Veterinary Integrative Sciences 2023; 21(2): 545 - 555 DOI; 10.12982/VIS.2023.038

Vet Integr Sci

Veterinary Integrative Sciences

ISSN; 2629-9968 (online)

Website; www.vet.cmu.ac.th/cmvj

Research article

Feeding habit and intensity of *Periophthalmus variabilis* caught from some coastal provinces in the Mekong Delta, Vietnam

U Van Hua [1,2], Quang Minh Dinh [3,*], Ton Huu Duc Nguyen [3]

[1]Institute of Food and Biotechnology, Can Tho University, Can Tho 900000, Vietnam
[2]Department of Biology, Hoang Dieu High School, Soc Trang 950000, Vietnam
[3]Department of Biology, School of Education, Can Tho University, Can Tho 900000, Vietnam

Abstract

Dusky-gilled mudskipper *Periophthalmus variabilis*, a member of the family Gobiidae, is a potential aquarium pet in the Mekong Delta (MD), Vietnam; however, data on its feeding habit and intensity has been limited. Therefore, this study aims to evaluate the relative gut length (*RGL*) and gastro-somatic index (*GI*) of *Periophthalmus variabilis* in order to determine the feeding habit and intensity of this mudskipper and its variation regarding sex, size, season, site, and their interaction. One thousand one hundred seventy mudskipper samples were collected monthly in four locations: Duyen Hai-Tra Vinh, Tran De-Soc Trang, Hoa Binh-Bac Lieu, and Dam Doi-Ca Mau from January 2022 to December 2022. The analysis showed that *Periophthalmus variabilis* was a carnivorous fish with an average RGL value of 0.52±0.01 SE (<1). In addition, the *RGL* of this species varied and depended on size, sampling site, season, and the interaction of both size and season with locations. The *GI* of the mudskipper was 4.27±0.29 SE, indicating that its feeding intensity belonged to the moderate category and varied with size and site but not sex, season, and interactions. These results supplement novel knowledge on its feeding habit and intensity, a basis for researching the aquaculture of *Periophthalmus variabilis* in MD.

Keywords: Dusky-gilled mudskipper, Gastro-somatic index, Mudskipper, Relative gut length

Corresponding author: Quang Minh Dinh, Department of Biology, School of Education, Can Tho University, Can Tho 900000, Vietnam. Email: dmquang@ctu.edu.vn

Article history; *received manuscript: 10 January 2023*
revised manuscript: 9 March 2023
accepted manuscript: 14 March 2023
published online: 24 April 2023
Academic editor; *Nguyen Trong Ngu*

Open Access Copyright: ©2023 Author (s). This is an open access article distributed under the term of the Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution, and reproduction in any medium or format, as long as you give appropriate credit to the original author (s) and the source.

INTRODUCTION

Periophthalmus variabilisis is distributed in the Indo-Pacific and Western Pacific regions (Froese and Pauly, 2021), including southeast Asia countries such as Singapore, Indonesia, Malaysia, Thailand, and Vietnam (Khaironizam and Norma-Rashid, 2002; Larson et al., 2016; Tran and Dinh, 2021). This fish lives in coastal estuarine mudflats, where brackish and marine water habitats exist (Murdy, 1989; Kottelat et al., 1993; Jaafar et al., 2009). This species has distinctive physiological and behavioral characteristics because of its ability to survive in conditions out of water for several hours (Murdy, 1989; Jaafar et al., 2009). In Taiwan and Japan, this species of mudskippers are exploited for food and have a high economic value (Ip et al., 1990). Several mudskippers are also environmental indicators for mangrove ecosystems (Murdy and Zeehan, 2017).

The relative gut length (*RGL*) is one of the essential indicators in fish feeding and varies depending on the fish gut size. Different intestinal lengths exist for different types of food (plants or animals), e.g., in herbivorous fish, the intestines are usually very long, whereas the carnivorous fish often have relatively short intestines (Nikolsky, 1963). Also, the gut length between individuals within a species can vary depending on their habitat, leading to variation in this index (Raubenheimer and Bassil, 2007). The gastro-somatic index (*GI*) was determined to show the feeding intensity of fish, and when this index shows a high value, it indicates that the fish has a high feeding intensity (Desai, 1970). In addition, the *GI* sometimes indirectly indicates the spawning season in some fish species. This index is low at the peak of the spawning season because the number of fish with hungry stomachs is more significant and is maximal during the post-spawning period. The increase and decrease of *GI* show an inverse relationship with the gonadansomatic index of sexual maturity (Krishna et al., 2016).

However, there is no data on the relative gut length and the gastro-somatic index, which determine fish feeding habit and intensity, respectively. Some recent studies show that fish's feeding habits and intensity change with sex, size, season, and site variables. Therefore, this study was conducted in some coastal provinces in MD to provide data on its *RGL* and *GI* regarding sex, body size, season, and site variables. These parameters, after elucidation, are a valuable basis for future research on the artificial culture of this species in MD.

MATERIALS AND METHODS

Study site and fish collection

Specimens were collected once a month and continuously for 12 months from January 2022 to December 2022 at four locations in the coastal Mekong Delta, Vietnam (Figure 1): Duyen Hai district, Tra Vinh province (DHTV; 94°1'18.6"N 106°30'35.8"E), Tran De district, Soc Trang province (TDST; 92°9'26.8"N 106°11'58.5"E), Dong Hai district, Bac Lieu province (DHBL; 90°6'03.2"N 105°29'49.1"E); and Dam Doi district, Ca Mau province (DDCM; 85°8'17.5"N 105°22'51.8"E). The temperature at the study site is approximately 27°C, and slight fluctuation between the wet and dry seasons; Noticeably, precipitation measures varied enormously between the dry (20 mm) and wet seasons (400 mm) (Le et al., 2006). The salinity was 12.3–23.5% and varied regarding season but not site variables, while the pH was 7.6–7.9 and changed concerning site but not season variables (Dinh et al., 2021).

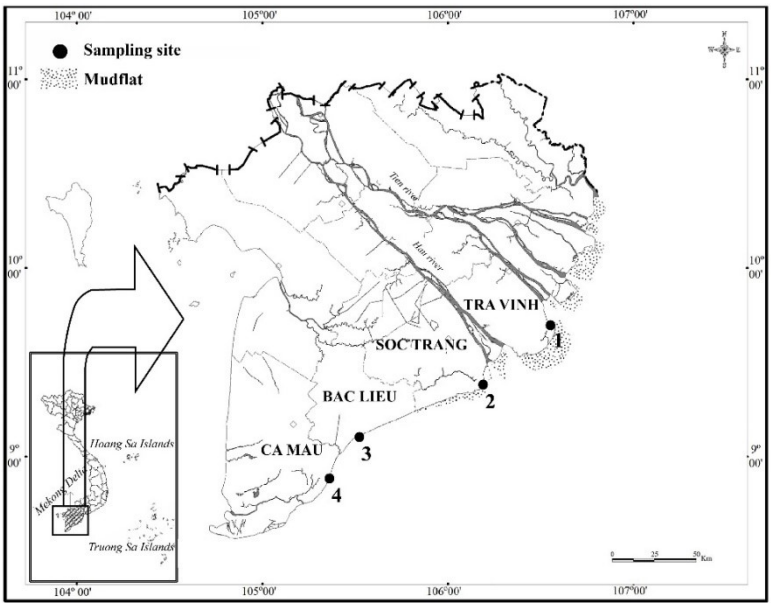

Figure 1 Four sites of dusky-gilled mudskippers collection in the Mekong Delta, Vietnam (1: Duyen Hai district, Tra Vinh province; 2: Tran De district, Soc Trang province; 3: Dong Hai district, Bac Lieu province; 4: Dam Doi district, Ca Mau province; modified from Dinh (2018))

Dusky-gilled mudskippers were collected directly by hand-catching for 4 hours continuously at night time with a size of 30 samples/species/month/location. Then, samples were anesthetized with MS222 and stored in a 5% formalin solution to prevent further decomposition of the food in the digestive tract. After that, they were transported to the laboratory for further analysis. The fish weight (W; ±0.01 g) and length (TL; ±0.1 cm) were measured before gastrointestinal removal for further studies. The use of fish was approved by The Council for Science and Education, School of Education, Can Tho University (Animal Welfare Assessment number: BQ2020-03/KSP).

Fish analysis

The mudskipper's digestive tract was carefully removed and measured to the nearest 0.1 cm in order to demonstrate the relative gut length ($RGL = L_g/TL$, where L_g: gut length and TL: fish total length). This RGL was an indicator of fish's feeding habits (Al-Hussaini, 1947; Drewe et al., 2004). Accordingly, $RGL>3$ meant the fish was a herbivore, RGL = 1 - 3 signified the fish was an omnivore, and RGL<1 indicated the fish was a carnivore (Table 1).

Table 1 Classification of relative gut length (Al-Hussaini, 1947)

Number	Relative gut length (RGL)	Feeding habit
1	RGL<1	Carnivorous fishes
2	1<RGL<3	Omnivorous fishes
3	RGL>3	Herbivorous fishes

The feeding intensity of this fish was estimated from the gastro-somatic index (*GI*). This index is determined based on the formula of Desai (1970) as gut-weight/fish weight.

Data analysis

PRIMER v.6.1.11 (Clarke and Gorley, 2006) with PERMANOVA+ v.1.0.1 add-on package (Anderson et al., 2008) was used to qualify the variation of *RGL* and *GI* according to sex, size, season, site, and their interactions at a meaningful level of 5%.

RESULTS

Relative gut length

Based on the relative gut length analysis, the *RGL* of *Periophthalmus variabilis* ranged from 0.49±0.01 SE to 0.57±0.01 SE, and average *RGL* values of 1,170 specimens were 0.52±0.01 SE (*RGL*<1), this meant that this species fish primarily belonged to the group of carnivorous fishes (Al-Hussaini, 1947). However, *RGL* of *Periophthalmus variabilis* changed with size (Pseudo-F=16.71, p=0.00), site (Pseudo-F =5,35, p=0.01), month (Pseudo-F =8.23, p=0.00, Fig. 2) and season (Pseudo-F =20.44, p=0.00), but not sex (Pseudo-F =0.17, p=0.69).

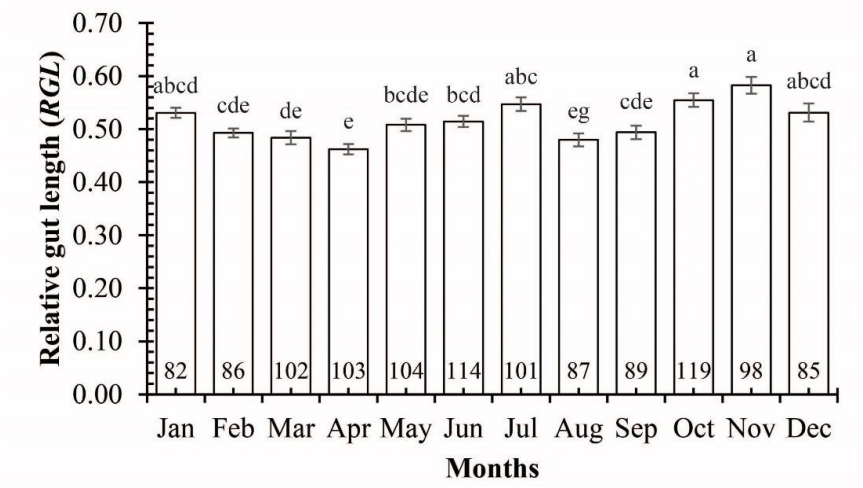

Figure 2 The *RGL* variation of *Periophthalmus variabilis* regarding month (number in each column represented a number of collected fish; different letters (a, b, c, and d) showed a significant difference)

The variation of *RGL* regarding month was presented in Figure 2, showing that the feeding habits of dusky-gilled mudskippers varied significantly throughout the study period. The spatial *RGL* variation of this mudskipper concerning the site was presented in Figure 3. The *RGL* of the two locations, including Tra Vinh and Ca Mau, were similar and significantly higher than those of fish in Soc Trang and Bac Lieu. Typically, the *RGL* of mudskipper in Tra Vinh and Ca Mau were 0.54±0.01 SE and 0.53±0.01 SE, whereas samples from Soc Trang and Bac Lieu had *RGL*s of 0.51 and 0.50, respectively.

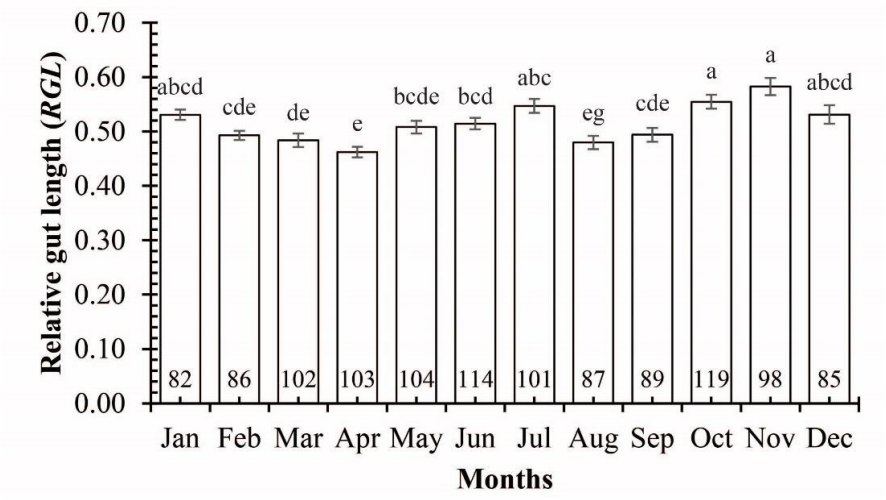

Figure 3 The variation in *RGL* of *Periophthalmus variabilis* regarding site (different letters (a, c, c, and d) displayed significant differences)

The interactions consisting of sex×size; sex×site; sex×size×season; sex×size×site; sex×season×site; and sex×size×season×site showed a significant impact on the *RGL* of *Periophthalmus variabilis*. For the interaction between sex and site (Figure 4), there was a considerable difference (Pseudo-F=3.96, $p<0.05$) among those females, with *RGL* of 0.50 ±0.01 SE in the dry season and 0.53±0.01 SE in the wet season, while males had *RGL* of 0.49 ±0.01 SE in the dry season and 0.54±0.01 SE in the wet season. Similarly, the interaction of season×site also indicated a significant difference in impact on the *RGL* of *Periophthalmus variabilis* (Pseudo-F=13.61, $p<0.05$). Typically, the value of *RGL* in Bac Lieu and Ca Mau was significantly different between the dry and wet seasons, whereas *RGL* was slightly different and nonsignificant for Tra Vinh and Soc Trang (Figure 5).

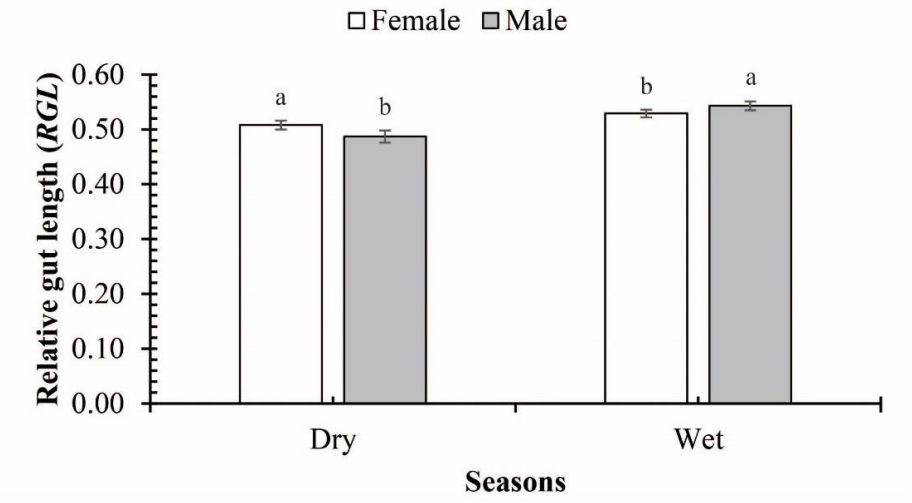

Figure 4 The interaction of sex and season regulating *RGL* variation of *Periophthalmus variabilis* (different letters (a and b) displayed significant differences)

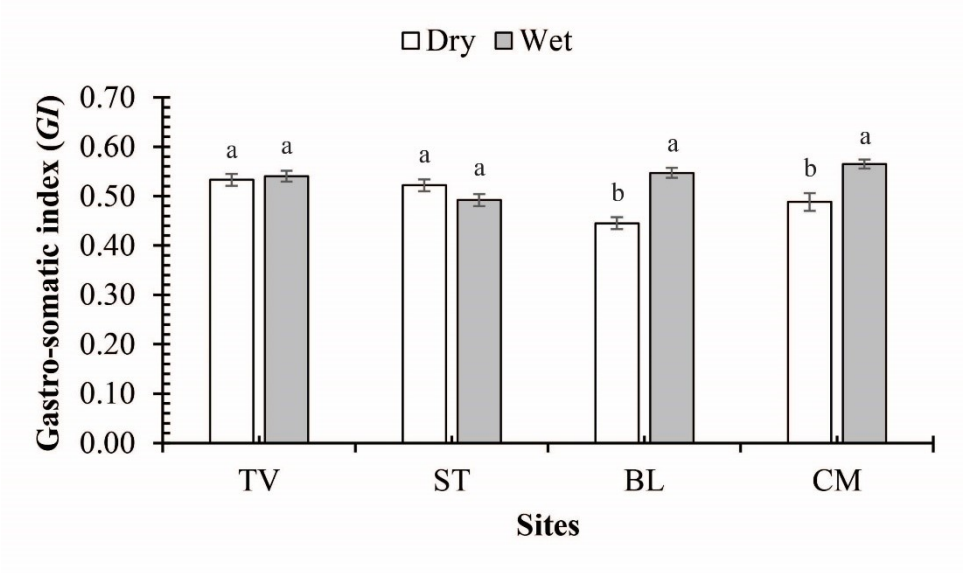

Figure 5 The interaction of sex and site regulating *GI* variation of *Periophthalmus variabilis* (different letters (a and b) displayed significant differences)

Gastro-somatic index

The gastro-somatic index (*GI*) of *Periophthalmus variabilis* was 4.27±0.29 SE and changed with size (Pseudo-F=37.87, $p < 0.05$). In comparison with other previous studies, *GI* in this species was relatively low compared to some fish species in MD, such as *Periophthalmodon septemradiatus* (Dinh et al., 2018), *Parapocryptes serperaster* (Dinh et al., 2017b), *Eleotris melanosoma* (Dinh et al., 2017a). In addition, female *GI* (4.15±0.14 SE) was significantly higher than in males (3.79 ± 0.17 SE, $p<0.05$), indicating that females showed a more vigorous feeding intensity. This difference may be due to the high nutritional requirements of the female during development or spawning. However, the feeding intensity of this fish was not significantly different by season ($p>0.05$), ranging from 4.05±0.18 SE in the dry season to 3.89±0.13 SE in the wet season.

Besides, the intensity of this mudskipper also changed significantly differently ($p<0.05$) among the four sampling sites (Fig 6). Noticeably, the highest *GI* was in Ca Mau (4.40±0.26 SE), whereas the lowest *GI* was recorded in Bac Lieu (3.43±0.2), Tra Vinh (3.79±0.21 SE), and Soc Trang (4.25±0.22 SE). Furthermore, the feeding intensity of *Periophthalmus variabilis* varied and depended on the environmental change. The mudskipper *GI* also differed significantly among the 12-month study ($p<0.05$), reaching the highest value in November but the lowest one in July (Figure 7).

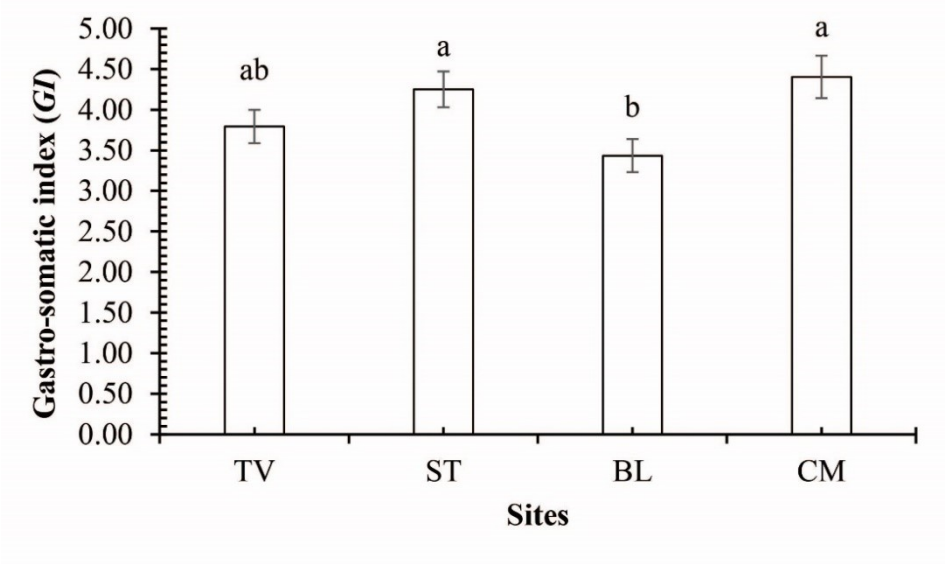

Figure 6 The variation in *GI* of *Periophthalmus variabilis* regarding site (different letters (a and b) displayed significant differences)

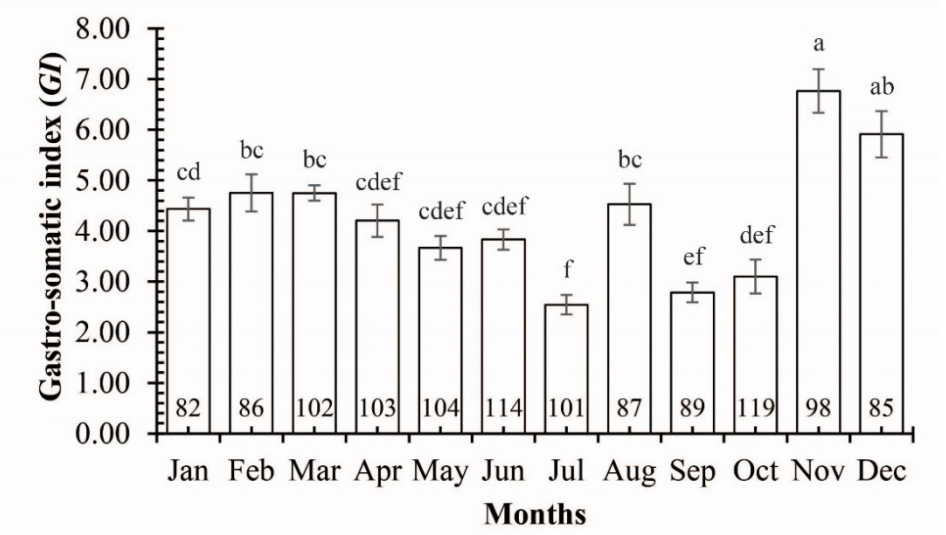

Figure 7 The variation in *GI* of *Periophthalmus variabilis* regarding month (number in each column represented a number of collected fish; different letters (a, b, c, d, e, and f) displayed significant differences)

On the other hand, *GI* of *Periophthalmus variabilis* did not change with sex×size (Pseudo-F=0.05, p=0.83); sex×season (Pseudo-F=0.25, p=0.62); sex×site (Pseudo-F=0.63, p=0.60); size×season (Pseudo-F 0.22, p=0.63); size×site (Pseudo-F=0.77, 0.50); season×site (Pseudo-F=0.42, p=0.75); sex×size×season (Pseudo-F=0.16, p=0.69); sex×size×site (Pseudo-F=1.78, p=0.14); sex×season×site (Pseudo-F=0.30, p=0.81); size×season×site (Pseudo-F=1.01, p=0.41); and sex×size×season×site (Pseudo-F=0.61, p=0.61).

DISCUSSION

Similar to *Periophthalmus variabilis*, several mudskippers in the MD also belong to the group of carnivores such as *Periophthalmodon schlosseri* (Tran et al., 2019) and *Periophthalmodon septemradiatus* (Dinh et al., 2018). This assumption was also found in other gobies, such as *Glossogobius giuris* (Dinh et al., 2022), *Glossogobius sparsipapillus* (Tran et al., 2021), *Butis koilomatodon* (Nguyen et al., 2020), *Oxyeleotris urophthalmus* (Vo and Dinh, 2014), and *Eleotris melanosoma* (Dinh et al., 2017a). The feeding habits of fish were also not significantly different by sex of *Glossogobius aureus* (Phan et al., 2021). The *RGL* was the lowest in July, and the highest *RGL* was observed in November, which may be related to this fish's reproductive behavior or maturity. This result is consistent with the study of Dinh et al. (2017b); Dinh et al. (2018), which found that both two species *Parapocryptes serperaster* and *Periophthalmodon septemradiatus* in the MD also had a monthly change in feeding habit.

Periophthalmus variabilis was a carnivore based on the relative gut length and Gastro-somatic index of fish samples evaluated. The mudskipper's *RGL* ranged from 0.49 and 0.57 and was divided into a group of carnivores with moderate feeding intensity (Al-Hussaini, 1947). These values were consistent with those previously studied for other species of the *Periophthalmus* genus (Clayton, 1993). Besides, this species recorded an intraspecific change in the *RGL* as larger fish displayed a longer digestive tract. Moreover, seasonal variations could be contributed to the changes in *RGL*, especially in the wet season, because of the abundant food availability for fish development in this season (July to November) (Hortle, 2009). Likewise, the spatial variation in *RGL* was also found by Dinh et al. (2018) in *Periophthalmodon septemradiatus* and Nguyen et al. (2020) in *Butis koilomatodon* living in the Mekong Delta.

As can be seen, rainfall and changes in habitat conditions of the two seasons did not affect the intensity of preying on this mudskipper. Some species exhibited a similar *GI* between the two seasons, such as *Eleotris melanosoma* (Dinh et al., 2017a) and *Stigmatogobius pleurostigma* (Dinh and Tran, 2018). Similarly, the change in feeding intensity by month was also found in *Parapocryptes serperaster* in the Mekong Delta (Dinh et al., 2017b), but not in *Eleotris melanosoma* (Dinh et al., 2017a) and *Stigmatogobius pleurostigma* (Dinh and Tran, 2018). This present study result was consistent with the study of Dinh et al. (2018), who concluded that feeding intensity changes of *Periophthalmodon septemradiatus* were not affected by the two factors' interaction such as fish size and site, fish size and season, and site and season. These results could be helpful for further studies like Na Lampang et al. (2020) before cultivating studying with this fish.

CONCLUSIONS

Dusky-gilled mudskipper belongs to the group of carnivorous fishes. The relative gut length of this fish is influenced by the fish size, location, and time, but not seasonally; these factors also influence the fish's gut biometric index. The feeding intensity of female fish is similar to that of male fish, but the mature fish group differs from that of mature fish. The feeding

intensity of this species is affected by the fish size and the habitat they live. However, their feeding intensity was not affected by sex and season. The results obtained through the study have supplemented the scientific data on the fish's appetite and the intensity of dusky-gilled mudskipper in the Mekong Delta, thereby serving as the basis for subsequent research on the aquaculture of dusky-gilled mudskipper.

ACKNOWLEDGEMENTS

This study is funded by Vietnam National Foundation for Science and Technology Development (NAFOSTED) under grant number: 106.05-2019.306.

AUTHOR CONTRIBUTIONS

U Van Hua; Investigation, methodology, formal analysis, manuscript preparation, editing, and finalization
Quang Minh Dinh; Conceptualization and design of the experiment, investigation, supervision, editing, and finalization
Ton Huu Duc Nguyen; Conceptualization and design of the experiment, investigation, editing, and finalization

CONFLICT OF INTEREST

We have no conflict of interest.

REFERENCES

Al-Hussaini, A.H., 1947. The feeding habits and the morphology of the alimentary tract of some teleosts living in the neighbourhood of the Marine Biological Station, Ghardaqa, Red Sea. Publ. Mar. Biol. Stat. Ghar. 5, 1-61.

Anderson, M.J., Gorley, R.N., Clarke, K.R., 2008. PERMANOVA+ for PRIMER: Guide to software and statistical methods. PRIMER-E, Plymouth, United Kingdom.

Clarke, K.R., Gorley, R.N., 2006. PRIMER v6: User Manual/Tutorial. PRIMER-E, Plymouth, United Kingdom.

Clayton, DA, 1993. Mudskippers. Oceanogr. Mar. Biol. Annu. Rev. 31, 507-577.

Desai, V.R., 1970. Studies on fishery and biology of Tor tor (Hamilton) from river Narmada. I. Food and feeding habits. J. Inland Fish. Soc. India. 2, 101-112.

Dinh, Q.M., Nguyen, D.T., Danh, S., 2017a. Food and feeding habits of the broadhead sleeper Eleotris melanosoma from coastline in Soc Trang. In: Le, C.X. (Ed.), Proceedings of the 7th national scientific conference on ecology and biological resources, Ha Noi, 20 October 2017, pp. 1873-1879. (in Vietnamese)

Dinh, Q.M., Qin, J.G., Dittmann, S., Tran, D.D., 2017b. Seasonal variation of food and feeding in burrowing goby Parapocryptes serperaster (Gobiidae) at different body sizes. Ichthyol. Res. 64(2), 179-189.

Dinh, Q.M., 2018. Aspects of reproductive biology of the red goby Trypauchen vagina (Gobiidae) from the Mekong Delta. J. Appl. Ichthyol. 34(1), 103-110.

Dinh, Q.M., Tran, L.T., Nguyen, T.T.K., 2018. The relative gut length and gastro-somatic indices of the mudskipper Periophthalmodon septemradiatus (Hamilton, 1822) from the Hau River. VNU J. Sci. Nat. Sci. Tec. 34(3), 75-83.

Dinh, Q.M., Tran, M.T.D., 2018. Digestive tract morphology, food and feeding habits of the goby Stigmatogobius pleurostigma (Bleeker, 1849) from the coastline in Soc Trang. VNU J. Sci. Nat. Sci. Tec. 34(2), 46-55. (in Vietnamese)

Dinh, Q.M., Lam, T.T.H., Nguyen, T.H.D., Nguyen, T.M., Nguyen, T.T.K., Nguyen, N.T., 2021. First reference on reproductive biology of Butis koilomatodon in Mekong Delta, Vietnam. BMC Zool. 6(1), 1-14.

Dinh, Q.M., Truong, N.T., Phan, G.H., Tran, N.S., Nguyen, T.H.D., 2022. Factors influencing food composition, feeding habits and intensity of Glossogobius giuris caught from the Vietnamese Mekong Delta. J. King Saud Univ. Sci. 34(6), 102159.

Drewe, K.E., Horn, M.H., Dickson, K.A., Gawlicka, A., 2004. Insectivore to frugivore: ontogenetic changes in gut morphology and digestive enzyme activity in the characid fish Brycon guatemalensis from Costa Rican rain forest streams. J. Fish. Biol. 64(4), 890-902.

Froese, R., Pauly, D., 2022. FishBase. Available online: www.fishbase.org (Accessed on 8 August, 2022).

Hortle, K.G., 2009. Fisheries of the Mekong River Basin. In: Campbell, I.C. (Ed.), The Mekong. Academic Press, San Diego, pp. 197-249.

Ip, Y.K., Chew, S.F., Lim, L.L., Low, W.P., 1990. The mudskipper. In: Chou, L.M., Ng, P.K.L. (Eds.), Essays in zoology. National University of Singapore, Singapore, pp. 83-95.

Jaafar, Z., Perrig M., Chou L.M., 2009. Periophthalmus variabilis (Teleostei: Gobiidae: Oxudercinae), a valid species of mudskipper, and a re-diagnosis of Periophthalmus novemradiatus. Zool. Sci. 26(4), 309-314.

Khaironizam, M.Z., Norma-Rashid, Y., 2002. Length-weight relationship of mudskippers (Gobiidae: Oxudercinae) in the coastal areas of Selangor, Malaysia. Naga. 25(3-4), 20-22.

Kottelat, M., Whitten, T., Kartikasari, S.N., Wirjoatmodjo, S., 1993. Freshwater fishes of western Indonesia and Sulawesi. Periplus Editions, Indonesia. pp. 293.

Krishna, P., Panchakshari, V., Prabhavathi, K., 2016. Feeding habits and stomach contents of Asian seabass Lates calcarifer from Nizampatnam Coast. Int. J. Adv. Res. 4(4), 168-172.

Larson, H.K., Jaafar, Z., Lim, K.K., 2016. An updated checklist of the gobioid fishes of Singapore. Raf. Bul. Zool. 37, 744-757.

Le, T., Nguyen, M.T., Nguyen, V.P., Nguyen, D.C., Pham, X.H., Nguyen, T.S., Hoang, V.C., Hoang, P.L., Le, H., Dao, N.C., 2006. Provinces and City in the Mekong Delta. In: Le, T. (Ed.), Geography of Provinces and Cities in Vietnam, vol. VI, Vietnam Education Publishing House, Ha Noi. pp. 49-94. (in Vietnamese)

Murdy, E.O., 1989. A taxonomic revision and cladistic analysis of the oxudercine gobies (Gobiidae, Oxudercinae). Aust. Mus. J. 11, 1-93.

Murdy, E.O., Jaafar, Z., 2017. Taxonomy and systematics review. In: Jaafar, Z., Murdy, E.O. (Eds.), Fishes out of water: biology and ecology of mudskippers, CRC Press, Boca Raton, pp. 1-36.

Na Lampang, P., Palasai, A., Senarat, S., Kettratad, J., Jiraungkoorskul, W., Boonyoung, P., 2020. The existence of argyrophilic endocrine cells in the digestive system of snake eels (Pisodonophis boro, Hamilton, 1822). Vet. Integr. Sci. 18, 75-83.

Nikolsky, G.V., 1963. Ecology of fishes, Academic Press, London, pp. 352.

Nguyen, Y.T.N., Lam, T.T.H., Dinh, Q.M., 2020. The relative gut length and gastro-somatic indexes of Butis koilomatodon living in the coastal estuaries of some provinces in the Mekong Delta. Thai Nguyen Uni. J. Sci. Tec. 225(08), 358-365. (in Vietnamese)

Phan, G.H., Dinh, Q.M., Truong, N.T., Nguyen, T.H.D., 2021. The relative gut length and gastro-somatic index of Glossogobius aureus from some provinces in the Mekong Delta. Thai Nguyen Uni. J. Sci. Tec. 226(05), 44-50. (in Vietnamese)

Raubenheimer, D., Bassil, K., 2007. Separate effects of macronutrient concentration and balance on plastic gut responses in locusts. J. Comp. Physiol. B. 177, 849-855.

Tran, C.C., Nguyen, T.H.D., Nguyen, H.T.T., Vo, L.T.T., Dinh, Q.M., 2021. Diet composition and feeding habit of Glossogobius sparsipapillus caught from estuarine regions in the Mekong Delta. Egypt. J. Aquat. Res. 47(3), 313-319.

Tran, L.T., Dinh, Q.M., 2021. Population structure of Periophthalmodon schlosseri (Perciformes: Gobiidae) in Soc Trang province, Vietnam. Aquac. Aquar. Conserv. Legis. 14(3), 2445-2454.

Tran, T.L., Hoang, D.H., Dinh, Q.M., 2019. Digestive tract morphology, food composition and feeding habits of the giant mudskipper Periophthalmodon schlosseri (Pallas, 1770) from the coastline in Tran De, Soc Trang. VNU J. Sci. Nat. Sci. Tec. 35(3), 30-38. (in Vietnamese)

Vo, T.T., Tran, D.D., 2014. Study on nutritional characteristics of Oxyeleotris urophthalmus fish distributed along the Hau River, Can Tho Uni. J. Sci. Special Issue (Fisheries), 192-197. (in Vietnamese)

How to cite this article;
U Van Hua, Quang Minh Dinh, Ton Huu Duc Nguyen. Feeding habit and intensity of *Periophthalmus variabilis* caught from some coastal provinces in the Mekong Delta, Vietnam. Veterinary Integrative Sciences. 2023; 21(2): 545 - 555.