Chapter 3

Preliminary Data Analysis

In this chapter we describe the preliminary data analysis based on the quantities of the low value fish collected monthly from January 2003 to December 2006. In the first section we show description of variables used in this study. The total catch weight, percentage and species of low value fish are investigated in Section 3.2. The time series plot of the total low value fish, categorised by gear type and group, is shown in Section 3.3. In the last section we explore the distribution and the data transformation of the low value fish.

3.1 Descriptions of variables

The low value fish data used in this study were recorded by month, year and gear type used. There are four years from 2003 to 2006, 48 months and three types of gear used. These fish were also classified in term of fish group according to biological characteristics (vertebrate and invertebrate) and their living habitat (freshwater, brackish and marine) (Choonhapran, 1996). There are six groups, to cover the twenty three species, as shown in Table 3.1.

3.2 The total catch weights, percentage and species of low value fish

The data cover the four-year study period from January 2003 to December 2006. The fish catches were classified by unit price into three groups; low, medium and high price. The catch weights were 1343.3, 4686.7 and 3981.5 metric ton (13.4%, 46.8% and 39.8%) for low, medium and high priced species, respectively.

Variable	Details
Year	2003, 2004, 2005, 2006
Month	January, February, March, April, May, June, July, August, September, October, November, December
Gear	Trap, Set bag net, Gill net
Group	Freshwater Invertebrates, Estuarine Invertebrates, Marine Invertebrates, Freshwater Vertebrates, Estuarine Vertebrates, Marine Vertebrates
Species	*Macrobrachium equidens*, *Sphaerozius nitidus*, *Ocypode macrocera*, *Rasbora lateristriata*, *Trichogaster trichopterus*, *Trichopsis vittata*, *Ambassis gymnocephalus*, *Ambassis marianus*, *Aplocheilus panchax*, *Tylosurus crocodilus crocodilus*, *Rhinogobius hongkongensis*, *Parioglossus phillippinus*, *Butis koilomatodon*, *Hippichthys penicillus*, *Thryssa dussumieri*, *Setipinnata melanochir*, *Lycothrissa crocodilus*, *Scomberomorus commerson*, *Acentrogobius caninus*, *Acentrogobius chloreostigmatoides*, *Apogon endekataenia*, *Platycephalus indicus* and *Tetraodon nigroviridis*

Table 3.1: Study variables

Table 3.2 shows the catch weights, in metric tons and percentages, of low value fish by year, fishing gear, and fish group. The highest catch weight was 365.4 metric tons (27.2%) in 2006; 971.7 metric tons (72.3%) was caught by set bag net. However, freshwater invertebrates were not found in the landing record. The estuarine vertebrates were the largest group (533.2 metric tons, or 39.7% of total catch).

Variable	Category	Weight (metric ton)	%
Year	2003	319.3	23.8
	2004	337.2	25.1
	2005	321.3	23.9
	2006	365.4	27.2
Gear	Trap	138.6	10.3
	Set bag net	971.7	72.3
	Gill net	233.1	17.3
Group	Estuarine Invertebrates	78.3	5.8
	Marine Invertebrates	79.9	5.9
	Freshwater Vertebrates	224.4	16.7
	Estuarine Vertebrates	533.2	39.7
	Marine Vertebrates	427.5	31.8

Table 3.2: Total catch weight and percentage of low value fish categorized by year, gear type, and fish group, from Songkhla Lake during 2003–2006

Figure 3.1 shows the catch weight of low value fish of species group by year and gear type. The estuarine vertebrate catches increased every year and the highest catch weight occurred in 2006 at 164.5 metric tons (12.2%). The catch weight of estuarine invertebrates, marine invertebrates, freshwater vertebrates, and marine vertebrates were similar (2a). The highest catch weight of estuarine invertebrates was caught by traps [at about 56.6 metric tons (4.2%)]. The set bag net presented the highest catch weight of estuarine vertebrates [at about 457.1 metric tons (34.0%)], followed by the marine vertebrates [about 376.5 metric tons (28.0%)]. In contrast, the maximum catch weight of freshwater vertebrates was caught by the gill net (2b) [148.1 metric tons (11.0%)].

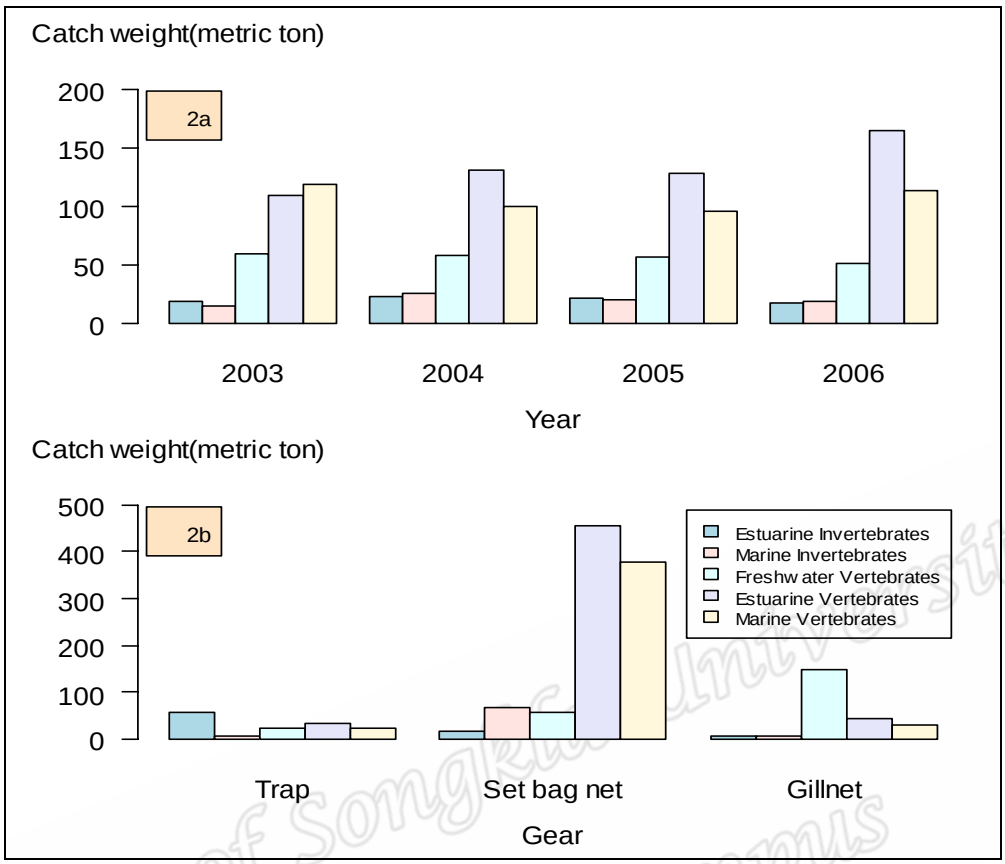

Figure 3.1: Catch weights of low value fish grouping by year (2a) and gear type (2b)

Table 3.3 shows species, family and weight of the low value fish that were caught in the Lake during 2003–2006. Twenty three species of six fish groups were identified including freshwater invertebrates, estuarine invertebrates, marine invertebrates, freshwater vertebrates, estuarine vertebrates and marine vertebrates. However, the freshwater invertebrate was not found in the landing record. The estuarine vertebrates were the largest proportion [533.2 metric tons (39.7%)]. The largest species catches were *Rasbora lateristriata*, *Ambassis gymnocephalus*, *Ambassis marianus* and *Thryssa dussumieri*, being 158.4, 143.7, 139.8 and 111.5 metric tons (11.8, 10.7, 10.4 and 8.3%), respectively.

Group	Family	Common Name	Scientific Name	Weight (metric ton)
Estuarine Invertebrates	Palaemonidae	Dwarf prawn	*Macrobrachium equidens*	78.3
Marine Invertebrates	Xanthidae	Xanthid crab	*Sphaerozius nitidus*	63.2
	Ocypodidae	Ghost crab	*Ocypode macrocera*	16.7
Freshwater Vertebrates	Cyprinidae	Yellow rasbora	*Rasbora lateristriata*	158.4
	Osphronemidae	Tree spot gourami	*Trichogaster trichopterus*	38.2
	Belontiidae	Croaking gourami	*Trichopsis vittata*	27.8
Estuarine Vertebrates	Chandidae	Naked-head glassy perchlet	*Ambassis gymnocephalus*	143.7
		Estuary perchlet	*Ambassis marianus*	139.8
	Aplocheilidae	Blue panchax	*Aplocheilus panchax*	72.1
	Hemiramphidae	Quay garfish	*Tylosurus crocodilus crocodilus*	59.1
	Gobiidae	Long-tailed sand goby	*Rhinogobius hongkongensis*	58.2
		Dwarf goby	*Parioglossus phillippinus*	28.1
	Eleotridae	Mud sleeper	*Butis koilomatodon*	28.9
	Synathathidae	Beady pipefish	*Hippichthys penicillus*	3.2
Marine Vertebrates	Engraulididae	Dussumier's thryssa	*Thryssa dussumieri*	111.5
		Dusky-hairfin anchovy	*Setipinnata melanochir*	49.2
		Sabretoothed thryssa	*Lycothrissa crocodilus*	38.1
	Trypauchenidae	Horse face loach	*Scomberomorus commerson*	69.9
	Gobiidae	Tropical sand goby	*Acentrogobius caninus*	58.5
		Bighead goby	*Acentrogobius chloreostigmatoides*	41.1
	Apogonidae	Candystripe cardinalfish	*Apogon endekataenia*	25.7
	Platycephalidae	Bartail flathead	*Platycephalus indicus*	24.1
	Tetraodontidae	Spotted green pufferfish	*Tetraodon nigroviridis*	9.4

Table 3.3: Species, family and the catch weight in metric tons of low value fish, for each group.

3.3 Time series plot

A time series is a sequence of observations observed over time, usually at regular intervals. The monthly catches were of low value fish measured in kilograms weight and landed at Songkhla Lake ports. A time series of low value fish shows the monthly total catch weight, by gear type and by group, as shown in Figures 3.2 to 3.4.

Figure 3.2 shows the distribution of low value fish in monthly catch during 2003-2006. The monthly catches have a similar pattern, with the highest catch in March and the lowest around January and February. In 2003, the maximum catch weight was 111.0 metric tons and the minimum catch was 11.4 metric tons. In 2004, the maximum catch weight was 95.7 metric tons and the minimum catch was 12.5 metric tons. In 2005, the maximum catch weight was 90.9 metric tons and the minimum catch was 11.8 metric tons. In 2006, the maximum catch weight was 119.5 metric ton and the minimum catch was 15.8 metric tons.

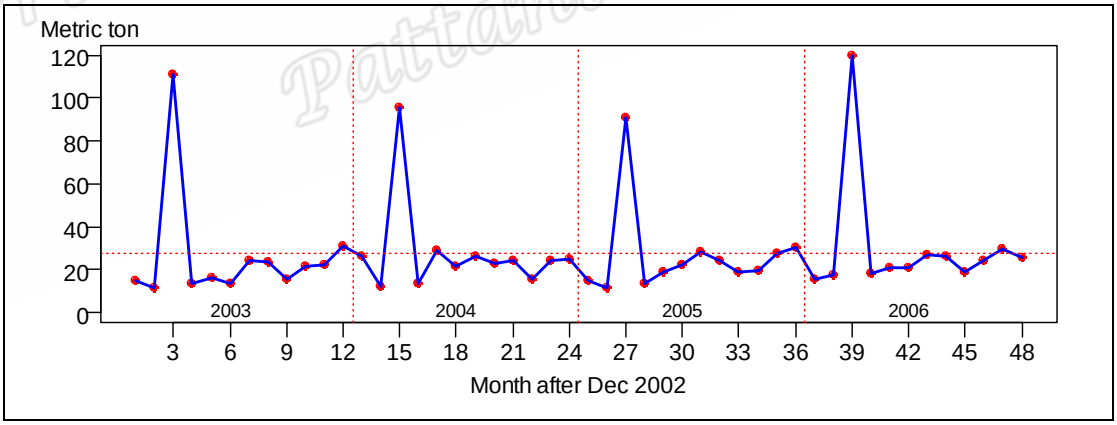

Figure 3.2: Monthly total catch weight of low value fish in Songkhla Lake during 2003-2006

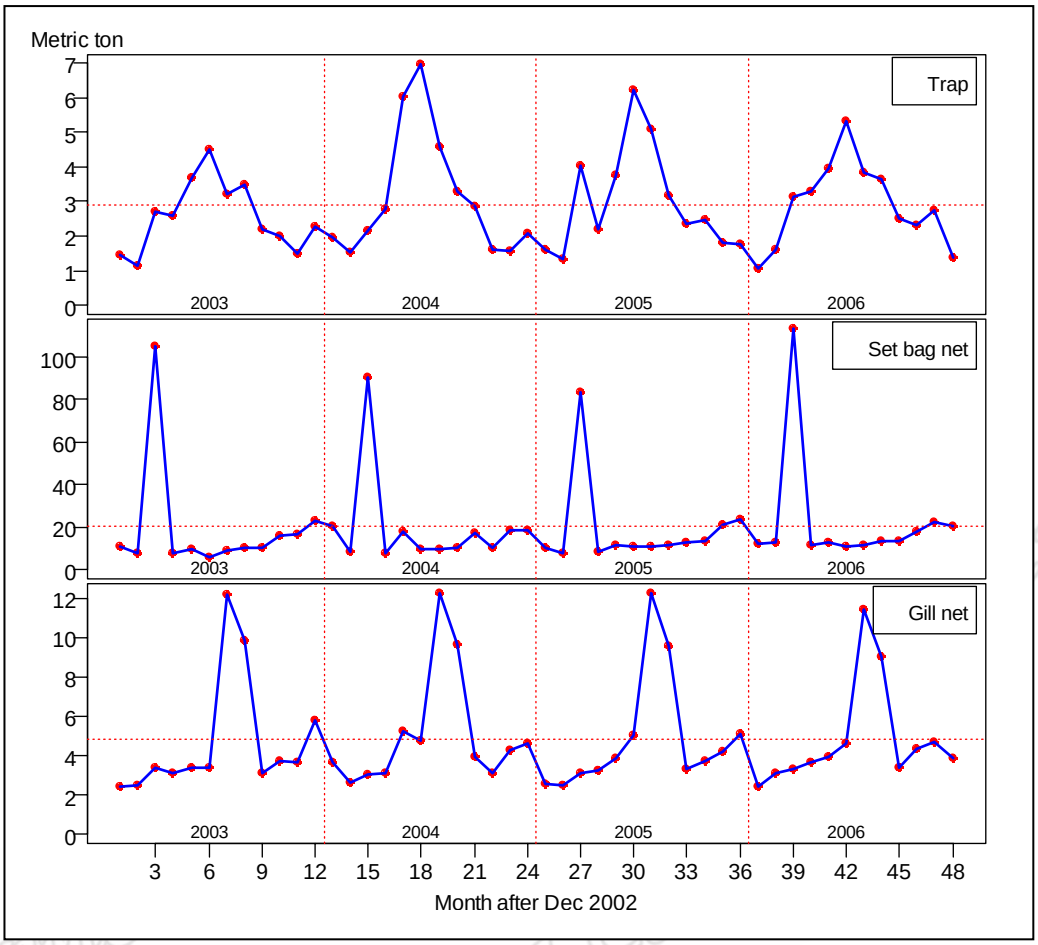

Figure 3.3: Monthly total catch weight of low value fish in Songkhla Lake during 2003-2006 using trap, set bag net and gill net type

Figure 3.3 shows the monthly catch weights of low value fish using trap, set bag net and gill net type. The maximum catch weights by trap were 4.5, 6.9, 6.2 and 5.3 metric tons in June in 2003, 2004, 2005 and 2006, respectively (upper panel). The maximum catch weights by set bag net were 104.9, 90.5, 83.7 and 113.1 metric tons in March in 2003, 2004, 2005 and 2006, respectively (middle panel). In addition, the maximum catch weights by gill net were 12.2, 12.2, 12.2 and 11.4 metric tons in July in 2003, 2004, 2005 and 2006, respectively (lower panel).

Figure 3.4 shows the monthly catch weight of estuarine, marine invertebrates, freshwater, estuarine and marine vertebrates. *Macrobrachium equidens* was the only

species of low value in this group. The highest catch weights were 3.1 and 4.6 metric tons found in June 2003 and 2004. In 2005 and 2006, the highest catch weights were 4.0 and 2.7 metric tons found in March and November, respectively.

Ocypode macrocera and *Sphaerozius nitidus* were low value species of the marine invertebrates group. The maximum catch weights were 4.4, 8.3, 7.3 and 6.2 metric tons found in March in 2003, 2004, 2005 and 2006, respectively. The highest monthly catch weight in 2004 was in May (7.5 metric tons).

Rasbora lateristriata, *Trichopsis vittata* and *Trichogaster trichopterus* contributed the third highest catch weight of low value species in the freshwater vertebrates group. The catch weight of this group was stable from January to June, increased continuously in July and August, decreased in September and increased continuously again in October to December in 2003, 2004 and 2005. In addition, the catch weights in 2006 were lower for December than they were in other years. The maximum catch weights were approximately 11-13 metric tons, in July and August.

Ambassis gymnocephalus, *Ambassis marianus* and *Aplocheilus panchax* were the third highest catch weight of low value species of the estuarine vertebrates group. The maximum catch weights were 38.1, 39.2, 40.5 and 62.9 metric tons in March 2003, 2004, 2005 and 2006, respectively.

Thryssa dussumieri, *Acentrogobius caninus* and *Scomberomorus commerson* were the third highest catch weight of low value species of the marine vertebrates group. The peak happened at the same as with the estuarine vertebrates. The maximum catch weights were 64.1, 44.5, 37.0 and 46.0 metric tons, in March 2003, 2004, 2005 and 2006, respectively.

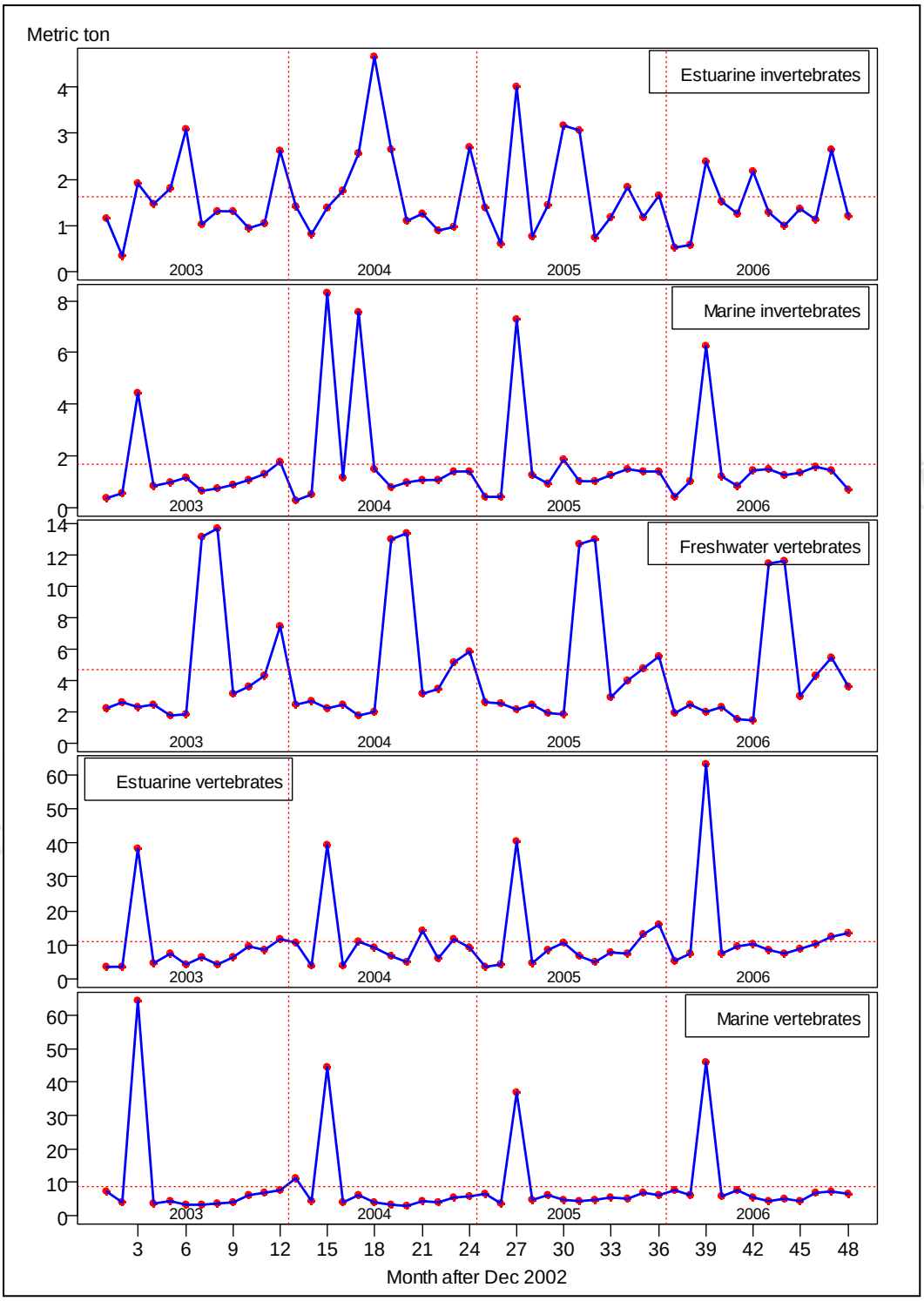

Figure 3.4: Monthly catch weight of the low value fish of estuarine, marine invertebrates, freshwater, estuarine and marine vertebrates groups

Note that, the peak of the time series for total low value fish was very high in March. The patterns of peak of time series were different when we separated by gear. The peak of time series for set bag net had similarities with the total low value fish, being very high in March. For trap, it was continuously high in January to June, it highest peak, and slightly decreased until December. For gill net, it slightly increased in January to July, it highest peak, and slightly decreased in August. It decreased greatly in September and then a little until December.

When we separated by group and gear, we found the patterns and peaks in time series for some groups and gears to be the same as for the total low value fish but for other groups and gears there were differences. The peak in time series of marine invertebrates, estuarine and marine vertebrates had similarities with the total low value fish and set bag net. The peak for marine invertebrates was a little different, with catch very high in May 2004. The peak in time series of freshwater vertebrates was similar to the peak for gill net. For the peak of estuarine invertebrates, it was quite different from other peaks.

3.4 Distributions of the total low value fish, each gear and group

Figure 3.5 shows histograms of the total low value fish in Songkhla Lake during 2003-2006, before and after a data transformation aimed at reducing the skewness. The catch weight of total low value fish was transformed by taking the natural logarithm. The skewness coefficients for the catch weights of total low value fish were 10.42. However, after taking the natural logarithm of the catch weight, these skewness coefficients were reduced to -0.11.

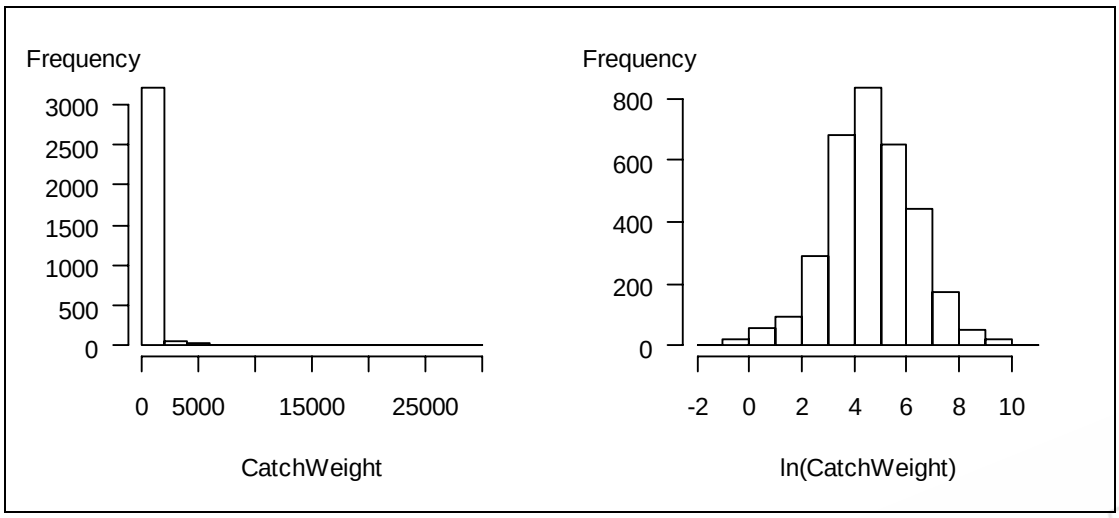

Figure 3.5: Histogram of low value fish in Songkla Lake during 2003-2006

Figure 3.6 shows histograms of the low value fish in Songkhla Lake during 2003-2006 by gear: trap, set bag net and gill net, before and after a data transformation aimed at reducing the skewness. The catch weights by three gears were transformed by taking the natural logarithms. The skewness coefficients for the catch weights by trap, set bag net and gill net gear were 5.98, 7.35 and 10.25, respectively. However, after taking the natural logarithm of the catch weight, these skewness coefficients were reduced to -0.26, -0.16, and -0.15, respectively.

.

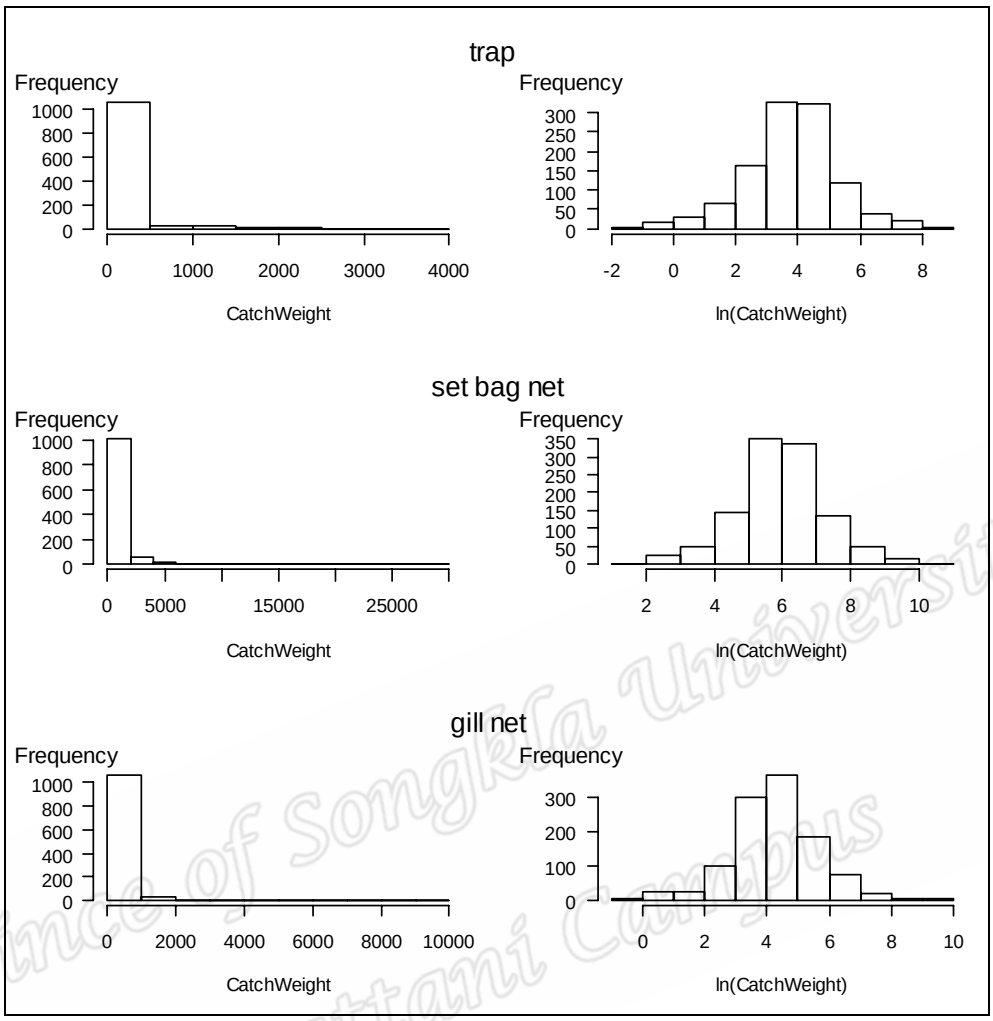

Figure 3.6: Histogram of low value fish by gears: trap, set bag net and gill net

Figure 3.7 shows histograms of the low value fish in Songkhla Lake during 2003-2006 by group: estuarine invertebrates, marine invertebrates, freshwater vertebrates, estuarine vertebrates and marine vertebrates, before and after a data transformation aimed at reducing the skewness. The catch weights by five groups were transformed by taking the natural logarithms. The skewness coefficients for the catch weights of estuarine invertebrates, marine invertebrates, freshwater vertebrates, estuarine vertebrates and marine vertebrates group were 2.18, 5.39, 5.39, 7.52 and 13.86, respectively. However, after taking the natural logarithms of the catch weights, these skewness coefficients were reduced to 0.09, 0.22, 0.24, -0.31 and 0.19, respectively.

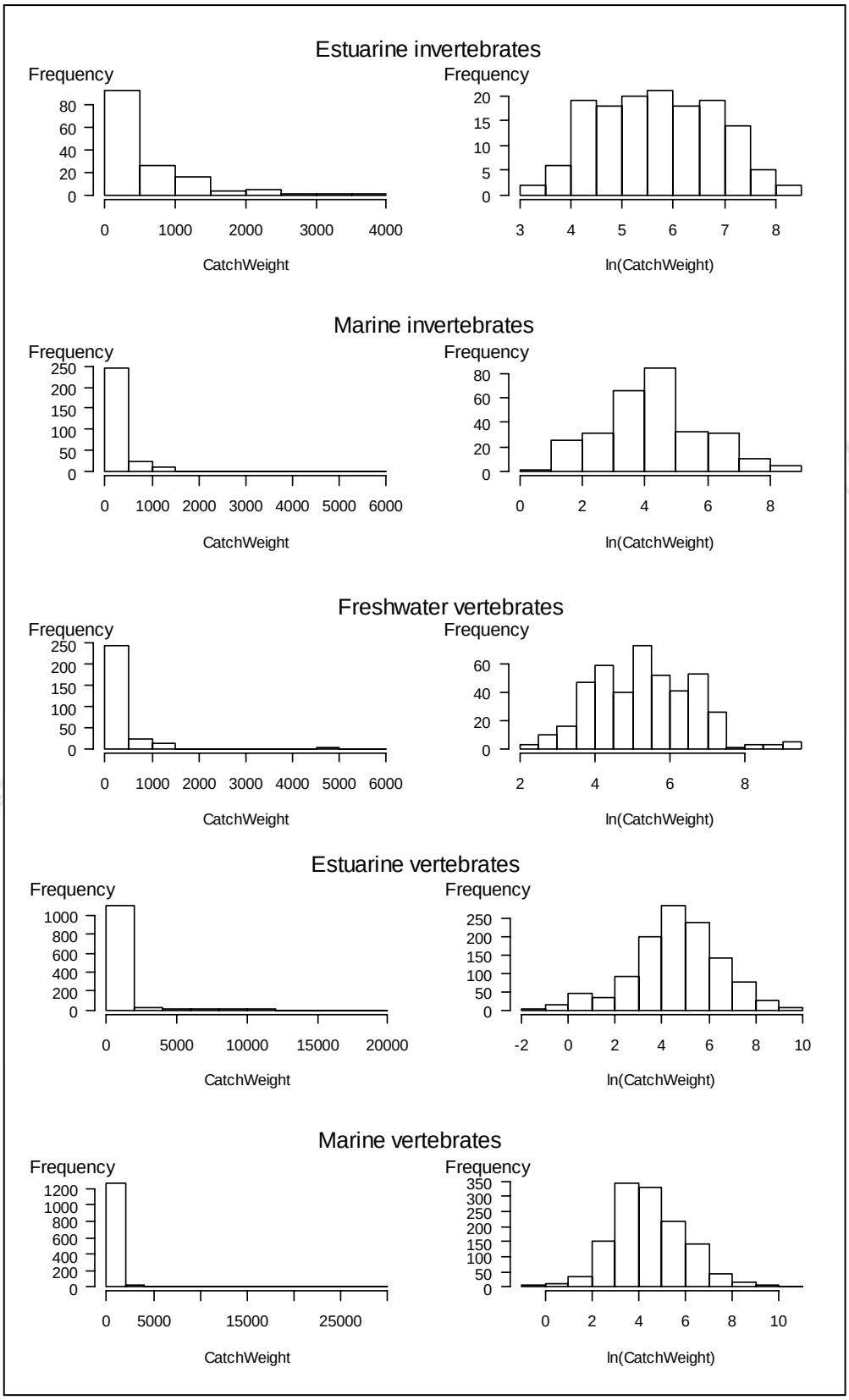

Figure 3.7: Histogram of low value fish by fish groups