Palembang, Bogor	EN
2	Patin siam	*Pangasinodon hypophthalmus*	Bogor	EN
3	Cupang adu, Thailand	*Betta splendens*	Medan, Thailand	VU
4	Unicorn	*Naso unicornis*	Banyuwangi	LC
5	Dory, Blue tang	*Paracanthurus hepatus*	Banyuwangi	LC
6	Butterfly, Copperband	*Chelmon rostratus*	Banyuwangi	LC
7	Butterfly, Klein	*Chaetodon kleinii*	Banyuwangi	LC
8	Butterfly, Threadfin	*Chaetodon Auriga*	Banyuwangi	LC

9	Lemon	*Labidochromis caeruleus*	Bogor	LC
10	Electric Blue	*Sciaenochromis ahli*	Depok, Tulungagung,	LC
11	Lele Bule	*Clarias batrachus*	Bogor	LC
12	Zebra Danio	*Danio rerio*	Bogor	LC
13	*Goldfish*, Koki, Komet, Mas	*Carassius auratus*	Purwakarta, Sukabumi, Bogor	LC
14	Koi	*Cyprinus rubrofuscus*	Blitar, Sukabumi, Bogor,	LC
15	Redfin, Rainbow Shark	*Epalzeorhynchos frenatum*	Bogor, Jakarta	LC
16	Rosy Barb	*Pethia conchonius*	Bogor	LC
17	Srigunting	*Rasbora trilineata*	Bogor	LC
18	Keling kuning, Yellow wrase	*Halichoeres chrysus*	Banyuwangi, Jakarta	LC
19	Featherfin	*Synodontis eupterus*	Tulungagung, Bogor, Jakarta	LC
20	Belida, Lopis	*Chitala lopis*	Palembang, Bogor	LC
21	Cupang Halfmoon	*Betta imbelis*	Medan, Thailand, Bogor, Jakarta	LC
22	Sepat hias	*Trichopodus trichopterus*	Bogor	LC
23	Palmas	*Polypterus palmas*	Medan, Palembang, Bogor	LC
24	Nemo, Badut	*Amphiprion percula*	Banyuwangi	LC
25	Blue Damsel, Cantik	*Chrysiptera cyanea*	Banyuwangi	LC
26	Baronang, Foxface rabbitfish	*Siganus vulpinus*	Banyuwangi	LC
27	Arapaima	*Arapaima gigas*	Amazone,	DD
28	Butterfly, Spottail	*Chaetodon ocellicaudus*	Banyuwangi	DD
29	Dwarf Rainbowfish	*Melanotaenia praecox*	Bogor, Jakarta	DD
30	Black Ghost, Ikan pisau	*Apteronotus albifrons*	Depok	NE
31	Albino Cory	*Corydoras aeneus*	Depok, Bogor, Jakarta	NE
32	Red Tail Tetra	*Aphyocharax dentatus*	Bogor, Jakarta	NE
33	Rumy Rednose Tetra	*Hemigrammus rhodostomus*	Bogor, Jakarta	NE
34	Ember Tetra	*Hyphessobrycon amandae*	Bogor, Jakarta	NE
35	Neon Tetra	*Paracheirodon innesi*	Bogor	NE
36	Red Devil	*Amphilophus labiatus*	Bogor, Jakarta	NE
37	Lou han	*Amphilophus citrinellus* × *Cichlasoma trimaculatum*	Bogor	NE
38	Oscar	*Astronotus ocellatus*	Bogor	NE
39	Diskus	*Symphysodon discus*	Bogor, Jakarta	NE
40	Manfis, Angel fish	*Pterophyllum scalare*	Bogor, Jakarta	NE

41	Botia	*Chromobotia macracanthus*	Jambi, Bogor	NE
42	Sumatera	*Puntigrus tetrazona*	Bogor	NE
43	Harlequin	*Plectorhinchus chaetodonoides*	Banyuwangi	NE
44	Alligator gar	*Atractosteus spatula*	Bogor	NE
45	Sapu, Bandaraya	*Hypostomus plecostomus*	Bandung, Jakarta	NE
46	Arwana Silver	*Osteoglossum bicirrhosum*	Kalimantan, Bogor, Jakarta	NE
47	Red Tail Catfish	*Phractocephalus hemioliopterus*	Amazone,	NE
48	Molly	*Poecilia sphenops*	Bogor	NE
49	Guppy, Impun	*Poecilia reticulate*	Bogor	NE
50	Platty	*Xiphophorus variatus*	Bogor	NE
51	Mickey mouse platy	*Xiphophorus maculatus*	Bogor, Jakarta	NE
52	Sword tail, German Metalic	*Xiphophorus hellerii*	Bogor, Jakarta	NE
53	Zebra laut, strip damselfish	*Dascyllus melanurus*	Banyuwangi,	NE
54	Silver Dollar	*Metynnis argenteus*	Lampung, Bogor	NE
55	Puff, Buntal	*Dichotomyctere nigroviridis*	Jakarta	LC

Based on Table 1, there are 55 species of fish with different categorized. Two species categorized as Endangered (EN) (Bala shark-*Balantiocheilos melanopterus* and Patin siam-*Pangasinodon hypophthalmus*). The IUCN categorize of Endangered (EN) given to species whose existance is increasingly less in the nature that can effected by the reduction of population size (population size < 2.500 of adult individuals). The cuantitative analisys showed that the probability of extinction in the wild nature at least 20% in 20 year or the fifth generation.

There is one species (ikan cupang-*B. splendens*) that can be categorized as Vulnerable (VU) species. The IUCN categorize of Vulnerable (VU) given to species with has be reduction of population size and occurs in a span of 10 years and can be extinc in nature. Several factors that can cause this species of vulnerable category are massive utilization and exploitation, especially as collection, so that the amount in nature is less.

Therefore, 24 species can be categorized as Least Concern (LC) there are Unicorn (*Naso unicornis*), Dory/*Blue tang* (*Paracanthurus hepatus*), Copperband *Butterfly* (*Chelmon rostratus*), Klein *Butterfly* (*Chaetodon kleinii*), Threadfin *Butterfly* (*Chaetodon auriga*), Lemon (*Labidochromis caeruleus*), *Electric Blue* (*Sciaenochromis ahli*), Lele Bule (*Clarias batrachus*), Zebra Danio (*Danio rerio*), Goldfish (*Carassius auratus*), Koi (*Cyprinus rubrofuscus*), Redfin/*Rainbow Shark* (*Epalzeorhynchos frenatum*), Rosy Barb (*Pethia conchonius*), Srigunting (*Rasbora trilineata*), Keling kuning/Yellow wrase (*Halichoeres chrysus*), Featherfin (*Synodontis eupterus*), Belida/Lopis (*Chitala lopis*), Cupang *Halfmoon* (*Betta imbellis*), Sepat hias (*Trichopodus trichopterus*), Palmas (*Polypterus palmas*), Nemo/Badut (*Amphiprion percula*), ikan Cantik/*Blue Damsel* (*Chrysiptera cyanea*), Baronang/*Foxface rabbitfish* (*Siganus vulpinus*), and Puff/Buntal (*Dichotomyctere nigroviridis*). The IUCN category of *Least Concern* (LC) given to species whose still abundant and can found in the nature.

There are three species that categorized as Data Deficient (DD) (Arapaima-

Arapaima gigas, Spottail Butterfly-*Chaetodon ocellicaudus*, and Dwarf Rainbow fish-*Melanotaenia praecox*). The species in the category of Data Deficient (DD) is the species with no more or enough information about its conservation status. The data deficient not only show that the species have not been studied yet extensifly, but can show that its species that less caught or not available information about species abundance and distribution.

There are nine species that categorized as *Not Evaluated* (NE). The species are Ikan pisau/Black Ghost (*Apteronotus albifrons*), Albino Cory (*Corydoras aeneus*), Red Tail Tetra (*Aphyocharax dentatus*), Rumy Rednose Tetra (*Hemigrammus rhodostomus*), Ember Tetra (*Hyphessobrycon amandae*), Neon Tetra (*Paracheirodon innesi*), Red Devil (*Amphilophus labiatus*), Lou han (*Amphilophus citrinellus* × *Cichlasoma trimaculatum*), Oscar (*Astronotus ocellatus*), Diskus (*Symphysodon discus*) Manfis/*Angel fish* (*Pterophyllum scalare*), Botia (*Chromobotia macracanthus*), ikan Sumatera (*Puntigrus tetrazona*), Harlequin (*Plectorhinchus chaetodonoides*), Alligator gar (*Atractosteus spatula*), Sapu-sapu/Bandaraya (*Hypostomus plecostomus*), Arwana Silver (*Osteoglossum bicirrhosum*), Red Tail Catfish (*Phractocephalus hemioliopterus*), Molly (*Poecilia sphenops*), Guppy/Impun (*Poecilia reticulata*), Platty (*Xiphophorus variatus*), Mickey mouse platy (*Xiphophorus maculatus*), Sword tail/*German Metalic* (*Xiphophorus hellerii*), Zebra laut/*Strip damselfish* (*Dascyllus melanurus*), dan *Silver Dollar* (*Metynnis argenteus*). The IUCN category of *Not Evaluated* (NE) given to species with not identification, absolutely.

Ornamental fish is one of the most promising export commodities. Haryono et al., (2016), stated that the high demand for both domestic and international markets caused the increase of public interest in pursuing the business of ornamental fish. This is evident from the number of production which has continued to increase since 2012 (Utami, 2013). According to Subiakto (2014), in the period of 2010 – 2013, the income of houshold from the ornamental fish cultivation sector could reach Rp. 50.840.000 / year.

In the business of ornamental fish, knowledge of the types of ornamental fish business is very important for businesses to be able to adjust their abilities so that later they can choose the right type of business. Haryono *et al*. (2016) stated that the type of business in the ornamental fish business is very much related to the amount of capital to be invested. The difference in capital found in traders lies in the type of fish sold and the maintenance costs of the fish. Moreover, such as the size of the trade stalls, the number of aquariums, water, lighting, and the use of electricity used. Excactly, the range at that time was considered sufficient bonafite in starting a business for beginners. In addition, related to starting this ornamental fish business is not attach to what the nominal must be issued. The main aspect that needs to be emphasized is what kind of ornamental fish will be offered to consumers because the type of fish traded can affects to the amount of first fund used. Haryono *et al*. (2016), states that business activities of ornamental fish have several comparative advantages, including can be done with little fund, can be done by home industries, the market is never saturated, the development of new strains can be done individually, and this business activity can empower the community through small industries that lead to exports. Based on this, ornamental fish business units in Indonesia can be categorized into several types, namely ornamental fishing in nature, ornamental fish farmers, ornamental fish breeders, traders (ornamental fish stores), ornamental fish inter-city traders, collectors, exporters and importers of ornamental fish, and associations (Kuncoro, 2009).

The importance of fish conservation status data is presented to minimize the threat of high demand for ornamental fish. This is appropriate with Government Regulation Number 60 of 2007 about Conservation of Fish Resources, which are populations vulnerable to extinction, be categorized as rare biota, there has been a reduction drastic in the number of fish populations in nature, and / or low reproductive capacity.

There are 14 locations in Indonesia and two of them are imported from outside Indonesia, which are suppliers of ornamental fish in the Tegallega fish market (Table 1). The fourteen regions are Bandung, Banyuwangi, Blitar, Bogor, Depok, Jakarta, Jambi, Kalimantan, Lampung, Medan, Palembang, Purwakarta, Sukabumi, Tulungagung.

The one location for supplying ornamental fish that is different from the location in general, namely Banyuwangi Regency. This regency is one of the regions which is the origin of the ornamental fish distribution, especially sea water ornamental fish, even exported to foreign countries such as Japan, Taiwan, Hong Kong, China and Germany (Kusrini, 2010). Ornamental fish from Banyuwangi were captured by fishermen off the coast in the Banyuwangi area. Even so, the offshore area in Banyuwangi Regency has fish houses. Fish house or commonly called a fish apartment is a building that is composed of solid objects placed in the waters, which have a function as a spawning ground for adult fish and a protection area for puppies to survive and breed (nursery ground) which aims to restore the availability of fish resources (Budhiman *et al*., 2012; Kamaali, 2016).

Conclusion

There are 55 species of fish included in 27 families with different conservation status categories. Two species including the Endangered (EN) category, one species included in the vulnerable or Vulnerable (VU) category, 24 species included in the low risk category or Least Concern (LC), three fish species included in the data or data deficiency category Deficient (DD), and nine species that fall into the Not Evaluated (NE) category. The origin of ornamental fish sending countries in the market comes from three countries, namely Indonesia (14 cities), Brazil and Thailand.

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