

MORPHOLOGICAL VARIATIONS OF LARVAE AND JUVENILES OF *ACANTHOPAGRUS LATUS* COLLECTED FROM NORTHERN VIET NAM

Nguyen Hoang Xuan Anh, Tran Duc Hau, Tran Trung Thanh
Hanoi National University of Education

The 20 species of *Acanthopagrus* of the family Sparidae are recorded along the coasts in the Indo-West Pacific region (Iwatsuki 2013; Nelson et al. 2016). Of them *Acanthopagrus latus*, commonly known as yellow sea bream, is the most widespread species distributed from the Luzon, the Philippines to northern Honshu along the Pacific coasts and middle Honshu along the Sea of Japan coasts (Iwatsuki 2013; Hayashi & Hagiwara 2013). In Vietnam, this family consists of 3 genera and at least 4 species, in which, the number of species of the genus *Acanthopagrus* are dominant (Nguyen 2005). This species is variable in genes, spawning season and morphological characteristics for the adults (Xia et al. 2008). This raises the question of whether this species can be variation in morphological characteristics of early stages. However, differences in larval and juvenile ontogeny among difference regions have not been reported yet. Recently, when we had stated to survey seasonally fish larvae and juveniles in the estuaries along coast of northern Vietnam (Ta et al. 2011; Tran et al. 2012; Tran et al. 2017), larvae and juveniles of *A. latus* could be collected abundantly along the bank waters. On observing them, we recognized that their morphology vary markedly in different estuaries. In this study, a detailed description of larval and juvenile *Acanthopagrus latus* is provided for the first time in Viet Nam.

I. MATERIALS AND METHODS

Larvae and juveniles of *A. latus* used in this study were collected in the bank waters of the Kalong and Tien Yen estuaries, as well as in Quat Lam (Fig. 1), northern Vietnam using a small seine net (1 × 4 m, 1 mm mesh-aperture) (Kinoshita et al. 1988). Fish samples were fixed in 5% formalin and then sorted specimens were transferred into 70% ethanol and subsequently measured by sizes to determine developmental stage (Kendall et al. 1984). The description of *A. latus* larval and juveniles based on 90 specimens representing all available size groups randomly selected from the Tien Yen, Kalong estuaries and Quat Lam (30 samples for each area). Observations and drawings of *A. latus* were made with a binocular microscope and camera lucida. Proportional measurements followed Leis & Trnski (1989). The measurement is used in this paper as follows: standard length (SL), pre-dorsal-fin length (PDL), pre-anal length (PAL), head length (HL), body depth (BD), eye diameter (ED), snout length (SnL), pectoral fin length (PFL), caudal peduncle length (CPL), caudal peduncle depth (CPD) (Leis & Trnski 1989). Meristic characters: dorsal fins (D), anal fin (A), pectoral fins (P).

Samples used in this study were deposited at the Faculty of Biology, Hanoi National University of Education (BHNUE 378001001-378001008). Identification of the present specimens of *A. latus* was accordance with Kinoshita (1993). Morphometric data of samples were evaluated for heterogeneity of variances using ANCOVA ($p < 0.05$).

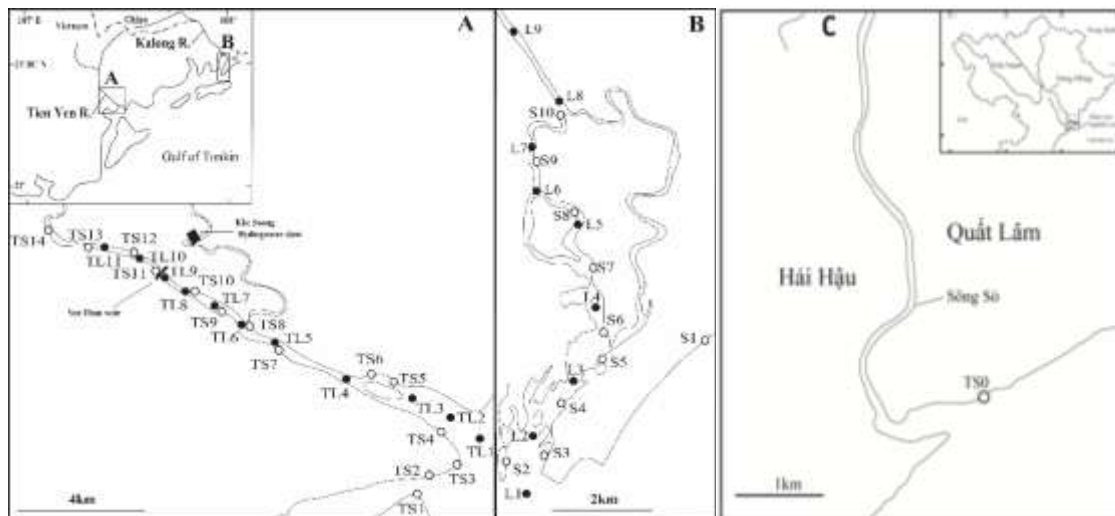


Figure 1: Chart showing the stations where fish larvae and juveniles were collected in the Tien Yen (A), Kalong (B) and Quat Lam (C) estuaries

II. RESULTS

Identification of *A. latus* larvae and juveniles

Three *Acanthopagrus* species are present in the coast of northern Vietnam (Nguyen 2005; Tran et al. unpublished data). Larvae and juveniles of *A. latus* (Fig. 3) were identified based on a vertical band of melanophores initially formed on the tail and lack the melanophores at the angle of the lower jaw (Kinoshita 1993).

Morphological variations of *A. latus* larvae and juveniles

Acanthopagrus latus larvae have similar morphology to other species in this genus. Larvae and juveniles of *A. latus* have a deep body, big head, big round eyes, nostril in each side. The anus is located in the middle of body. Meristics: D: XI, 11; A: III, 8; P: 15. The ventral starting point is after pelvic fin and the first dorsal fin I is after ventral fin. Anal starting point is between the dorsal fin I and the dorsal fin II. The dorsal fin I located in the anteriority of the body. Larvae and juveniles collected in the Tien Yen, Kalong estuaries and Quat Lam are type-T, type-K and type-Q, respectively. Larvae and juveniles are laterally compressed and relatively slender in three types. The snout is round and short. The eyes are round and large. The moderate mouth reaches at least the anterior edge of the eye. The snout length and eye diameter are ca. 6-8% and 7-10% in type-K, 5-8% and 9-11% in type-T, 5-8% and 8-12% in type-Q, respectively and these ratios appear stable throughout the larva-juvenile stages. Reversely, the head length, body depth and caudal peduncle length change proportionally with their growth in three areas. The head is moderate in size, ca. 26% and 27% SL in the smallest larvae and increasing gradually to ca. 30% and 31% in juvenile of type-K and type-T. Moderate body rises gradually from ca. 18% to 30%. The arse-hole is in the middle. The caudal peduncle lengths in the smallest larvae are ca. 18% in type Q and 19% in both types-K and type-T, which increasing significantly to ca. 27% of type-Q and slowly rise to 21% and 23% in type-K and type T, respectively. There can be significant mean differentiation in six parts (snout, head, pre anal length, pre dorsal length, body depth, eye diameter) among three types. Furthermore, when pre anal, head, eyes compared as ratios to pre anal length, head length and eye diameter are also considerably larger in type-T than in type K and type-Q.

Mean proportion body parts to the standard length

Ratios (%) to SL	Ka Long Mean (min-max)	Tien Yen Mean (min-max)	Quat Lam Mean (min-max)
PAL	53.96 (52.63-56.25)*	55.66 (51.69-58.33)*	52.21 (50.87-53.98)*
PDL	39.0 (37.69-41.22)*	37.94 (34.82-40.16)*	35.64 (29.41-37.39)*
HL	28.67 (27.41-30.53)*	29.67 (27.67-31.67)*	27.98 (26.13-34.57)*
BD	28.72 (26.92-30.30)*	27.41 (23.21-29.63)*	23.83 (18.18-29.63)*
ED	9.58 (8.77-10.60)*	10.29 (9.23-11.47)*	9.57 (8.62-11.73)*
SnL	7.75 (6.64-8.39)*	7.10 (5.80-8.50)*	6.67 (5.73-8.64)*
CPL	19.86 (18.89-21.05)	20.93 (19.26-23.21)	21.08 (18.26-26.69)
CPD	11.97 (11.11-12.97)	10.89 (9.38-12.21)	10.54 (9.60-12.35)
PFL	17.08 (11.54-21.09)	16.91 (6.25-21.48)	12.13 (6.86-14.87)

*: significant differences at $p < 0.05$ between three areas

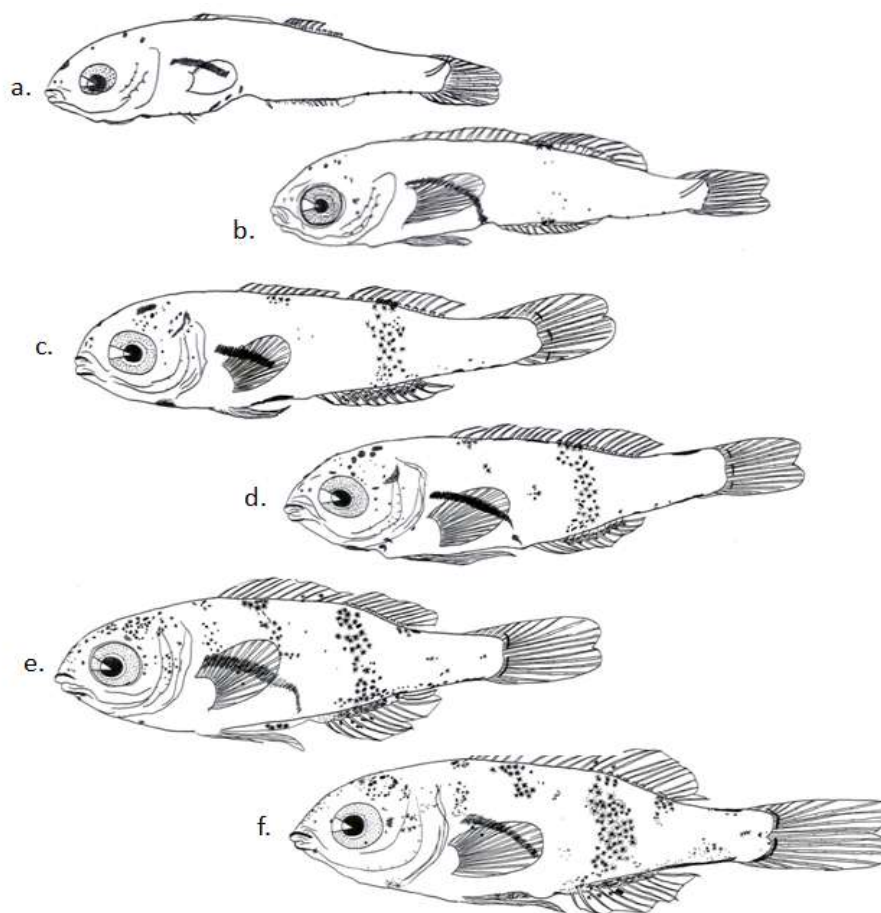


Figure 2: Developmental stages of *A. latus* collected from the Kalong (e. post flexion larva, SL=13.5 mm; f. juvenile, SL=14.1 mm); Tien Yen (c. post flexion larva, SL=10.8 mm; d. post flexion larva, SL=12.4 mm) estuaries; Quat Lam (a. post flexion larva, SL=8.1 mm; b. post flexion larva, SL=10.1 mm)

Pigmentation

Melanophores were present along the margins of jaws, on the side of the body, and along the dorsal and ventral margins of the tail. A row of melanophores is present ventrally from the chin to the hindgut. The melanophores along the ventral margin are heavier in type-K than in type-T. At 8.1 mm (Fig. 2a), the small melanophores start to present irregularly on the head, above of orbit and along the origin of pelvic and anal fins. At 10.1 mm (Fig. 2b), black pigment spots appear on the tail, and forming clearly black pigment spots along the caudal peduncle. At 11.3 mm (Fig. 3c), black pigment is concentrated in align from the origin of the 4th-7th dorsal soft fins to the origin of anal fins. Many others were dispersed in the body and clearly in the above of orbit. At 13.5 mm (Fig. 2e), the melanophores are denser and clearer; developed into black line at caudal peduncle. The pigment along the anal is still being completed. At 14.1 mm, the black pigment continues to develop, concentrates in a combination above the orbit, on the head and covers the origin of anal fins, pelvic fins and caudal fins and a clear align of pigment or a stripe is formed from the origin of the 2nd-5th dorsal soft fins to the origin of anal fins, which appears in both sides of the body.

Discussion

The results of the recent study show that the morphological characters of larval and juvenile *Acanthopagrus latus* are variable among three different areas in Vietnam. This finding is in agreement with the results obtained for other fish species in northern Vietnam. A study of Tran et al. (2017) illustrated that there were differences of Asian seaperch (*Lateolabrax*) in pigmentation pattern between Kalong and Tien Yen estuaries. The other study of Tran et al. (2012) on Ayu also showed there were differences between Vietnam and Japan. When *A. latus* larvae and juveniles from Vietnam were compared with Japanese *A. latus*, there were a few differences in morphology or pigmentation. Few melanophores are distributed on the head of 8.1 mm Vietnamese specimens. Meanwhile same size Japanese samples are heavily presented (Kinoshita 1993). The 10.8 mm fish collected in Vietnam are much heavier and denser compared to the 10.9 mm Japanese fish (Kinoshita 1993). In general, the appearance of melanophores in Vietnamese specimens tends to be faster than those fish in Japan (Kinoshita 1993).

The pigment along the caudal peduncle is an important feature to distinguish between *A. latus* and *A. schlegeilii*: *A. latus* forms the black band on the caudal first, but *A. schlegeilii* forms the black band on the dorsal first (Kinoshita et al. 1993). This band starts to have the sign of melanophores concentrating in align from the origin of dorsal fins to the origin of anal fins. *A. schlegeilii* species has a different number and shape of black pigment spots along the body compared with *A. latus*. The *A. latus* can be distinguished by the lack of melanophores at the base of dorsal fin I and the angle region of the mouth (Kang et al. 2014).

III. CONCLUSION

Morphology of the larvae and juveniles of *A. latus* collected from northern Vietnam coast is firstly recorded in this study. They are characterized by deep body, round and short snout, especially the distribution of melanophores; a much longer and harder fourth dorsal fin I and second anal fin. Most of proportional parts of this species during larval and juvenile stages are significantly different among the Kalong, Tien Yen and Quat Lam. The distribution of black pigment changes with growth.

Acknowledgement: This research was funded by Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number: 106-NN.05-2014.03. Sincere

thanks for the assistance of the Laboratory Fish (Department of Zoology, Faculty of Biology, Hanoi National University of Education) staff for their support during the field work and in the laboratory.

REFERENCES

1. **Hesp A. S., Potter I. C., Hall N. G.,** 2004. Reproductive biology and protandrous hermaphroditism in *Acanthopagrus latus*, *Environmental Biology of Fishes*, 70: 257-272.
2. **Iwatsuki Y.,** 2013. Review of the *Acanthopagrus latus* complex (Perciformes: Sparidae) with descriptions of three new species from the Indo-West Pacific Ocean, *Journal of Fish Biology*, 83:64-95.
3. **Kang C. B., Lee S. H., Hwang J. H., Han K. H.,** 2014. Morphological development of larvae and juveniles of *Acanthopagrus schlegeli* (sic). *Journal of the Korean Society of Developmental Biology*, Korea Ocean and Fisheries Institute, Busan, Korea, 4: 311-319.
4. **Kendall A. W. Jr., Ahlstrom E. H., Moser H. G.,** 1984. *Early life history stages of fishes and their characters*. In: Moser H. G., Richard W. J., Cohen D. M., Fahay M. P., Kendall A. W. Jr., and Richardson S. L., (Eds), *Ontogeny and Systematics of fishes*, American Society of Ichthyologists and Herpetologists, Special Publication 1: 11-12.
5. **Kinoshita I., Fujita S., Takahashi I., Azuma K.,** 1988. Occurrence of larval and juvenile Japanese snook, *Lates japonicas*, in the Shimanto estuary, *Japanese Journal of Ichthyology*, 34: 462-467.
6. **Kinoshita I.,** 1993. Ecological study on larvae and juveniles of sparine fishes occurring in surf zones of sandy beaches. *Bulletin of Marine Sciences and Fisheries*, Kochi University 13: 21-99.
7. **Hayashi M., Hagiwara K.,** 2013. *Sparidae*. In Nakabo T. (ed.) *Fishes of Japan with pictorial keys to the species*, 3rd edition - II, pp. 955-959.
8. **Leis J. M., Trnski T.,** 1989. *The larvae of Indo-Pacific shore fishes*. New South Wales University Press, Australia, pp. 221-227.
9. **Nelson J. S., Grande T. C., Wilson M. V. H.,** 2016. *Fishes of the world*, 5thed. John Wiley & Sons, Hoboken.
10. **Nguyen Van Hao,** 2005. *Freshwater fishes of Vietnam*, Vol. 3. Agricultural Publishing House, Hanoi.
11. **Tran T. T., Tran D. H., Ha T. N.,** 2017. Occurrence of fish larvae and juveniles in the bank waters at the mouth of the So estuary, Nam Dinh province. *Journal of Biology*, 39 (2).doi:10.15625/0866-7160/v39n2.8397.
12. **Ta T. T., Tran H. D., Kinoshita I., Sashida M., Azuma K.,** 2011. Larval and juvenile ichthyofauna in the estuaries of the Northern Viet Nam. The 44th Annual Meeting of the Ichthyological Society of Japan, Hirosaki University, Hirosaki, Aomori, Japan.
13. **Tran H. D., Kinoshita I., Ta T. T., Azuma K.,** 2012. Occurrence of Ayu (*Plecoglossus altivelis*) larvae in northern Vietnam. *Ichthyological Research*, 59: 169-178.
14. **Tran T. T., Tran H. D., Kinoshita I.,** 2017. Occurrence of two types of larvae of the Asian seaperch (*Lateolabrax*) in the estuaries of northern Vietnam. *Ichthyological Research*, 64: 244-249.

15. Xia J. H., Huang J. H., Gong J. B., Jiang S. G., 2008. Significant population genetic structure of yellowfin sea bream *Acanthopagrus latus* in China. *Journal of Fish Biology*, 73: 1979-1992.

**ĐA DẠNG HÌNH THÁI ẾU TRÙNG VÀ CÁ CON LOÀI
ACANTHOPAGRUS LATUS THU ĐƯỢC Ở PHÍA BẮC VIỆT NAM**

Nguyễn Hoàng Xuân Ánh, Trần Đức Hậu, Trần Trung Thành

TÓM TẮT

Nghiên cứu này mô tả sự đa dạng hình thái ấu trùng và cá con loài *Acanthopagrus latus* dựa trên 90 mẫu vật chọn ngẫu nhiên từ các mẫu thu được bằng lưới seine tại cửa sông Tiên Yên, Ka Long và tại biển Quất Lâm. Ấu trùng và cá con loài *A. latus* được đặc trưng bởi các đặc điểm hình thái: cơ thể cao, dẹt, miệng nhỏ được ngăn cách một khoảng với mắt và đặc điểm phân bố màu sắc. Các số đếm: D: XI, 11; A: III, 8; P: 15. Sắc tố đen xuất hiện ở trên đầu và thân, thay đổi cùng với sự phát triển của cơ thể và tập trung thành các hàng ở thân. Tỷ lệ các phần của cơ thể: ca. BD=18-30% SL, HL=27-35% SL, SnL=5-9% SL, ED =8-12% SL. Nghiên cứu này bổ sung dữ liệu về sự đa dạng trong phân bố sắc tố ở giai đoạn sớm của *A. latus* và cung cấp thông tin so sánh các đặc điểm hình thái của 2 loài: *A. latus* và *A. schlegelii*.