สถานภาพการประมงปลาเป็ดและการใช้ประโยชน์เพื่อการเพาะเลี้ยงสัตว์น้ำในประเทศไทย

Status of Trash Fish and Utilization for Aquaculture in Thailand

เมธี แก้วเนิน และ ศันสนีย์ หวังวรลักษณ์[1]

Methee Kaewnern and Sansanee Wangvoralak[1]

บทคัดย่อ

ผลการศึกษาการเปลี่ยนแปลงและแนวโน้มของผลผลิตปลาเป็ดจากการทำประมงทะเลของประเทศ ในรอบ 30 ปีที่ผ่านมา และข้อมูลที่เกี่ยวข้องเครื่องมือทำการประมง เรือทำการประมงและพื้นที่ทำการประมง ตลอดจนการใช้ประโยชน์ปลาเป็ด โดยเฉพาะอย่างยิ่งในการเพาะเลี้ยงสัตว์น้ำ แสดงให้เห็นว่าผลผลิตปลาเป็ดมีสัดส่วนประมาณ 35 % ของผลจับสัตว์น้ำ ในปัจจุบันผลผลิตปลาเป็ดมีแนวโน้มลดลง อย่างไรก็ตามการเปลี่ยนแปลงผลผลิตปลาเป็ดแปรผันตามจำนวนเรือประมง ผลการศึกษาพบว่าผลผลิตสองในสามส่วนมาจากการจับในอ่าวไทย และผลจับร้อยละ 80 มาจากการทำประมงอวนลากแผ่นตะเฆ่ ปลาเป็ดส่วนใหญ่ถูกนำไปใช้เป็นวัตถุดิบในการผลิตปลาป่น ปริมาณความต้องการปลาเป็ดส่วนใหญ่จึงขึ้นอยู่กับความต้องการปลาป่นเพื่อผลิตอาหารสัตว์ ร้อยผลผลิตปลาป่นร้อยละ 40 ใช้เพื่อผลิตอาหารสัตว์น้ำ จากแนวโน้มการเพิ่มขึ้นของผลิตจากการเพาะเลี้ยงสัตว์น้ำแสดงให้เห็นว่าปริมาณปลาเป็ดและปลาป่นที่ผลิตภายในประเทศอาจไม่เพียงพอต่อความต้องการเนื่องการข้อจำกัดเกี่ยวกับทรัพยากรสัตว์น้ำและจำนวนเรือประมง ดังนั้นการใช้อาหารทดแทน เช่น ถั่วเหลือง และการนำเข้าปลาป่นจึงเป็นแนวทางที่สามารถช่วยสนับสนุนความต้องการได้

ABSTRACT

The results from study on trash fish production from marine fisheries of Thailand during last 3 decades, related information on fishing gears, fishing vessel and fishing grounds, and information on trash fish utilization especially for aquaculture indicated that 35 % of marine production is trash fish. In recent years trash production has been declining. However, It is likely that trash fish production will fluctuate with the number of vessels. About two-third of production comes from the Gulf of Thailand and otter board trawler contributes about 80% of total trash fish production. Most of trash fish production in Thailand has been used as raw materials for fishmeal production. About 40 % of fishmeal production are used for aquaculture feed. According to increasing of aquaculture production, Domestic trash fish and fishmeal may not able to supply the demand. Supporting supplies from imported fishmeal and substituted feed ingredients therefore are possible.

Key Words : Trash fish, Aquaculture, Thailand

Kaewnern, M.: ffismtk@ku.ac.th

[1] ภาควิชาการจัดการประมง คณะประมง มหาวิทยาลัยเกษตรศาสตร์ บางเขน กรุงเทพฯ 10900

Department of Fishery Management, Faculty of Fisheries, Kasetsart University, Bangkok 10900 Thailand

INTRODUCTION

Fishery industry plays an important role to Thailand development in term of the source of income and labor employment. The Office of Agriculture Economics reported that in 2002 agriculture products including fishery sector contributed approximately 9.2% of GNP, which accounted for $ 12.2 billion. Of this, fishery products contribute about 21%, and more than 80% of which come from marine capture fishery. Almost all fisheries products come from marine capture sector. Only less than 10 % of total production are from natural fresh waters, commercial fish farms, and irrigated paddy fields. Marine fisheries have been rapidly developed since the early 1960s, particularly with the introduction of trawls. About 80 % of total marine capture production is fish, and the rest are squid and cuttlefish, and shrimps. Among fish production, food fish or economic fish accounts for 65 %, while the other 35 % is trash fish which is defined as low value marine fishes (true trash fish) and under-sized or juvenile of commercially valuable species. Therefore, beside food fish, trash fish is recognized as important marine production. It is utilized both in direct and indirect manner for agriculture and aquaculture activities. As trash fish production could reflects marine fishery resources status and the utilization indicates its demand. Therefore to pay attention on this aspect, information on production and its utilization should be reviewed and the statistic analysis should be conducted to serve a synthesized information that will benefit all interested persons and institutions.

METHODOLOGY

The data of trash fish from marine fisheries of Thailand during last 3 decades and related information such as fishing gears, fishing vessel and fishing grounds gathering from fishery statistics of Department of Fisheries were reviewed. Meanwhile the information on trash fish utilization was gathered from aquaculture farm survey and several publications.

The data of trash fish production from 1971 to 2000 that reported by Department of Fisheries was analyzed with its related information such as number of fishing vessel by type of fishing gear to find out the relationship of its tendency. Polynomial function, which is a simple regression function and can be presented in term of $Y = aX^2 + bX + c$, when Y = production or number of vessel and X = year, was used to fit the trends of trash fish production and number of fishing vessel.

The data gathering from landing place survey, Thai fishing vessel statistic and marine fisheries statistic reports of Department of fisheries, and species composition of trash fish study reports were synthesized. Then status of trash fish was described by using results from trend analysis incorporated with synthesized relating information.

The fishmeal production and production from coastal aquaculture freshwater aquaculture and marine shrimp culture during 1985 to 2000 were gathered from Department of Fisheries. These data were also analyzed by using polynomial function of simple regression analysis for figure out the trends of fishmeal production and production from coastal aquaculture freshwater aquaculture and marine shrimp culture. The function can be presented in term of $Y = aX^2 + bX + c$, when Y = production and X = year, respectively.

Data of trash fish utilization which gathered from Aquatic Feed Quality Control Division, Department of Fisheries, Fishmeal producer Association, Animal Feed Producer Association, Office of Agricultural Economics and aquaculture farm surveys were also synthesized. Then trash fish utilization and its demand, therefore, were described by using results of these trend analysis and synthesized information.

RESULTS AND DISCUSSION

Trash fish production

Proportion of trash fish in total marine production in last three decades has been declining. In 1971-1980, this proportion was quite high at 40-50 %, while in 1991-2000, it decreased to about 23-26 %. Trash fish production peaked in 1987 with 1.11 million t (about 43% of total marine production). Since then, the production had been generally declined from 982,000 t in 1991 to 775,000 t in 2000. The results of regression analysis indicated that trends of trash fish production and number of fishing vessel can be presented as polynomial function as the followings; $Y_1 = -9.316X^2 + 367.7X + 5717.2$, ($r^2 = 0.6$) and $Y_2 = -16.509X^2 + 628.15 + 1904.1$, ($r^2 = 0.6$) when Y_1 = trash fish production (100 tons), Y_2 = number of otter board trawl vessel and X = year, respectively. The study found that one major factor that affected the production of trash fish during last decades is the reduction of number of fishing vessels, especially otter board trawl, pair trawls and push net with engine. It is likely that trash fish production will fluctuate with the number of operated fishing vessels which regarding to gasoline cost and fishmeal price (figure 1).

Trawling catches most of trash fish production in Thailand. In trawl fisheries, otter board trawler contributes about 80% of total trash fish production. Lesser amount of trash fish are caught in beam trawl, which may be due to small size of fishing vessels and near shore operation compared to other trawl fisheries. Trash fish are mostly caught by vessels larger than 18 m. Although trawl fisheries operate in both the Gulf of Thailand and Andaman Sea, about two-third of production comes from the Gulf of Thailand. Trash fish production from purse seine fisheries is usually low (about 3 % of total

trash fish production in 1999). The other fishing gear that catches some trash fish is push net (about 1.4%), this gear is rather destructive and has caused conflicts with other small-scale stationary gears.

Trash fish species in the Gulf of Thailand and the Andaman Sea vary slightly. The synthesized information using report of Pokapunt, W. and C. Tantivala (1985), Tabtimsang, W. (1986), Sripanpaiboon, S. (1995), Marine Fisheries Division (1999) and Isara, P. and R. Phoonsawat, (2002) indicated that in the Gulf of Thailand, the pelagic species of juvenile of high value species found in trawl and push nets are *Stolephorus spp., Sardinelaa spp., Rastrelliger spp.* and *Caranx spp*, and demersal species are Sciaenidae, Cynoglossidae, *Upeneus spp., Suurida spp*. and *Sillago spp*. True trash fish species caught by trawl fisheries are *Leiognathus binuds*, Apogonidae, Gobiodae, Callionymidae, Balisloidae, and *Platycephalus spp. Mugil spp*. is the juvenile economic species found only in push net fisheries production. Other bycatch species from trawl compose of cuttlefish, shrimp, krill and crab, while in push net, only swimming crab is bycatch. Trash fish species that caught from Anadaman Sea is less diverse. Species of juvenile of high value fish and true trash fish, which found in both trawl and push net fisheries, are *Upeneus spp*. and *Leiognathus bindus*, respectively. Most of juvenile of high value trash fish caught by push net are pelagic species, such as *Stolephorus spp*. and *Sardinella spp*., and some demersal species, such as *Therapon spp*. True trash fish species caught by push net are Apogonidae and *Platycephhalus spp*. Beside those species, bycatch production of trawl fisheries comprises of cuttle fish such as *Sepia spp*., *Lologo spp*. and *Octopus spp*., and only crab is caught as bycatch in push net fisheries.

Utilization of Trash Fish

In general, trash fish are used in fishmeal plants, fish sauce plants, poultry farms and fish farms. Most of trash fish production in Thailand has been used as raw materials for fishmeal production since the last several decades. During 1970s, more than 50 % of total trash fish were used for this purpose, and the amount increased to 90 % in recent years. The data indicated that 96 fishmeal plants used 94 % of trash fish in 2000 (Department of Fisheries, 1983-2003). Trash fish was also used for fish sauce plant and livestock farms. It is known that many freshwater fish farmers and coastal aquaculture farms used trash fish as fresh feed ingredients, such as in farming of groupers and mud crabs. There is no information, however, on the extent of this type of use. Some amounts of trash fish are use for livestock production, in particular for chicken, duck and pig. Some farmers are reported to use as high as 20% of trash fish in the ingredients of duck feed.

Fishmeal is a product of trash fish processing, fishmeal product is used as animal feed ingredient, especially for poultry, after mixed with some cereals. Fishmeal is recognized as an

essential ingredient of animal feed due to availability of every essential amino acids and unidentified growth factor that accelerates animal growth. Normally, fishmeal is accounted for 7-12 % of animal feed ingredients (Feedstuff Users Promotion Association, 2002). The information collected by Fishmeal Producer Association indicates that fishmeal-processing plants in Thailand produce only 8% of the high protein product (product with greater than 63 % protein). About 39% of the products are of lower protein contents (58-63 % protein). Trash fish is not the only raw material for fishmeal production. Rather, it accounts for about 53-63 % of total raw materials. The rest are fish remains and other fish, which account for 31-44% and 3-5 %, respectively. In 2000, 775,000 t of fishmeal was produced by 96 fishmeal plants, using 1.15 million t of raw materials. Of these, 63% were trash fish, 31% were other fish and the rest were fish remains. In general, 4 t of raw materials are required to produce 1 t of fishmeal. After the big decrease in trash fish production in 1997, many fishmeal producers turned to use matured *Sardinella spp,* and waste from canned-seafood processing plants. In addition, with the expansion of surimi processing plants, which use fish as main ingredient, all fish wastes from these processing plants are sent to fishmeal plants. This resulted in the decreasing use of trash fish for fishmeal processing (from 90 % in 1984 to 63 % in 2000), and an increase use of other materials. Fishmeal processing plants are scattered on both sides of the coasts.

Many freshwater fish farmers and coastal aquaculture farmers use trash fish as part of their feed ingredients. For freshwater fish culture, trash fish can be used in catfish, snaked head fish and goby fish farms. The amount of use depends largely on costs of trash fish and other feed ingredients. In coastal aquaculture, farmers use ground trash fish to feed carnivorous fish, especially seabass and grouper. The aquaculture farm surveys indicated that trash fish species used for direct feeds are *Caranz spp., Sardinella spp. and Rastrelliger spp*. The study results also revealed that the amount of trash fish applied in fish farm depends on rearing duration. Normally, trash fish are fed to seabass twice a day for 5-7 months, and can amount to as high as 87,000 kg per year. As trash fish was used for aquaculture through fishmeal, quantity of trash fish that are used depending on aquatic feed production. According to Animal Feed Producer Association's records, the amount of fishmeal used for aquaculture feed in 2003 was approximately 248,000 t, of which 196,000 t used for shrimp farm and 52,500 t used for fish farm.

Demand of Trash fish

Fishmeal proportion for shrimp feed is quite high. For giant freshwater prawn feed, fishmeal used ranges from 24-52 % by weight, and 30-48 % for black tiger shrimp feed. Carnivorous fish feed also requires high proportion of fishmeal. The proportion of 25-50 % is reported in striped snake-head fish and walking catfish feed. Herbivorous fish feed uses low fishmeal proportion compared to shrimp

and carnivorous fish feed. A range of 18-35 % by weight is recommended for herbivorous fish such as common silver barb, giant gourami and Nile tilapia. There are many aquatic feed plants in Thailand. A total of 85 plants was reported by Department of Fisheries in 2002, comprising of 43 pellet feed plants and 42 additive feed plants.

Demand for trash fish depends largely on demand for livestock and aquaculture feeds. Approximately 51-68% of fishmeal production is used in domestic feed industry every year. The rest of the production is exported. Domestic fishmeal demand and price have been increasing due to the expansion of marine shrimp culture industry. In 1987, domestic uses of fishmeal were 273,000 t and increased to 734,000 t in 1994. The average growth rate during that period was approximately 15.4 %. Animal Feed Producers Association reported in 2003 that 606,000 t of trash fish were used as raw material for animal feeds, 40 % of which was used for aquatic animal feed, while 22% and 20% were used for chicken and swine, respectively.

The demand of trash fish for aquaculture may increase with the growth in freshwater and coastal aquaculture, including shrimp farming. As about 32 % and 8 % of fishmeal production were used as raw material for shrimp and fish feed, and about 90 % of trash fish were used for fishmeal production, therefore trash fish demand can be relatively estimated from the increasing of aquaculture production. The results of regression analysis indicated that trends of fishmeal production and production from coastal aquaculture, freshwater aquaculture and marine shrimp culture can be presented as polynomial function as the followings; $Y_3 = -1.988X^2 + 44.901X + 116.27$, ($r^2 = 0.7$), $Y_4 = -0.4682X^2 + 35.576X - 8.5752$, ($r^2 = 0.9$), $Y_5 = 0.4408X^2 + 5.7914X + 67.317$, ($r^2 = 0.9$), $Y_6 = 0.9705X^2 + 36.894X - 51.861$, ($r^2 = 0.9$), when Y_3 = fishmeal production (1,000 tons), Y_4 = coastal aquaculture production (1,000 tons), Y_5 = freshwater aquaculture production(1,000 tons), Y_6 = marine shrimp production (1,000 tons) and X = year, respectively. The data indicated that coastal aquaculture, freshwater fish productions seem to be increased where as shrimp production curved to a steady stage. This growth of aquaculture production indicated the big demand on fishmeal. However according to fishmeal production of Thailand, it tends to be decreased due to reduction of trash fish catches. (figure 1 and 2). Although trash fish production will fluctuate with the number of vessels as mentioned above. Increasing of vessel lead to increasing of trash fish. However due to limitation of fishery resources of Thailand and the government policy that aim to control the resources utilization to sustainable level, therefore number of vessel may could not be increased to serve this demand. Hence, trash fish from marine capture fisheries could not support aquaculture activity in long term. This information indicated the reasons why total amounts of imported fishmeal of Thailand

were high in many years according to information of Office of Agricultural Economics. In addition, It should be noted, however, that the increasing use of feed substitutes, such as soybean, and trade agreement such as FTA with fishmeal producer country, influences the demand of trash fish for fishmeal production and use in aquaculture.

CONCLUSION

The overall information can be concluded that trashfish production of Thailand tend to be decreased due to reduction of fishing vessel and then lead to reduction of domestic fishmeal. About 40 % of fishmeal have been used for aquaculture feed industry. Due to increasing trend of trash fish and fishmeal demands, domestic fishmeal production could not serve these demands. Supporting supplies from imported fishmeal and substituted feed ingredients therefore are possible. However, according to results of trends analysis of this study, it should be noted that its were figured out by using simple regression analysis. Therefore, to forecast the future trend for further analysis, time series analysis should be conducted.

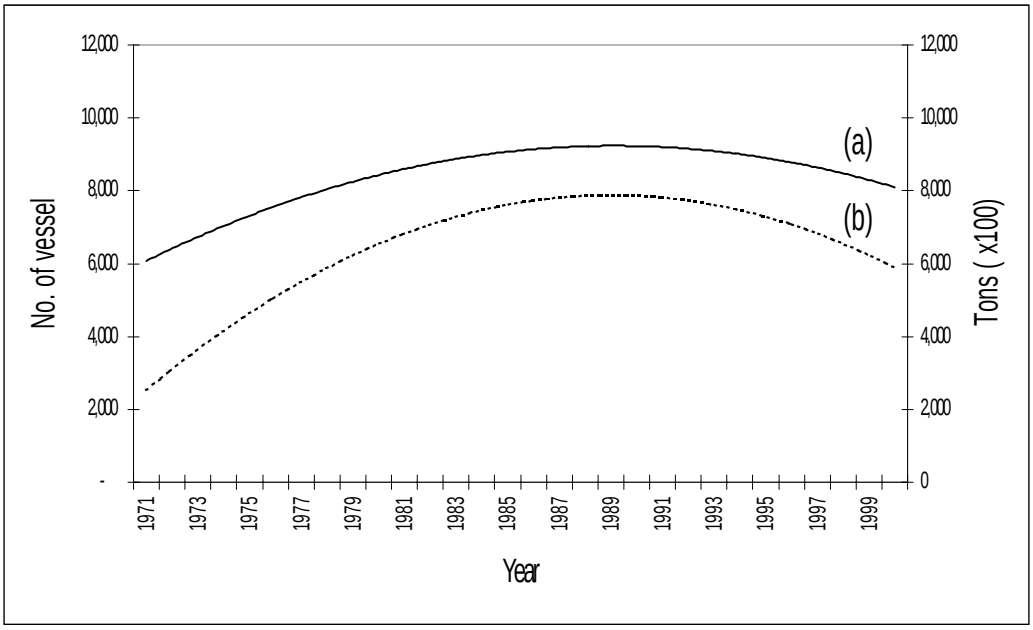

Figure 1. Trends of trash fish production (a) and number of otter board trawl vessel (b) during 1971-2000

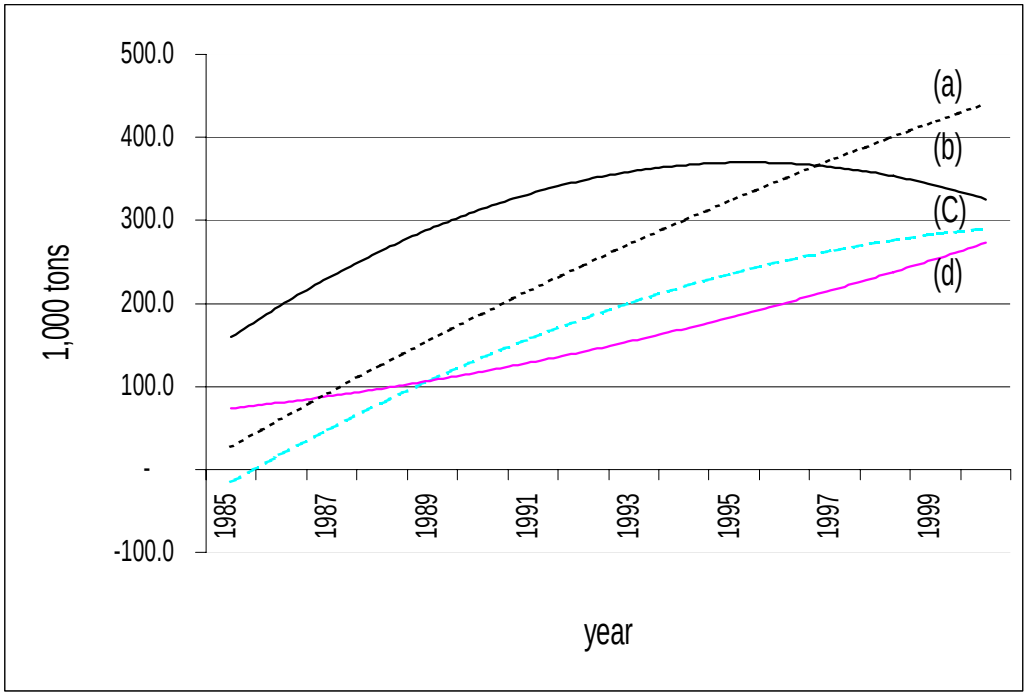

Figure 2 Trends of Fishmeal production and aquaculture production during 1985 –2000, a) coastal aquaculture, b) fishmeal, c) marine shrimp culture and d) freshwater aquaculture

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