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Diversity and Conservation Status of Gelodok Fish (Perciformes: Gobiidae) in East Pohuwato Coastal Area, Gorontalo Province, Indonesia

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Abstract *This study aims to determine the diversity and conservation status of Gelodok fish in the Pohuwato Coastal Mangrove Area. Data collection techniques were carried out by surveying the location to see the conditions and determine the sampling site. Sampling was done by cruising method using 3x3 meter size net. The fish found then analyzed the level of diversity and conservation status. The results showed that the spadefish found in the mangrove area of East Pohuwato Village consisted of two species of gelodok fish, namely Periophthalmus malaccensis and Periophthalmus argentilineatus with a diversity value of 0.17016 classified as low diversity. The conservation status of Periophthalmus malaccensis is included in the Data Deficient (DD) category and Periophthalmus argentilineatus is included in the Least Concern (LC) category based on the IUCN Red List of Threatened Species (IUCN).*

Keywords: *Gelodok fish, Diversity, Conservation status*

INTRODUCTION

Mangrove ecosystems are one of the important and productive environments encompassing terrestrial and marine ecosystems inhabited by various terrestrial and aquatic biota. (Rahim & Baderan, 2017). Mangroves have physical, chemical and biological functions such as wave resistance, nursery areas for marine biota larvae, supplying nutrients needed by marine biota and trapping sediment and have high biodiversity including birds, snakes, molluscs, crabs and fish, one of which is spadefish. (Amalia & Budijastuti, 2022)

Mudskipper is one of the fish species that live in mangrove ecosystems that belong to the *Gobiidae* family. *Mudskippers* have a variety of species, but have many similarities in terms of morphology (Ridho et al., 2019). This fish likes muddy areas in coastal areas and this fish has amphibian-like characteristics, which can walk on mud, climbing mangrove roots (Mukharomah et al., 2016). This fish has an important role in maintaining the balance of the mangrove ecosystem because this fish can eat particles and organic matter as well as living things suspended in water so commonly referred to as filter feeder animals (Akinrotimi et al., 2013). This is in line with research conducted by Anggoro (2010). This fish has the ability to absorb heavy metals (Pb) and acts as a bioindicator of environmental pollution, and can be a source of livelihood for the surrounding community (Ningsih & Santoso, 2020). This gelodok fish has an economic value that has the potential to be traded because it can be a raw material for livestock food and can also be consumed as an alternative food because this fish contains important components needed by the body such as 7.91% protein, 0.46% fat and 72.80% water (Lestari et al., 2022).

Initial observations in the Bajo tribe showed that in Lemito village, Pohuwato district, some people consume gelodok fish as a traditional medicine to treat asthma and can be consumed by pregnant women to increase stamina and for the health of the mother and fetus. Based on research conducted by Asshidiq (2020) gelodok fish has bioactive compounds contained in the body of this animal, these compounds have various benefits for human life, including being used as antibacterial, anti-inflammatory, anticancer and antioxidant.

Gelodok fish has many benefits that must be studied, one of which is through research to be known and preserved. In the Pohuwato area, there are still many who do not know about the potential and benefits of spadefish and the value of its diversity so that currently the spadefish population is decreasing due to human activities that destroy its habitat, such as mangrove logging as a land conversion used in infrastructure development or agricultural and fisheries land, so a study was conducted that aims to determine the diversity and conservation status of spadefish in the Pohuwato Coastal Mangrove Area.

MATERIALS AND METHODS

Materials

The materials used in the study were all types of Gelodok fish found in the 20x20 m plot. data collection begins with a site survey to see the conditions and determine the sampling site. Sampling was carried out at 3 stations based on mangrove criteria with the cruising method on the plot using a 3x3 meter size net. Parrotfish found were then counted, photographed and analyzed for diversity and conservation status.

Methods

This research was conducted in July-September 2023 at the mangrove area on the coast of Pohuwato. Precisely in East Pohuwato Village, Marisa District (Figure 1). The method used in this research is Survey method and *Purposive Sampling* with quantitative descriptive approach.

Analysis of data on the diversity of skinks is calculated using

$$(H') = -\sum_{t=l}^{s} Pi\ In\ Pi$$

H = Shannon-Wiener diversity index
Ni = Number of individuals of the 1st species
N = Total number of individuals
Pi = 1st fish count ratio (ni/N)
I = 1,2,3 dsr.

Criteria for diversity results based on Shannon-Wiener (Basri et al., 2020)
H'≤ = Low diversity
H' 1≤ H'≤ 3 = Moderate diversity
H' ≥ 3 = High diversity
To determine the conservation value of steelhead trout, it is measured based on the conservation status and frequency of presence of fish species in a place using the formula

$$CVI \sum_{i=1}^{k} [log\ log\ (Fi + 1)x\ SVi$$

CVI = Conservation value index
Fi = Frequency of presence of species i
Svi = Type conservation status score
K = Number of species obtained
I = Number of individuals

Conservation status score based on IUCN endangerment criteria: Extinct = Extinct in the wild = Critically Endangered = 16, Endangered = 8, Vulnerable = 4, Near Threatened = 4, and Least Concern = 1, Data Deficient = 0, Not Evaluated = 0. (Rinaldi et al., 2017)

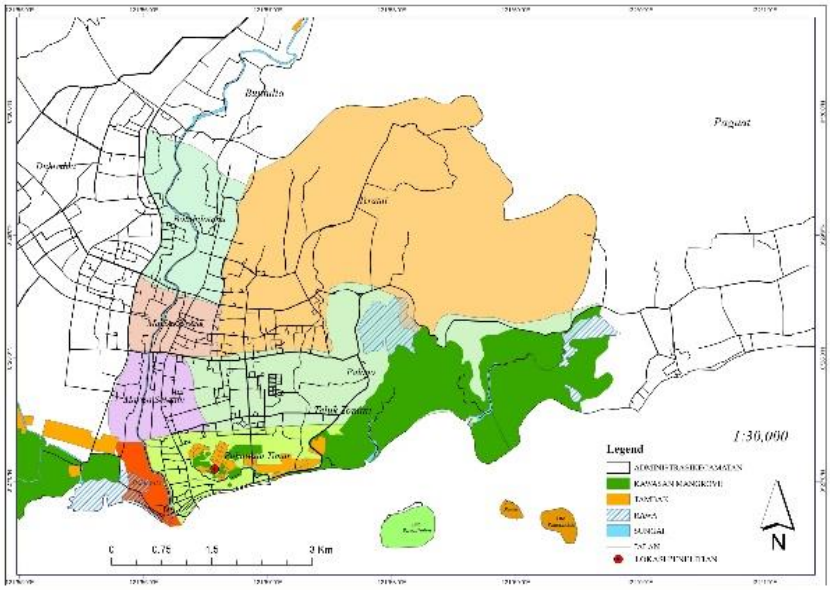

Figure 1: Sampling sites of gelodok fish

RESULT AND DISCUSSION

1. Species diversity and conservation status of Gelodok fish

The trout found in the mangrove area of Pohuwato Timur Village consisted of two species of trout, namely *Periophthalmus malaccensis* (Figure 2) and *Periophthalmus argentilineatus* (Figure 3) while the results of the study of *Periophthalmus malaccensis and Periophthalmus argentilineatus (*Figure 3) were not found. Baderan et al. (2023) Baderan et al. (2023) found 5 species of silverfish, namely *Periophthalmus argentilineatus, Periophthalmus kalolo, Periophthalmus malaccensis, Periophthalmus minitus, Periophthalmus variabilis* in Boalemo Regency. The diversity value at the research location of 0.17016 is classified in the low diversity category (Table 1). This result is in line with the results of Ningsih & Santoso (2020) which shows that the diversity of Gelodok fish in the mangrove forest ecosystem is classified as low diversity (H'= 0 to 0.98). Research results Akbar et al. (2020) also found that the level of diversity of Tembakul or Gelodok fish (*Gobiidae* spp) on the coast of Ternate Island at 3 stations was included in the low diversity category with a value between H' of 0.58 to 0.67.

The results showed that the level of spadefish diversity in the mangrove area of East Pohuwato village was in the low category. This can be caused by the small number of species of spadefish found at that location. The value of diversity is determined by the number of species found in an ecosystem, where if the number of species is high then the level of diversity is high, and vice versa. Murhandini, Hidayat, & Muhammad (2022) mentioned that the low species diversity was due to the fact that only one species of fish was found, namely trout (Periophthalmus sp.) in the habitat of the mangrove area which was the research location. Akbar et al., (2020) explained that a community has a high level of diversity if the community is composed of many species, while the low value of fish diversity is due to the small number of species found. Low fish biodiversity indicates that habitat conditions have been damaged such as habitat degradation, natural disasters, pollution, and others. (Murhandini et al., 2022) adds that the value of species diversity which is

classified as low can mean that the fish habitat area has an unstable ecosystem, very low productivity and heavy ecological pressure. According to (Ramadhani et al., 2019) the presence and condition of mangroves have an influence on the diversity and number of fish in them. If the condition of mangroves has been damaged or has experienced land conversion as a pond, it can result in the natural habitat for trout being disturbed and its diversity being low. According to Khairul (2020) a low level of diversity indicates that the ecosystem is experiencing a decline in condition.

The conservation status of *Periophthalmus malaccensis* with a conservation value of 0 and included in the *Data Deficient* (DD) category and *Periophthalmus argentilineatus* with a conservation value of 1 and included in the *Least Concern* (LC) category based on the IUCN *Red List of Threatened Species* (IUCN) (Table 1). Based on the IUCN *Red List of Threatened Species* (IUCN) data, apart from these two species, there are 8 species of gelodok fish in the genus *Periophthalmus* with known conservation status, including *P. novemradiatus* (DD) and *P. chrysospilos P. walton, P. novaeguineaensis, P. kalolo, P. weberi, P. minutus,* and P. *barbarus* with conservation status (LC). (IUCN, 2023). According to Utami & Budiantoro (2022) LC conservation status indicates that *Periophthalmus argentilineatus is* at low risk of extinction.

The conservation status of a living creature, in this case the bobwhite fish, is an indicator used to show the level of threat of the bobwhite fish from extinction. The determination of conservation status aims to provide protection and preservation of various types of animals from extinction. (Kantun, 2018). The conservation status of spadefish can be influenced by various factors, one of which is utilization by the community. Pangasius in the mangrove area of Pohuwato Timur village is usually utilized for community consumption. However, this fish is consumed only as medicine for certain diseases. This makes the community not often hunt or catch the fish, so the risk of extinction is still relatively low. According to Nursida and (Permana, 2022) overfishing can accelerate extinction. Overfishing makes the rate of fish production not proportional to the high rate of capture, because the reproductive rate of fish takes longer to reach adult size. This will result in the number of fish decreasing and extinction.

2. Environmental Parameters

The diversity and conservation status of spadefish is also influenced by the environmental factors of mangroves that are the habitat of these fish. If the environmental factors and conditions are poor, it can affect the growth and development of frogfish, resulting in a decrease in the level of biodiversity and even extinction. According to Baderan et al (2023) environmental conditions can affect the high and low diversity of species, one of which is environmental quality. The results of measuring environmental parameters show that the temperature at the research location is 35^0 C. This temperature value is high enough to support fish life, especially silverfish. Latuconsina (2021) explains that in general the optimal temperature range for fish life in tropical waters is between 28 and 32°C. According to (Pramunandar, Tamti, & Wulandari (2023)) gelodok fish can still survive at temperatures between 28 and 38°C because glodok fish have a high tolerance for extreme environmental changes.

Light intensity also influences the diversity and life of steelhead trout. The value of light intensity at the research location is 6.14 lux. Research results Noprianto Try, Muhammad Sugihartono (2022) also shows

that the best light intensity for fish growth is 61.4 x 10 Lx. According to Kusuma, Prasetiyono, & Bidayani (2020) light intensity affects the growth rate of fish length and weight because high light intensity produces a brighter environment that increases the sensitivity of fish in detecting food and protecting themselves. However, light intensity that is too high can cause stress and even death in fish.

Another environmental parameter that also affects the life of skinks is humidity. The measurement results obtained an air humidity value of 60% and substrate humidity of 3.1 wet. According to Budi, Widiyani, & Budiharjo (2018) frogfish can survive outside the water for a long time with 60% to 80% humidity. Ansari, Trivedi, Saggu, & Rehman (2014) explained that the habits and habitats of goldfish have a direct influence on environmental factors such as humidity. In many species of silverfish, regulation under hyposmotic conditions is the behavior of evapotranspiration through the skin. A humid environment is the most suitable environment for the survival of these fishes because they need body moisture in order to breathe through their skin when they are out of water.

The growth and development of skinks is also influenced by the pH value of their habitat, both water pH and substrate pH. The pH of the substrate was measured at 8 and the pH of the water was 8.91. According to Pramunandar et al., (2023) the pH value of waters from 6 to 9 is still in the normal category that can be tolerated by aquatic organisms, such as trout, so that they can live and develop in the Mangrove ecosystem area with this pH range. Irawan, Sari, Prasetiyono, & Syarif (2019) stated that each fish has a different pH range in supporting fish survival and growth.

pH affects the physiological processes of fish such as stunted growth and fish will be very sensitive to bacteria, parasites and water will be toxic to fish. According to Asmi et al (2022) the pH range of the substrate for skink habitat is between 5.8 to 8.2. Sari, Halili, & Asriyana (2021) explain that habitats that have a pH that is too low in the substrate will inhibit the activity of microorganisms, on the other hand, if the pH is too high, the type of bacteria present in the substrate changes so that it can interfere with the growth of natural food for trout. This can be detrimental to the growth and diversity of frogfish.

Pangasius at the study site were found to live on mud substrates. According to Dinh & Nguyen (2023) frogfish prefer habitats with muddy substrate types because they are used to build nests that aim to protect from predators and a place to hide when the waters are in high tide conditions. Muddy soil substrate types are favored by aquatic biota such as gastropods and small crustaceans which are the food of skinks. Elviana, Sunarni, Maturbongs, Sajriawati, & Fakhriyyah (2019) added that silverfish prefer muddy substrate environments that are used as spawning grounds and other activities.

Figure 2. Peripthalmus argentilineatus

Figure 3. Peripthalmus argentilineatus

Table 1. Diversity and Conservation Status of Gelodok Fish in the Mangrove Area of East Pohuwato Village

Species	Diversity Index	Category	Conservation Value	Conservation Status
Periophthalmus malaccensis	0.17016	Low	0	DD
Periophthalmus argentilineatus			1	LC

Table 2. Environmental Parameter Values in the Mangrove Area of East Pohuwato Village

Environmental Parameters	Measurement Results
Temperature (°C)	35
Light Intensity (lux)	6.14
Air Humidity (%)	60
Substrate Moisture (wet)	3.1
pH of Water	8.91
pH of Substrate	8
Substrate Type	Sandy Mud

CONCLUSION

Gelodok fish in the mangrove area of East Pohuwato Village consists of two species of trout, namely *Periophthalmus malaccensis* and *Periophthalmus argentilineatus* with a diversity value of 0.17016 classified as low diversity category. The conservation status of *Periophthalmus malaccensis is* included in the *Data Deficient* (DD) category and *Periophthalmus argentilineatus is* included in the *Least Concern* (LC) category based on the IUCN *Red List of Threatened Species (*IUCN).

REFERENCE

Akbar, N., Bode, I. D., Baksir, A., Tahir, I., Paembonan, R. E., Marus, I., & Wibowo, E. S. (2020). Distribusi dan karakteristik habitat ikan tembakul (Gobiidae sp) di pesisir Pantai Pulau Ternate Provinsi Maluku Utara. *Jurnal Maritim*, *1*(2), 49–58. https://doi.org/https://doi.org/10.51742/ojsm.v1i2.46

Akinrotimi, O. A., Edun, o. M., Uka, A., & Owhonda, K. N. (2013). Public Perception of Mudskipper Consumption in Some Fishing Communities of Rivers State, Nigeria. *Journal of Fisheries and Aquatic Science*, *8*(1), 208–212. https://doi.org/10.3923/jfas.2013.208.212

Amalia, P. R., & Budijastuti, W. (2022). Morfometri Ikan Gelodok (Famili Gobiidae) di Perairan Mangrove Wonorejo Surabaya Morphometry of Mudskipper Fish (Family Gobiidae) in Mangrove Wonorejo Surabaya. *Lentera Bio*, *11*(3), 457–472.

Anggoro, S. (2010). Bioakumulasi Plumbun (Pb) Pada Ikan Gelodok (Periopthalmus Sp) Di Perairan Segara Anakan Kabupaten Cilacap: Studi Pendahuluan Pemanfaatan Bioindikator Pencemaran Pada Daerah Mangrove. *Sains Akuatik: Jurnal Ilmiah Ilmu-Ilmu Perairan*, *13*(2), 1–2.

Ansari, A. A., Trivedi, S., Saggu, S., & Rehman, H. (2014). Mudskipper : A biological indicator for environmental monitoring and assessment of coastal waters. *Journal of Entomology and Zoological Studies*, *2*(6), 22–33.

Asmi, W. I., Mulyaningrum, E. R., & Dewi, L. R. (2022). Keanekaragaman Jenis dan Kelimpahan Ikan Gelodok (Periopthalmus sp.) di Kawasan Mangrove Pantai Kertomulyo Pati Jawa Tengah. *Jurnal Impresi Indonesia*, *1*(2), 128–134. https://doi.org/10.58344/jii.v1i2.16

Asshidiq, H. N., Rozirwan, & Hendri, M. (2020). Uji Toksisitas Ekstrak Ikan Gelodok (P. boddarti) Yang Diambil Dari Perairan Pulau Payung Sungai Musi Dengan Metode Brine Shrimp Lethality Test (BLST). *Maspari Journal : Marine Science Research*, *12*(1), 9–18. https://doi.org/10.56064/maspari.v12i1.11607

Baderan, D. W. K., Aydalina, R. V., & Hamidun, M. S. (2023). Morphological characteristics and biodiversity of mudskipper fish (Periophthalmus: Gobiidae) in mangrove ecosystem of coastal Bay of Tomini, Boalemo, Gorontalo Province, Indonesia. *Biodiversitas*, *24*(1), 498–507. https://doi.org/10.13057/biodiv/d240158

Basri, M. C., Santoso, H., & Laili, S. (2020). Kepadatan Populasi Ikan Gelodok Di Hutan Mangrove Desa Penunggul Kecamatan Nguling Kabupaten Pasuruan. *Biosaintropis (Bioscience-Tropic)*, *5*(2), 66–71. https://doi.org/10.33474/e-jbst.v5i2.251

Budi, A. S., Widiyani, T., & Budiharjo, A. (2018). Daily Behavior of the Mudskippers at Wonorejo Mangrove Forest Surabaya. *Inventing Prosperous Future through Biological Research and Tropical Biodiversity Management AIP*, *020003*, 1–6. https://doi.org/https://doi.org/10.1063/1.5050099 ?

Dinh, Q. M., & Nguyen, T. H. D. (2023). Burrow behaviour, structure and utilization of the amphibious mudskipper Periophthalmus chrysospilos Bleeker, 1853 in the Mekong Delta. *Saudi Journal of Biological Sciences*, *30*, 1–9. https://doi.org/10.1016/j.sjbs.2022.103525

Elviana, S., Sunarni, S., Maturbongs, M. R., Sajriawati, & Fakhriyyah, S. (2019). Mudskipper Diversity And Its Relationship to An Environmental Condition In Estuary. *IOP Conference Series: Earth and Environmental Science*, *343*(1), 8–13. https://doi.org/10.1088/1755-1315/343/1/012191

Irawan, D., Sari, S. P., Prasetiyono, E., & Syarif, A. F. (2019). Performa Pertumbuhan Dan Kelangsungan Hiduo Ikan Seluang (Rasbora einthovenii) Pada Perlakuan pH Yang Berbeda. *Jurusan Akuakultur*, *4*(2), 15–21.

IUCN. (2023). *Grid List Map Stats Taxonomy Red List Category Land Regions Country Legends Marine Regions Threats Habitats Conservation Actions*. IUCN Red List of Threatened Species English. https://www.iucnredlist.org/search?taxonomies=172293&searchType=s... 2022-2

Kantun, W. (2018). *Pengelolaan Perikanan Tuna*. Gadja Mada University Press.

Khairul, K., & Khairul, K. (2020). Fish Biodiversity in the Swamp Ecosystem of Barumun River Area. *International Journal of Applied Biology*, *4*(1), 94–99. https://doi.org/10.20956/ijab.v4i1.10222

Kusuma, P. R., Prasetiyono, E., & Bidayani, E. (2020). Kelangsungan Hidup dan Pertumbuhan Ikan Pala Pinang (Desmopuntius pentazona) dalam Wadah Pemeliharaan dengan Warna Berbeda. *Limnotek : Perairan Darat Tropis Di Indonesia*, *27*(1), 55–66. https://doi.org/10.14203/limnotek.v27i1.296

Latuconsina, H. (2021). *Ekologi Ikan Perairan Tropis*. Gadja Mada University Press.

Lestari, D., Hartanti, L., Sofiana, M. S. J., Yuliono, A., & Kurniadi, B. (2022). Proximate and Essential Macrominerals Analysis of Tembakul (Mudskipper) Fish Flour as a Food Source for Stunting Prevention. *Berkala Sainstek*, *10*(1), 45. https://doi.org/10.19184/bst.v10i1.31030

Mukharomah, E., Madang, K., & Santoso, L. M. (2016). Morfologi Dan Variasi Interspesies Ikan Glodok (Periopthalmus Gracilis Dan Periopthalmus Variabilis) Di Wilayah Perairan Makarti Jaya Dan Sungsang; Dan Sumbangannya Pada Pembelajaran Biologi SMA. *Prosiding Seminar Nasional Pendidikan Tanggal 2 Juni 2016, FKIP Universitas Muhammadiyah Palembang*, *1*(1), 267–276.

Murhandini, I. K., Hidayat, J. W., & Muhammad, F. (2022). Struktur Komunitas Ikan di Pantai Karang Jahe Rembang. *Bioma : Berkala Ilmiah Biologi*, *24*(1), 80–89. https://doi.org/10.14710/bioma.24.1.80-89

Ningsih, A., & Santoso, H. (2020). Keanekaragaman Ikan Gelodok (Mudskipper) Di Hutan Mangrove Kecamatan Ujung Pangkah Kabupaten Gresik. *Journal Enggano*, *5*(3), 367–376. https://doi.org/https://doi.org/10.31186/jenggano.5.3.367-376

Noprianto Try, Muhammad Sugihartono, M. Y. A. (2022). Pertumbuhan dan Kelangsungan Hidup Larva Ikan Patin Siam (Pangasianodon Hypophthalmus .F.) dengan Intensitas Cahaya yang Berbeda. *Jurnal Akuakultur Sungai Dan Danau*, *7*(1), 32–38. https://doi.org/10.33087/akuakultur.v7i1.126

Permana, F. N. A. (2022). Status Konservasi Biota Laut yang Teridentifikasi di Tempat Pelelangan Ikan (TPI) Kabupaten Pangandaran, Jawa Barat. *Jurnal Ilmu-Ilmu Perikanan Dan Budidaya Perairan*, *17*(1), 48–57. https://doi.org/https://jurnal.univpgri-palembang.ac.id/index.php/ikan

Pramunandar, N., Tamti, H., & Wulandari, S. (2023). Kelimpahan ikan glodok (Boleophthalmus boddarti Pallas 1770) pada ekosistem mangrove di ekowisata Lantebung Kota Makassar. *Agrokompleks*, *23*(1), 62–91. https://doi.org/10.51978/japp.v23i1.480

Rahim, S., & Baderan, D. W. K. (2017). *Huta Mangrove Dan Pemanfaatannya*. CV BUDI UTAMA.

Ramadhani, S. F., Setyobudiandi, I., & Haryadi, S. (2019). Inventarisasi dan Ekologi Ikan Gelodok (Famili : Gobidae) di Kabupaten Brebes Provinsi Jawa Tengah. *Journal of Tropical Fisheries Management*, *2*(1), 43–51. https://doi.org/10.29244/jppt.v2i1.25320

Ridho, M. R., Patriono, E., & Solikha, M. (2019). Food habits of three species of mudskippers in the Musi River Estuary, South Sumatra, Indonesia. *Biodiversitas Journal of Biological Diversity*, *20*(8), 2368–2374. https://doi.org/10.13057/biodiv/d200835

Rinaldi, R. K., Widyorini, N., & Purnomo, P. W. (2017). Komposisi Larva Ikan Di Kawasan Koservasi Mangrove Dusun Senik, Desa Bedono, Kecamatan Sayung, Demak. *Diponegoro Journal of Accounting*, *2*(1), 2–6. http://i-lib.ugm.ac.id/jurnal/download.php?dataId=2227%0A???%0Ahttps://ejournal.unisba.ac.id/index.php/kajian_akuntansi/article/view/3307%0Ahttp://publicacoes.cardiol.br/portal/ijcs/portugues/2018/v3103/pdf/3103009.pdf%0Ahttp://www.scielo.org.co/scielo.ph

Sari, R., Halili, & Asriyana. (2021). Pola pertumbuhan Dan Faktor Kondisi Ikan Gelodok (Periopthalmus argentilineatus) Di Perairan Desa Mekar Sama Tampo Kecamatan Napabalano Pulau Muna Sulawesi Tenggara. *Jurnal Manajemen Sumber Daya Perairan*, *6*(3), 173–184.

Utami, I., & Budiantoro, A. (2022). BIOLOGI KONSERVASI: Strategi Perlindungan Keanekaragaman Hayati Indonesia. In *Bintang Semesta Media.*