
Biological and ecological assessment of conservation and aquaculture development of *Trigonostigma espei* in Chantaburi province

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Some biological and ecological aspects were investigated in the *Trigonostigma espei* (Lambchop Rasbora). Fish samples were collected from natural vegetated water bodies in Chantaburi Province, Eastern region of Thailand, between January 2006 and January 2007. The results revealed that this species was mainly found in Klung District. The body color of *T. espei* is bronze-pink and elongate, with a black triangular shaped marking on the back half of its side. The fins are clear, except for yellow triangles on the dorsal fin and tail. The body shape is oblong and compressed, with standard length 1.28-2.29 cm. This fish was normally found from mid-water levels to surface in canals and the genus is schooling fish. The relative gut length showed that body length/alimentary tract ratio was 1:0.75. Food component was analyzed in gut contents averaged 90 % aquatic insect, 75% Zooplankton, 43% phytoplankton, 25% worm and 2% algae, indicated its omnivorous feeder. The calculated length-weight relationship was $W = 0.0134 L^{3.2}$ whereas, $R^2 = 0.80$. The egg was adhesive dimensal, round in shape, with 0.9 mm. in average diameter. The average fecundity was 66 eggs. Due to degradation of its natural habitats and the high price in European tropical fish market, the species population in nature is increasingly decline, and reported as one of vulnerable groups in Thailand. This study provides baseline information that required for biodiversity conservation. The reproductive physiology is necessary to study for successful aquaculture development of *Trigonostigma espei*.

Key words: Lambchop Rasbora

Introduction

Trigonostigma espei is a naturally native small freshwater fish that may call Lambchop rasbora that is a slender fish with a unique bronze color and pink blush, and no orange stripe above the black triangle (Kottelat and Witte,

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1999a,b). Martin and Brittan (1954) reported that Lamchop rasbora in Klonh river Kingdom of Cambodia are usually found at middle to upper surface of river and also found in freshwater sources in general. The body length is about 2.5 cm. with this, Mongkolprasit *et al.* (1997) is also reported that Lamchop rasbora has been appeared in the checklist of fishes in Thailand. They are native to thickly vegetated streams and pools in Southeast Asia, especially Thailand and Cambodia. Of the total number of ornamental fish species imported into the United States during 1992 (1,539 species), only 20 species account for more than 60% of the total number of individuals being imported. The Espei Rasbora ranks sixteenth in number of individuals and accounts for 0.9% of the total (Clyde *et al.*, 2007). In Thailand the fish status is reported as a vulnerable species. (Vidthayanon, 2005). The objectives of this study were to identify Lamchop rasbora (*Trigonostigma espei*) and studied on its distribution in Chantaburi Province, Eastern Thailand and to investigate some biological aspects of Lamchop rasbora as baseline information for aquaculture development and biodiversity conservation.

Materials and methods

Lamchop rasbora (*Trigonostigma espei*) was collected by using nylon net at natural water reservoirs in Chantaburi province, eastern part of Thailand between January 2006 and January 2007. The research study focused on distribution of Lamchop rasbora, taxonomy, feeding habitat, sex determination, length-weight relationship and fecundity.

Distribution of Lamchop rasbora

Survey and collection of Lamchop rasbora were done using GPS, checked water temperature using thermometer, water pH, dissolve oxygen (DO) measurement and it was also measured and weighted the samples.

Characteristics and taxonomy

The identification was done by following the species description of Smith (1945) and other related literatures.

Study on feeding habitat

The samples of Lamchop rasbora were placed in plastic containers, and then suddenly transferred to bottle glass jar which contained 10 % formalin. The collection was done every week until 1 month. All fish samples were

measured and weighted. The random fish sample was operated the upper area of stomach and intestine about 1/3 of food tract using scissor and brought out by forceps to examine food inside the stomach and intestines, then recorded the fullness of food inside stomach and intestines according to the Fullness method of Hynes (1950) as follows:- 0 = not found food in stomach and intestine, 1 = slightly found, 2 = found lower than half, 3 = found half, 4 = found more than half and 5 = found full. To distinguish the kinds of foods, all taken out food was made on slide which a drop of glycerol and covered with cover slip, then examine under microscope at lower and higher magnification, then identified the types of food which divided into 5 groups as follows:- aquatic insects, plant plankton, animal plankton, aquatic worm and algae according to the works of Pensri (2537); Saranarach (2545); Ladda (2543, 2544); Laousri (2545); Rpbert (1989); David (1999) and Yuwadee (2548). All data were recorded and statistical analyzed frequency percentage according to Thanittha *et al.* (2545) and modified the formular of Hystop (1980) for percent frequency occurrence of food items (F_i %) which F_i (5) = frequency of food types/amount of examined fish X 100.

Sex determination

The living fishes were brought for sex determination and examined the secondary sexual characteristics in order to know the different between male and female by toughing and eye sight such as color, body shape, sex determinant and size etc.

Length-weight relationship

The fishes were selected at random to measure the length and weight in each fish. The data were then calculated as parameter of correlation according to the formular of Lafer(1970) which expressed the relationship between length and weight as following equation:- $W = aL^b$, $W = \log a + b \log L$ where W = weight (g), L = length (cm), a and b = constant values.

Fecundity

The female fishes were weighted and measured the length, thereafter operated the stomach and cut the ovary, then maintained in 10% formalin. The eggs were weighted and counted the egg number in the ovary, then measured egg arrangement in row and divided by the egg number to get egg diameter.

4. E-ngaw	8.50	5.73	27.02	N12° 27' 06.7"
				E102° 17' 09.7"

Characteristics and taxonomy

Body color is bronze-pink black with triangular shaped mark. The fins are clear, except for yellow triangles on the dorsal fin and tail. The body shape is oblonged and compressed. (Fig. 2) The values of standard length and weight for identification are presented in Table 2.



Fig.2. Characteristics of Lambchop Rasbora (*Trigonostigma espei*).

Table 2. The weight and standard length of Lambchop Rasbora (*Trigonostigma espei*).

Sites	Number of individuals	Average weight (g)	Standard length (mm)
1. Trgo-nong	14 ¹	0.1520 ¹	17.0 ¹
2. Sra-bap	22	0.1054	15.75
3. Kong-si-rai	33	0.1293	19.0
4. E-ngaw	40	0.0626	15.0

¹ = Average of four replications.

According to its characteristic, it is identified that this species belongs to Order Cypriniformes, Family Cyprinidae, Subfamily Rasborinae and genus *Trigonostigma*. This species was originally described in 1967 by H. Meinken and placed in the genus *Rasbora*. Thereafter, Kottelat and Witte (1999b) reviewed some of the cyprinid and stated that genus *Rasbora* is closely-related species to *Trigonostigma*, proposed to transfer to the new genus *Trigonostigma*. This name is from the Greek, trigonon means a triangle or hatchet and stigma means a spot or brand. The revision revised into 4 species as follows:- *T. heteromorpha*, *T. espei*, *T. hengeli* and *T. somphongsi*. However, these four species share a similar pattern and spawn behaviors that vary from the species

Rasbora. T. espei is used to replace the genus *Rasbora* which shows egg scattered.

There are four species of the genus *Trigonostigma* as follows:-

T. heteromorpha - The Harlequin or Red Harlequin. This is the type species for the genus *Trigonostigma*.

T. espei –This is also called the lambchop rasbora by virtue of the shape of the black patch looking like a piece of lambchop.

T. hengeli - It is named after a man Mr. Hengel so it is also called Hengel's Harlequin or Hengel's Rasbora, and also commonly called glowlight rasbora.

T. somphongsi - This is another fish that is named after a man, in this case a Thai man Khun (Mr.) Somphong.

Study on feeding habitat

Result showed that body length/gut length was 1:0.75. The percentage of gut content were 90% aquatic insect, 75% zooplankton, 43% phytoplankton, 25% worm and 2% algae, suggesting that the fish is omnivorous species as seen in tables 3 and 4. This result is also similar to the work of Hyslop (1980).

Table 3. The mean ratio of *gut length* to total length.

Sites	Number of Sample	Average			
		Standard length (mm)	Weight (g)	Gut length (mm)	Standard length: Gut length
Trgo-nong	14	2.0136	0.2417	1.5000	1:0.7449
Sra-bap	22	1.6764	0.1303	1.3282	1:0.7923
Kong-si-rai	33	1.7921	0.1011	1.3394	1:0.7474
E-ngaw	40	1.6498	0.846	1.2220	1:0.7407
Total	109	-	-	-	-
Average	-	1.7450	0.1190	1.3147	1:0.7534

Length-weight relationship

The length-weight was closely correlated to each other which R^2 was 0.8039 (Fig. 3) where averaged length was 1.74 cm and averaged weight was 0.12 g. where the shortest length was 1.39 cm and the lowest weight was 0.0319 g and longest length was 2.36 cm and the highest weight was 0.1865 g as seen in Table 5. This study is similar to the work of Clyde, *et al.* (2007).

Table 4. Composition of stomach contents of *Trigonostigma espei* expressed by Percent Frequency Occurrence of food items.

Sites	Number of sample	Fullness method	Fi (%)				
			Insect	Zooplankton	Phytoplankton	worm	algae
1. Trgo-nong	14	2	100	70.63	70.63	44.44	5.5
2. Sra-bap	22	1	97.5	89.16	33.33	5	2.5
3. Kong-si-rai	33	2	95.83	83.92	55.92	33.57	0
4. E-ngaw	40	1	77.2	77.27	33.05	18.05	0
total	109	-	-	-	-	-	-
average	-	2	92.63	75.83	43.81	25.26	2

Table 5. Length-weight relationships of Lambchop Rasbora (*Trigonostigma espei*).

No.	Length(cm)	Weight(g)	No.	Length(cm)	Weight(g)
1	2.09	0.1865	16	1.79	0.0790
2	1.95	0.1237	17	1.39	0.0458
3	1.83	0.0979	18	1.43	0.0532
4	2.12	0.2844	19	2.26	0.1292
5	1.98	0.1828	20	1.41	0.0361
6	2.08	0.1531	21	2.21	0.1477
7	1.76	0.0746	22	2.18	0.1571
8	1.83	0.1156	23	1.54	0.0437
9	1.97	0.0911	24	1.42	0.0537
10	2.07	0.1805	25	2.13	0.1158
11	1.43	0.0435	26	1.89	0.0491
12	1.79	0.0919	27	1.43	0.0319
13	1.45	0.0398	28	1.48	0.0519
14	1.47	0.0426	29	2.05	0.1284
15	2.09	0.1865	30	1.72	0.0821

Fecundity

Result showed that weight and fecundity of Lambchop Rasbora (*Trigonostigma espei*) was correlated to each other where R^2 was 0.7969 (Fig.4). However, it is observed that the eggs are adhesive dimensal, round in shape which the diameter averaged of 0.9 mm. The fecundity is also related to size and weight of the fish gonad that samples obtained from 10 females of body weight ranged from 0.0987 to 0.1816 g. that could appear a range of 45 to 86 eggs. The averaged fecundity was 66 eggs as illustrated in Table 6.

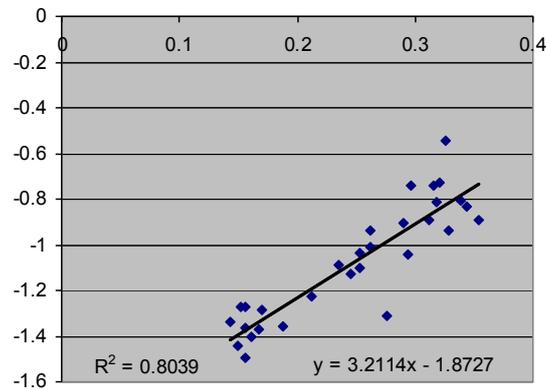


Fig. 3. Length-weight relationship of Lambchop Rasbora (*Trigonostigma espei*).

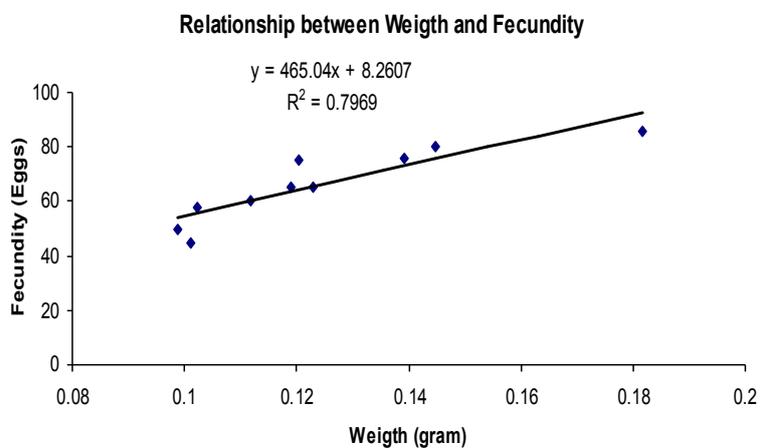


Fig. 4. Relationship between weight and fecundity.

It is revealed that *T. espei* is rare endemic species in Chantaburi province. Sadly it is thought to be under threat of habitat loss through deforestation or pollution from agricultural chemicals while others are considered to be at risk of overfishing for the aquarium trade. It is currently listed as "vulnerable species" on the Thailand Red Data: Fish by Vidthayanon (2005).

Table 6. Relationship between size and number of eggs from the gonads of *Trigonostigma espei*.

No.	Standard length (mm.)	Weight (g)	Fecundity
1	18.7	0.0987	50
2	19.0	0.1011	45
3	19.2	0.1023	58
4	19.5	0.1189	65
5	19.5	0.1117	60
6	19.9	0.1230	65
7	20.1	0.1203	75
8	20.5	0.1393	76
9	20.9	0.1447	80
10	21.5	0.1816	86
Average	1.99	0.1242	66

References

- Brittan, M.R. (1954). A revision of the Indo-Malayan fresh-water fish genus *Rasbora*. Monogr. Inst. Sci. Technol., Manila 3: 1-224.
- Hyslop, E.J. (1980). Stomach contents analysis a review of methods and their application. J. fish Biol 17: 414-429 pp.
- Kottelat, M. and Witte, K.E. (1999a). Two new species of *Microrasbora* from Thailand and Myanmar, with two new generic names for small Southeast Asian cyprinid fishes (Teleostei: Cyprinidae). J. South Asian Nat. Hist. 4(1): 49-59.
- Kottelat, M. and Witte, K.E. (1999b). Previously *Rasbora* Genus *Trigonostigma*. Available from: <http://www.bollmoraakvarieklubb.org>.
- Martin, R and R. Brittan. (1954). The Cyprinid Fish Genus *Rasbora* in Malaya. Bull of the Raffle Mus. 25 (1954): 129-159.
- Monkolprasit, S., Sontirat, S., Vimollohakarn, S. and Songsirikul, T. (1997). Checklist of Fishes in Thailand. Office of Environmental Policy and Planning, Bangkok, Thailand. 353 p.
- Clyde, S. Tamaru, B., Cole, R. B. and Brown, C. (2007). A Manual for Commercial Production of the Tiger Barb, *Capoeta tetrazona*, A Temporary Paired Tank Spawner. *Center for Tropical and Subtropical Aquaculture Publication Number 129*. 48 pp.
- Vidthayanon, C. (2005). New Species and Recorded Species from the Mekong River paper presented at the Seminar on Fisheries. 15-17 September, Bangkok: National Inland Fisheries Institute, Department of Fisheries (in Thai).

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