

## Status of Trash Fish from Bottom Trawl Fishery and Utilization in Myeik Township, Tanintharyi Region, Myanmar

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### ABSTRACT

Catch data, catch composition and fishing boat information were collected from 281 bottom trawlers and 70 fish carrier boats in Myeik Township, Tanintharyi Region, Myanmar in 2017. Meanwhile 50 fishermen were interviewed for data regarding trash fish price and its distribution. Trash fish statistics were also gathered from Myanmar's Department of Fisheries of Myeik Township, Tanintharyi Region. Information on trash fish utilization for fishmeal production was also gathered by interviewing four fishmeal factory managers in Myeik Township. In addition, other related information on Myanmar fisheries was reviewed. All information was used to describe the status of trash fish from the bottom trawl fishery and its utilization. Moreover, some management aspects were discussed. From the surveys, a catch composition of 39.16% trash fish, 60.34% marketable fish and 0.50% shrimp was found at the landing site. Information from fishermen showed that all bottom trawlers sold 100% of trash fish to local fishmeal plants, and trawlers provided 55% to 70% of the total trash fish for fishmeal production. Fishmeal produced during 2013 to 2017 was exported as follows: 42.06% to Thailand and 10.67% to Malaysia. Of the remainder, 43.76% was sold in Yangon for aquaculture and animal feed and 3.51% was sold to local animal farms. The data showed that trash fish are among the targeted species of the bottom trawl fishery in Myanmar. Although Department of Fisheries of Myanmar has implemented many measures to control overfishing and to conserve juvenile fishes, fishing for trash fish has not been reduced significantly, because price and demand incentives are high. This situation has led to an increase of new fishing boats in this region. To conserve juvenile fishes of economically important species from trawl fisheries in this area, alternative management approaches are needed.

**Keywords:** Bycatch, Fishmeal, Myeik Township, Trawler, Trash Fish

### INTRODUCTION

Myeik Township is located in Tanintharyi Region, which is bounded by Mon State, Thailand and the Andaman Sea (Figure 1). Tanintharyi Region is considered to be one of the two largest fisheries industry areas of Myanmar, owing to 1,200 km of coastline along the Andaman Sea and 84,344 km<sup>2</sup> of offshore fishing grounds (Table 1).

The fishery industry plays an important role for local people, by providing employment, income and livelihood for hundreds of thousands of people in this region. However, the fisheries industry has also experienced rapid expansion and raised considerable economic and environmental concerns.

The bottom trawl is a popular commercial fishing gear and trash fish is its main catch, and

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recently, use of this fishing gear has been gaining popularity. Typically, this fishing gear catches low value fishes or trash fish, including juveniles of commercial species due to its small codend mesh size. Every low value or “trash fish” species is utilized for fisheries products in this region. Twenty years ago, trash fish caught as bycatch was only used for artisanal human food in Myanmar. At present, due to incentives of trash fish price and demand, fishermen actively target trash fish during their fishing efforts. Like in other Asian countries, the demand for trash fish has grown along with

the booming aquaculture sector, and all or most of catches are sold to markets (Staples and Funge-Smith, 2005). A large amount of this trash fish is targeted for processing by the fishmeal industry for export and also for local consumption. Unfortunately, small-size commercial fish species comprise a large proportion of this trash fish production, yet it is a fact that trash fish is important for the fishmeal industry in Myanmar. Although the Department of Fisheries of Myanmar has implemented many measures in the past five years to control overfishing and to conserve juvenile fishes, including a closed

Table 1. Area of marine fishing grounds of Myanmar.

No.	Fishing Ground	Area (km <sup>2</sup> )
1	Rakhing	36,780
2	Ayawady, and Mon	105,138
3	Tanintharyi	84,344
4	Continental shelf area of Myanmar	228,781
<b>Total</b>		<b>455,043</b>

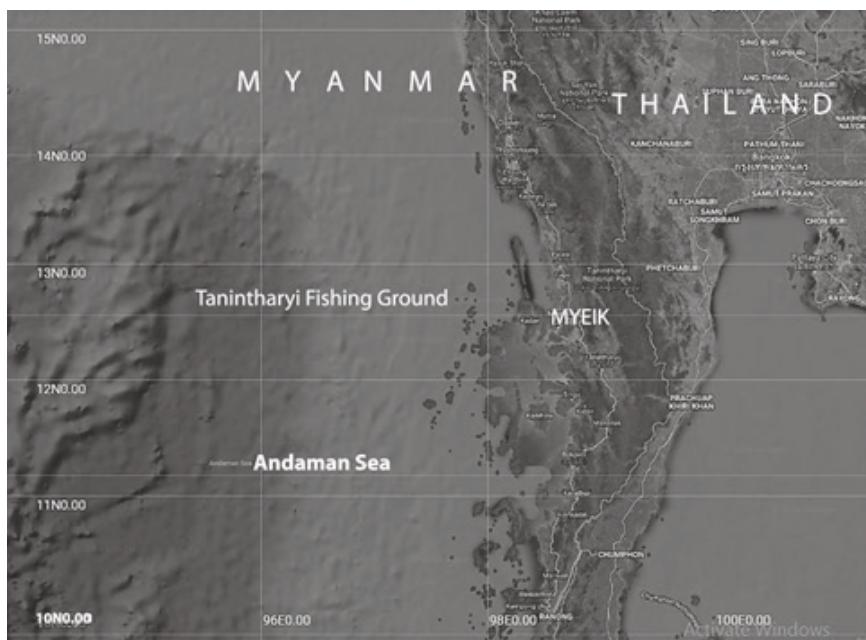


Figure 1. Location of Myeik Township and Tanintharyi Region, Myanmar.

season for all commercial fishing gears, now more fishing boats are being operated and more small-size commercial fish species are being exploited. It seems that for Myanmar, there is difficulty deciding between incomes of local people and resource conservation. To solve this problem, more information is needed, however very few surveys or other research have been published regarding the trawl fishery of Myanmar. Therefore, status of trash fish species harvested by the bottom trawler fishery and their utilization should be reviewed.

In this study, data from field surveys and relevant secondary data were gathered and analyzed, and management issues were considered. The gathered information will benefit future fisheries management to reduce the decline of economically important juvenile fish resources in the Tanintharyi Region fishing ground.

## MATERIALS AND METHODS

### *Primary data collection*

Data regarding trash fish production, catch composition and boat size were gathered from a total of 281 bottom trawlers and 70 carrier boats by field surveys at Myeik Township landing site located at  $98^{\circ} 36'34''$  E and  $12^{\circ} 24' 45''$  N, where all commercial fishing boats landed. The Department of Fisheries (DOF) of Myanmar classifies the bottom trawlers into five groups, by boat length: 12.0-17.9, 18.0-23.9, 24-29.9, 30.0-35.9 and 36.0-44.9 m; therefore the trash fish production data were gathered accordingly. Meanwhile, data for trash fish price and distribution, including market location, were collected from 50 fishermen by interviews. Information on trash fish utilization for fishmeal production was gathered by interviewing four fishmeal factory managers in Myeik Township. Data collection for this study was conducted in 2017.

### *Secondary data collection*

Yearly reports of trash fish utilization, fish meal exporting and local consumption data for the 2013 to 2017 fiscal years (fiscal year in Myanmar runs from April to March of the next year) were gathered from Department of Fisheries, Myanmar. In addition, other related information on Myanmar fisheries was reviewed, such as fishing boat statistics from 2007-2017.

### *Data analysis*

Descriptive statistics were used for data analysis. Average trash fish production for each bottom trawler was estimated as tons of production per fishing day at the landing site. The trends of landed catch of bottom trawlers and trash fish production were shown using associated charts.

## RESULTS AND DISCUSSION

### *Status of fisheries in Myanmar*

Myanmar is the largest fishing nation in the Bay of Bengal region. According to Myanmar ecosystem surveys in 2013 and 2015, FAO-NORAD (2013, 2015) reported that total marine catches were 1.3-1.8 million tons·y<sup>-1</sup>. They contributed around 10% to the GDP and played an important role in the livelihoods of Myanmar's population. In 2017, the total production of fishes was 5.67 million tons in Myanmar. Of this, the production of freshwater fish was 2.64 million tons (47%) and the production of marine fish was 3.03 million tons (53%). The exported amount of fish and fishery products was 0.439 million tons, the value of which was 605.820 million USD in 2016-2017. It was exported to 40 different countries. The exported amount was 8% of the total production of marine fish in Myanmar in this period, 2016-2017 (Department of Fisheries, 2017).

### *Type of marine fisheries in Myanmar*

The types of marine fisheries in Myanmar are classified as inshore fisheries and offshore fisheries. Marine inshore fisheries have long been carried out by traditional boats, with a length up to 10 m and a motorization up to 12 HP. The fishing grounds for the inshore boats are located within 16-m depth areas at lowest low tide, which generally is 5 nautical miles offshore in Rakhine to 10 nautical miles offshore in Ayeyarwady and Tanintharyi. Inshore fisheries are generally small-scale fisheries and use a variety of gears such as hook and line, gillnets, traps, anchovy purse seines and trammel nets. According to the official statistics, the number of inshore powered boats gradually increased to about 16,012 boats in 2017 from 12,240 in 2015 and non-powered boats decreased to 10,704 boats in 2017 from 13,391 in 2015. The target species are pelagic species and high-value species such as lobster, shrimp, grouper, mud crab, clams, etc. Some of the catch is used for local consumption, but the highly valued species are mostly bought by middlemen for export. Offshore fishery boats are more than 10 m long and/or use an engine larger than 12 HP. The offshore boats are classified by the gears used: trawlers, purse seiners, drift netters, long liners, trappers and falling netters. The trawlers were mainly fishing in the Tanintharyi fishing ground and the drift netters were mainly fishing in Mon and Ayeyarwaddy fishing grounds. Their total numbers steadily increased from 2,111 boats in 2007 to 3,153 boats in 2017.

### *Bottom trawler in Tanintharyi region*

Bottom trawlers with otter boards are popular commercial fishing boats in the Tanintharyi fishing ground (Figure 2). Their use is conspicuously increasing compared with other fishing gears. The statistical data showed that the number of registered bottom trawlers was increasing year by year (Figure 3). The survey data indicated that bottom trawlers accounted for about 62% of total fishing boats (Figure 4). Most of the boats were

built from wood with a length of 15 to 45 m and used a diesel engine ranging from 300 to 600 HP. The nets used for trawlers were mostly imported from Thailand; the net design is described in Okawara *et al.* (2004). The trawl is used with 120-180 mm mesh size. Polyethylene 700 d/12-21 netting is used for the wing, square upper panel and belly, and 20 to 30 mm mesh size polyethylene 380 d/9-15 netting is used for the codend (Figure 5). The major landing sites of the trawlers are Myeik, Dawei and Kawthoung Townships in Tanintharyi Region. However, all of fishmeal industries of Tanintharyi Region were situated in Myeik Township.

### *Trash fish production from bottom trawlers in Myeik Township, Tanintharyi region*

In the Tanintharyi fishing ground, trash fish production increased steadily during the period from 2013 to 2016, but declined in 2017 (Figure 6). Trash fish was the main production of bottom trawlers. Their production of trash fish increased from 67,830 tons in 2013 to 80,763 tons in 2014. However, production declined by 10.4% to 72,360 tons in 2017 compared with 2014. The study found that production of trash fish from bottom trawlers was affected by reduction of operated trawlers resulting from implementation of a closed season during June to August which started in 2013 (Figures 7, 8, 9).

According to DOF of Myanmar boat size classification, trash fish from the boats with lengths of 18 to 23.9 m and 24 to 29.9 m accounted for about 83% of total production. Meanwhile, fish carrier boats were carrying 19% of trash fish from bottom trawlers (Table 2 and Figure 10). There are many species of trash fish, and the composition depends on the fishing area and the gear type. Based on the 2017 survey data, catch composition for 281 bottom trawlers and 70 fish carrier boats was 39.16% trash fish, 60.34% commercial finfish and 0.50% shrimp (Table 3 and Figure 11). Most of the trash fish (55-70%) used for fishmeal production in this region was caught by bottom trawlers.



Figure 2. Bottom trawler (length of 20 m) in Myeik Township.

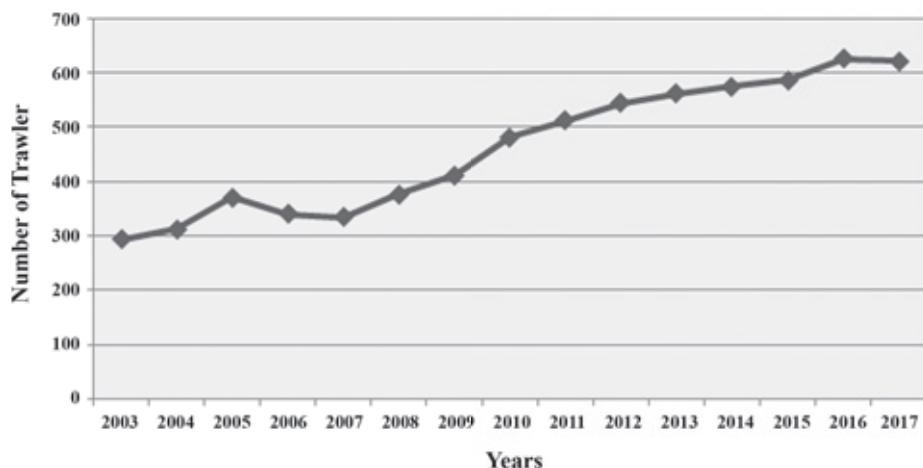


Figure 3. Number of bottom trawlers with otter boards in Tanintharyi fishing ground.

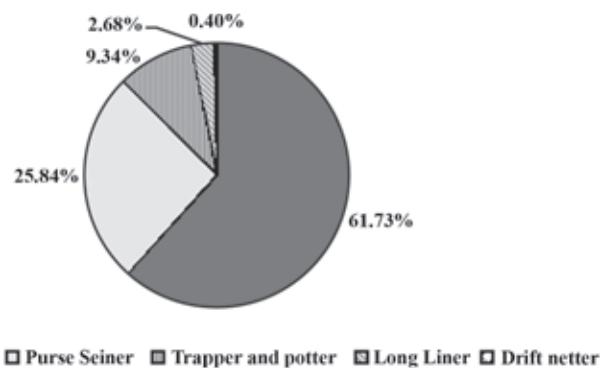


Figure 4. Types of commercial off-shore fishing boats in Myeik Township.

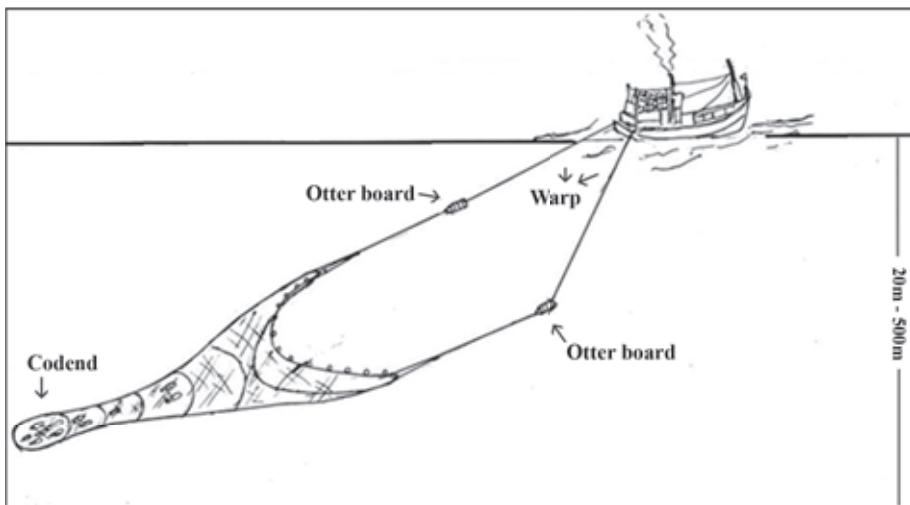


Figure 5. Myanmar bottom trawler with otter board.

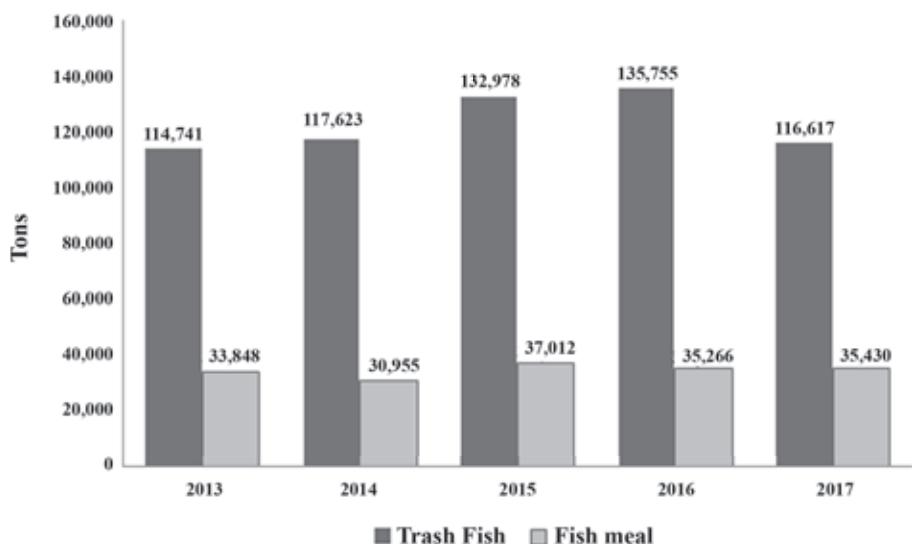


Figure 6. Trash fish total catch (metric tons) from all fishing gears and utilization for fishmeal production in Tanintharyi fishing ground during 2013 to 2017 fiscal year.

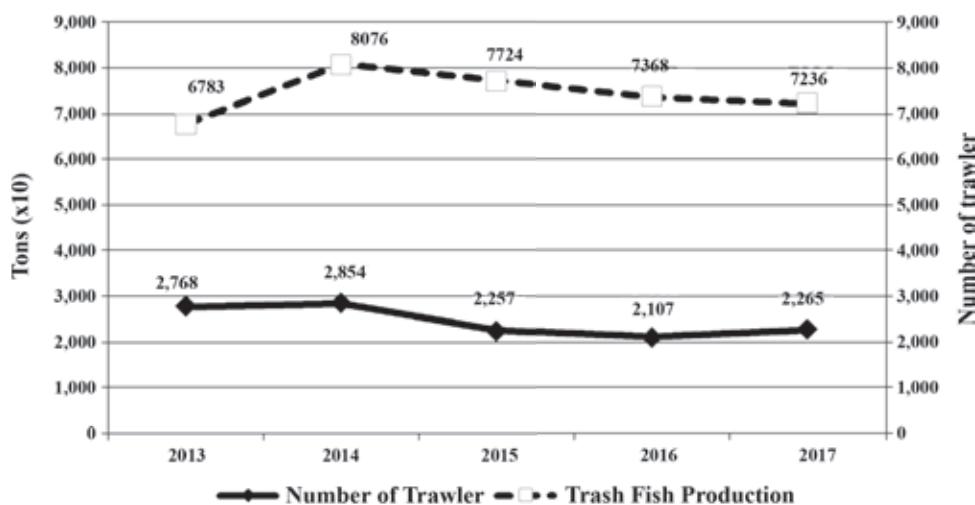


Figure 7. Trash fish production and number of bottom trawlers at Myeik Township landing site from 2013 to 2017 fiscal year.

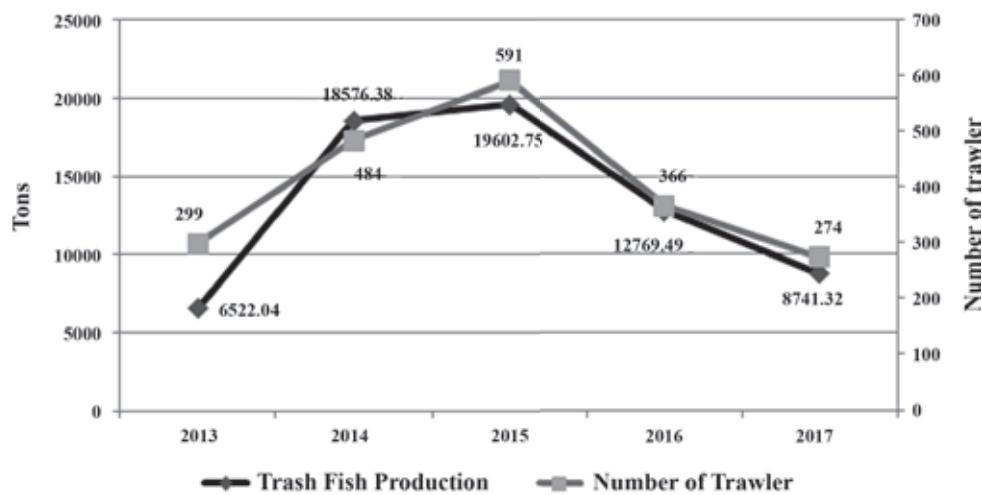


Figure 8. Trash fish production and number of bottom trawlers at Myeik Township landing site in closed season (June to August) from 2013 to 2017.

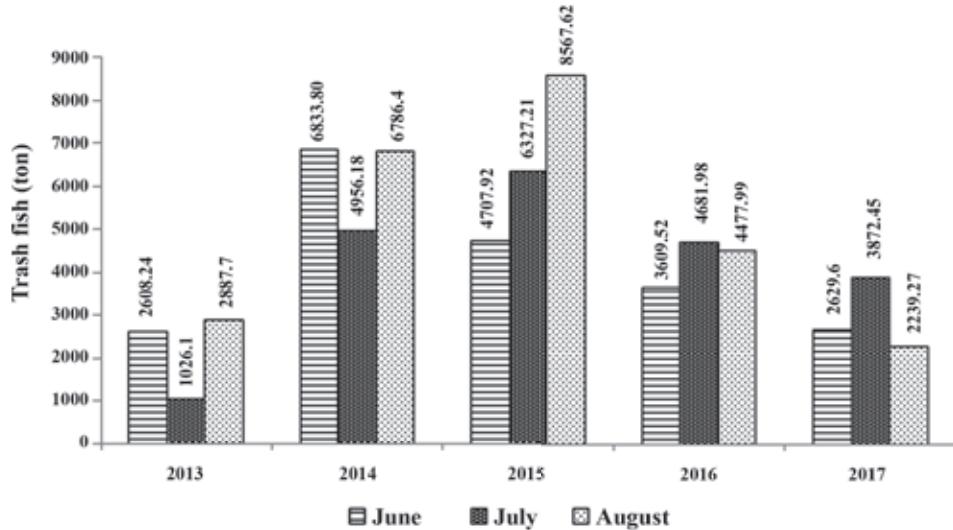


Figure 9. Monthly trash fish production in closed season from 2013 to 2017.

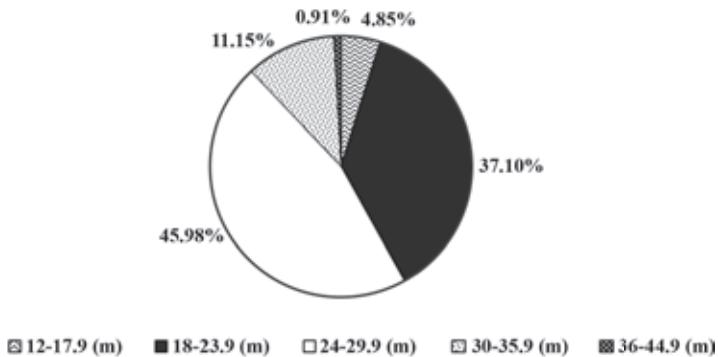


Figure 10. Proportion of total trash fish production by different sizes of bottom trawlers landed in Myeik Township in March 2017.

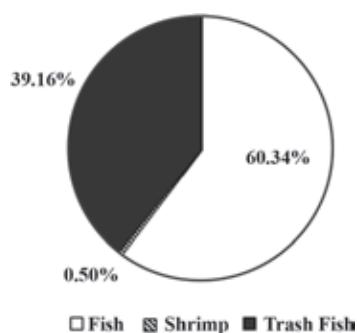


Figure 11. Average commercial fish, shrimp and trash fish production of boats at the landing site in Myeik Township. Data collected from 281 bottom trawlers in March 2017.

Table 2. Number and length of bottom trawlers at the landing site in Myeik Township in March, 2017.

Size (m)	Number of boat
12-17.9 (m)	18
18-23.9 (m)	115
24-29.9 (m)	124
30-35.9 (m)	22
36-44.9 (m)	2
Carrier Boats	70
<b>Total</b>	<b>351</b>

Table 3. Catches from bottom trawlers by boat length according to survey in March 2017.

Boat length	12-17.9 (m)	%	18-23.9 (m)	%	24-29.9 (m)	%	30-35.9 (m)	%	36-44.9 (m)	%	Carrier Boats	%
Fish (ton)	378.72	48	3662.7	54	4788.57	56	1077.45	54	92.7	56	5028.81	73
Shrimp (ton)	3.73	2	57.65	2	56.19	1	5.94	2	0.8	1	0	-
Trash fish (ton)	382.14	50	2920.65	44	3619.3	43	877.47	44	72	43	1880.6	27
<b>Total</b>	<b>764.59</b>	<b>100</b>	<b>6641.0</b>	<b>100</b>	<b>8464.06</b>	<b>100</b>	<b>1960.86</b>	<b>100</b>	<b>165.5</b>	<b>100</b>	<b>6906.6</b>	<b>100</b>

### *Utilization of trash fish and fishmeal in Myeik Township*

All of the fishmeal plants of Tanintharyi Region were situated in Myeik Township, and every trawler landed in Myeik Township to sell their trash fish. In the past, trash fish was considered as bycatch and used as direct feed for culture of other fish species such as small-sized grouper and sea bass. It also was used to produce dried fish, fish sauce and fish paste. Like other countries, trash fish have been used as raw material for fishmeal production. Most of the trash fish production in Thailand has been used as raw material for fishmeal production for the last several decades (Kaewnern and Wangvoralak, 2005). In Myeik Township, most of the trash fish has been used for fishmeal production during the last fifteen years, therefore trawlers have been targeting trash fish for processing into fishmeal. There is demand for trash fish from both the marine capture fishery and the fishmeal processing industry. The main destinations of fishmeal were exports to Thailand and Malaysia, domestic animal feed and local consumption. During the last fifteen years, 100% of trash fish from bottom trawlers was sold

to the local fishmeal plants, and 55-70% of trash fish used by the plants came from the trawl fishery.

In Myeik Township, during 2013 to 2017, 52.73% of fishmeal from processing plants was exported, 43.76% was used for the domestic pellet feed industry and 3.51% was used by local animal farms (Figure 12). Domestic fishmeal demand decreased in the Myeik area, from 17,638.8 tons in 2013 to 11,441 tons in 2017. This was due to increasing transportation costs between Myeik and Yangon, compared to shorter distance to Thailand and a lower local market price compared with export countries. According to survey results in 2017, a total of 116,617 tons of trash fish from all fishing gears was used as raw material for fishmeal production, and 23,889 tons of fishmeal was exported to Thailand and Malaysia. Meanwhile, only 11,441 tons of fishmeal was used domestically. Trawlers contributed 72,360 tons or 62% of all trash fish in 2017. In Myeik Township, 205,597 tons of fishmeal was produced by five fishmeal plants by using 739.667 tons of trash fish as raw material during 2013 to 2017. On average, production of a ton of fishmeal required 4 tons of trash fish.

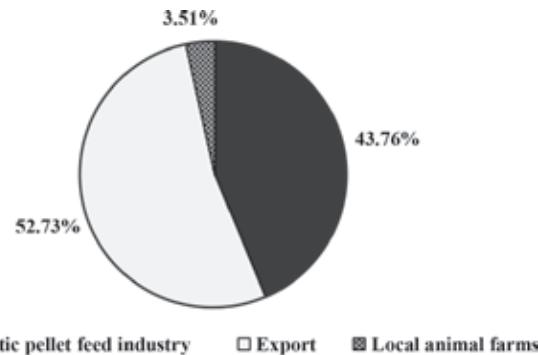


Figure 12. Fishmeal export and local utilization from 2013 to 2017 fiscal years in Myeik Township.

#### *Biological and economic impacts in Tanintharyi waters*

The demersal fisheries resources in Myanmar have received only limited estimations of Catch per Unit Effort (CPUE) and Maximum Sustainable Yield (MSY). Estimates of total biomass of Myanmar's demersal fisheries resources were 750,000 metric tons in 1980 and 320,000 metric tons in 2013, reported by Nakken, O and Aung (1980) and by the Dr. Fridtjof Nansen research vessel in 2013 and 2015. The more recent demersal biomass estimate represents a 50% decrease from 1979-1980. DOF of Myanmar has known that trash fish includes some economically valuable juvenile fishes, and that heavy fishing for trash fish may lead to marine fishery resource deterioration. Myanmar has very limited information on species compositions from trash fish, however, other neighboring countries such as Thailand shown that 18% to 32% of the trash fish were juveniles of important commercial species, there were no chance to grow to a large size by trash fish overfishing (Staples and Funge-Smith, 2005). In Thailand, trash fish made up 31% of the total production from the trawler fishery (Kaewnern and Wangvoralak, 2005), while survey data from this study showed that trash fish was 39% of total production from the trawl fishery in Myeik Township, Tanintharyi Region. It seems that both Myanmar and Thailand were vulnerable on trash fish catch data from trawler fishery. Moreover, there is very little information on juvenile species composition of trash fish in

Myanmar. However, composition of the dominant species caught by bottom trawlers in the Tanintharyi fishing ground have been reported by Thapanand-Chaidee (2010) and by the Dr. Fridtjof Nansen research vessel in 2013 and 2015. It was found that juveniles of commercial demersal species caught by bottom trawlers included *Saurida undosquamis*, *Saurida tumbil*, *Leiognathus bindus*, *Photopectroalis bindus*, *Upeneus* spp., *Nemipterus bipunctatus*, *Secutor* spp. and *Gazza minuta* etc. It is likely, then, that these juvenile fishes are included with trash fish in the Tanintharyi fishing ground.

Due to insufficient information on juvenile species composition in Myanmar, studies on economic loss are lacking. This leads to difficulty in the implementation of fishery management approaches, since fishermen and other stakeholders who use the trash fish do not recognize the importance of juvenile fish in terms of economic value.

#### *Management issues according to bottom trawl and trash fish*

The DOF of Myanmar has tried to implement some conventional fisheries management measures such as minimum codend mesh size, closed areas and a closed season to counteract the situation of high fishing pressure, and to protect juvenile fishes and degraded environments. These measures were also implemented in Thailand (Somboon, 2010). According to regulations of Myanmar for trawlers, codend mesh size must be

not less than 2.0 inches for fish trawls and 1.5 inches for shrimp trawls. In addition, DOF has implemented a closed season measure since 2013 for all commercial fishing gears to protect declining fisheries resources. However, according to the results from this study, trash fish catching was not reduced noticeably because of economic forces, especially trash fish price and market demand. Fishermen then tend to catch every species by using small codend mesh size. Results of this study revealed that trash fish price was about  $0.19\text{-}0.25 \text{ USD}\cdot\text{kg}^{-1}$  and fishmeal price was about  $0.88\text{-}1.03 \text{ USD}\cdot\text{kg}^{-1}$ . These prices were quite satisfactory for fishermen.

In Myanmar, fishing activity is operated under the Free Fishing (FF) system, and there is no real limitation of the total catch allowed. Fishermen are free to harvest as much as they desire. Other countries have experienced similar problems, where measures to control catch could not be successfully enforced. Although an Individual Transferable Quota system (ITQs) is recommended in some countries, ITQs are more difficult to implement in the complex multispecies fisheries of tropical countries like Myanmar. This problem is also found in other Asian countries such as Thailand, where fishing grounds are quite similar to Myanmar. In addition, Myanmar also has critical monitoring and enforcement problems like other countries that are mentioned in Ahmed *et al.* (2007). Low participation by the fishery community in Myanmar was another problem leading to enforcement problems.

Hence, to reduce the problems of fisheries resources in Myeik Township as mentioned above, the local fishery community must be instilled with an obligation to use it in way that is responsible, according to Endroyono (2015). We therefore recommend that to ensure effective implementation measures to manage overfishing of trash fish in Myeik Township, several activities should be conducted, such as implementation of a satellite Vessel Monitoring System (VMS) to manage fishing activities, strengthening awareness of fishermen about negative impacts of using improper mesh size in fishing gears, and research on breeding stocks and larvae or juvenile fishes in the Tanintharyi

fishing ground in order to demarcate and implement closed areas. Use of selective gear is another alternative measure that may be promoted to protect juvenile fishes, such as using juvenile and trash fish excluder devices (JTEDs) as recommended by Chokesanguan *et al.* (2010). Moreover, fishmeal plants in Myeik Township should be encouraged to produce more value-added products from fresh fish and specific fish species in order to reduce demand for trash fish.

## CONCLUSION

In the Tanintharyi fishing ground, the total marine catch has been increasing as well as the proportion of trash fish in the total catch. Overall, information from this study showed that trash fish is one of the primary targets of the bottom trawl fishery due to its demand for use in fishmeal by domestic plants. The results of data analysis indicated that trash fish production fluctuated during the last five years. In the last two years, trash fish production decreased from bottom trawlers due to a reduction in fishing boats in the closed season. Despite these trends, fisheries resources are still under high pressure. DOF of Myanmar has implemented many measures to control overfishing and to conserve juvenile fishes, however, fishing for trash fish could not be reduced sufficiently, because both price and demand for the fish were high. This situation has led to an increase of new fishing boats in this region. To conserve economically important juvenile fishes from trawl fisheries in this area, alternative management approaches are needed. The results of this study could be utilized to provide basic information for future bottom trawl fishery management in Myanmar.

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