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IDENTIFICATION OF Anisakis simplex IN PURPLE SPOTTED BIG EYE FISH (*Priacanthus* sp.) FROM SOUTH BALI WATER AREA

Identifikasi Anisakis simplex Pada Ikan Swanggi (*Priacanthus* sp.) di Perairan Bali Selatan

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ABSTRACT

Anisakis simplex infection in fishery products can be dangerous because it has zoonotic can transmitted infection from fish to humans. Purple spotted big eye fish (*Priacanthus* sp.) is one of the reef fish species produced in the waters of South Bali and is not immune to the zoonotic threat *Anisakis simplex* poses. This study was conducted to identify *Anisakis simplex* which is known to infect Purple Spotted Big Eye Fish (*Priacanthus* sp.) in the South Bali Water Area. The parameters observed in this study were related to the prevalence and intensity of *Anisakis simplex* in Purple Spotted Big Eye Fish (*Priacanthus* sp.). The research method used was descriptive quantitative with purposive sampling of fish samples. The samples used were 30 fish obtained from 15-20% of the catch of purple spotted big eye fish in the South Bali Water Area. The results of the study showed that the morphological identification that had been carried out showed that *Anisakis simplex* found to infect Purple Spotted Big Eye Fish (*Priacanthus* sp.) was an *Anisakis simplex* type III larva with a prevalence rate of 26.3% classified as a frequent infection. The intensity value of *Anisakis simplex* in this study was 4.92 ind/fish and was classified as a low category. The predilection from this study showed that the most infections were in the intestinal organs.

Keywords: Anisakis simplex, Identification, Purple Spotted Big Eye Fish, South Bali Waters Area

ABSTRAK

Infeksi *Anisakis simplex* pada hasil perikanan dapat membahayakan, karena memiliki sifat zoonosis yang dapat menular dari ikan ke manusia. Ikan Swanggi (*Priacanthus* sp.) merupakan salah satu jenis ikan karang yang dihasilkan di Perairan Bali Selatan dan tidak luput dari ancaman zoonosis yang ditimbukan oleh *Anisakis simplex*. Penelitian ini dilakukan untuk identifikasi terhadap *Anisakis simplex* yang diketahui menginfeksi Ikan Swanggi (*Priacanthus* sp.) di Perairan Bali Selatan. Parameter yang diamati dalam penelitian ini adalah terkait dengan

prevalensi dan intensitas *Anisakis simplex* pada Ikan Swanggi (*Priacanthus* sp.). Metode penelitian yang dilakukan adalah secara deskriptif kuantitatif dengan pengambilan sampel ikan secara purposive sampling. Sampel yang digunakan adalah sebanyak 30 ekor ikan yang didapatkan dari 15-20% hasil tangkapan ikan swanggi di Perairan Bali Selatan. Hasil Penelitian menunjukan bahwa identifikasi morfologi yang telah dilakukan menunjukan bahwa *Anisakis simpex* yang ditemukan menginfeksi Ikan Swanggi (*Priacanthus* sp.) merupakan larva *Anisakis simplex* tipe III dengan tingkat Prevalensi sebesar 26,3% tergolong kedalam infeksi sering. Nilai intensitas *Anisakis simplex* dalam penelitian ini sebesar 4,92 ind/ekor dan tergolong kedalam kategori rendah. Predileksi dari penelitian ini menunjukan bahwa infeksi terbanyak adalah pada organ usus.

Kata Kunci : Anisakis simplex, Identifikasi, Perairan Bali Selatan, Ikan Swanggi

INTRODUCTION

South Bali waters area is the largest fish producer in Bali Province located in Badung Regency. The fishery products produced are quite diverse and have high economic value with various types of fish, for example pelagic fish, reef/demersal fish, and deep sea fish. 12 million tonnes of fish are produced annually in Badung Regency from the catch (Badan Pusat Statistik, 2023). Some of the most commonly found and widely cfonsumed types of fish are reef fish, such as purple spotted big eye fish, parrot fish, and grouper fish which have a habitat at a depth of 15-35 m below sea level (Fishbase, 2024). Reef fish habitat and abundance can be affected by serious problems, such as ecological impacts and fish diseases that threaten fish health, one of the fish diseases that may arise can be caused by parasites (Cinner *et al.*, 2020). The circulation of these fish cannot be separated from several, such as the endoparasite Anisakis (Ngginak *et al.*, 2023).

Anisakis is a type of endoparasite that can cause zoonotic properties or can transmit diseases from animals to humans. Types of Anisakis that can be zoonotic include *Anisakis simplex*, *Anisakis pegrrefi*, *Anisakis typica*, and *Anisakis ziphidarum* (Klimpel *et al.*, 2014). *Anisakis simplex* is a common type that can be found in waters in Indonesia. The life cycle of *Anisakis simplex* consists of four stages of larval development which in these stages make reef fish an intermediate host to fulfill its life cycle. If there is a problem in external factors that can affect the life cycle of Anisakis simplex, it can cause *Anisakis simplex* not to fulfill its life cycle (Kleinerzt *et al.*, 2014). The problem that may arise is an increase in pollutants in the waters. This will cause the anisakis larvae to die and will not be able to fulfill its life cycle in the definitive host (Dawa *et al.*, 2024). Therefore, based on the discussion, it is necessary to conduct research related to the identification of *Anisakis simplex* in purple spotted big eye fish in the South Bali Waters Area in order to determine the morphology of *Anisakis simplex* based on the type and type of larvae.

METHODS

Place and Time of Research

This study was conducted on November to December 2024. Sample of Purple Spotted Big Eye Fish (*Priacanthus* sp.) were obtained from fishermen's catches in the South Bali Waters Area by *purposive sampling* with certain criteria using of 30 fish based on 15-20% of fish catch (Etikan and Bala, 2017). Parasite observations were carried out at the Marine Laboratory, Faculty of Marine Science and Fisheries, Udayana University.

Methodology of Research

The research method used was descriptive quantitative This is a method that is done by analysing an object, symptom or phenomenon to solve a problem accurately (Sugiyono, 2017).

The research work method carried out by conducting a necropsy on fresh Purple Spotted Big Eye Fish (*Priacanthus* sp.) samples obtained from fishermen. The organs observed in this study were the intestines, gonads, and liver which were placed in a petri dish that had been given a 9% physiological NaCl solution. Observations were made using a Stereo Zeiss Stemi 305 Microscope. The samples obtained were then stored using a 5 mm vial bottle that had been given 70% alcohol (Palm and Bray, 2014).

Data Analysis

Prevalence

Prevalence is a percentage data of fish that describes parasite infection in fish population. The prevalence formula (Kabata, 1985) is:

$$P=\frac{N}{n}x\ 100\ \%$$

Note:
N= Number of infected fish, n = Number of fish examined

Table 1. Category of Prevalence

No	Mark	Category	Information
1.	100-99%	Always	Very Severe Infection
2.	98-90%	Almost Always	Severe Infection
3.	89-70%	Usually	Moderate Infection
4.	69-50%	Very often	Very Frequent Infection
5.	49-30%	Generally	Common Infections
6.	29-10%	Often	Frequent Infections
7.	9-1%	Sometimes	Infection Sometimes

Source: Kabata, 1985

Intensity

Intensity describes the number of parasite densities that can infect fish and can be calculated using the formula (Kabata, 1985) and the intensity category in Table 2.

$$I=\frac{P}{n}$$

Note:
P = Number of parasites infecting fish, n = Number of fish infected with endoparasites

Table 2. Category of Intensity

No	Intensity (ind/fish)	Category
1.	>1000	Super infection
2.	>100	Severe infection
3.	55-100	Critical
4.	6-55	Currently
5.	1-5	Low
6.	<1	Very low

Source: Kabata, 1985

RESULT

Morphological Identification

Based on this results of the research that has been carried out, it shows that identification of *Anisakis simplex* can be done through morphological examination. The results of this study

indicate that the *Anisakis simplex* found was still in the Larva stage III phase. This can be seen based on the morphological form of the teeth, ventricle, and mucron. According to Messina *et al.*, (2016), *Anisakis simplex* type III has characteristics, namely the appearance of boring tooth which functions to penetrate the intestinal wall owned by the host in order to absorb nutrients in the small intestinal mucosa. In addition, type III larvae have a ventricle organ which functions as a connection between the esophagus and intestines of *Anisakis simplex*. (Figure 1) is the morphology of *Anisakis simplex*

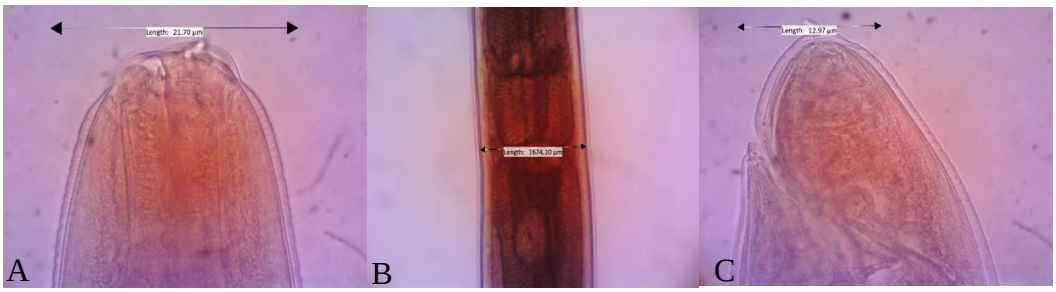

Figure 1. Morphology of *Anisakis simplex*. (A) Boring tooth; (B) Ventriculus; (C) Ventral part contains Mucron.

Prevalence

From this results of the calculation of the prevalence of *Anisakis simplex* in this study were 53.3% with a common infection category (Table 3)

Table 3. Result of Prevalence

Examined Fish	Infection fish	Degree of Prevalence (%)	Category	Information
30	16	53,3 %	Generally	Common Category

Intensity

The results of the calculation of the intensity of *Anisakis simplex* in Purple Spotted Big Eye Fish (*Priacanthus* sp.) are 4.92 ind/fish, which shows that the intensity of *Anisakis simplex* is classified as low (Table 4.)

Table 4. Result of Intensity

Examined Fish	Infection fish	Parasite Collection	Calculation of Intensity (Ind/fish)	Category
30	16	79	4,92	Low

DISSCUSION

Based on morphological observations of *Anisakis simplex*, it can be seen that in stage III larvae, *Anisakis simplex* has a mucron that functions as an organ for adaptation to the host and also the environment that is the habitat for *Anisakis simplex*. According to Sanam *et al.*, (2022), *Anisakis simplex* type III has a mucron organ that functions to adapt to the environment and host. In addition, the mucron functions as a penetration tool for *Anisakis simplex* to make it easier for it to attach to the host organ (Mattiucci, 2006). The results of this study indicate that of the 30 fish samples examined were 16 sample of purple spotted big eye fish (*Priacanthus* sp.) are infected by *Anisakis simplex* with the most predilection organs found in the intestine,

because of the many nutrients needed to it's life cycle. According to Kuhn et al., (2013), the intestinal organ has many nutrients needed for *Anisakis simplex* in it's life cycle.

From this study the prevalence is common category were 53,3 % caused by *Anisakis simplex* infection in Purple Spotted Big Eye Fish (*Priacanthus* sp.) influenced by several factors such as fish eating habits, population, and season. This study used samples of Purple Spotted Big Eye Fish (*Priacanthus* sp.) which are a type of coral fish and are carnivorous fish whose habitat is in coral reef associations, so they have a diet of consuming types of coral organisms, such as crustaceans as their food which are intermediate hosts for *Anisakis simpex* to their life cycle, so this shows that the level of frequent infection experienced by Purple Spotted Big Eye Fish (*Priacanthus* sp.) is caused by the diet of the fish, because coral fish have a tendency to consume coral organisms. According to Palm *et al.*, (2017), fish diet also affects the Anisakis parasite infection found, because several types of marine biota, such as small fish, and crustaceans are also intermediate hosts for Anisakis in their life cycle. Based on the results of this study, it can be seen that the prevalence value can fluctuate depending on the fish's eating habits, habitat, and environment, because the influence of the environment and increased pollutants in the waters can also affect the growth of *Anisakis simplex* larvae. According to Palm (2011), the level of pollutants in the waters can affect the development and life cycle of Anisakis, because this will cause the anisakis larvae not to develop and their fullfil life cycle, which in turn can also affect the prevalence value.

Based on this research calculation of the intensity of *Anisakis simplex* in Purple Spotted Big Eye Fish (*Priacanthus* sp.) are 4.92 ind/fish this low infection can be influenced by several factors, such as the age of the fish, environmental conditions, ecosystem, physiological conditions, size of the fish, and habitat. Based on the life cycle of *Anisakis simplex*, ecosystem factors are one of the factors that influence the growth of *Anisakis simplex* larvae, because the coral reef ecosystem does not support the growth of *Anisakis simplex* larvae which tend to be relatively. According to Siagian & Maryanti (2021), the growth of *Anisakis simplex* larvae in coral reef ecosystems does not support the growth of Anisakis larvae, because in this ecosystem there are many changes in temperature and decreased oxygen levels, so this affects the survival of *Anisakis simplex*. The low intensity of *Anisakis simplex* is also caused by the availability of intermediate hosts. According Sabadel *et al.*, (2024), this is because *Anisakis simplex* requires several intermediate hosts to fulfill its life cycle. Purple Spotted Big Eye Fish (*Priacanthus* sp.) is a type of coral fish that lives in one habitat and tends to be inhabited by only a few types of organisms, so this causes low *Anisakis simplex* infection. According to Abbas *et al.*, (2023), *Anisakis simplex* requires several intermediate hosts to fulfill its life cycle. If known that the intermediate host habitat has a low abundance of intermediate hosts, it will affect the number of *Anisakis simplex* in the waters.

CONCLUSION

Based on the results of this study, it can be concluded that *Anisakis simplex* infects Purple Spotted Big Eye Fish (*Priacanthus* sp.) is *Anisakis simplex* type III. This can be seen through morphological identification carried out on sample preparations. The prevalence of *Anisakis simplex* in this study was 26.3% with an intensity level of 4.92 ind/fish, which show that level of the attack and infection of *Anisakis simplex* is relatively low due to several factors such as the physiological conditions of the intermediate host and the host habitat. So this affects the level of infection of *Anisakis simplex*.

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REFERENCES

Abbas, N., Fathy, M., Ghaffar, A., Omar, H., Ayat, F., & Hassan, A. (2023). Morphological and Molecular Identification of Third-Stage Larvae of *Anisakis typica* (Nematoda: Anisakidae) from Red Sea coral trout, Plectropomus areolatus. *Parasitology Research*, 705–715.

Badan Pusat Statistik. (2023). *Produksi Perikanan Tangkap, 2022-2023*. Jakarta: BPS RI.

Cinner, J. E., Zamborain-Mason, J., Gurney, G. G., Graham, N. A. J., MacNeil, M. A., Hoey, A. S., Mora, C., Villéger, S., Maire, E., McClanahan, T. R., Maina, J. M., Kittinger, J. N., Hicks, C. C., D'Agata, S., Huchery, C., Barnes, M. L., Feary, D. A., Williams, I. D., Kulbicki, M., & Mouillot, D. (2020). Meeting Fisheries, Ecosystem Function, and Biodiversity Goals in a Human-Dominated World. *Science*, *368*(6488), 307–311.

Dawa, U. P. L., Awang, B. U. M. T. J., Gadi, D. S., & Lakapu, M. M. (2024). Identification and Prevalence of *Anisakis* sp. Parasites in Tuna at the Oeba Fish Auction Site (FAS)—Kupang City. *Jurnal Pengolahan Hasil Perikanan Indonesia*, *27*(10), 955–963.

Etikan, I., & Bala, K. (2017). Sampling and Sampling Methods. *Biometrics & Biostatistics International Journal*, *5*(6), 00149.

FAO. (2024). *Priacanthus* sp.

Kabata, Z. (1985). *Parasites and Diseases of Fish Cultured in the Tropics*. London and Philadelphia: Taylor dan Prancis.

Kleinertz, S., Damriyasa, I. M., Hagen, W., Theisen, S., & Palm, H. W. (2014). An Environmental Assessment of the Parasite Fauna of the Reef-Associated Grouper *Epinephelus areolatus* from Indonesian Waters. *Journal of Helminthology*, *88*(1), 50–63.

Klimpel, S., H. W. Palm., Ruckert, S., & Piatkowski, U. (2014). The Life Cycle of *Anisakis simplex* in The Norwegian Deep (Nothern North Sea). *Parasitol Res*,*94*, 1-9.

Kuhn, T., Hailer, F., Palm, H. W., & Klimpel, S. (2013). Global Assessment of Molecularly Identified *Anisakis dujardin*, 1845 (Nematoda: Anisakidae) in Their Teleost Intermediate Hosts. *Folia Parasitologica*, *60*(2), 123–134.

Mattiucci, S. (2006). Parasites as Biological Tags in Population Studies of Demersal and Pelagic Fish Species. *Parassitologia*, *48*(2), 23–25.

Messina, C. M., Pizzo, F., Santulli, A., Bušelić, I., Boban, M., Orhanović, S., & Mladineo, I. (2016). Anisakis (Nematoda: pegreffii Anisakidae) Products Modulate Oxidative Stress and Apoptosis-Related Biomarkers in Human Cell Lines. *Parasites and Vectors*, *9*(1), 1-10.

Ngginak, J., Romode, M. E., Sampe, R., & Manalu, T. S. J. (2023). Identifikasi Nematoda pada Ikan Tongkol (*Euthynnus affinis*) di Pelabuhan Ikan Oeba. *Bioed : Jurnal Pendidikan Biologi*, *11*(2), 185.

Palm, H. W. (2011). *Progress in Parasitology*. Progress in Parasitology

Palm H. W., & Bray, R. A. (2014) *Marine Fish Parasitology in Hawaii*. Hawaii: Westarp.

Palm, H. W., Theisen, S., Damriyasa, I. M., Kusmintarsih, E. S., Oka, I. B. M., Setyowati, E. A., Suratma, N. A., Wibowo, S., & Kleinertz, S. (2017). Anisakis (Nematoda: Ascaridoidea) from Indonesia. *Diseases of Aquatic Organisms*, *123*(2), 141–157.

Sabadel, A., Gay, M., Lane, H. S., Bourgau, O., Bury, S. J., Delgado, J., Duflot, M. (2024). Just Hitching a Ride: Stable Isotopes Reveal Non-Feeding Behaviour of Anisakis simplex Within Its Host Fish. *Journal of Fish Diseases*, 1–6.

Sanam, M. U. E., Detha, A., Wuri, D., & Dangga, S. (2022). Identifikasi Morfologi Larva *Anisakis* sp. pada *Epinephelus* sp. dan *Rastrelliger* sp di Perairan NTT. *Jurnal Kajian Veteriner*, *9*(2), 123–133.

Siagian, F. E., & Maryanti, E. (2021). Anisakiasis pada Ikan Laut di Indonesia: Prevalensi, Sebaran dan Potensi Patogenitasnya pada Manusia. *Jurnal Ilmu Kedokteran (Journal of Medical Science)*, *14*(1), 11.

Sugiyono, (2017). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D*. Bandung: CV. Alfabeta.