Analysis of stomach content of *Nemipterus japonicus* from the Blimbingsari waters, Banyuwangi, East Java

E Saraswati* and G O Perdhana

Agricultural and Fisheries Faculty, University of 17 Agustus 1945, Banyuwangi, Indonesia

*E-mail: erika@untag-banyuwangi.ac.id*

**Abstract.** *Nemipterus japonicus* is one of the fish that caught in Blimbingsari Waters, Banyuwangi. This research aimed to determine the food composition of *N. japonicus*. Descriptive method was used in this study. Collecting data by survey and observation was taken out on July-August 2018. The samples were collected from fisherman at Blimbingsari. Data analysis used Index of Preponderance (IP). The results showed that the main food of the *N. japonicus* was shrimp (IP 62.55%), the complementary food was crab (IP 26.03%) and squid (IP 5.92%), the supplementary food was brittle star (IP 2.37%) and fish (IP 2.85%).

Based on the composition of the food, *N. japonicus* was a type of carnivorous.

**Keywords:** food habits, index of preponderance, *Nemipterus japonicus*, stomach content

1. **Introduction**

One of the potential fish resources in Blimbingsari waters and an important commercial fish is *Nemipterus japonicus* (local name: kurisi, teribang; common name: Japanese Threafin-Bream, Pink Perch). Fishermen in Blimbingsari waters generally use hand line and gill net to catch *N. japonicus*. The number of gill net on Pacemengan beach 55 ships, with details of which 25 ships use surface gill net, and 30 ships use bottom gill net. Gillnet that is used for catching *N. japonicus* is the bottom gill net with a net mesh size of 1.5 inches with a depth of 8-10 meters based on our unpublished data.

The potential of *N. japonicus* in Blimbingsari waters which have high economic value causes higher fishing. The capture of *N. japonicus* which takes place continuously without proper management can decrease the population of *N. japonicus* so that it can affect other fish populations in the food chain. Therefore, management is needed in limiting the capture of *N. japonicus*, so that fisheries resources can be utilized optimally and sustainably.

Observation of feeding and food habits of fish can be used as basic information on the utilization and management of *N. japonicus*, especially in Blimbingsari waters. Information about aspects of fisheries biology and stock *N. japonicus* was reported by Kuthalingam (1969), Krishnamoorthi (1977) and Mudasir *et al* (2016). Some information about food and feeding habits of *N. japonicus* on Bombay coast were reported by Acharya *et al* (1994), in the South China Sea by Said *et al* (1994), in the
coastal waters of Bintulu Sarawak by Tonnie et al (2018). There is little information about food and feeding habits of \textit{N. japonicus} in Indonesia, especially in Blimbingsari coast.

The purpose of this study was to obtain information about food and feeding habits of \textit{N. japonicus} in Indonesian waters, especially Blimbingsari Banyuwangi waters.

2. Materials and methods

The description method was used in this study. Collecting data was conducted on Juli-August 2018, there were 386 samples comprising of 216 males and 170 females. The samples were collected from bottom gillnet fisherman at Blimbingsari. Total length ranging from 15.5-26.4 cm and weight ranging from 48-257 gr. Data analysis used frequency of occurrence according to Hyslop (1980) and analysis feeding habits and types of food in the stomach using Index of Preponderance (IP) according to Natarajan and Jhingran in Effendi (2002).

3. Results and discussion

3.1. The content of \textit{N. japonicus} stomach

A sample of 386 tails consisted of 216 males and 170 females with a total length ranging from 15.5-26.4 cm and weight from 48-257 g. The calculation results of frequency occurrence obtained by 250 stomachs containing foods and 136 empty stomachs. The number of empty stomachs in this study were alleged because fishing was carried out in the early morning, or fish caught in foraging. This because of fish is actively looking for food or fish stomach is in process of digesting the food after foraging. According to Sjafei (2001) an empty stomach resulted from complete digest or in a hungry condition. \textit{N. japonicus} stomach consisted of five types of food groups, namely crustaceans, crabs, fish, squid and brittle star (\textit{Ophiuroidea}), shown in table 1.

| No. | Organism   | Type of food                          |
|-----|------------|---------------------------------------|
| 1   | Shrimp     | \textit{Lysmata sp., Solenocera sp., Acetes sp.} |
| 2   | Crab       | \textit{Juvenile, Thalamita sp.}       |
| 3   | Fish       | Pieces of fish, bones, scales         |
| 4   | Squid      | Pieces of squid, tentacles            |
| 5   | Brittle Star | \textit{Ephioderma}               |

Oi analysis (table 2) showed that the shrimp was most often found with a value of 50.40%, respectively followed by crabs (29.60%), \textit{Ophiuroidea} (14.80%). The results of this study are in accordance with the study of Acharya \textit{et al} (1994), Said \textit{et al} (1994) and Tonnie \textit{et al} (2018) who observed the food and feeding habits of \textit{N. japonicus} and \textit{N. peronii}, where the most consumed foods of \textit{N. japonicus} were crabs and shrimp, while \textit{N. peronii} preferred shrimp and fish as the most consumed food.

The results of volumetric analysis of the food composition of \textit{N. japonicus} during the study found that shrimp were the most foods eaten by with a value of 35.34%, then crab 25.04%, squid 21.06%, fish 11.95%, brittle star 4.55%, and unidentified ones by 2.05%.

Tonnie \textit{et al} (2018) on the study in coastal water of Bintulu Sarawak have reported that the most consumed food by \textit{N. japonicus} was crab and shrimp. Crabs were found to be the most important diet by number, followed by shrimp. This is different from this study where shrimp is the most consumed
food by *N. japonicus* in Blimbingsari waters, similar to the results of Said *et al* (1994) study of food and feeding habits of *N. perronii*, where shrimp is the most consumed food.

### Table 2. Frequency of occurrence and volumetric, composition of *N. japonicus* food.

| No. | Organism            | Ni  | Oi (%) | V   | Vi (%) |
|-----|---------------------|-----|--------|-----|--------|
| 1   | Shrimp              | 126 | 50.40  | 31.05| 35.34  |
| 2   | Crab                | 74  | 29.60  | 22.00| 25.04  |
| 3   | Fish                | 17  | 6.80   | 10.50| 11.95  |
| 4   | Squid               | 20  | 8.00   | 18.50| 21.06  |
| 5   | Brittle star (Ophiuroidea) | 37 | 14.80 | 4.00 | 4.55 |
| 6   | Undefined           | 10  | 4.00   | 1.80 | 2.05   |

Note: Ni = total of stomachs containing one type of food
Oi = Frequency of occurrence
V = total volume of similar food
Vi = Volumetric

According to Khrisnamoorti (1971), *N. japonicus* are carnivorous, active predators, and eat moving animals. Most of the food consists of crustacea, fish, and cephalopods. According to Affandi (1992), the size of the fish feed was determined by considering the size of the body and the opening of the fish's mouth. The larger of the fish size and the opening of the fish mouth, the feed size greater.

### 3.2. Food composition of *N. japonicus*

The analysis of index of preponderance showed that the most frequent and most consumed food types of *N. japonicus* were shrimp (IP 62.5%), followed by crabs (IP 26.03%), squid (IP 5.92%), fish (IP 2.85%), and brittle star (IP 2.37%). The index of preponderance of *N. japonicus* is presented in the following table.

### Table 3. *N. japonicus* index of preponderance.

| No. | Food Organism | IP (%) |
|-----|---------------|--------|
| 1   | Shrimp        | 62.55  |
| 2   | Crab          | 26.03  |
| 3   | Fish          | 2.85   |
| 4   | Squid         | 5.92   |
| 5   | Brittle star  | 2.37   |
| 6   | Undefined     | 0.29   |
|     | Total         | 100.00 |

The frequency of occurrence and the volume of food types consumed by fish reflected in the preponderance index (IP) determine the preference of fish for a particular type of food. The preponderance index of a high type of food indicates that the food is preferred and is the main food of fish.

Based on the analysis of index preponderance, it can be seen the main foods, complementary foods, and additional food for *N. japonicus*. The main foods of *N. japonicus* were shrimp (IP 62.55%), the complementary foods were crab (IP 26.03%) and squid (IP 5.92%), the brittle stars (IP 2.85%) and fish (IP 2.37%) were additional foods. This shows that the main food of *N. japonicus* were crustaceans, and shrimps. This indicated that Blimbingsari Waters have many types of crustaceans. The bottom of Blimbingsari waters is a coral area, which is a habitat for various types of crustaceans.
According to Nontji (2002), in many coral reef areas, there are many living organisms that are associated with such species as algae, crustaceans, mollusks, because they are fertile areas rich in food.

Acharya et al (1994) reported that food habits of *N. japonicus* of Bombay coast were dominated by crustaceans, and were comprised of prawns, lobsters, squilla, crabs, amphipods and ostracods. Followed by young fishes *Polynemus tetractylum, P. Indicus, P. Sextarius, Lactarius Lactarius, Trypauchen vagina, Bregmaceros maclledandi*.

3.3. Food composition in different length classes

Based on the length size, there were differences in patterns of *N. japonicus* food habits, smaller than larger fish. In groups of length 15.5-18.7 cm, the main food of *N. japonicus* were crustaceans with IP values ranging from 71.77-100%. The larger size of the fish, the tendency to consume shrimp begins to decline by further increasing the consumption of crabs. Even at sizes more than 22cm consumption of crustaceans is relatively small, but consumption of crabs and squid increases with increasing length.

| No | Organism       | Indeks of Preponderance (%) |
|----|----------------|-----------------------------|
|    |                | 15.5 | 16.6 | 17.7 | 18.8 | 19.9 | 21.0 | 22.1 | 23.2 | 24.3 | 25.4 |
| 1  | Shrimp         | 100  | 71.77| 85.82| 64.80| 67.63| 61.23| 19.51| 7.32 | 0.00 | 0.00 |
| 2  | Crab           | 0.00 | 19.14| 11.41| 28.68| 15.48| 32.42| 24.39| 60.98| 9.09 | 84.21|
| 3  | Fish           | 0.00 | 3.99 | 0.28 | 0.50 | 10.16| 1.27 | 0.00 | 6.10 | 0.00 | 5.26 |
| 4  | Squid          | 0.00 | 1.59 | 1.13 | 2.79 | 2.74 | 2.14 | 56.10| 24.39| 72.73| 0.00 |
| 5  | Brittle Star   | 0.00 | 0.17 | 0.13 | 3.23 | 3.55 | 2.54 | 0.00 | 1.22 | 0.00 | 10.53|
| 6  | Undefined      | 0.00 | 0.32 | 1.18 | 0.00 | 0.43 | 0.00 | 0.00 | 0.00 | 18.18| 0.00 |

Table 4. *N. japonicus* index of preponderance by length class.

Tonnie et al (2018) stated that variation in the food composition on different length classes also provide information where fish changes their feeding habits from shrimp to crab and then to fish as it grows.

Dietary patterns of *N. japonicus* from several different research locations tend to be similar or similar in feeding habits. That is because the same species has a tendency to occupy the same niche. *N. japonicus* is the dominant carnivore that tends to eat on the bottom of the water. This is indicated by the presence of benthic organisms such as snake stars, crabs, gastropods, etc in their stomach.

3.4. Food composition in different sexes

The dietary habits of male and female *N. japonicus* were not different. Both of them selected the same type of food. However, there are differences between males and females based on the preponderance index (table 5). Male fish tended to consume more shrimp (IP 72.59%) in greater numbers than females which more prefered three types of food namely, crustaceans (IP 50.40%), crabs (36.59%) and squid (10.47%). This due to the size of male fish was smaller than female fish.

The study of Acharya et al (1994) reported that both males and females *N. japonicus* indicated marginal fluctuations in intake of different food material during different months. Crustaceans dominated the most dietary food in different length groups of males and females, except in the smallest (8.1-9.0 cm) and the largest (25.1-26.0 cm) length groups.
### Table 5. *N. japonicus* index of preponderance in different sexes.

| No. | Organism       | Indeks of preponderance (%) | Male (216 fish) | Female (170 fish) |
|-----|----------------|------------------------------|------------------|-------------------|
| 1   | Shrimp         | 72.59                        | 50.40            |                   |
| 2   | Crab           | 16.03                        | 36.59            |                   |
| 3   | Fish           | 4.59                         | 1.22             |                   |
| 4   | Squid          | 2.41                         | 10.47            |                   |
| 5   | Brittle star   | 3.77                         | 1.23             |                   |
| 6   | Undefined      | 0.61                         | 0.08             |                   |

The differences in the number of food organisms eaten by fish occur due to differences in the distribution of organisms in each region and also factors affecting the preferences of aquatic organisms on food, among others, the spread of food organisms, food availability factors, choice factors of fish itself and aquatic environmental factors (Effendie 2002).

### 4. Conclusion

The preponderance index analysis *N. Japonicus* food was crustaceans, namely shrimp and crabs, with IP values of 62.55% and 26.03%, respectively. Male fish consumed more shrimp than crabs, while female fish tended to consume both shrimp and crab. Based on length, smaller fish consumed more crustaceans than crabs. The larger size of fish tended to consume more crabs than crustaceans.

### References

Acharya P, Jaiswar A K, Palaniswamy R and Gulati D K 1994 A study on food and feeding habits of *Nemipterus japonicus* (Bloch) off Bombay Coast *J. Indian Fish. Assoc.* **24** 73-80

Affandi R, Sjafei D S, Raharjo M F and Sulistiono 1992 *Ikhtiologi: Pedoman Kerja Laboratorium* (Bogor: IPB University)

Effendie M I 2002 *Biologi Perikanan* (Yogyakarta: Yayasan Pustaka Nusantara)

Hyslop E 1980 Stomach contents analysis-a review of methods and their application *J. Fish Biol.* **17** 411-429

Khrisnamoortoth B 1971 Biology of threadfin bream, *Nemipterus japonicus* (Bloch) *Indian J. Fish.* **18** 1-21

Kuthalingam M D K 1969 Notes on some aspect of the fishery and biology of *Nemipterus japonicus* (Bloch) with special reference to feeding behavior *Indian J. Fish.* **12** 500-505

Mudasir, Sawant M S, Pawar R A, Pawsae A S and Bhat F A 2016 Stock identification of *Nemipterus japonicus* along West Coast of India using RAPD markers *SKUAST J. Res.* **18** 130-137

Nontji A 2002 *Laut Nusantara* (Jakarta: Djambatan)

Said Z M, Mohsin A K M and Ambak M A 1994 Food and feeding habits of *Nemipterus peronii* (Valenciennes) from the South China Sea *Pertanika J. Trop. Agric. Sci.* **17** 125-131

Sjafei D S and Robiyani 2001 Kebiasaan makanan dan faktor kondisi ikan kurisi (*Nemipterus tambuloides* Blkr) di perairan Teluk Labunan, Banten *JII* **1** 7-11

Tonnie M K, Abu H, Idris M H, Rajaee A H, Amin S M N and Nesarul M H 2018 Food and feeding habits of *Nemipterus japonicus* and *Nemipterus peronii* from Coastal water Bintulu, Sarawak, South China Sea *J. Environ. Biol.* **39** 857-864