TẠP CHÍ KHOA HỌC
TRƯỜNG ĐẠI HỌC QUY NHƠN

Đặc điểm sinh học dinh dưỡng của cá Thát lát (*Notopterus notopterus*) phân bố tại đầm Trà Ổ, tỉnh Bình Định

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Ngày nhận bài: 03/07/2020; Ngày nhận đăng: 04/08/2020

TÓM TẮT

Nghiên cứu này được thực hiện để xác định đặc điểm sinh học dinh dưỡng của cá Thát lát (*Notopterus notopterus*) phân bố tại đầm Trà Ổ, tỉnh Bình Định. Mẫu cá được thu định kỳ hàng tháng để phân tích hình thái giải phẫu hệ tiêu hóa, chỉ số sinh trắc ruột (RLG) và thức ăn tự nhiên của cá. Hình thái cấu tạo của hệ tiêu hóa của cá (răng nhỏ nhọn, lưỡi có răng sắc nhọn, dạ dày lớn, ruột ngắn) và chỉ số sinh trắc ruột (RLG) (dao động từ 0,3 đến 0,36) cho thấy cá có tính ăn thiên về động vật. Thành phần thức ăn tự nhiên của cá gồm có giáp xác, ấu trùng côn trùng, rễ thực vật thủy sinh và mùn đáy, trong đó tần số xuất hiện của thức ăn động vật là rất cao (95,8%). Như vậy, có thể nói rằng, cá Thát lát có tính ăn tạp nhưng thiên về động vật.

Từ khóa: *Cá Thát lát, hệ tiêu hóa, tập tính ăn, thức ăn tự nhiên.*

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JOURNAL OF SCIENCE
QUY NHON UNIVERSITY

Feeding Biology of Bronze featherback (*Notopterus notopterus*) distributed in Tra O lagoon, Binh Dinh province

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Received: 03/07/2020; Accepted: 04/08/2020

ABSTRACT

This study was conducted to determine the feeding biology of Bronze featherback (*Notopterus notopterus*) distributed in Tra O lagoon, Binh Dinh province. Fish samples were monthly collected to analyze anatomical morphology of digestive system, the relative length of the gut (RLG) and natural food of fish. The morphological characteristics of the fish's digestive system (small sharp - pointed teeth, sharp teeth on the tongue, big stomach, short intestines) and the relative length of the gut (from 0.3 to 0.36) indicate that this kind of fish is carnivorous. The natural food composition of fish included crustaceans, larvae of insects, aquatic plant roots and humus, of which the occurrence frequency of food which are animals was very high (95.8%). Thus, it can be said that Bronze featherback is an omnivore but focusing on animals.

Keywords: *Bronze featherback, digestive system, feeding behavior, natural food.*

1. INTRODUCTION

Tra O lagoon is a natural freshwater lagoon, having characteristics of the coastal lagoon system in Central Vietnam. The lagoon covers an area of about 1600 hectares. If supplies the local community with a large amount of aquatic products every year, many of which have high economic value that take a part to solve living needs of majority of coastal residents and contribute to the general socio-economic development of the locality and Binh Dinh province.

Bronze featherback distributed in this lagoon is one of economically valuable species considered. This fish species has delicious meat, especially plasticity of its meat, so it is often used to produce fish cakes, which is a special food in Phu My district in particular and Binh Dinh province in general. Therefore, the consuming demand of Bronze featherback inhabiting in Tra O lagoon is increasing. This is the cause of overexploitation, which leads to seriously decrease the mass of this fish in the wild and the commercial size of this fish is smaller and smaller. Thus, carrying out the complete and systematic studies on the basic biological characteristics of Bronze featherback, especially feeding biology, is essential to contribute to the effective conservation of this economically valuable species. In addition, studying on feeding biology of Bronze featherback will supply the important base for grow-out culture and breeding of this species to meet the market requirement and reduce pressure of exploitation for fish resources, as well as to diversify new cultured species in the locality.

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2. SUBJECT AND METHODS

2.1. Subject

Bronze featherback (*Notopterus notopterus)* distributed in Tra O lagoon, Binh Dinh province.

2.2. Methods

2.2.1. Sampling and treating fish samples

Fish with different sizes were collected every month in Tra O lagoon. Based on size of fish collected, we divided fish into 3 groups: <15 cm, 15 - 18 cm and > 18 cm.

After being colleted, the fish were freezed and brought to the Animal Science Laboratory, Faculty of Natural Sciences, Quy Nhon University to analyse within the day or fixed in 5 - 10% formol solution for later analysis.

2.2.2. Examining the digestive system and feeding habit of fish

Describing the characteristics of the digestive system (focusing on organs such as mouth, teeth, gill rakers, intestine) by observing of morphological and anatomical characteristics.

Examining feeding habit of fish: Based on the relative length of the gut (RLG) according to Al-Hussainy.[1]

$$RLG = \frac{Li}{L}$$

Where: + Li: Length of the gut of fish (cm)

+ L: Total length of fish (cm).

2.2.3. Analysing natural food of fish

We dissected fish to analyze natural food in fish stomachs or intestines. Stereomicroscope and optical microscope were used to analyze and identify prey items of fish. Then, these prey items were classified to the lowest possible taxon based on classification documents.[2,3]

- We determined occurrence frequency (%O) of each of food item using formula of Hyslop:[4]

$$Oi\% = \left(\frac{\text{Number of stomach containing prey i}}{\text{Total number of analysed stomach}}\right) \times 100$$

3. RESULTS AND DISCUSSION

3.1. Digestive system and feeding habit of fish

According to our observation, the digestive system of Bronze featherback also included organs like most other fish species. To identify feeding habit of this fish, we focussed on describing some of the following organs:

- Mouth: Mouth is relatively large, with a short flat snout; maxilla extended to anterior eye orbit (Figure 1).

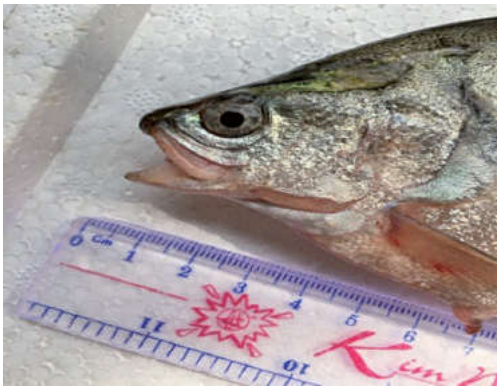

Figure 1. Morphology of mouth of Bronze featherback

- Teeth: There are small pointed teeth with rough teeth surface on both jaws (Figure 2). According to Nguyen Bach Loan,[5] fish that eat small animals often have small, smooth teeth. Thus, based on the described teeth characteristics, Bronze featherback can be a predator.

- Tongue: The tongue is well developed and movable, that had sharp teeth on the tip (Figure 2). Such morphological characteristics of the tongue show the adaptation of the fish as carnivorous behavior; it can be said that tongue is used to hold or tear prey when the fish eat.

Figure 2. Morphology of teeth and tongue of Bronze featherback

- Gill rakers: As our observations, Bronze featherback has four separate pairs of gill arch. Each gill arch has 2 rows of white gill rakers. For the first gill arch, a row of gill rakers is rod-shaped, short, thin, relatively pointed and sparse, that has its bottom attached to gill arch and its tip directed to the mouth cavity while another row of gill rakers was spiny knobs. For other gill arches, both rows of gill rakers are spiny knobs (Figure 3). According to Vu Trung Tang and Nguyen Dinh Mao,[6] the shape and size of gill rakers of the fish are often suitable for their feeding behavior. Fish eating small animals have thin, and sparse gill rakers while gill arches of fish eating large animals have sharp spines or their gill rakers form spiny knobs.[5] Thus, based on the morphological characteristics of gill rakers, it can be said that Bronze featherback can be a carnivore.

- Esophagus: Esophagus is linked to the pharynx, that moves food into the stomach. The esophagus of Bronze featherback is short, tubular, easily stretched and its wall is thick (Figure 4).

- Stomach: Stomach, that contains food and release digestive enzymes to digest food, is connected to the esophagus. Stomach of bronze featherback is bag-shaped, relatively large and its wall is thick (Figure 4).

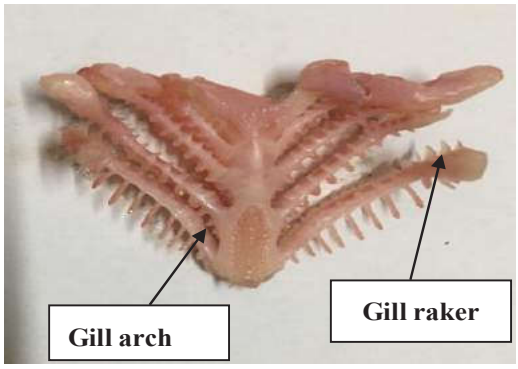

Figure 3. Morphology of gill arches and gill rakers of Bronze featherback

- Intestine: Intestine is the end part of the digestive tract, that connects the stomach and the anus of fish. It releases digestive enzymes and absorbs nutrients. The intestine of Bronze featherback is relatively short, large at the beginning, and has folds (Figure 4).

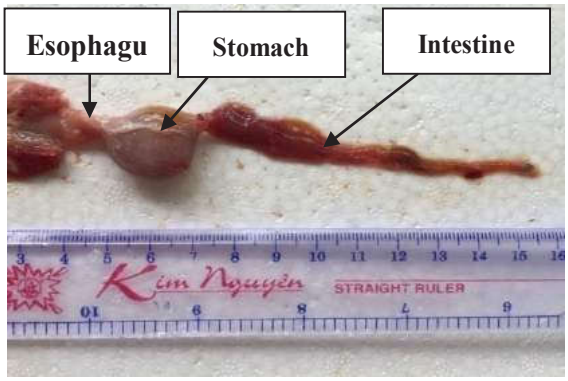

Figure 4. Morphology of stomach and intestine of Bronze featherback

The length of fish gut depends on natural food that they consume and this increases with increasing rate of plant in fish diet.[7] Therefore, to determine more accurately feeding habit of fish, we calculated the correlation index between the gut length (Li) and total length of fish (L) (The relative length of the gut - RLG). Results recorded on 228 individuals of fish with 3 size classes are shown in Table 1.

Bronze featherback has relatively low value of RLG that is from 0.30 to 0.36 (Table 1). According to Nikolsky,[8] carnivorous fish usually have RLG <1. Therefore, it can be said that Bronze featherback is also a carnivore. The results in Table 1 also show that RLG varied between different size classes of fish. Specifically, RLG of size class of fish > 18cm (0.36) is higher than this of size class 15 - 18cm (0.35) and size class <15cm (0.30). This shift can be the adaptability of fish in each ontogenetic stage.

Table 1. RLG of Bronze featherback

Size class of fish (cm)	Length of gut - Li (cm)	Total length of fish - L (cm)	RLG
< 15 cm	4.0 ± 0.13	13.6 ± 0.12	0.30
15 - 18 cm	5.7 ± 0.08	16.5 ± 0.07	0.35
> 18 cm	7.0 ± 0.16	19.5 ± 0.15	0.36

Based on analysed results of morphological characteristics of digestive system and RLG,

it can be seen that Bronze featherback is a carnivore. However, to more exactly examine feeding habit of this fish, we analyzed the composition of natural food in their stomach. The results are shown in the next section.

3.2. Natural food of fish

As it is impossible to directly observe feeding behavior of fish in the wild, the best way to determine feeding habit of the fish is to analyze the composition of food in their gut or stomach.[7]

The results of analysing natural food composition in the stomachs containing food of 216 fish individuals are shown in Table 2.

It can be seen from Table 2 that the natural food of Bronze featherback includes humus, aquatic plant roots, crustaceans, larvae of insects. Crustacean has highest occurrence frequency (63,4%), followed by humus (44,0%), larvae of insects (32,4%) and aquatic plant roots (19,9%). For larvae of insects, family Petaluridae (order Odonata) appears with the highest frequency (13,4%) while family Philopotamidae (order Trichoptera) has the lowest occurrence frequency (5,1%).

According to Vu Trung Tang and Nguyen Dinh Mao,[6] for omnivores that eat both plants and animals and also humus, there are those eating more animals than plants, and others eating more plants than animals. It can be seen that animals take 95,8% while plants only hold nearly 20% of the occurrence frequency in natural food composition of Bronze featherback. Thus, combining the results of analysis of natural food composition and the morphological and anatomical characteristics of the digestive system, it can be concluded that Bronze featherback is an omnivorous fish but focuses on animals.

Table 2. The natural food composition of Bronze featherback

Food composition	Occurrence frequency (%O)
Humus	**44.0**
Aquatic plant roots	**19.9**
Crustaceans	**63.4**
Larvae of insects	**32.4**
Order *Trichoptera* - Fam*ily Philopotam*idae	5.1
Order *Odonata* - Family *Petaluridae*	13.4
Order *Odonata* - Family *Lestidae*	6.9
Order *Diptera* - Family *Chironomidae*	6.9

4. CONCLUSION

Bronze featherback has the relatively large mouth, small pointed teeth; there are sharp pointed teeth on tongue; there are two types of gill rakers: rod-shaped, short, thin, and sparse gill rakers and knob-shaped gill rakers.

Stomach of its relatively big and bag-shaped. Intestine is relatively short and has folds. The relative length of the gut (RLG) is from 0.3 to 0.36.

The morphological and anatomical characteristics of digestive system and RLG value show that Bronze featherback is a carnivore.

The natural food composition of this fish includes humus, aquatic plant roots, crustaceans, larvae of insects. Animals are dominant prey that take 95,8% of occurrence frequency.

Based on all findings of this study, it can be said that Bronze featherback is an omnivore but tends to be a carnivore.

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