THE CONSERVATION STATUS OF THE FRESHWATER TURTLE (*BATAGUR BASKA*) IN THE PERAK RIVER, WEST MALAYSIA

Mohamed Hifni Mohd Baharuddin[1] and **Shahrul Anuar Mohd Sah**[2]

School of Biological Sciences,
Universiti Sains Malaysia,
11800 USM Penang,
MALAYSIA.

E-mail: [1]**mhifni@usm.my**
[2]**sanuar@usm.my**

ABSTRACT

The river terrapin *Batagur baska* is a freshwater turtle which is widely distributed and inhabits South and South Eastern Asia from West Bengal, India to South Vietnam and Sumatra. In West Malaysia the species is found in large rivers, with noticeable numbers in Perak River (Perak), Terengganu River (Terengganu) and Bukit Pinang River (Kedah). Throughout the region the population has declined to the extent that the river terrapin is currently listed as an endangered species by the International Union for Conservation of Nature and Natural Resources. A total of 12 surveys and trapping sessions were carried out from October 1994 to September 1995 along the estuary of the Perak River. A total of 73 captures were made comprising of 12 males and 61 females. Sex ratio of male adult to female adult is 1:1.45. Mean weight of adult males is 11.5 ± 0.6 kg (SE, n = 11) and adult females is 14.6 ± 1.2 kg (SE, n = 16). There is no significant difference between weight of adult males and adult females ($F_{1,26}$ = 3.66, P = 0.06). Mean carapace length of adult males is 423.2 ± 6.1 mm (SE) and adult females is 448.8 ± 11.6 mm (SE). There is no significant difference between carapace length of adult males and adult females ($F_{1,26}$ = 2.98, P = 0.09). Mean carapace width of adult males is 332.5 ± 2.7 mm (SE) and adult females is 374.4 ± 11.4 mm (SE) and there is a significant difference between carapace width of adult males and adult females ($F_{1,26}$ = 8.93, P = 0.006). Mean height of adult males is 169.7 ± 9.5 mm (SE) and adult females is 201.7 ± 8.4 mm (SE) and there is a significant difference between height of adult males and adult females ($F_{1,26}$ = 4.63, P = 0.04). A relatively high number of juveniles (20.5%) and subadults (42.5%) in the Perak River suggests that the area is a desirable site for the *in-situ* conservation of *Batagur baska* in the state of Perak. Conservation efforts, protective measures and existing legislation should be imposed and subsequently enforced for the recovery program.

Introduction

The river terrapin, *Batagur baska* or locally known as "tuntung", is a freshwater turtle that inhabits South and South Eastern Asia from West Bengal, India to

southern Vietnam and Sumatra. In Thailand this species is found in Pak Payoon, Phattalung Province and Amphur Ranote, Songkhla Province (Wirot, 1979). In Malaysia, *B. baska* is found in large rivers with noticeable numbers in Perak, Terengganu and Bukit Pinang rivers (Moll, 1980). However, throughout this region the population is dwindling such that it is now enlisted as an endangered species by the International Union for Conservation of Nature and Natural Resources (IUCN). Moll (1980) reported that the *B. baska* is being exploited for its eggs and flesh.

Physically, *Batagur* has a huge and deep shell which is heavily buttressed and fully webbed feet. The skull is serrated with tornia. Taxonomically, *B. baska* belongs to the family Emydidae and is also a subfamily of Batagurinae. According to Moll (1980), based on the recent reviews by Loveridge and Williams (1957) and McDowell (1964) on this subfamily, the turtles' closest relatives are *Kachuga* and *Callagur.*

Although detailed descriptions of the taxon appeared frequently (Cantor, 1847; Boulenger. 1912; De Rooij, 1915; Prichard, 1979 and Wirot. 1979) ecological information available on the local *B. baska* is still unsatisfactory (Moll, 1978). However several local studies and observations on the natural history, biology and conservation of *B. baska* have been made (Loch. 1951: Well, 1960; Hendrickson, 1961: Momin Khan, 1964: Hendrickson & Balasingam. 1966; Balasingam & Momin Khan. 1969; Moll 1976. 1979, 1980, 1984, 1987; Siow & Moll 1981; Mashor & Hifni 1985; Shariff 1986; Shariff *et al.* 1986; Hifni *et al.* 1988 and Hifni, 1992).

Loch (1951), Momin Khan (1964) and Moll (1978) gave brief accounts on the nesting behaviour, with stories and legends concerning this freshwater turtle. Hendrickson (1961), Momin Khan (1964), Balasingam and Momin Khan (1969) and Moll (1976, 1984 &1987) were concerned with conservation of *B. baska* and provided some data on the natural history, while Hifni (1992) discussed the conservation status of this species. Moll (1976 & 1987), Shariff (1986) and Shariff *et al.* (1986) described the hatching success and management of the *B. baska* in captivity. Moll (1980) gave brief account on the food consumed by *B. baska* in the wild. Hifni *et al.* (1988) carried out laboratory studies of food preference of *B. baska* on three species of aquatic plants.

The ecology of *B. baska* in Malaysia was reviewed by Moll (1980). He gave a considerable account on the distribution, habitat, population, movement, food, growth and reproduction. Estimates on the population size were based on the nesting record of *B. baska* per season. Although Moll carried out the capture-recapture study using Schnabel variant of the Lincoln Index, no consistent estimate of population size was shown and thus no conclusion was deduced from it. The study on movement using radio-tagged individuals was largely unsuccessful due to defective equipment and the inability to locate the tagged animals during the short sampling period. Growth of *B. baska* living under natural conditions could not be adequately studied due to time constraints, but instead Moll included the data of *B. baska* in captivity.

The Mark-Release-Recapture (MRR) method was used to estimate the population size of the *B. baska*. Captured individuals were marked with serial numbered metal tags and then released at the point of capture. The metal tags were attached by drilling a hole on the marginal carapace and then tying with a plastic ribbon. Sexing of captured individuals was done by the tail scale count.

Trapping and handling the animals were given l priority owing to the fact that *B. baska* is an endangered animal. Bearing this in mind the handling of the animals was done carefully so as not to hurt or injure them and more importantly to avoid fatalities.

Study site

In general, the whole tidal area of the Perak River is fairly vast. It is 0.5 km to 2.5 km in width and its depth can vary from 1 to 12 m. The river bed consists largely of clay and waste matter excreted by farm animals but certain areas are sandy. The vegetation on the tidal banks mainly comprise of various mangrove species. such as *Avicennia, Sonneratia, Rhizophara, Nipa* sp. and *Pandanus* sp. (Moll. 1980). Thus productivity is presumably high.

The study site chosen was at the mouth of Parit Jerman, an irrigation canal at Kampong Kayan. A total of 12 ecological field surveys were carried out at the estuary of Perak River. Data collection was carried out every month for a period of 13 months from October 1994 to September 1995. The study was conducted to estimate the population size and composition of B. baska. Morphological characteristics such as carapace length and width, plastron length and width. tail length. body weight and abnormality of individuals were recorded.

Methods

The trappings were carried out during spring tide at which there is the greatest rise or fall of water, occurring soon after the new and full moon each month. During the specific period when tides are ebbing, the turtles begin to leave the irrigation canal and move towards larger waterways. This is the most suitable period to trap these animals with nets.

The ambai nets were set during the highest point (peak) of the spring tide. The nets were tied to two strong nibong poles. The funnel bags were checked every 15 minutes. The nets were set in the canal near the opening of the main river.

Animals caught were removed from the net and their morphological characteristics were recorded. Standard measurements of the carapace length (CL), carapace width (CW), plastron length (PL). plastron width (PW), shell height (H) and body weight (W) were recorded. Other morphological deformities of each individual were also recorded. Calipers were used to measure the length and width, and tubular scale for weight.

The individuals were marked by drilling two holes on the right posterior of the tenth marginal carapace (10R) and attaching a numbered aluminium tag. The tag was anchored by tying a notch with a plastic ribbon. The method of marking followed Cagle's (1939) code system. After marking, the animal were released at the point of capture.

Results and discussion

A total of 73 river terappins were caught throughout the study period. None of the individuals marked were recaptured. Based on the captured animals there were 12 males and 61 females. The sex ratio of adult male to adult female is 1:1.45. When compared to Moll's (1980) sex ratio (1: 1.29) there is a similarity between the two results.

The number of adults caught were 27, juveniles numbered 15 and subadults 31. The population comprised of (37%) adults, (20.5%) juveniles and (42.5%) subadults. The percentage shows that there is relatively a high number of juveniles and subadults (immatured), which suggests that the area is suitable as an *in-situ* conservation site.

The mean weight of adult males are 11.5 ± 0.6 kg (SE, n = 11) while the mean weight of females are 14.6 ± 1.2 kg (Se, n = 16). There is no significant difference between the weight of adult males and adult females ($F_{1,26} = 3.36$, $P = 0.06$).

Mean carapace length of adult males was 423.2 ± 6.1 mm (SE) while adult females was 448.8 ± 11.6 mm (SE). There is no significant difference between carapace length of adult males and adult females ($F_{1,26} = 2.98$, $P = 0.09$). The mean carapace value for both sexes appear slightly lower when compared to Moll's (1980) results (male, 438 ± 21.48 mm ; female, 488.34 ± 22.87 mm). The slight differences in the mean carapace value for both sexes may be due to Moll's samples comprising of more adults.

The mean carapace width of adult males was 332.5 ± 2.7 mm (SE) while mean carapace width of adult females was 374.4 ± 11.4 mm (SE). There is a significant difference between carapace width of adult males and females ($F_{1,26} = 8.93$, $P = 0.006$). Adult females had a wider carapace width and appeared somewhat larger than adult males.

Mean height of adult males was 169.7 ± 9.5 mm (SE) while mean height of adult females was 201.7 ± 8.4 mm (SE) and there is a significant difference between height of adult males and adult females ($F_{1,26} = 4.63$, $P = 0.04$). It appears that adult males had a shallower shell height when compared to the adult females.

All relationships show a linear regression except for the weight (W) to carapace length (CL) which is more of a curve relationship (Figure 1–9). The curve relationship presumably indicates that there is a change in diet as the size and age

increases. At a younger age, terrapins are more dependent on a vegetative diet but as they grow, they depend more and more on a mixed diet (omnivorous). The population estimate using Mark-Release-Recapture (MRR) methods yielded no success. There was no recapture at all due to several reasons.

The first factor was not enough sampling stations set along the Perak River. The terrapins travel great distances (travel range) following the movement of the tide along the estuary of Perak River. The estuary of Perak River has many tributaries and deep man-made waterways which are frequently used by the terrapins. More suitable sampling stations should be established in order to have a good representation of the population. This could probably overcome the problem of not getting any recapture.

Another factor was lack of frequent samplings. In this study trapping was only conducted once a month. Doubling the trapping effort to twice a month could improve the capture and recapture rate. This definitely requires more manpower and funding.

References

Balasingam, E. and Mohamad Khan Bin Momin Khan. 1969. Conservation of the Perak River Terrapin *Batagur baska*. *Malayan Nature Journal* 23: 27–29.

Boulenger, G. 1912. *A vertebrate fauna of the Malay Peninsular from the Isthmus of Kra to Singapore, including the adjacent islands.* Taylor and Francis, London.

Cagle, F. 1939. A system of marking turtles for future identification. *Copeia* 1939: 170–173.

Cantor, T. 1847. Catalogue of reptiles inhabiting the Malayan Peninsular and Islands. *Journal Asiatic Soc. Bengal* 16. (Reprint 1966). A. Asher & Co., Amsterdam.

De Rooij, N. 1915. *The reptiles of the Indo-Australian archipelago. Vol. I. Lacerta, Emydosauria.* London: Brill.

Hendrickson, J. 1961. Conservation investigations of Malayan turtles. *Malayan Nature Journal (Special Issue)*: 214–223.

Hendrickson, J. and E. Balasingam. 1966. Nesting beach preferences of Malayan sea turtles. *Bull. Nat. Mus. Singapore* 33(10): 69–79.

Hifni, B., M. Masshor and M. Azinuddin. 1988. *Laboratory studies of food preferences of river terrapin,* Batagur baska *(Gray) on three species of aquatic plants.* Paper presented at Simposium Biologi Kebangsaan Ke-III. Keseimbangan Penyelidikan Asas dan Gunaan dalam Biologi. Universiti Kebangsaan Malaysia. Bangi.

Hifni, B. 1992. *Current status of turtles in Peninsular Malaysia.* Paper presented at First joint USM-PSU Seminar 'Progress in biological research'. Universiti Sains Malaysia, Penang.

Kenward, R. 1987. *Wildlife Radio Tagging.* Academic Press Publ. Inc., San Diego.

Loch, J. 1951. Notes on the Perak River turtle. *Malayan Nature Journal* 5: 157–160.

Loveridge, A. and E. Williams. 1957. Revision of the African tortoises and turtles of the suborder Cryptodira. *Bull. Mus. Comp. Zool.* 115: 161–577.

McDowell, S. 1964. Partition of the genus *Clemmys* and related problems in the taxonomy of the aquatic Testudinidae. *Zool. Soc. (London), Proc.* 143: 239–279.

Mashhor, M. and B. Hifni. 1985. Projek Sungai Perak. *Perantara USM* 15: 20.

Mohamed Khan Bin Momin Khan. 1964. A note on *Batagur baska* (the river terrapin or tuntung). *Malayan Nature Journal* 18: 184–187.

Moll, E. 1976. *Ecology and management of the tuntung, Batagur baska in Malaysia.* Unpublished report to the Game Department of West Malaysia.

Moll, E. 1978. Drumming along the Perak River. *Natural History* 37(5): 36–43.

Moll, E. 1979. Reproductive cycles and adaptations. In: M. Harless and H. Morlock (eds.). *Turtles: perspectives and research.* John Wiley and Son, New York.

Moll, E. 1980. Natural history of the river terrapin, *Batagur baska* (Gray) in Malaysia (Testudines: Emydidae). *Malaysian Journal of Science* 6(A): 23–62.

Moll, E. 1984. River terrapin recovery plan for Malaysia. *Journal of Wildlife and Parks* 3: 37 –47.

Moll, E. 1987. *Final report. The river terrapin conservation program in Malaysia: Follow-up study and evaluation.* Unpublished report to the Game Department of West Malaysia.

Pritchard, P. 1979. *Encyclopedia of turtles.* T.F.H. Publ. Inc. Jersey City. N.J

Shariff, S. 1986. Hatching success of the river terrapin *Batagur baska* at the captive breeding projects in Perak and Trengganu. *Journal of Wildlife and Parks* 5: 53–59.

Shariff, S., Z.A. Shukor and H.A. Manap. 1986. *Aspects of growth, reproduction and recommendation for management of the river terrapin Batagur baska at Bota Kanan, Perak.* Paper presented at Seminar on Wildlife Conservation and Management. Wildlife and National Park Department, Kuala Lumpur.

Siow, K.T. and E. Moll. 1981. Status and conservation of estuarine and sea turtles in West Malaysia waters. Pp 339–347 in: K. Bjorndal (ed.). *Biology and Conservation of Sea Turtles.* Smithsonian Press, Washington, D.C.

Wells, K.S. 1960. A note on turtles. *Malayan Nature Journal* 14: 108–121.

Wirot, N. 1979. *The turtles of Thailand.* Mitbhadung Press, Bangkok.

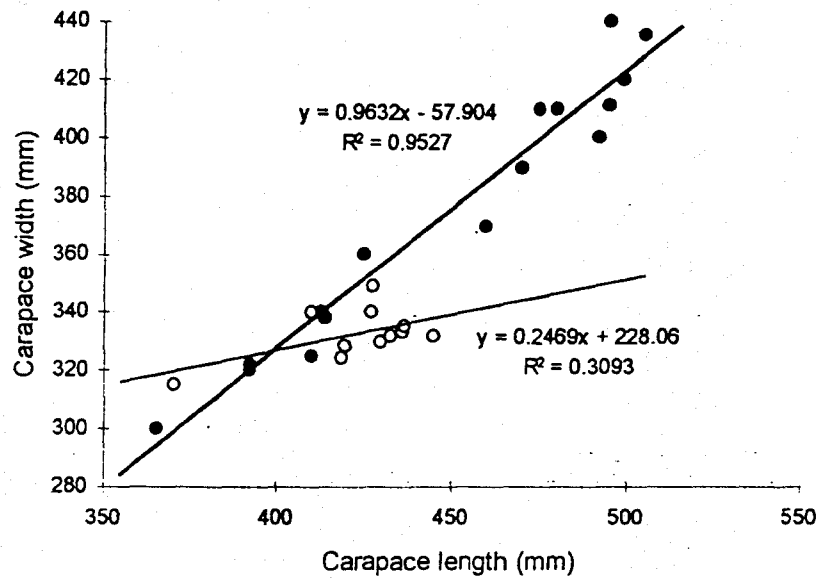

Fig. 1. Relationship between carapace width (CW) to carapace length (CL) in 27 adult *Batagur baska* (11 males and 16 females) from the Perak River. Open circles represent males and closed circles represent females. Regression formula for females (bold line): CW = 0.9632 CL - 57.904; $R^2 = 0.9527$ and regression formula for males (thin line): CW = 0.2469 CL + 228.06; $R^2 = 0.3093$.

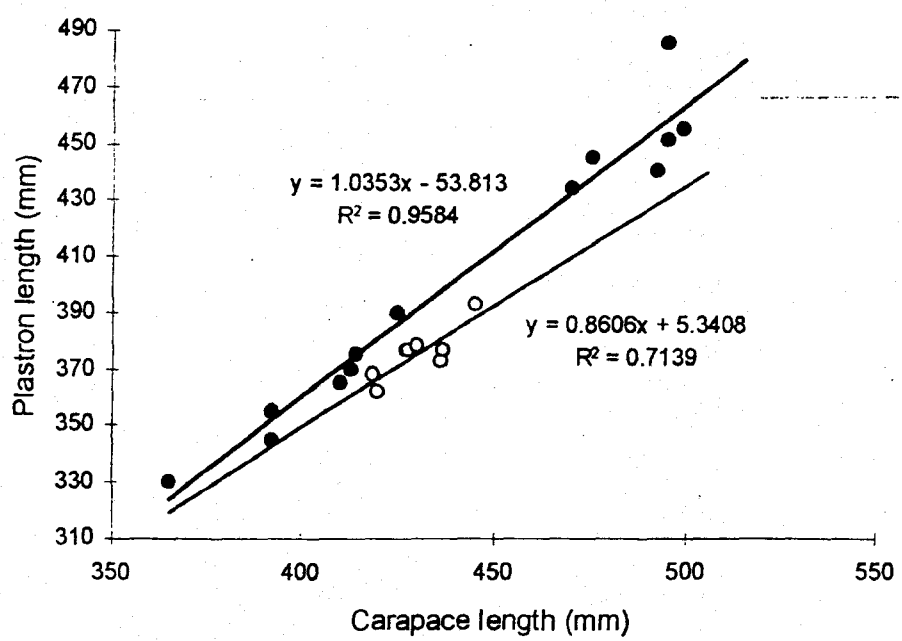

Fig. 2. Relationship between plastron length (PL) to carapace length (CL) in 21 adult *Batagur baska* (8 males and 13 females) from the Perak River. Open circles represent males and closed circles represent females. Regression formula for females (bold line); PL = 1.0353 CL - 53.813; $R^2 = 0.9584$ and regression formula for males (thin line); PL = 0.8606 CL + 5.3408; $R^2 = 0.7139$.

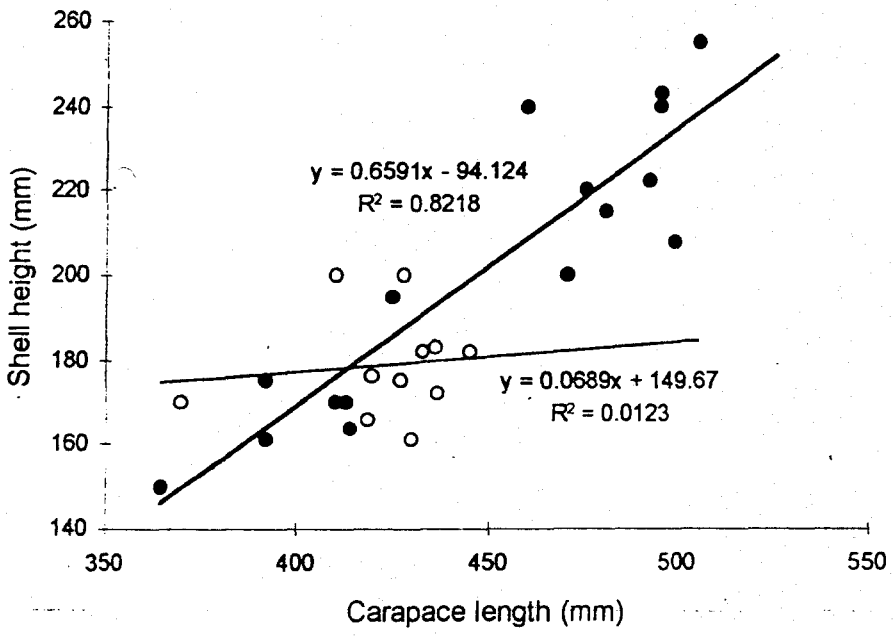

Fig. 3. Relationship between shell height (SH) to carapace length (CL) in 27 adult *Batagur baska* (11 males and 16 females) from the Perak River. Open circles represent males and closed circles represent females. Regression formula for females (bold line): SH = 0.6591 CL - 94.124; R^2 = 0.8218 and regression formula for males (thin line): SH = 0.0689 CL + 149.67; R^2 = 0.0123.

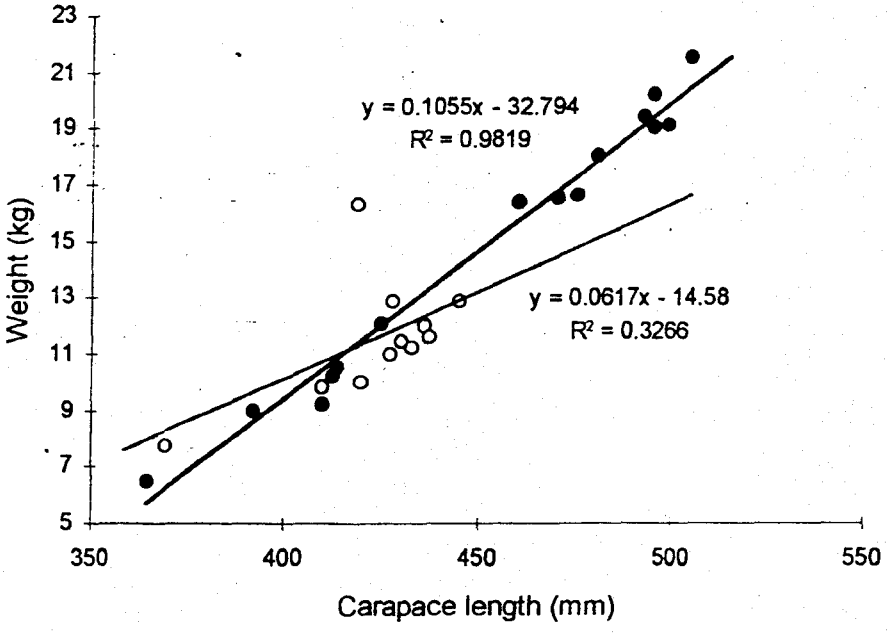

Fig. 4. Relationship between weight (W) to carapace length (CL) in 27 adult *Batagur baska* (11 males and 16 females) from the Perak River. Open circles represent males and closed circles represent females. Regression formula for females (bold line); W = 0.1055 CL - 32.794; R^2 = 0.9819 and regression formula for males (thin line); W = 0.0617 CL - 14.58; R^2 = 0.3266.

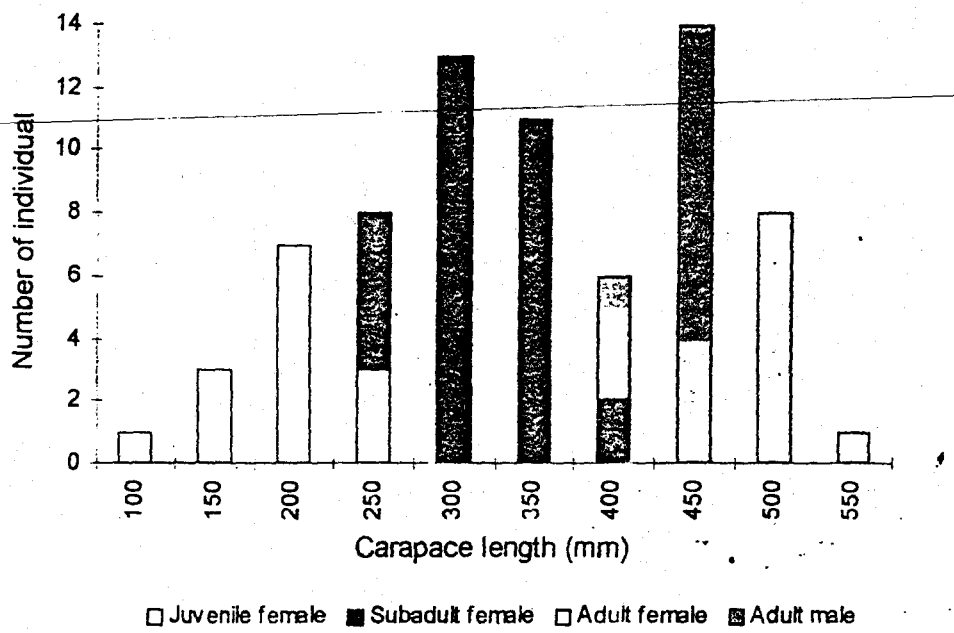

Fig. 5. Carapace length distribution of 72 *Batagur baska* collected and documented from Perak River according to size, sex and maturity status during the study period. Only a single individual juvenile male was collected and there was no trapping of subadult males.

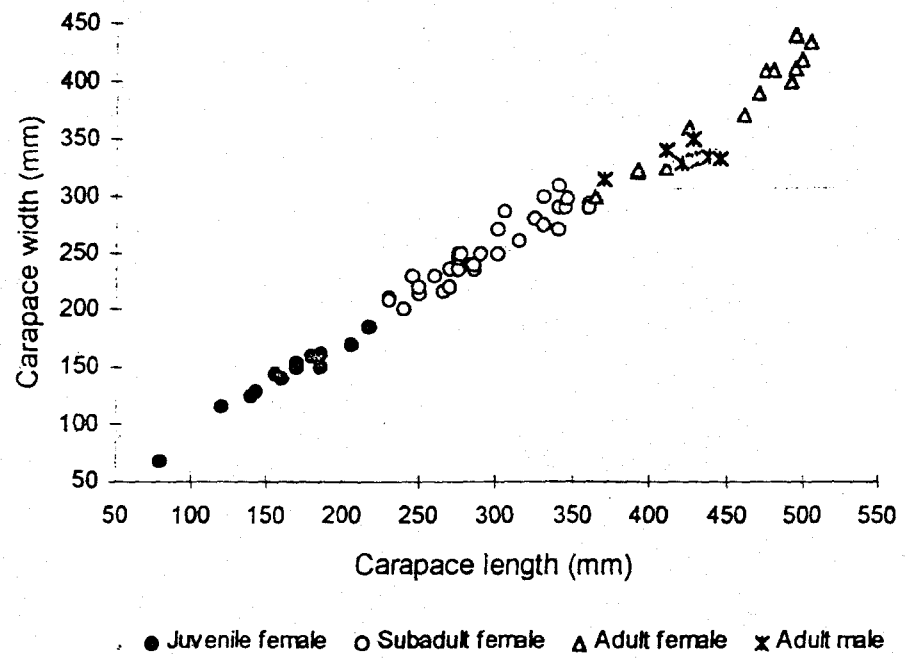

Fig. 6. Relationship between carapace width (CW) to carapace length (CL) for 72 *Batagur baska* captured (11 adult males, 16 adult females, 31 subadult females and 14 juvenile females) from the Perak River. The single juvenile male was not included in the figure. Regression formula for juvenile females; CW = 0.8379 CL + 7.5795; R^2 = 0.9627 and regression formula for subadult females; CW = 0.7586 CL + 30.004; R^2 = 0.8729.

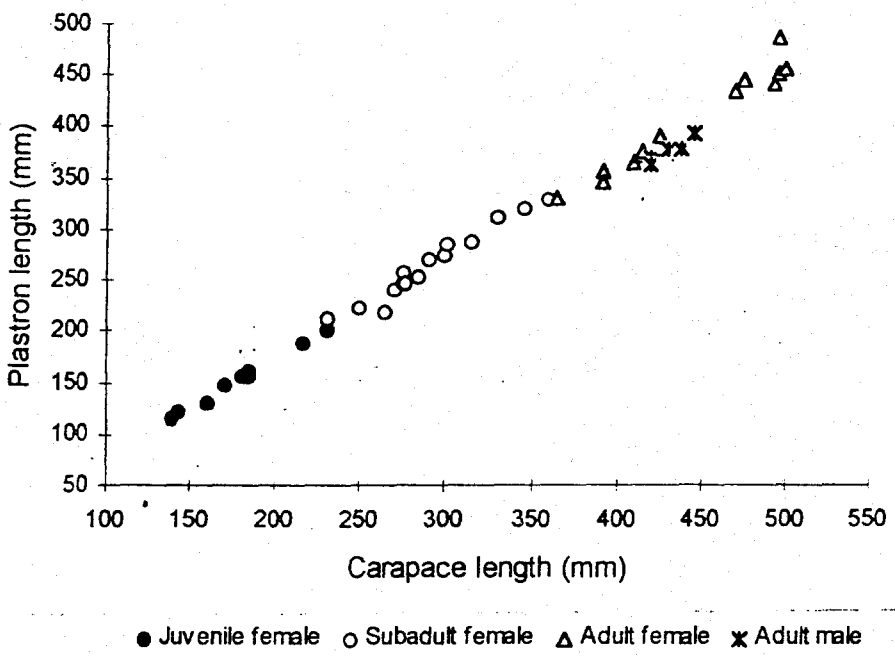

Fig. 7. Relationship between plastron length (PL) to carapace length (CL) for 46 *Batagur baska* captured (8 adult males, 13 adult females, 16 subadult females and 9 juvenile females) from the Perak River. The single juvenile male was not included in the figure. Regression formula for juvenile females: PL = 0.4362 CL + 63.121; R^2 = 0.1671 and regression formula for subadult females; PL = 1.0048x - 28.131; R^2 = 0.9546.

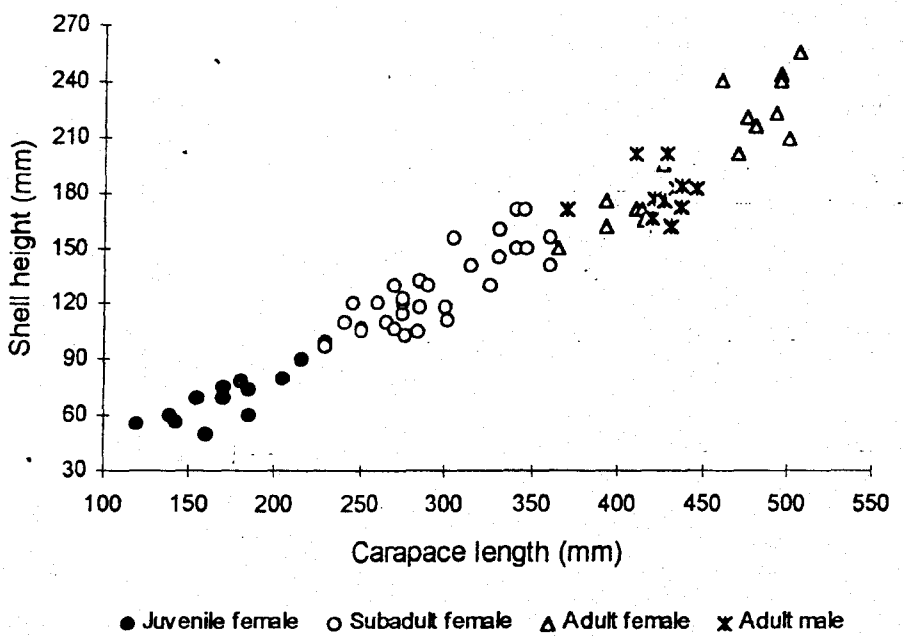

Fig. 8. Relationship between shell height (SH) to carapace length (CL) for 72 *Batagur baska* captured (11 adult males, 16 adult females, 31 subadult females and 14 juvenile females) from the Perak River. The single juvenile male was not included in the figure. Regression formula for juvenile females; SH = 0.2327 CL + 31.758; R^2 = 0.4403 and regression formula for subadult females; SH = 0.3811 CL + 13.631; R^2 = 0.387.

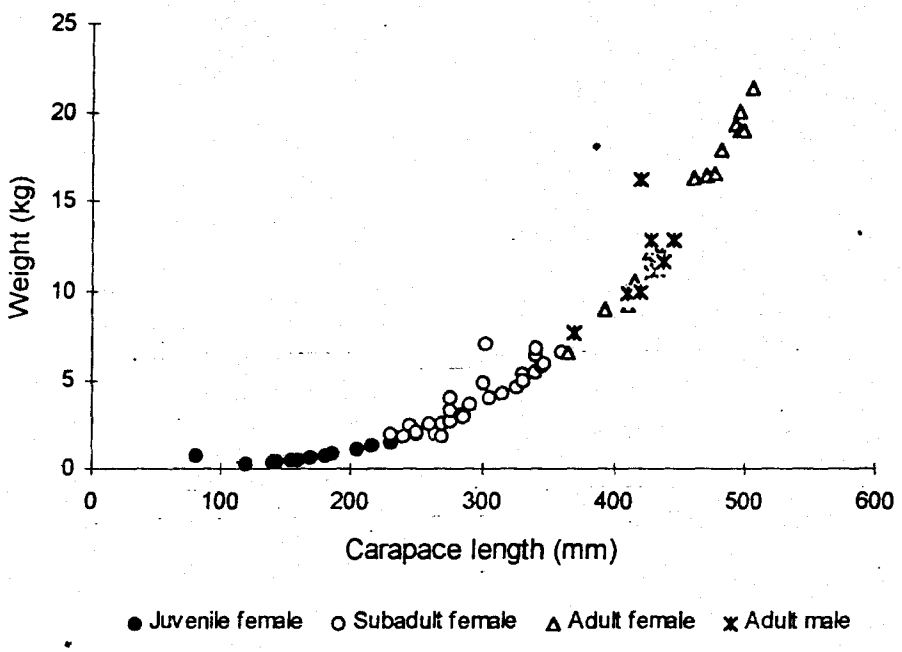

Fig. 9. Relationship between weight (W) to carapace length (CL) for 72 *Batagur baska* captured (11 adult males, 16 adult females, 31 subadult females and 14 juvenile females) from the Perak River. The single juvenile male was not included in the figure. Regression formula for juvenile females; W = 0.0074 CL - 0.5008; R^2 = 0.5946 and regression formula for subadult females; W = 0.0414 CL - 8.2659; R^2 = 0.828