SOME ASPECTS OF BIOLOGY AND POPULATION DYNAMICS
OF THE GOBY PSEUDAPOCRYPTES ELONGATUS
( CUVIER 1816 ) IN THE MEKONG DELTA

TRAN DAC DINH

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OF THE GOBY *PSEUDAPOCRYPTES ELONGATUS* (CUVIER 1816)
IN THE MEKONG DELTA**

**TRAN DAC DINH**

**January 2008**

**Chairperson** : Prof. Mohd Azmi Ambak, Ph.D

**Member** : Assoc. Prof. Anuar Bin Hassan, Ph.D
Assoc. Prof. Nguyen Thanh Phuong, Ph.D

**Institute** : Faculty of Agrotechnology and Food Science

The goby, *Pseudapocryptes elongatus* (Cuvier, 1816), is a common and commercial
fish in the coastal areas of the Mekong Delta, Vietnam. This species is recently
cultured in semi-intensive and intensive farming system. However, the seeds are
collected only from the wild and not enough for aquaculture. Meanwhile, studies on
the biology of this species are still limited, especially on the reproductive biological
characteristics. Therefore, some aspects of the biology and population dynamics of
the goby *Pseudapocryptes elongatus* distributed in the coastal mud flat areas of the
Mekong Delta were investigated from January 2004 to June 2005. The fish
populations were collected and examined to determine the reproductive biological
characteristics. Threats to its natural population were identified and the results can be
used for sustainable use of the fish populations and aquaculture purposes.

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Most gobiid fishes make burrows and have lifestyles based on their burrows. Therefore, burrows of the goby were observed in the inter-tidal areas and the burrow casts were made by pouring polyester resin into the burrow openings. Twelve burrow casts had been made, in which seven complete casts were obtained. The burrow casts showed no particular chamber structure, which is used for spawning and egg-tending in the tunnels. In addition, eggs of the goby were also not found in the burrow casts. These findings suggest that the goby do not breed inside burrows; they use the burrows just for shelter.

A total of 1058 specimens of the goby (479 females, 461 males and 118 juveniles) was collected for determination of the reproductive biological characteristics of the goby. The overall female-male sex ratio was not significantly different from 1:1 (1:0.96). The seasonal distribution of maturity stages and fluctuations of condition factor ($CF$), gonadosomatic index ($GSI$) and hepatosomatic index ($HSI$) indicated that the breeding season of this species occurs with two spawning peaks in July and October. There was marked reduction in size of liver during the spawning season; this finding shows that goby's liver has a leading role in reproduction. Length at first maturity ($L_m$) was determined to be 15.4 cm and 16.3 cm for females and males, respectively. Batch fecundity ($F$) ranged from 2,652 to 29,406 hydrated oocytes per ovary of the fish with total length between 12.8 and 22.4 cm. The relationship between total length ($TL$) and batch fecundity ($F$) was $F = 0.1517*TL^{3.9757}$.

Study on occurrences of larvae and juveniles were carried out at 10 sampling sites in the inter-tidal areas during spawning seasons. The larvae and juvenile were collected using larval net with a length of 3 m, a mouth diameter of 0.8 m, and mesh size of

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0.5 mm. Mean density of larvae ($167 \pm 214$) was significantly higher than that of juveniles ($10 \pm 9$) ind./100 m$^3$. The highest densities of both larvae and juveniles were found at the sampling sites adjacent to the estuaries. Results show that the goby breeds in mud flats of the estuarine areas. Mean densities of the larvae in new moon and full moon were 366 ($\pm 438$) and 10 ($\pm 7$) ind. /100 m$^3$, respectively. Meanwhile, those of juveniles were 13 ($\pm 19$) and 7 ($\pm 4$) ind. /100 m$^3$. The densities of both larvae and juveniles in new moon were significantly higher in full moon; this suggests that the lunar cycle affects spawning season of this species. Total length of the larvae ranged from 5.5 to 14.5 mm in which the dominant length was 8.5 mm; meanwhile, that of the juveniles was from 9.5 to 16.5 mm with the most abundant fish was 14.5 mm in total length.

Sagittal otoliths of the goby were removed and examined for determination age structure of the fish stock. The otoliths are disc-shaped for small sized individuals and becomes slightly oval shape with increasing size. At the centre of a sagittal otolith is a round-shape nucleus. When viewed under transmitted light, the otoliths clearly showed annuli as opaque zones that appeared darker than the adjacent hyaline or translucent zones. The maximum number of opaque zone was determined to be four indicating that the age of the fish population ranged between 0$^+$ and 4$^+$ age class. The female attained a mean total length of 146, 170, 196 and 218 mm at a time of formation of the first, second, third and fourth annulus, respectively. Meanwhile, the mean total length of male in the first to fourth annuli was 145, 174, 199 and 220 mm. There was not significant different in the mean length at age between female and male in all age classes. However, the mean length of male in 2$^+$, 3$^+$ and 4$^+$ age class was slightly higher than that of female.

For length frequency data, a total of 9,435 fish specimens ranged from 9 to 24 cm in total length were collected monthly over the period of 18 consecutive months using a fixed-bag-net with a codend of 15 mm mesh size. The length frequency data were analyzed using FiSAT II software. The von Bertalanffy growth curve was obtained with the following parameters: $L_\infty$ = 25.9 cm, $K$ = 0.66 $yr^{-1}$ and $t_0$ = -0.26 yr. Longevity ($t_{max}$) was determined to be 4.55 yr. Total mortality rate ($Z$) based on length converted catch curve gave a value of $Z$ = 2.84 $yr^{-1}$, as compared to a lower $Z$-value of 2.48 $yr^{-1}$ obtained from mean length method for age. Natural mortality rate was obtained at a value of $M$ = 1.46 $yr^{-1}$. Consequently, the fishing mortality and exploitation rate were calculated with the values of $F$ = 1.38 $yr^{-1}$ and $E$ = 0.49, respectively. Meanwhile, length at first capture ($L_c$) was determined to be 10.05 cm. Recruitment pattern showed two recruitment peaks with different magnitudes; and mean of the recruitment peaks was separated by an interval of 5 months. The analyses of relative yield-per-recruit ($Y'/R$) and biomass-per-recruit ($B'/R$) gave the summary statistics as follows: $E_{max}$ = 0.65, $E_{0.1}$ = 0.55 and $E_{0.5}$ – 0.33. Results show that the current exploitation rate ($E$ – 0.49) was less than the optimum exploitation rate ($E_{0.1}$ = 0.55). However, the length at first capture was lower than the length at first maturation ($L_c$ = 10.05 < $L_m$ = 16.3 cm). This finding shows that the fish stock suffers from growth overfishing. It is therefore recommended that codend of 15 mm mesh size of the fixed-bag nets should be increased and fishing efforts need to be regulated for sustainable use the fish stock.