

## Trends in milkfish fry production in Sofronio Española, Palawan, Philippines with notes on 12-year province-wide production

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### ABSTRACT

The gathering of wild milkfish fry in the Philippines remains an important livelihood activity among the coastal inhabitants as the milkfish growers continue to prefer the fry harvested from the wild over those produced from hatchery. However, up to date statistics on fry production from the wild is lacking. Given such shortage of information, the volume of fry and catch per unit effort (CPUE) from the two coastal villages in the municipality of Sofronio Española, Palawan were determined; and the 12-year data on volume of fry harvested within the province of Palawan were obtained from two major fry buyers in Puerto Princesa City. In Sofronio Española, the catch in 2011 was about 50% lower than in 2009; while the CPUEs in 2011 largely varied between the two villages. The dwindling volume of fry between 2000 and 2012 calls for further study to determine the causes of this decline which could be used as basis in proposing a management plan to sustain both fry and milkfish industry.

**Keywords:** milkfish fry, Palawan, Philippines

### INTRODUCTION

Milkfish *Chanos chanos* (Chanidae), locally called 'bangus' is widely distributed in the tropical and warm temperate regions of the Indo-Pacific Ocean; it is an important aquaculture commodity in Southeast Asia with fry source mostly coming from the wild. Mother milkfish can reach a maximum total length of 150cm and a life span ranging from 5 to 20 years (Bagarinao 1999). The number of mature eggs a female milkfish can spawn varies between 1 - 9 million (JICA 1987, Yap et al. 2007). Because of the importance of wild milkfish fry in aquaculture, both the mother and the fry are protected in the Philippines under Republic Act 8550 for which sections 98-99 prohibit the capture of mother milkfish and exportation of both breeders and fry (DA 1998).

Fry collection with its peak season in the Philippines between April and June (Bagarinao 1999) is usually carried out traditionally with the use of locally made stationary (eg. tidal set net) or mobile gears (e.g. fry sweeper; fry bull dozer) (Villaluz 1984, Bagarinao 1999). The Philippines requires about 1.726 billion of milkfish fry per year. However, fry production from all regions in the Philippines was only about 161 million in 1995, thus having a

deficit of 1.565 billion fry (Ahmed et al. 2001). Such deficit might be the result of inadequate statistics on the volume of collected milkfish fry (Bagarinao 1999, Ahmed et al. 2001, Avillanosa et al. 2005). Palawan is one of the largest milkfish fry producers in the country, however, available information on the volume of collected fry were only for the year 1963 and 1973 at 32 and 10 million fry, respectively (Ahmed et al. 2001).

In spite of its importance as a form of livelihood among the gatherers and in the milkfish culture industry, efforts to assess the present condition of fry grounds in the province of Palawan are virtually non-existent (Avillanosa et al. 2005). With the uncertainties on volume of fry harvested from the wild, this study aimed to determine the catch per unit effort in Sofronio Española; and trends in milkfish fry production in Palawan.

## **MATERIALS AND METHODS**

The study was conducted in the only two known milkfish fry producing villages of Sofronio Española: Pulot Shore (8°56'50.58"N 118°02'01.76"E) and Punang (9°03'10.08"N 118°05'14.65"E) some 140 km south of Puerto Princesa, the capital city of the province of Palawan. The fry ground in Pulot Shore was relatively narrow with a gently sloping shoreline which allows fry gathering during high and low tides. In Punang, the fry ground was characterized by a wide sandy beach with fringing mangrove forests which makes fry gathering difficult during high tide (Figure 1). The number of fry collectors in Pulot Shore (43 persons) was three times higher than in Punang (14 persons).

The number of fry harvested from the two coastal villages was obtained by having a concession of milkfish fry in Sofronio Española during the years 2009 and 2011. Total number of fry harvested from the two villages in 2009 and 2011 was compared with Chi Square using the statistical software SPSS version 16 (Field 2009). The CPUE of fry gatherers from both villages in 2011 was determined by dividing the number of collected fry with the time spent in harvesting. The earnings of fry gatherer were also noted for each day of operation. To have a wider picture of trends in milkfish fry industry in Palawan, the data on the volume of harvested fry from other municipalities for 12 years were obtained from two major fry buyers stationed in the City of Puerto Princesa.

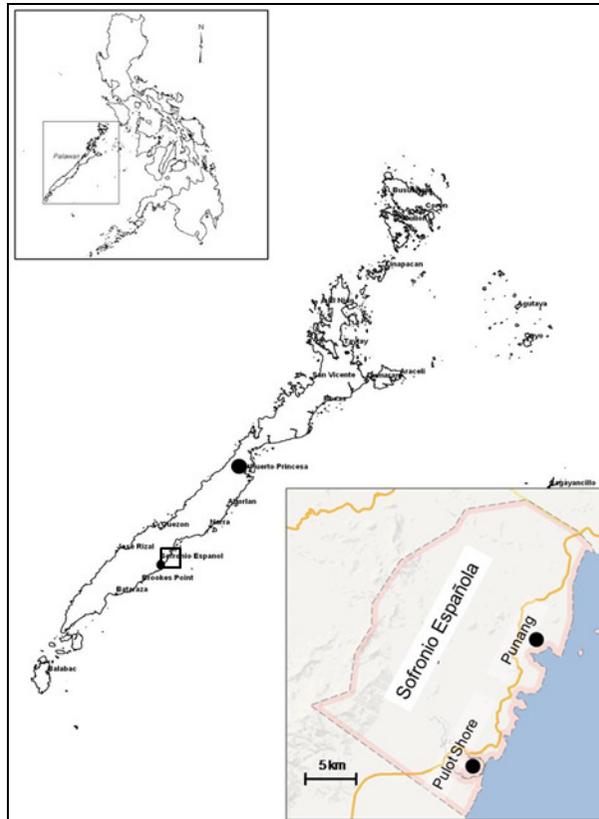


Figure 1. Location of Pulot Shore and Punang in Sofronio Española, Palawan, Philippines.

## RESULTS

The general trends in monthly volume of milkfish fry harvested from the two villages of Sofronio Española, Palawan were high during summer (March) and declined towards the early rainy season (June). In Pulot Shore, harvesting appeared in two seasons: March - June and September – December 2012. The highest number of harvested fry recorded in March (334,259 fry) comprised about 41% of all harvested fry (812,121 fry) in that village. In Punang, fry harvesting only occurred in summer until early rainy season (March – June). Hence, the volume of harvested fry (134,312 fry) captured during that period was much lower than in Pulot Shore (625,500 fry). Overall, the number of milkfish fry harvested in Punang only comprised 14% of all harvested fry (946,433 fry) from both villages (Figure 2).

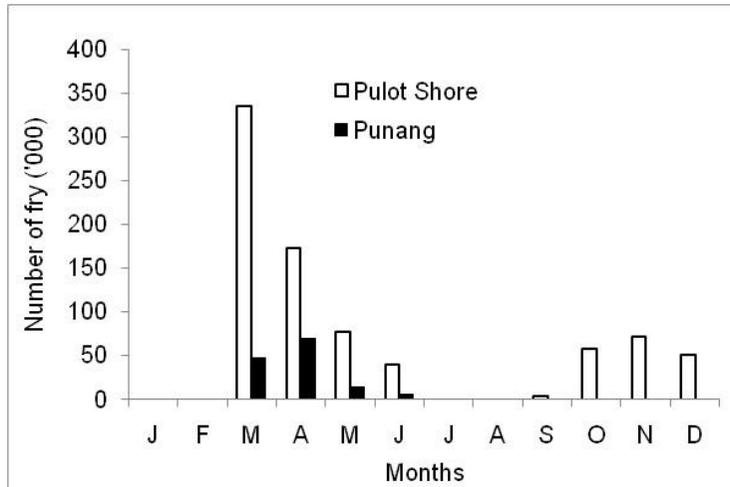


Figure 2. Monthly volume of wild fry harvested from Pulot Shore and Punang in 2011.

Volumes of fry in 2009 and 2011 have shown remarkable difference and decline for both villages (Figure 3). In 2009, the volume of harvested fry in Pulot Shore (1,461,321 fry) was 77% higher than in Punang. Such percent difference was elevated to 86% in 2011, with Pulot Shore having 812,121 fry compared to 134,321 fry from Punang. A significant decline on volume of harvested fry between 2009 and 2011 was noted for both Punang ( $\chi^2 = 16,7942 > 3.84$ ) and Pulot Shore ( $\chi^2 = 185,384 > 3.84$ ). The combined volume of harvested fry from the two villages in 2011 (946,433 fry) was 50% lesser than in 2009 (1,907,999 fry).

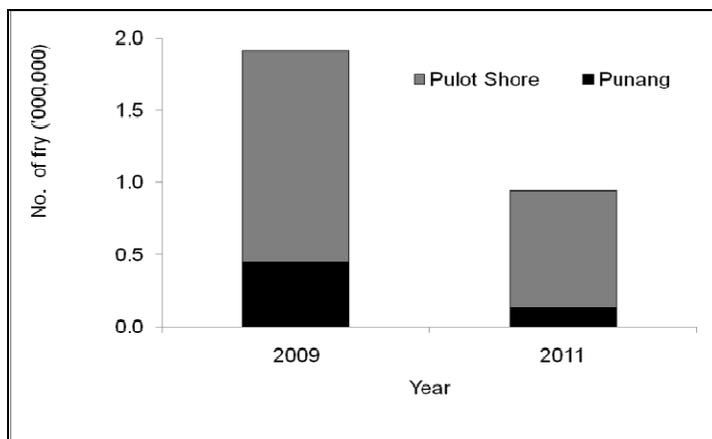


Figure 3. Total annual volume of harvested milkfish fry from the two villages of Sofronio Española, Palawan for the year 2009 and 2011.

### Catch per Unit Effort and Earnings of Fry Gatherers

The CPUE in Pulot Shore was much higher in March, reaching about 443 fry.h<sup>-1</sup> compared to about 200 fry.h<sup>-1</sup> in other months of the year (Figure 4). In that month, the average income of PhP 190h<sup>-1</sup> and an average of 5 h operation could make fry gatherers in Pulot Shore earn as much as PhP 950 per operation. However, the average CPUE (222 fry.h<sup>-1</sup>), income (PhP 85 h<sup>-1</sup>), and duration of operation (3.75 h) can only make the fry gatherers earn an average income of PhP 340 per operation (95% CI= PhP 520-160 per operation).

In Punang, the average CPUE in March (292 fry.h<sup>-1</sup>) was twice higher than in other months of the year. The average income in March (PhP 80 h<sup>-1</sup>) was twice higher than the average income (PhP 43 h<sup>-1</sup>; Figure 5) from March to June, but much lower than in Pulot Shore. Monthly average time (2.2-3.1 h) spent in collecting fry was nearly twice lower than in Pulot Shore.

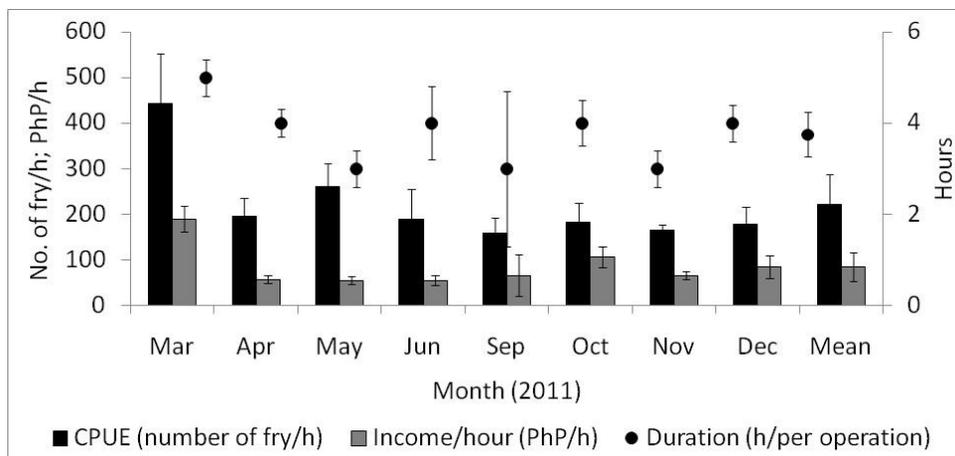


Figure 4. Catch per unit effort, average income/hour and duration of fry collection in Pulot Shore in 2011.

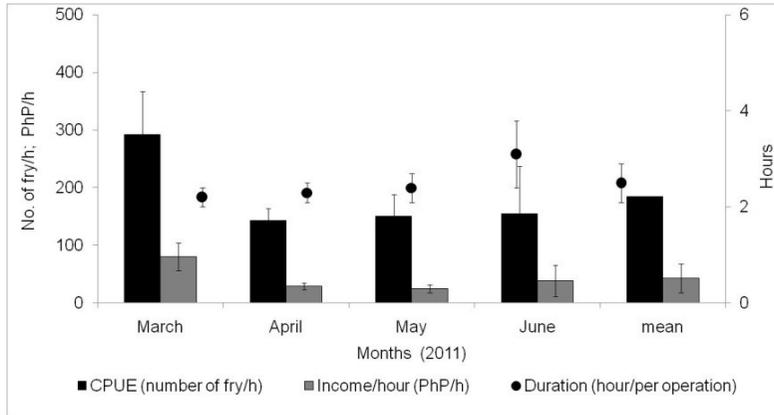


Figure 5. Catch per unit effort, average income/hour and duration of fry collection in Punang in 2011.

### Volume of Harvested Fry in Palawan

The sources of fry as per record of the only two fry buyers in the City of Puerto Princesa were only 12 of the 23 municipalities in Palawan (Figure 6). In Buyer A, the highest number (>20 million) of harvested milkfish fry in 2001 was followed by a sharp decline in 2002 and was gently sustained towards 2005 (5,000,000 fry). There was a gradual recovery of supplies towards 2009 but not as high as in 2001. The volume of fry in Buyer B was relatively stable from 2006-2009. In 2011, the yearly volume of fry dropped by 60%.

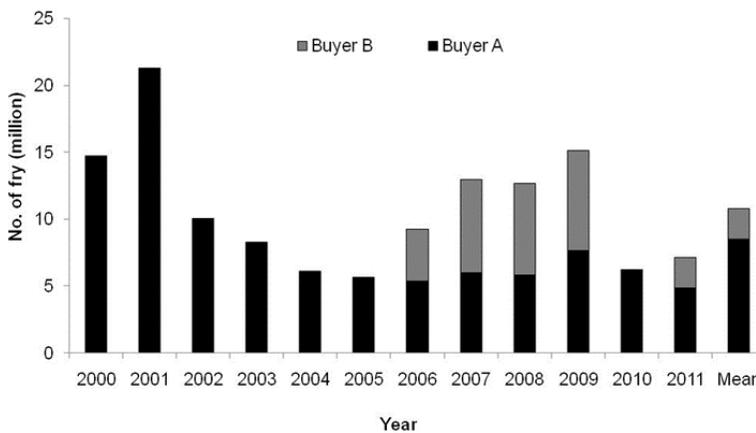


Figure 6. Yearly (2000-2011) number of milkfish fry harvested from Palawan water based on the records of two milkfish fry buyers in Puerto Princesa city. Data for 2012 only cover the first half of the year.

## DISCUSSION

The variations in the volume of harvested milkfish fry could have been the effects of the monsoons, mangrove vegetations, topography, habitat degradation, and reduction in the number of breeding milkfish in the wild. The northeast monsoon which generally occurs during the months of September to February brings milkfish fry to the east coast of Palawan including the municipality of Espanola. By contrast, the southwest monsoon could have driven the current towards the centre of the Sulu Sea, limiting the fry that settles on the studied sites. The peak of fry season in this study coincided with the observed peak in the northern parts of Palawan which occurred for three to four months in a year, with a peak in May and the lean month is June (Avillanosa et al. 2005). In some provinces, the fry collection is observed year round with different peak and lean seasons. For example, in Glan, Cotabato the peaks in volume of wild milkfish fry occurred between April and October. In Hamtik, Antique the fry gathering occurred between March to November with peaks in May and October. In Santa Ana, Ilocos Norte the fry production is from April until October with peak in June (Bagarinao 1999).

Fry collection in Punang was only possible during low tide in areas not covered with mangroves. When high tide comes, these areas were too deep for the fry collectors to operate their gears. By contrast, the absence of mangrove trees in the shoreline of Pulot Shore allowed fry gatherers to operate both during high and low tides. In addition, Pulot Shore has sandy and gently sloping area, a characteristic of most milkfish fry grounds (Bagarinao 1999) and could be another reason for having a higher number of collected milkfish fry than in Punang where shoreline was relatively wide and flat.

The port serving as loading area of mined nickel in Punang since 2009 could have added to the reduced abundance of milkfish fry or difficulty in catching them. Heavy siltation clogged on the net collection devices, making the fry gathering difficult or such siltation and other pollutants could have affected the number of fry. Between 1998 and 2002, second cropping (September – December) was still observed in Punang (pers. obs.) so there is a possibility that fry abundance was affected with heavy siltation. Interviewed fry gatherers of Ahmed et al. (2001) believed that domestic pollution, siltation and turbidity have brought tremendous changes on fry catching grounds.

There might be some underestimation of volume of fry shipped out of Palawan. One of the buyers provided a summarized volume of milkfish fry instead of allowing the record book to be personally checked. Milkfish fry dealers may have the tendency to reduce the number of shipped fry to

reduce air transport charges. The records of the Provincial Fishery Office depend on the report of fry buyers and such may not represent the real volume of fry shipped out of Palawan if the buyers do not declare the correct volume of fry.

The dwindling volume of harvested milkfish fry in Pulot Shore even with the absence of siltation from nickel mining port suggests that there are other factors affecting such decline. Accidental catching of mother milkfish (Sabalo) by drift net operators and unsustainable fishing operations specifically the use of illegal means of operations cause low catch of milkfish fry in Roxas, Palawan (Avillanosa et al. 2005). There are pressures and conflicts among habitat, human settlements, fisheries and tourism in many fry grounds (Bagarinao 1999). The volume of harvested wild milkfish fry is greatly affected by seasonal conditions, overexploitation, environmental pollution, illegal fishing, open access to fishing, conflicts in the use of rights and appearance of large number of fish predators (Ahmed 2001).

The similarities between the reported 10 million fry production in Palawan in 1973 (Bagarinao 1999) and the average volume of fry (10.66 million) from 2000 to 2011 indicated a stable supply of fry in the Province for the last 40 years. Such however was much lower compared to 32 million fry obtained in 1963 (see Bagarinao 1999).

Sources of data in this study did not include all the municipalities and fry buyers in Palawan so there is a possibility that the real volume of harvested fry from Palawan is much higher than the number indicated in this report. However, the sheer drop in the supply of fry in the two villages of Sofronio Española is quite alarming and could be happening in other parts of the province. Mother milkfish aggregate in estuarine areas to spawn (JICA 1987) are vulnerable to exploitation during their spawning period. Reef fishes that aggregate during spawning are so vulnerable to fishing (Johannes et al. 1999, Russell 2001, Sadovy, 2007). A declining trend in the volume of harvested marine fishes (Barut et al. 1997) and species richness (Nañola et al. 2011) has been reported in the Philippines.

Knowing where the milkfish aggregate to spawn and declaring such as protected areas can help ensure a steady supply of milkfish fry from the wild. Identification and protection of areas where other fish species aggregate to spawn are important in conserving marine biodiversity.

Continuous monitoring of milkfish fry production from the wild is needed to detect yearly changes in abundance. Understanding the factors that affect these changes is important to effectively manage the milkfish fry resources in Palawan. A nationwide monitoring is also needed for the

government to evaluate the current condition of milkfish fry industry in other parts of the country.

The average income derived by fry collectors during the peak season (PhP 2,709), is much higher than in lean months (PhP 384). This is similar with the observation of Ahmed et al. (2001) in Puerto Princesa City where there is a large difference on the monthly average income during the peak (PhP 3,064) and lean (PhP 31) seasons. With health problems affecting some hatchery reared fry (Hilomen-Garcia 1997, Marte 2003, Cruz-Lacierda et al. 2004) and the high cost of its production in the Philippines (Lee et al. 1997), the demand for wild fry will continue to persist, making the supply in the wild critical for the development of milkfish farming industry.

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