

## 1. INTRODUCTION

Anchovy is a small pelagic fish that the majority of Thai people know as Pla katak. Pla saiton, Pla hau on, Pla chingchang, Pla bura or Saimai (young anchovy) are other local names. This fish is distributed widely inshore and offshore at a depth range of 5-60 m. Anchovy is the second highest in quantity among pelagic fish with economic value, representing about 16% of the total pelagic fish landings (Department of Fisheries of Thailand, 1995). The catches of anchovy increased substantially from 1982 up to now due to the introduction of light luring techniques, which gather the fish in a concentration so they can be captured effectively. From the years 1989 to 1995 the total catches of anchovy in Thailand increased remarkably and reached a maximum at 169,359 tonnes (t), valued at US\$ 26,515,000 in the year 1995 (Department of Fisheries of Thailand, 1995).

The development of anchovy fisheries is rapidly expanding over the Gulf of Thailand and Andaman Sea. The fishermen try to find more fish to supply the increasing demand for export products. Fresh and dried fish, fish sauce and budu made from anchovy are usually supplied for domestic consumption, especially the anchovy fish sauce which is well known as having the best quality among fish sauces. Recently, boiled-dried anchovy has been exported in large quantities and at a high price, as well as anchovy fish sauce.

Expansion of the number of fishing boats and wider use of fishing grounds by moving from one place to another are causing conflicts among the “invaders” and local fishermen all over the country. Problems to be solved, which differ from case to case, have been directed either to the Director-General of the Department of Fisheries or through the provincial fisheries officers during the last ten years.

In the Department of Fisheries, especially the Marine Fisheries Division, researchers try everything to solve such problems. Problems with political implications are very hard to solve. Based on the 1997 Constitution, a public hearing was started at Songkhla Province in February 1999, where recently problems occurred among the anchovy fishermen and local fishermen operating small trawlers. At this writing it has not yet reached a final conclusion.

This paper aims at reviewing the anchovy fisheries from published and unpublished data in all aspects, including finding out which data are lacking and which are essential to be collected to support sustainable development and the other aspects like bio-economics and socio-economics.

## 2. THE SPECIES FOUND IN THE GULF OF THAILAND

Anchovy is a small pelagic fish ranging from 2 to 10 cm total length. In a certain season, it forms huge schools, which can be lured by light at nighttime. The main distribution is in shallow to fairly deep waters from 5 to 60 m. (Wongratana, 1980; Boongerd, 1997). Most species of anchovy are estuarine or brackish water fishes (Wongratana, 1985). Taweelit (1984) reported on the distribution of anchovies along the coast of the Gulf of Thailand and Andaman Sea. Anchovy belongs to the Family Engraulidae, genera *Encrasicholina* and *Stolephorus*. Previously, the genus *Encrasicholina* was included in the *Stolephorus* genus, but these genera were clearly separated by Nelson (1983). When looking at the body shape of anchovy, it can be simply divided into two types namely, the rounded shape of *Encrasicholina* and the compressed shape of *Stolephorus* (Whitehead, Nelson and Wongratana, 1988).

*Encrasicholina* are small and rather round-bodied anchovies. Eggs are oval-shaped, without a knob at the end (Figs. 1A and 1B). This genus is marine, pelagic and schooling, mostly inshore except *E. punctifer* which is an oceanic species. Wongratana (1980 and 1983) recognized five species belonging to the genus *Encrasicholina*.

*Stolephorus* are small and moderately compressed anchovies; the eggs are oval, with or without a knob at the end. These are marine, pelagic and schooling species, mostly inshore, some perhaps entering river mouths. Recently, there were 19 species identified of which 6 species are distributed throughout the Indo-Pacific region, the rest are distributed in more limited areas, e.g. Western Indian Ocean, Western Pacific.

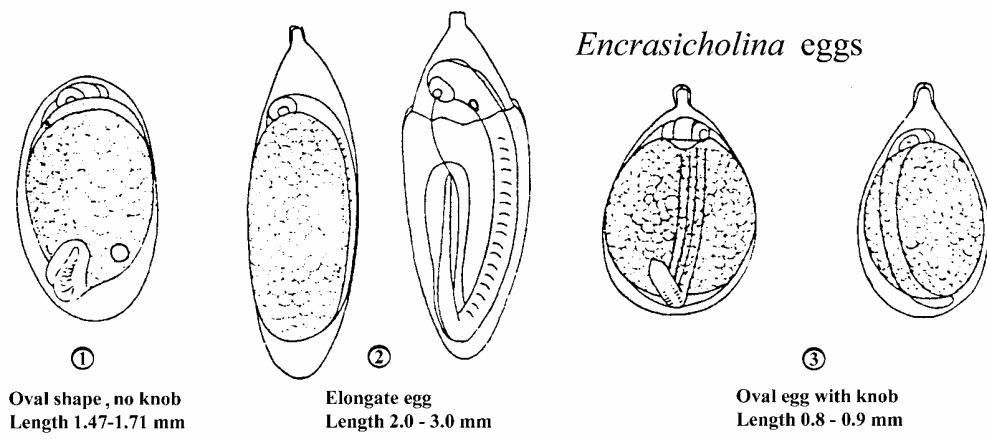


Fig. 1A. Three types of anchovy eggs collected by larval net (Chayakul, pers. com.)

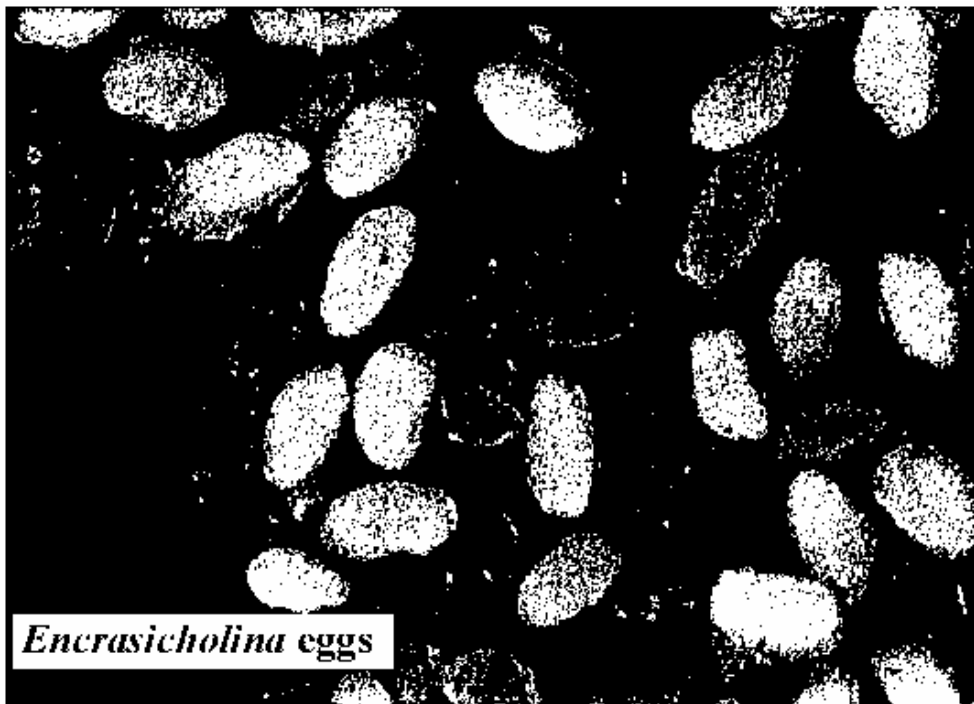


Fig. 1B. *Encrasicholina* eggs (Manprasit, 1996)

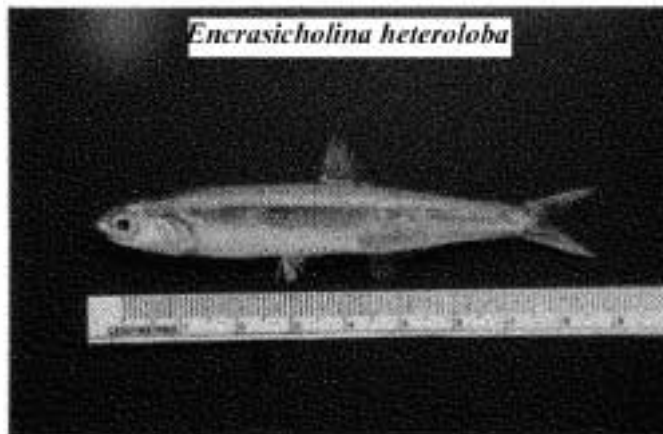
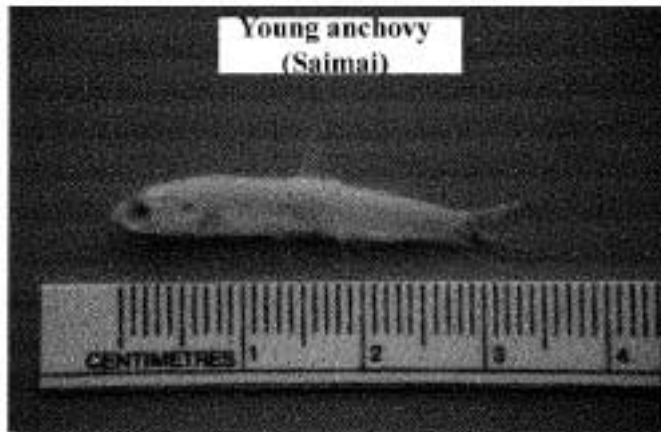
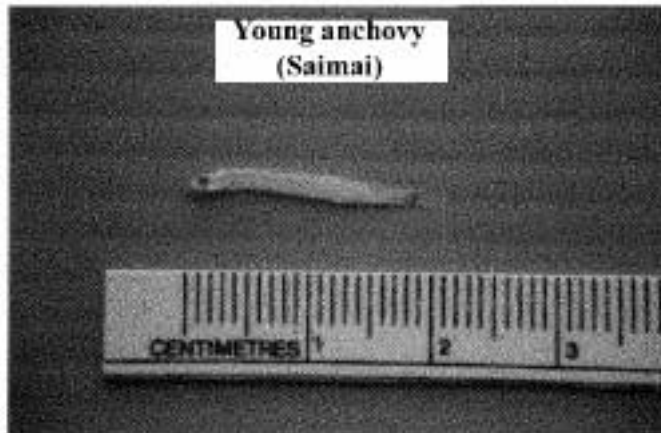


Fig. 2. Fresh anchovies from the Gulf of Thailand

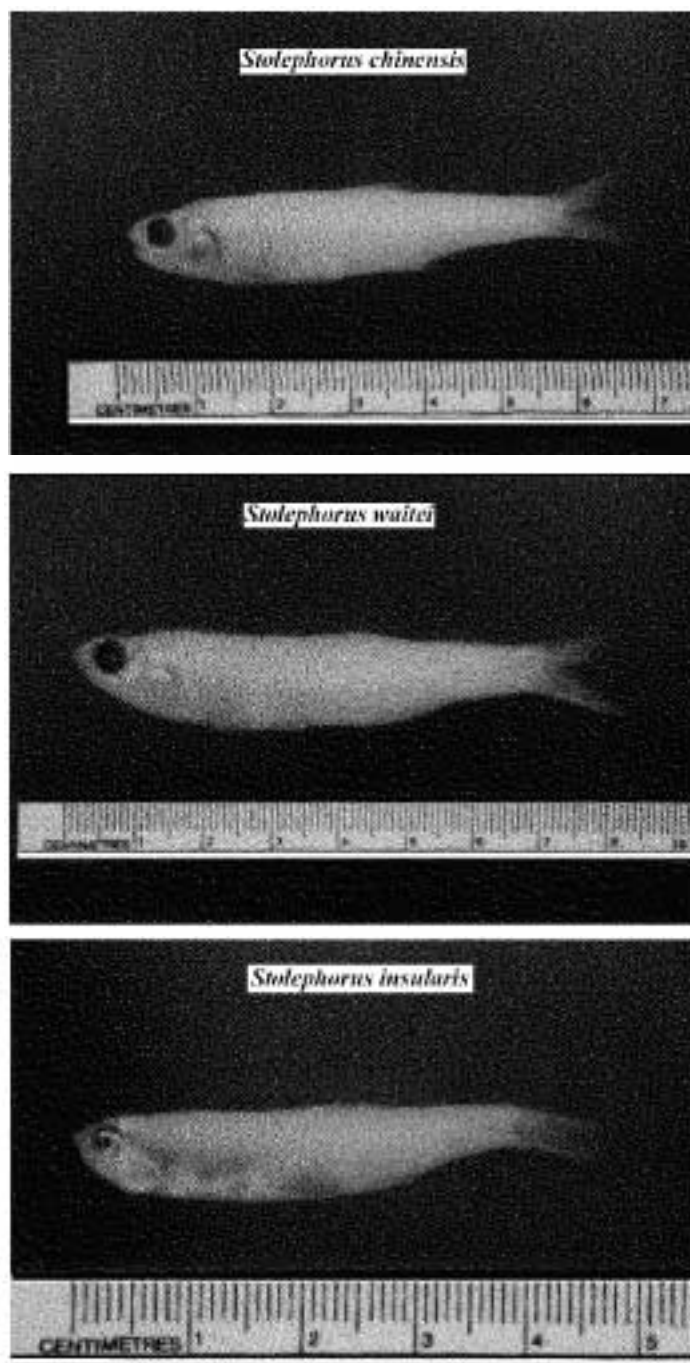
Wongratana (1988) reported the widespread distribution of anchovy in the Indo-Pacific (Hawaii, Japan, Tahiti, Australia, Papua- New Guinea, the Philippines, Indonesia, Korea, Southeast Asia, India, Arabian Sea and Red Sea). In Thai Waters (Gulf of Thailand and Andaman Sea), Taweessit (1984) reported the species caught by anchovy purse seines (APS, daytime fishing), about 86.8% of the fish caught were *Encrasicholina heteroloba* (*Stolephorus heterolobus*). In the Gulf of Thailand the abundant species are *Encrasicholina heteroloba*, *E. devisi* and *E. punctifer*, which contributed around 80-90% of the anchovy catches (Chaitiamvong, 1999). Eleven species were found in the Gulf of Thailand whereas in the Andaman Sea nine species were found, of which *Stolephorus ronquilloi* Wongratana, 1983 is restricted to the Andaman Sea (Wongratana, 1980; Wongratana, 1985; Nelson and Wongratana, 1988; Whitehead, Nelson and Wongratana, 1988), (Figs. 2-4). The species found in Thai Waters are:

- Encrasicholina devisi* (Whitley, 1940)
- E. heteroloba* (Rüppell, 1837)
- E. punctifer* Fowler, 1938
- Stolephorus baganensis* Hardenberg, 1933
- S. chinensis* (Günther, 1880)
- S. commersonii* Lacepède, 1803
- S. dubiosus* Wongratana, 1983
- Stolephorus indicus* (van Hasselt, 1823)
- S. insularis* Hardenberg, 1933
- S. ronquilloi* Wongratana, 1983 (only in the Andaman Sea)
- S. tri* (Bleeker, 1852)
- S. waitei* Jordan & Seale, 1926

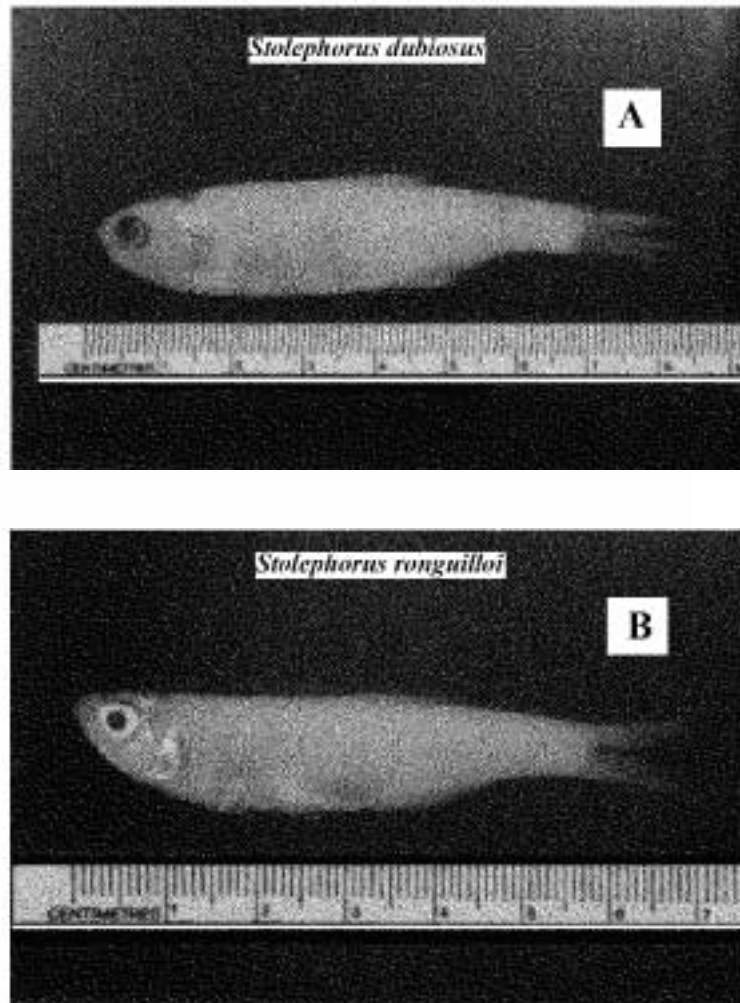
Detailed species identification is given by Wongratana, 1985; Whitehead, Nelson and Wongratana, 1988.

Chaitiamvong (1999) found 10 species of anchovy in the Gulf of Thailand which are different from the former record as follows:

- Encrasicholina devisi* (Whitley, 1940)
- E. heteroloba* (Rüppell, 1837)
- E. punctifer* Fowler, 1938
- S. chinensis* (Günther, 1880)
- S. dubiosus* Wongratana, 1983
- Stolephorus indicus* (van Hasselt, 1823)
- S. insularis* Hardenberg, 1933
- S. tri* (Bleeker, 1852)
- S. waitei* Jordan & Seale, 1926
- S. andhraensis* Babu Rao, 1966

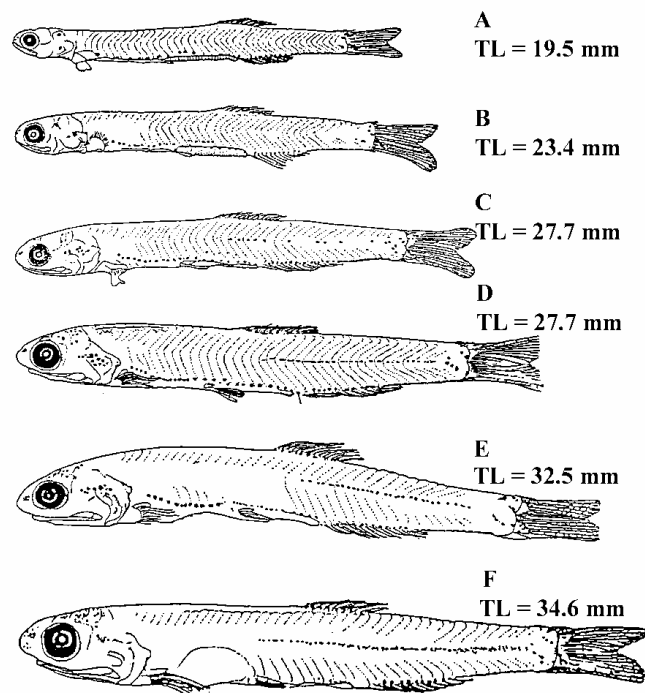


**Fig. 3. Preserved anchovies from the Gulf of Thailand**



**Fig. 4. Preserved anchovies from the Gulf of Thailand (A) and Andaman Sea (B)**

Engraulid larvae can be recognized and distinguished from the Clupeid larvae by their long and slender shape of 38-45 myomeres, the overlapping position of dorsal and anal fins, oblique mouth and large maxilla extending beyond the mid eye. Pigment patterns are used for species determination. Full descriptions of Engraulid larvae were given by Songchitsawat (1989) and Chayakul (1996). Chayakul (1996) studied the fish larvae in the Gulf of Thailand and drew the developmental steps of *Encrasicholina* and *Stolephorus* larvae (Fig. 5)



**Fig. 5. The development of the anchovy larvae**  
**(Rearranged from Charyakul, 1996 Note length of D is obviously wrong)**

### **3. THE BIOLOGY OF ANCHOVY**

#### **3.1 The distribution of eggs and larvae**

Wattanachai (1978) surveyed the distribution of fish eggs and larvae using larval nets. Anchovy eggs and larvae were abundantly distributed in March around Chang and Kuit Islands in Trad Province and Sattahip in Cholburi Province (Fig. 6). Songchitsawat (1989) surveyed the fish larvae around Chang Island on the east coast of the Gulf of Thailand, in Trad Province in the year 1983. The average number of Engraulid larvae at 16 stations showed a high peak of abundance in July. The average number of larvae per 1,000 cubic meters of water gradually increased from August to May of the following year. The highest number was 1,887 in July (recalculated from Songchitsawat, 1989). Engraulid larvae near Chang Island showed spatial distribution; the outer zone of the island was less abundant than the inner zone. The seasonal distribution in northeast, inter-monsoon and southwest monsoons showed a percentage of occurrence of 35.0%, 23.2% and 30.4% respectively (Songchitsawat, 1989).

Chayakul (1980, 1996) also surveyed fish eggs and larvae in Prachuab Kiri Khan and Surat Thani Provinces. The results showed high density of anchovy eggs and larvae in these areas with two peaks in February-April and July-August. Engraulid larvae were found all over the Gulf of Thailand and Andaman Sea (Songchitsawat, 1989; Chayakul, 1996).