



## Market potential analysis for *tengas* (*Neolissochilus* sp.) in the Malaysian market

\*Khai, N. X., Kusairi, M. N., Ahmad, S., Syahaneem, M. Z. and Fatimah, M. A.

Institute of Agriculture and Food Policy Studies, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia

### Article history

Received: 28 June 2014  
Received in revised form:  
28 November 2014  
Accepted: 15 December 2014

### Keywords

*Neolissochilus* sp  
*Tengas*  
Malaysian freshwater fish  
Market potential analysis

### Abstract

There are some signals that Malaysian marine landings are decreasing and that wild stocks have been over-fished. However, it has extensive inland water bodies which have the potentials to be developed into freshwater aquaculture sites. *Tengas* (*Neolissochilus* sp.), a freshwater type of fish, are found in abundance in Malaysia; but has not reached the commercial level in the market. This paper examines the potential of developing *tengas* as a commercial freshwater species. The data used in this study were obtained through primary data search from key informants and a survey. A semi-structured open-ended questionnaire with Malay and Chinese languages was designed for the interviews. The study areas covered Peninsular Malaysia and East Malaysia. From the survey, we found that *tengas* has potential to be taken as a food item and an ornamental fish. The wild stock of *tengas* in fact is also worthwhile to be conserved for agro-tourism development. Many restaurant operators are willing to invent cooking method on *tengas*.

© All Rights Reserved

### Introduction

The Malaysian fishery industry is highly dependent on marine capture fisheries. In 2010, this sub-sector contributed approximately 71% to the total national fish production (Department of Fisheries Malaysia, 2010). However, marine fish stock has been over-exploited (Tai *et al.*, 2007). Its declining contribution to the industry is giving the stakeholders a warning sign of the need to conserve the fish stock and to look for alternatives so as to sustain the fish industry.

Malaysia has extensive inland water resources (Salam and Gopinath, 2006). Currently, inland capture fishery contributes marginally to the total fish production as this resource is far more limited than marine fish stock. However, freshwater aquaculture has ample room for improvement. In 2010, aquaculture sub-sector contributed about 29% to the total national fish production with production of 581 thousand tonnes valued at RM 2.8 thousand million of which, freshwater aquaculture contributed 27% (Department of Fisheries Malaysia, 2010). The main cultured freshwater species are red tilapia (*Oreochromis* spp.) and catfishes (*Clarias* spp.).

*Tengas* (*Neolissochilus* sp.), a freshwater fish, are found in abundance in Malaysia. Physically, both *tengas* and *kelah* (*Tor* spp.), an expensive freshwater fish species in Malaysia, are almost identical (Siti *et al.* 2007; Jamaludin, 2011). They are in the same

family, but in different species and genus (Yuzine *et al.*, 2007; Siow, 2011). Hence, some have referred to *tengas* as false mahseer (Rosly *et al.*, 2008).

*Tengas* is consumed as a food fish for certain communities in Malaysia. However, it has not reached the commercial level like other species in the Malaysian market. Introducing new food to the market can help in the food security issue, and can also be useful for the consumer by the provision of more alternatives available in the market. In fact, the market potential of the fish species in Malaysia still remains unclear due to the lack of contemporary analyses backed by formal testing procedures. Therefore, the main objective of this study is to provide a preliminary assessment of the market potential of *tengas*.

### Materials and Methods

This study attempts to study the market potential through investigate producers in order to assess the availability, price, awareness of the product. Consumer awareness is also one of the aspects to be identified in this study. However, the producers and consumers of *tengas* are widely dispersed throughout Malaysia. Information on them is not easily obtainable from existing sources. Thus a survey can be costly and prohibitive for this study.

Hence the approach taken in this study is to focus

\*Corresponding author.  
Email: [ngxinkhai@gmail.com](mailto:ngxinkhai@gmail.com)

first on restaurant operators who serve freshwater fish dishes. The scope of the study is limited to the Klang Valley and Pahang areas. To reduce the time and budgetary requirements, the snowball sampling method is chosen. This approach does not depend on the construction of a sampling frame. Although initial respondents have to be identified, further respondents depend on the references from this initial set of respondents. In the beginning stage, we depended on a Chinese restaurant owner in Serdang, who is serving freshwater fishes, to get information on *tengas* and *kelah*. From their recommendations, we were able to find more relevant retailers and intermediaries who are involved in *tengas* and *kelah* species. To ensure a diversity of contacts, we also searched for information on freshwater fish suppliers' available on the internet.

The advantage for conducting snowball sampling is that it would increase the efficiency of the study when attempting to gather information about a particular topic, when a limited number of participants or test subjects are available (Sadler *et al.*, 2010). Snowball sampling relies on referrals and by word of mouth in order to acquire more participants. Since the snowball sampling method is not based on a probabilistically determined set of respondents, the usual statistical tests based on assumed population distributions are not applicable here. This method, however, is useful as a preliminary investigative tool. The set of respondents collected can be treated as a set of case studies from which useful information can be drawn.

Personal interviews were conducted through face-to-face interviews, phone calls and emails. A semi-structured questionnaire is designed to ensure certain selected topics are covered in the discussions while able to accommodate more open-ended answers from respondents.

Besides, annual observations (2002-2007) of the total *tengas* landings and retail values are extracted from Department of Fisheries in Malaysia. The selection of the variables is based on the data availability. Both of these variables are adopted to calculate for unit value for *tengas*, as a proxy of *tengas* price.

## Results and Discussion

### *Current status of tengas*

According to Table 1, *tengas* landings increased from 1.33 metric tonnes in 2004 to 3.71 metric tonnes in 2013. However, the landings from rivers dropped drastically from 3.08 metric tonnes in 2009 to 0.83 metric tonnes in 2013. Furthermore, the landings

Table 1. *Tengas* Landings by Sources, MT (2004 – 2013)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
River	0.09	0.41	NA	0.67	NA	3.08	NA	NA	NA	0.83
Dams/Lakes	1.24	1.06	NA	0.88	NA	0	NA	NA	NA	2.88*
Total	1.33	3.40	NA	1.55	NA	3.08	NA	NA	NA	3.71

Source: Department of Fisheries (2004-2013)

Note: \**Tengas* were caught from lakes.

Table 2. Wholesale, retail, and unit values of *Tengas*, RM'000

	2005	2007	2013
Wholesale value	4.15	6.11	7.47
Retail value	6.84	9.79	12.45
Unit value* (RM/KG)	4.65	6.32	15.00

Source: Department of Fisheries (2005, 2007 and 2013)

Note: \* Authors' calculation

from dams also were last recorded in 2008.

According to the *tengas* suppliers, they are depending on the wild stock as currently there is no optimum aquaculture technology on this species. They also affirmed that *tengas* is widely available in natural habitats in Malaysia. Key informants also claimed that food for *tengas* is more flexible and also *tengas* is not as sensitive to water quality as other indigenous species, like *kelah*. Hence, it has more suitable habitats to live in and they are easily found in Malaysia. These suppliers are providing *tengas* to domestic aquarium for ornamental purpose.

According to the respondents and an informant, the average marketable size for *tengas* is around 200 grams. In fact, the key informant believes that 200 grams is sufficient in overcoming the food security issue. Although a few respondents stated that they have found *tengas* of around 2 kg, the average size of *tengas* caught is getting smaller. According to a key informant and several fish suppliers, it is increasingly difficult to find *tengas* of 1 to 2 kg in the wild due to pollution from logging activities. Besides, two respondents opined that *tengas* takes longer duration to grow. Its weight unit would not exceed 2 kg by feeding it for 2 years.

These statements have implied that heavy dependence on the wild stock and increasing difficulties in capturing larger size of *tengas* indicating that *tengas* might have been over-exploited by human activities. Sustainable aquaculture technologies, therefore, have to be introduced in order to promote sustainable supplies of *tengas* in the market.

### Price

Table 2 illustrates wholesale, retail, and unit

values of *tengas* in 2005, 2006, and 2013 due to a complete data set for *tengas* is only available for those years. Unit value of *tengas* has increased from about RM4.70 per kg in 2005 to RM15.00 per kg in 2013. The value in 2013 is higher than unit values for some common farmed freshwater fishes, like big head carp (*Aristichthys nobilis*), black tilapia, and freshwater catfish. It is also higher than the unit value of some wild caught fishes, like big head carp, freshwater catfish, lomah (*Labiobarbus ocellatus*), feather back (*Notopterus notopterus*), three spot gouramy (*Trichogaster trichopterus*), kissing gouramy (*Helostoma temminckii*), terubul (*Osteochilus hasseltii*), and tilapia nilotica. *Tengas* are also found to be of same price with wild caught red tilapia, in 2013.

In addition, unit value of total aquaculture freshwater fish (RM6.95 per KG) denotes the average unit value of these species in the market. If the higher value species, which are giant freshwater prawn, goby, and giant snakehead, are not taken into account, the average unit value is RM6.75 per KG. This implies that except for certain high-valued species the unit value of *tengas* is at par with the average level of other farmed freshwater fishes in Malaysia.

Moreover, according to the Department of Fisheries Malaysia (2002), the estimated retail price of *tengas* at major market is found RM39.38 per kg while *kelah* is only RM26.83 per kg. However, there is no data available on *tengas* in the subsequent years.

#### *Restaurant operator awareness*

*Tengas* is also named as green *kelah* in local restaurants. None of the five interviewed restaurant operators are currently serving or have served *tengas* before. Four know about *tengas* but have not served *tengas* due to lack of demand by their customers. However, some of the restaurant operators agreed that there is a viable market for *tengas* in the Klang Valley area.

According to a few web pages, restaurants in Taman Connaught and Jalan Ipoh are charging higher price for *tengas* than other freshwater fish. Some of the restaurant operators also claimed that *tengas* has similar taste and texture with *kelah* from Peninsular Malaysia. In contrast, some of them stated that the texture of *tengas* is slightly rougher than *kelah*. They believe that source of *tengas* is the key factor that affect its taste and texture. Only *tengas* living in clean water environment have good texture and taste.

One of the restaurant operators does not know about *tengas*, but he would like to try in the preparation of *tengas*, if available. Four out of five restaurant operators would like to have a few pieces

of *tengas* for testing. This indicates that restaurant operators are willing to invent some cooking methods on *tengas*, which is widely acceptable to consumers.

#### *Customer awareness*

*Tengas* is not widely known by restaurant customers. *Kelah* and *tengas* suppliers reported that most consumers have difficulties in differentiating the species. Presently, in Kampung Bukit Tinggi area, customers are hardly looking for *tengas*. As *tengas* is also named as green *kelah*; thus, some customers will compare its taste, texture, and presentation with *kelah* or red *kelah*.

Even though two out of the five restaurant operators admitted that the taste and texture of *tengas* are no different than *kelah*, their customers prefer red *kelah* as certain consumers, especially the Chinese community put more preference on red items. For instance, red tilapia is highly demanded amongst their customer compared to black tilapia.

Nevertheless, *tengas* is taken as a food fish for certain population in Malaysia. There are many of the respondents also know about *tengas* consumption in some of the Malay, Chinese and native communities. Malay communities prefer to prepare *tengas* in curry, masak lemak (coconut gravy), deep fried, and grilled. Chinese communities like to steam it with soy sauces. While, native communities also like to bake or deep fry *tengas*. It shows that *tengas* is demanded by certain population groups in Malaysia.

*Tengas* of around 200 grams is acceptable amongst Malay and native community as smaller size of *tengas* is suitable for deep frying and baking. However, the Chinese community prefer *tengas* which exceeds 1 kg as they claim that smaller *tengas* has less meat; thus, not suitable to be steamed. *Tengas* are always compared to *kelah* in the market. Thus, changing perception of consumers on *tengas* is one of the challenges in developing *tengas* as a commercial food fish. According to experience of the key-informant, in order to make new fish species, such as *tengas* more popular, it has to be promoted through restaurants. There are a few fisheries species, such as shark meat and mantis shrimps, have been successfully introduced through the restaurants even though they have no market value years ago. Moreover, mantis shrimps were once taken as feed for livestock. These species, in turn, are now famous and expensive dishes in Malaysia, particularly among Chinese community.

#### *Ornamental*

Besides being consumed for food, *tengas* has the potential to be developed as ornamental fish in

the local markets. The *tengas* suppliers claimed that *tengas* they produced, with around three inches per piece, are mainly for ornamental purpose. Currently, ornamental *tengas* of around three inches is priced from RM5 to 8 per piece at the retail level. It is available in many aquariums within the Klang Valley area.

There are numerous freshwater fish enthusiasts willing to pay high prices for ornamental fishes, including *tengas*. In fact, ornamental *tengas* has higher value compared to *tengas* for food. For instance, some respondents are willing to pay RM20 for a piece of 100-200 grams of live *tengas* to display in their restaurant or house.

#### Agro-tourism

Freshwater fishes, inclusive of *tengas*, are also worthwhile to be conserved not only for bio-diversity, but also important to be developed as an attraction for agro-tourism. According to some web pages, many of the fishers are willing to travel long distances in order to fish specific fish species, like *toman*, *kelah*, *sebarau*, and even *tengas*.

In fact, the income generated through agro-tourism can be even greater than aquaculture. Agro-tourism helps to develop the local community welfare and surrounded area economy. For instance, a well-established fish sanctuary encourages tourists to spend more on accommodation, equipments, food, and transportation.

#### Conclusion

These preliminary results indicate that *tengas* has the potential to be developed as food, ornamental, and recreational fish in Malaysian. *Tengas* from inland ecosystem, however, is too fragile to be directly extracted for commercial consumption. The wild stock is also worthwhile to be conserved as it has also high potential to be developed in agro-tourism sector, which will bring higher revenue compared to aquaculture activity.

There are many of the restaurant operators are willing to experiment cooking method on *tengas*, if it is available. One of the key informant also opined that effectively promote the new fish species to Malaysian consumers can be done through restaurants. *Tengas* from sustainable sources should be made available and accessible to restaurant operators.

Sustainable supply of the species is also a major concern in this study. As there is no optimum aquaculture technology on this species. Currently, the suppliers of *tengas* are solely relying on wild stock. In fact, there is a sign of over fishing on *tengas* in

the wild. Thus, in order to commercial this species, further studies on biological and supply chain aspects are worthwhile to be conducted.

#### Acknowledgement

We would like to express our gratitude to the invaluable sponsorship from Selangor State Fisheries Office on this project.

#### References

- Department of Fisheries Malaysia. 2002. Annual Fisheries Statistics, volume 1. Putrajaya: Department of Fisheries Malaysia, Ministry of Agriculture Malaysia.
- Department of Fisheries Malaysia. 2010. Annual Fisheries Statistics, volume 1. Putrajaya: Department of Fisheries Malaysia, Ministry of Agriculture Malaysia.
- Jamaludin, I. 2011. Ikan Kelah – Malaysian Mahseer. Research report from Jelebu Fisheries Research Institute, Malaysia.
- Rosly, H., Hanna, M. Y. and Muhammad, Z. H. 2008. Pond culture of Malaysian mahseer, *Tor douronensis*. Chapter 5 in Siti S. S., A. Christianus, & Ng C. K. (Eds). Mahseer: The biology, culture and conservation (supplementary volume), p. 45-52. Kuala Lumpur, Malaysia: Malaysian Fisheries Society.
- Sadler, G.R., Lee, H., Lim, R.S. and Fullerton, J. 2010. Recruitment of hard-to-reach population subgroups via adaptations of the snowball sampling strategy. *Nursing and Health Sciences* 12: 369-374.
- Salam, M. N. A. and N. Gopinath. 2006. Riverine fish and fisheries in Malaysia: An ignored resource. *Aquatic Ecosystem Health and Management* 9: 159-164.
- Siow, R. 2011. Pengenalan kepada ikan tengas. FRI Glami Lemi, Jelebu. Malaysia: Department of Fisheries.
- Siti, S. S., A. Christianus, Ng., C. K. and Sena, S. S. 2007. Mahseer: The biology, culture and conservation. Proceedings of the International Symposium on the Mahseer. Kuala Lumpur: Malaysian Fisheries Society.
- Tai S. Y., Kusairi M. N., Nik Mustapha R. A. and Ishak O. 2007. Fisheries Sector Development. Chapter 22 in Fatimah M. A. et al., 50 Years of Malaysian Agriculture: Transformational Issues, Challenges and Direction. Universiti Putra Malaysia Serdang: UPM Press.
- Yuzine, E., Kamarul, R. K., Khairul, A. A. R., Siti, K. D., Siti, S. S. and Tan, S. G. 2007. Phylogenetic relationship among three mahseers of the Subtribe *Tores (Cyprinidae)* in Malaysia. Chapter 14 in Siti S. S., A. Christianus, Ng C. K. and Sena, S. D. S. (Eds). Mahseer: The biology, culture and conservation, p. 203-216. Kuala Lumpur, Malaysia: Malaysian Fisheries Society.