Analysis of capture fisheries prime commodities in Pariaman City, West Sumatera, Indonesia

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Abstract. Capture fisheries of Pariaman City consist of sea capture fisheries and general water capture fisheries, which have the potential to be developed. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources, with marine fish resources of 7892 tons. Potential marine fish resources consist of pelagic, demersal, coral fish, as well as crustaceans and molluscs. Of the potential marine fish resources, 2841.12 tons year^{-1} are represented by large pelagic fish, 3156 tons year^{-1} are small pelagic fish, and 236.76 tons year^{-1} are demersal fish. In 2018, Pariaman City targeted a capture fisheries production of 6588 tonnes. With such large capture fisheries resources, Pariaman City has a prime commodity in the regional economic development sector. The purpose of this study is to analyze the superior commodities in the capture fisheries sector in Pariaman City. The research was conducted in August 2020. The method used in this research is a descriptive method using primary and secondary data. Data collection was conducted by direct observations, interviews, and literature study. The data analysis methods used are Location Quotient (LQ) analysis, Shift Share (SS) analysis, and Specialization analysis (SI). Main catch fishery commodities in Pariaman City include *Eleutheronema tetradactylum*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*.
Key Words: *Auxis rochei, Auxis thazard,* capture fisheries, *Eleutheronema tetradactylum, Katsuwonus pelamis*.

Introduction. Pariaman City is located on the Western Coast of Sumatera Island, which is geographically south of the equator, latitude 00^{0}33’00’’ - 00^{0}40’43''S and longitude 100^{0}10’33''- 100^{0}10’55’’E. Thus, Pariaman City has a tropical climate with sufficient rainfall. The land area is located at an altitude between 2 - 35 m above sea level (asl), with an average height between 0 - 15 m asl. Thus, Pariaman City is a lowland stretch with few hills.

The marine and fisheries potential of Pariaman City is diverse according to the location of the Unitary State of the Republic of Indonesia, which is located at the equator and between two continents and two oceans. The fishery potential consists of fishing and cultivation. The dominant fishing is sea fishing. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources with marine fish resources of 7892 tons. Potential marine fish resources consist of pelagic, demersal, coral fish and crustaceans and molluscs. Of the potential marine fish resources, 2841.12 tons per year are large pelagic fish, 3156 tons per year are small pelagic fish, and 236.76 tons per year are demersal fish. In 2018, Pariaman City targeting a capture fisheries production of 6588 tonnes.

Determining prime fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to gain comparative and competitive advantages in the face of globalization of trade. A superior commodity is a commodity that is in high demand, has a high selling value and is expected to be able to provide a large income compared to other types. The marketing activities can be divided into local and export superior commodities. The existence of prime exports is expected to increase foreign exchange for the country from the non-oil

and gas sector and can also increase regional income (Kohar 2012). According to Sembiring (2009), the existence of a superior commodity means that a country is able to produce products with distinctive attributes, which are due to domestic resource factors. Provision of quality products must be carried out followed by increased productivity and efficiency, so that these commodities have high competitiveness.

Prime commodities are expected to provide a greater income compared to other commodities. According to Resosudarmo et al (2002), if utilized optimally and sustainably, the potential of Indonesia's marine resources can become the main capital for national development in the future. Determination of superior fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to achieve comparative and competitive advantages in the face of globalization of trade. Steps towards efficiency can be taken by determining fish commodities that have comparative advantages, both in terms of supply and demand, as well as high competitive advantages (Alit 2017). Kohar (2012) stated that the criteria for superior fisheries commodities are the following: high production and selling prices; high public taste; high market demand; economically important fish/non-fish species; the flesh is tender/soft, chewy, not prickly, and highly nutritious.

The purpose of this research is to analyze the superior capture fisheries commodities in Pariaman City, including: (1) determining the amount of capture fisheries production; (2) determininge the growth of capture fisheries production; and (3) determineing the contribution of capture fisheries.

Material and Method

Description of the study sites. The method used in this study uses descriptive methods, namely direct observation of the field through surveys and interviews with fishery port parties and fishermen to obtain primary data. The primary data is processed and strengthened by secondary data, with some reinforcement in the form of references and literature studies, aiming to determine the superior commodity of capture fisheries in Pariaman City. This research was conducted for 1 month, in August 2020. According to Arifin (2008), the descriptive method is a research method where the researcher or writer comes directly to the data source and analyzes the data as it is. Data collection in this study is primary data collection and secondary data. Primary data collection was carried out by means of observation, interviews, and literature study.

Primary data. The primary data required includes data on the price of fish which is a prime commodity, continuity of production, and government policies regarding follow-up on superior commodities in Pariaman City. Primary data was obtained by direct observation and interviews with related parties, including the Pariaman City Marine and Fisheries Service to local fishermen.

Secondary data. Secondary data collected is from the Department of Marine Affairs and Fisheries and the Central Statistics Agency for the City of Pariaman and West Sumatera Province in the 2014 - 2018 period. The data obtained include the following: production data and production value per type of fish each year in Pariaman City, and production data and production value per type of fish in West Sumatera Province.

Analysis of the capture amount of fisheries production. Location quotiens analysis (LQ) was used to determine the amount of capture fisheries production. According to Budiharsono (2001), the formula for calculating LQ is:

$$LQ = \frac{vi/_{vt}}{Vi/_{Vt}}$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fishery production at Pariaman City level; Vi - total production of species i fish at national level;

Vt - total capture fisheries production at national level. If LQ≥1, type i fish is a prime commodity in Pariaman City; if LQ≤1, type i fish is not a prime commodity in Pariaman City.

Capture fisheries production growth analysis. Shift Share analysis was used to determine the growth of capture fisheries production. According to Susanto (2008), the formulas used for the Shift Share analysis are as follows:

Gj =Yjt – Yjo

Nj = Yjo (Yt/Yo) – Yjo

(G-N)j = Yjt – (Yt/Yo) –Yjo

Djt = {(Yijt – (Yit/Yio) Yijo)}

Where: Gj - total fishery production growth in Pariaman City; Nj - regional share component in Pariaman City; (G-N)j - net shift component in Pariaman City; Djt - diferential shift component in Pariaman City; Yij - total production of type i fish at Pariaman City level; Yj - total capture fishery production at Pariaman City level; Yi - total production of type i fish in West Sumatera Province; Y - total capture fisheries production in West Sumatera Province; o - initial period (2014); t - end period (2018).

If Gj-Nj<0, the fishery growth in area j (Pariaman City) is slower than in West Sumatera Province. If Gj-Nj>0, the fishery growth in area j (Pariaman City) is faster than in West Sumatera Province. If Djt>0, the type of fish i in area j (Pariaman City) grows faster than the same fish species in West Sumatera Province. If Djt<0, the fish species i in area j (Pariaman City) has a slower growth compared to the growth of the same fish species in West Sumatera Province. Djt shows the differential shift component used to measure the amount of net shift caused by certain species of fish that grow faster or slower in the concerned area.

Analysis of the contribution of capture fisheries production. Shift Share analysis is used to determine the growth of capture fisheries production. According to Susanto (2008), the formula used for the Shift Share analysis is as follows:

$$SI = \left[\frac{vi}{vt} - \frac{Vi}{Vt}\right] x\ 100\ \%$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fisheries production at Pariaman City level; Vi - total production of fish species i in West Sumatera Province; Vt - total capture fisheries production at the level of West Sumatera Province.

Results and Discussion. Capture fisheries resources have an important role in the economic turnover of coastal communities in Pariaman City. Among the most important species are *Thunnus* spp., *Euthynnus affinis*, *Katsuwonus pelamis*, *Sardinella* spp., *Rastrelliger* spp., *Atule mate*, *Engraulidae* spp. and some reef fish, with of high economic value. Capture fisheries represent the main livelihood for some coastal communities in coastal villages in Pariaman City. The number of fishermen in Pariaman City in 2017 reached 1183 people.

Analysis of the amount of capture fisheries production. Irnawati et al (2011) stated that the LQ method makes a comparison of the relative share of sector i revenue at the regional level to total regional income in the relative share of sector i revenue at the provincial level to provincial revenue. In this study, the determination of LQ with income criteria is replaced by production criteria and fish production value. LQ analysis is used to determine a capture fishery commodity in Pariaman City, whether the fish species is a basic or non-basic commodity by comparing it to a wider area, namely the province. If

the value of LQ>1, type i fish is the leading commodity in Pariaman City, whereas if the value of LQ<1, type i fish is not the leading commodity in Pariaman City.

Based on Table 1, the fish that have an LQ>1 include *Trichiurus lepturus*, *Makaira* sp., *Polynemidae*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*. These types of fish are commodities representing the base sector for capture fisheries in Pariaman City. The highest LQ value was found in *Makaira* sp., namely 2.81, followed by *Polynemidae* (2.76) and *K. pelamis* (2.59). This is because the production of *Makaira* sp. in Pariaman City is the largest in West Sumatera Province. The fish with an LQ<1 are not included in the catch fishery base commodity in Pariaman City, because the fishery production is still low when compared to other areas in West Sumatera Province. These commodities include *Atule mate*, *Trachinotus* spp., *Decapterus* spp., *Engraulidae*, *Lutjanus campechanus*, *Litopenaeus vannamei, Epinephelus* spp., *Rastrelliger* spp. and *Loligo* spp.

Table 1
Capture fisheries commodities in Pariaman City based on the Location Quotient (LQ) analysis in 2018

Types of fish	*LQ*	*Information*
Atule mate	0.68	Non prime
Trachinotus spp.	0.94	Non prime
Decapterus spp.	0.27	Non prime
Trichiurus lepturus	1.85	Prime
Engraulidae	0.37	Non prime
Makaira sp.	2.81	Prime
Lutjanus campechanus	0.60	Non prime
Polynemidae	2.76	Prime
Auxis rochei	2.21	Prime
Auxis thazard	1.48	Prime
Katsuwonus pelamis	2.59	Prime
Rastrelliger spp.	0.45	Non prime
Epinephelus spp.	0.27	Non prime
Litopenaeus vannamei	0.22	Non prime
Loligo spp.	0.39	Non prime

Capture fisheries production growth analysis. Shift Share analysis is a very useful technique in analyzing the growth of capture fisheries production in Pariaman City compared to the fishery production in West Sumatera Province, or commonly known as the Net Shift component. The Net Shift Component of capture fisheries commodities in Pariaman City in the 2014–2018 period amounted to 205661.14 kg. So it can be concluded that the Net Shift component (Gj - Nj)> 0, and in 2014-2018 the growth of fishery production in Pariaman City was faster than in West Sumatera Province. According to Mangilelang et al (2015), Shift Share analysis is a very useful technique in analyzing changes in the regional economic structure compared to the provincial economy.

The purpose of this analysis (Table 2) is to determine the performance or work productivityof the regional economy by comparing it with a larger region (regional/province). To determine the types of fish that have the potential to be developed into superior capture fisheries commodities, it is necessary to calculate the Djt for each fish.

Table 2
The catch fishery commodity in Pariaman City based on the Shift Share (SS) analysis in 2018

Types of fish	SS	Information
Atule mate	-25.4	Slow
Trachinotus spp.	-10.8	Slow
Decapterus spp.	40.4	Fast
Trichiurus lepturus	-10	Fast
Engraulidae	40	Fast
Makaira sp.	-16.6	Fast
Lutjanus campechanus	-4.6	Fast
Polynemidae	59.4	Fast
Auxis rochei	85.4	Fast
Auxis thazard	229.2	Fast
Katsuwonus pelamis	186.2	Fast
Rastrelliger spp.	-46.2	Slow
Epinephelus spp.	-22.2	Slow
Litopenaeus vannamei	-16	Slow
Loligo spp.	-9	Slow

Based on Table 2, several capture fisheries commodities in Pariaman City experienced faster growth when compared to the same commodity at the provincial level, which means that the value of Djt>0. These fishery commodities include *Decapterus* spp., Engraulidae, Polynemidae, *A. rochei*, *A. thazard* and *K. pelamis*. The highest value of Djt occurred for *K. pelamis*, namely 229.2; this occurred because the production of *K. pelamis* was the largest compared to other fish species in Pariaman City, and when compared to other areas in West Sumatera province.

If capture fisheries commodities have a Djt value less than 0, then the fisheries commodity growth is slower than that of the same fish species at the provincial level. This fishery commodity has lower competitiveness when compared to the same fish species in other districts in West Sumatera Province. These fishery commodities include *A. mate*, *Trachinotus* spp., *T. lepturus*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Analysis of the contribution of capture fisheries production. The specialization analysis (Table 3) is used to determine the existence of specialization in capture fisheries production in certain fish species in Pariaman City. If SI>1, then there is a specialization of fishery production in Pariaman City relatively comparable to the province, while if SI<1, there is no specialization in fishery production in Pariaman City relative to that of West Sumatera Province.

Table 3
The catch fishery commodity in Pariaman City based on the Specialization (SI) analysis in 2018

Fish	SI	Information
Atule mate	-4.44	No Specialization
Trachinotus spp.	-2.32	No Specialization
Decapterus spp.	1.07	Specialization
Trichiurus lepturus	-1.96	No Specialization
Engraulidae	-2.95	No Specialization
Makaira sp.	0.9	No Specialization
Lutjanus campechanus	0.49	No Specialization
Polynemidae	4.25	Specialization
Auxis rochei	5.25	Specialization
Auxis thazard	5.53	Specialization

Katsuwonus pelamis	9.42	Specialization
Rastrelliger spp.	-3.66	No Specialization
Epinephelus spp.	0.45	No Specialization
Litopenaeus vannamei	-2.04	No Specialization
Loligo spp.	0.5	No Specialization

Based on Table 3, there fish that experience specialization in production, which means that they contribute to economic growth in Pariaman City, including *Decapterus* spp., Polynemidae, *A. rochei*, *A. thazard* and *K. pelamis*, the latter having the highest specialization value (SI) (9.42%).

The fish with specialization value (SI) less than 1 do not experience specialization in fishery production in Pariaman City when compared to the production of West Sumatera Province. This fishery commodity has low competitiveness when compared to other areas in West Sumatera Province, so that there is no specialization of capture fisheries activities for these fish commodities in Pariaman City (*A. mate*, *Trachinotus* spp., *Trichiurus lepturus*, Engraulidae, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Prime capture fisheries commodity in Pariaman City. The prime catch fisheries commodities in Pariaman City are obtained from the results of the analysis of (LQ), (SS), and (SI) (Table 4).

Table 4

Results of the analysis of location quotient (LQ), shift share (SS), and specialization (SI) of capture fisheries commodities in Pariaman City in 2018

Types of fish	*LQ*	*Djt*	*SI (%)*	*Information*
Atule mate	0.68	-25.4	-4.44	Not prime
Trachinotus spp.	0.94	-10.8	-2.32	Not prime
Decapterus spp.	0.27	40.4	1.07	Not prime
Trichiurus lepturus	1.85	-10	-1.96	Not prime
Engraulidae	0.37	40	-2.95	Not prime
Makaira sp.	2.81	-16.6	0.9	Not prime
Lutjanus campechanus	0.6	-4.6	0.49	Not prime
Polynemidae	2.76	59.4	4.25	Prime
Auxis rochei	2.21	85.4	5.25	Prime
Auxis thazard	1.48	229.2	5.53	Prime
Katsuwonus pelamis	2.59	186.2	9.42	Prime
Rastrelliger spp.	0.45	-46.2	-3.66	Not prime
Epinephelus spp.	0.27	-22.2	0.45	Not prime
Litopenaeus vannamei	0.22	-16	-2.04	Not prime
Loligo spp.	0.39	-9	0.5	Not prime

Note: Djt - diferential shift component in Pariaman City.

Table 4 shows that the superior capture fisheries commodities in Pariaman City include *Polynemidae*, *A. rochei*, *A. thazard* and *K. pelamis*. This commodity is a large pelagic fish, except for *Polynemidae*, which are demersal fish. The fish that are not included in the superior capture fisheries commodity in Pariaman City are *A. mate*, *Trachinotus* spp., *Decapterus* spp., *T. lepturus*, *Engraulidae*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp. Determination of the superior capture fisheries commodity is based on the amount of production.

Eleutheronema tetradactylum. *Eleutheronema tetradactylum* (Figure 1) is one of the capture fisheries prime commodities in Pariaman City. The results of the analysis show that the (LQ) value of *E. tetradactylum* is 2, 76, which means that the fish is the base for capture fisheries in Pariaman City. The Djt value of *E. tetradactylum*, 59.4, indicates that the fish production growth is faster than that of the same fish species from West

Sumatera Province, so that it has a competitive edge when compared to other regions. The SI of *Eleutheronema tetradactylum* in Pariaman City reaches 4.25%, which means that the fish is relatively specialized in production in Pariaman City. This fish is an important consumption fish in Kuwait, India, Thailand, Vietnam, Malaysia, Singapore and Indonesia (Motomura 2004).

E. tetradactylum belongs to the Polynemidae family, which consists of 41 species in 8 genera, which are epibenic fish and can be found in all tropical and subtropical marine waters. *E. tetradactylum* is a protandrous hermaphrodite fish (Motomura 2004). The number of fishing activities causes this fish stock to rapidly decline, marked by a drastic decrease in catch (Wijopriyono et al 2012). In 2012, the production of *E. tetradactylum* was only 9273 kg with a very significant decrease in production, namely 49822 kg when compared to the production in 2008. The optimum sustainable production value (Catch Maximum Sustainable Yield) of *E. tetradactylum* was 4067 kg per year within an optimum fishing effort of 497 trips per year. Fishing effort in 2012 was 849 trips (170.8% of the optimum fishing effort), so there has been an overfishing of *E. tetradactylum* (Indra et al 2013).

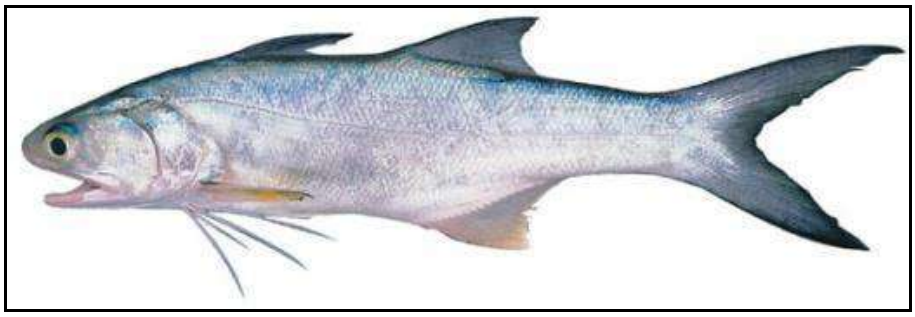

Figure 1. *Eleutheronema tetradactylum* (source: FishBase).

Auxis rochei. *A. rochei* (Figure 2) production in 572 Fisheries Management Area has been recorded in capture fisheries statistics starting from 2005. In the previous year, the production of all tuna species was recorded in statistical data for "tuna" only, without distinguishing the species. *A. rochei* production from 2005-2012 showed a fluctuating trend, the lowest was in 2005-2007 and increased rapidly in 2008-2012. *A. rochei* only contributes 2% of all neritic tuna production originating from the waters of West Sumatera (Anonymous 2013). This value is very small compared to the percentage of other types of mackerel, such as krai krai by 26%. There is a possibility that the data recording officer in the field misidentifies it because morphologically, *A. rochei* and *A. thazard* are very similar. Apart from being marketed in the local market, neritic tuna has been caught by fishermen which also enter the industry and are exported. The level of cultivation of *A. rochei* that is continuous without the existence of control can cause its sustainability to be threatened, therefore accurate and precise scientific information is needed.

The length of the first ripe gonads (Lm) of *A. rochei* is 24.6 cm (Research Institute for Marine Fisheries 2013). Based on the Lm value, the length distribution of *A. rochei* caught in the waters of West Sumatera shows that adult fish are 53% and immature fish are 47%. Setyadji et al (2013) obtained a more different range, namely 23-32 cm for mini purse seines and 20-28 cm for large purse seines (industrial scale) in the South Indian Ocean. One of the differences in the length of the fish caught is caused by the difference in the size of the mesh used. *A. rochei* population will be sustainable if the size caught is above the length of the first time the gonads mature. Continuous exploitation of juvenile *A. rochei* by means of non-selective purse seine fishing gear will cause the sustainability of *A. rochei* to be threatened.

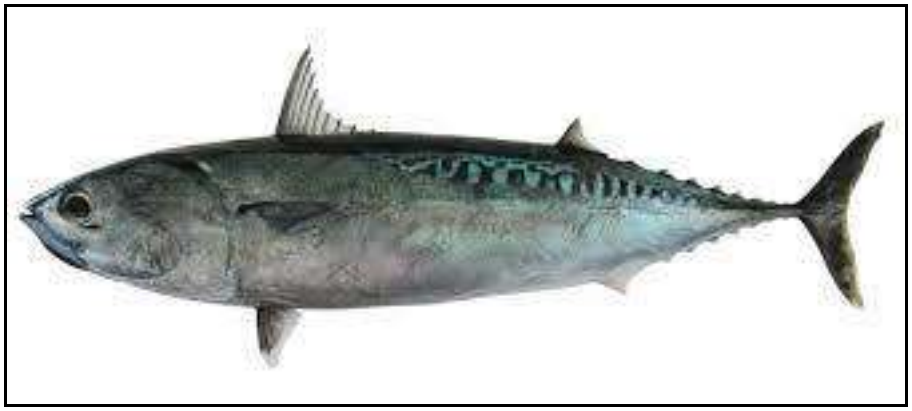

Figure 2. *Auxis rochei* (FishBase).

Auxis thazard. *A. thazard* (Figure 3) is a pelagic fish from the Scombridae family. This fish can be found in almost all tropical and subtropical waters (Collette & Aadland 1996; Liu 2008). *A. thazard* is included in neritic tuna with sea surface habitats up to a depth of 50 meters (Collette & Nauen 1983; Maguireet al 2006; Herera & Pierre 2009). The migration pattern is local with the optimum temperature between 27-27.9ºC. The catch of *A. thazard* is increasing every year with a variety of fishing gears (gill nets, purse seines and pole and line). IOTC (2014) reports that more than 90% of *A. thazard* catch is concentrated in four countries, namely Indonesia (59%), India (14%), Sri Lanka (11%) and Iran (7%). Thus, *A. thazard* is an economically important fish in Indonesia and one of its distribution areas in Western Sumatera, especially in the waters around Sibolga.

According to Ghosh et al (2012), the size of the fish first reached gonad maturity at a fork length of 29.7 cm. According to Prawira et al (2016), *A. thazard* in the waters of western Sumatra have a standard length of 34.89 cm. Based on the research of Ghosh et al (2012), the frequency of mature tuna landed at the Kusamba fish auction is only 12% of the total sample. This can be caused by the size of the mesh used by the fishermen, which is too small, causing immature fish to be unable to escape from the net.

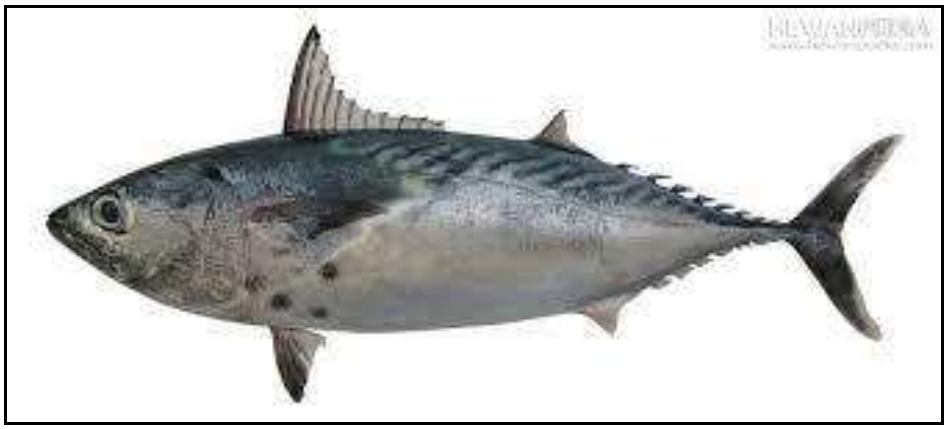

Figure 3. *Auxis thazard* (FishBase).

Katsuwonus pelamis. *K. pelamis* (Figure 4) is a highly migratory species and occupies tropical and sub-tropical waters Arai et al (2005). Their distribution, movement and vulnerability are influenced by their preferred habitat. The presence of prey, suitable temperature and sufficient oxygen significantly affect the survival of *K. pelamis*. As a consequence, the spatial distribution of *K. pelamis* is seasonal and has an annual pattern (Mugo et al 2010).

The distribution of *K. pelamis* in Indonesia includes the Indonesian Ocean, the west coast of Sumatera, South Java, Bali, Nusa Tenggara, East Indonesian waters including the Banda Sea, Flores Sea, Maluku Sea, Makassar Sea (Uktolseja 1989). The

fishing location for *K. pelamis* is determined by different seasons in each water. Catching *K. pelamis* can be conducted all year round. The results obtained differ from season to season and also vary according to the fishing location. According to Supriana et al (2014), the distribution areas for tuna and *K. pelamis* in Indonesia include the Banda Sea, Maluku Sea, Flores Sea, Sulawesi Sea, Indian Sea, Halmahera Sea, northern Aceh waters, west Sumatera, southern Java, northern Sulawesi, Tomini Bay, Cendrawasih Bay, and the Arafura Sea.

Rochman et al (2015) stated that the continuous use of *K. pelamis* in the Indian Ocean, especially in Indonesia's territorial areas, results in the utilization rate of *K. pelamis* in optimum conditions so that it needs caution and accuracy in its management. According to IOTC (2016), the status of *K. pelamis* stocks in 2014 in the Indian Ocean was in good condition. One aspect to support efforts to manage fish resources is basic knowledge regarding aspects of reproductive biology (Jatmiko et al 2015) and the spawning season (Suwarsoet al 2015).

Research results of Rochman et al (2015), Zedta et al (2017) and Nurdin & Panggabean (2017) shpw that the capture length of *K. pelamis* in the South Indian Ocean, Java was 38.73, 39.4, and 40 cm, respectively, while the results of Hidayat et al (2017) in the Pacific Ocean showed a capture length of 40.1 cm. The difference in the length value of first catch in each region is strongly influenced by the fishing gear used. The average length in this study was 42.5 cm. The results of Nikijuluw (2009) and Jatmiko et al (2015) showed that the Lm of *K. pelamis* at maturity was between 41-43 cm in the Indian Ocean. Indian Ocean Tuna Commission (2013) reported that the Lm of *K. pelamis* is 44 cm. The Lm in the Western Indian Ocean is 37.8 cm (Grande et al 2010) and 44.7 cm in the Southern Indian Ocean, Bali (Hartaty & Arnenda 2019). According to Udupa (1986), these differences can occur because of the suitability of environmental conditions (Lambert et al 2003). In this study, *K. pelamis* caught in the Southern Indian Ocean, Java and Nusa Tenggara, had not yet reached gonad maturity. A large number of young fish caught will put the fish stock at risk.

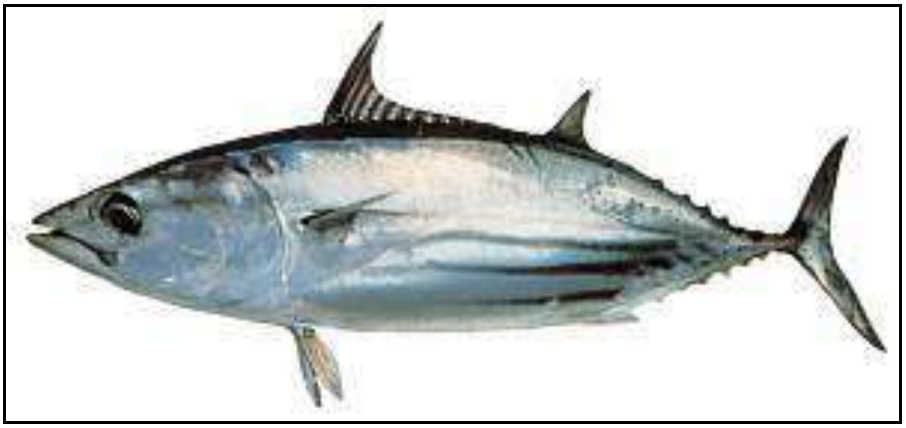

Figure 2. *Katsuwonus pelamis* (FishBase).

Government efforts to increase fishery potential. According to Suharno & Tri (2015), there are several problems in fisheries on the coast of Pariaman City, namely the lack of welfare of fishermen, indications of over fishing, fluctuating fishery production, use of various kinds of fishing gear, fishing fleets which are still dominated. Small-scale/community fisheries and generally fishermen in small-scale fisheries have not been able to use the appropriate input as they should (unable to combine inputs optimally).

Government efforts to increase the potential for superior capture fisheries commodities in Pariaman City include diversification of prime fishery products, increasing public awareness in participating in fisheries and marine management, increasing supervision in the utilization of fishery resources and building and developing industrial estates for prime capture fisheries commodities.

Conclusions. Main catch fisheries commodities in Pariaman City include *Eleutheronema tetradactylum* with a location quotient value of 2.76, differential shift of 59.4 and specialization of 4.25%. *Auxis rochei* present a location quotient value of 2.21, differential shift of 85.4 and specialization of 5.25%. *Auxis thazard* presents a location quotient of 1.48, differential shift of 229.2 and specialization of 5.53%. *Katsuwonus pelamis* had a location quotient value of 2.59, differential shift of 186.2 and specialization of 9.42%.

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Analysis of capture fisheries prime commodities in Pariaman City, West Sumatera, Indonesia

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Abstract. Capture fisheries of Pariaman City consist of sea capture fisheries and general water capture fisheries, which have the potential to be developed. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources, with marine fish resources of 7892 tons. Potential marine fish resources consist of pelagic, demersal, coral fish, as well as crustaceans and molluscs. Of the potential marine fish resources, 2841.12 tons year^{-1} are represented by large pelagic fish, 3156 tons year^{-1} are small pelagic fish, and 236.76 tons year^{-1} are demersal fish. In 2018, Pariaman City targeted a capture fisheries production of 6588 tonnes. With such large capture fisheries resources, Pariaman City has a prime commodity in the regional economic development sector. The purpose of this study is to analyze the superior commodities in the capture fisheries sector in Pariaman City. The research was conducted in August 2020. The method used in this research is a descriptive method using primary and secondary data. Data collection was conducted by direct observations, interviews, and literature study. The data analysis methods used are Location Quotient (LQ) analysis, Shift Share (SS) analysis, and Specialization analysis (SI). Main catch fishery commodities in Pariaman City include *Eleutheronema tetradactylum*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*.
Key Words: *Auxis rochei, Auxis thazard,* capture fisheries, *Eleutheronema tetradactylum, Katsuwonus pelamis*.

Introduction. According to Pariaman City marine and fisheries statistics data (2018), Pariaman City is located on the Western Coast of Sumatera Island, which is geographically south of the equator, latitude 00^{0}33’00’’ - 00^{0}40’43''S and longitude 100^{0}10’33''- 100^{0}10’55’’E. Thus, Pariaman City has a tropical climate with sufficient rainfall. The land area is located at an altitude between 2 - 35 m above sea level (asl), with an average height between 0 - 15 m asl. Thus, Pariaman City is a lowland stretch with few hills.

The marine and fisheries potential of Pariaman City is diverse according to the location of the Unitary State of the Republic of Indonesia, which is located at the equator and between two continents and two oceans. The fishery potential consists of fishing and cultivation. The dominant fishing is sea fishing. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources with marine fish resources of 7892 tons (MFS, 2018). Potential marine fish resources consist of pelagic, demersal, coral fish and crustaceans and molluscs. According to Pariaman City marine and fisheries statistics data (2018), Of the potential marine fish resources, 2841.12 tons per year are large pelagic fish, 3156 tons per year are small pelagic fish, and 236.76 tons per year are demersal fish. In 2018, Pariaman City targeting a capture fisheries production of 6588 tonnes (MFS, 2018).

Kohar (2012), stated that determining prime fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to gain comparative and competitive advantages in the face of globalization of trade. A superior commodity is a commodity that is in high demand, has a high selling value and is expected to be able to provide a large income compared to

other types (Sembiring, 2009). According to Kohar (2012), the marketing activities can be divided into local and export superior commodities. The existence of prime exports is expected to increase foreign exchange for the country from the non-oil and gas sector and can also increase regional income (Kohar 2012). According to Sembiring (2009), the existence of a superior commodity means that a country is able to produce products with distinctive attributes, which are due to domestic resource factors. Provision of quality products must be carried out followed by increased productivity and efficiency, so that these commodities have high competitiveness.

Prime commodities are expected to provide a greater income compared to other commodities. According to Resosudarmo et al (2002), if utilized optimally and sustainably, the potential of Indonesia's marine resources can become the main capital for national development in the future. According to Kohar (2012), determination of superior fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to achieve comparative and competitive advantages in the face of globalization of trade. Steps towards efficiency can be taken by determining fish commodities that have comparative advantages, both in terms of supply and demand, as well as high competitive advantages (Alit 2017). Kohar (2012) stated that the criteria for superior fisheries commodities are the following: high production and selling prices; high public taste; high market demand; economically important fish/non-fish species; the flesh is tender/soft, chewy, not prickly, and highly nutritious.

The purpose of this research is to analyze the superior capture fisheries commodities in Pariaman City, including: (1) knowing the amount of capture fisheries production; (2) know the growth of capture fisheries production; and (3) know the contribution of capture fisheries.

Material and Method

Description of the study sites. The method used in this study uses descriptive methods, namely direct observation of the field through surveys and interviews with fishery port parties and fishermen to obtain primary data. The primary data is processed and strengthened by secondary data, with some reinforcement in the form of references and literature studies, aiming to determine the superior commodity of capture fisheries in Pariaman City. This research was conducted for 1 month, in August 2020. According to Arifin (2008), the descriptive method is a research method where the researcher or writer comes directly to the data source and analyzes the data as it is. Data collection in this study is primary data collection and secondary data. Primary data collection was carried out by means of observation, interviews, and literature study.

Primary data. The primary data required includes data on the price of fish which is a prime commodity, continuity of production, and government policies regarding follow-up on superior commodities in Pariaman City. Primary data was obtained by direct observation and interviews (30 respondents) with related parties, including the Pariaman City Marine and Fisheries Service to local fishermen.

Secondary data. Secondary data collected is from the Department of Marine Affairs and Fisheries and the Central Statistics Agency for the City of Pariaman and West Sumatera Province in the 2014 - 2018 period. The data obtained include the following: production data and production value per type of fish each year in Pariaman City, and production data and production value per type of fish in West Sumatera Province.

Analysis of the capture amount of fisheries production. Location quotiens analysis (LQ) was used to determine the amount of capture fisheries production. According to Budiharsono (2001), the formula for calculating LQ is:

$$LQ = \frac{vi/_{vt}}{Vi/_{Vt}}$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fishery production at Pariaman City level; Vi - total production of species i fish at national level; Vt - total capture fisheries production at national level. If LQ≥1, type i fish is a prime commodity in Pariaman City; if LQ≤1, type i fish is not a prime commodity in Pariaman City.

Capture fisheries production growth analysis. Shift Share analysis was used to determine the growth of capture fisheries production. According to Susanto (2008), the formulas used for the Shift Share analysis are as follows:

Gj =Yjt – Yjo

Nj = Yjo (Yt/Yo) – Yjo

(G-N)j = Yjt – (Yt/Yo) –Yjo

Djt = {(Yijt – (Yit/Yio) Yijo)}

Where: Gj - total fishery production growth in Pariaman City; Nj - regional share component in Pariaman City; (G-N)j - net shift component in Pariaman City; Djt - diferential shift component in Pariaman City; Yij - total production of type i fish at Pariaman City level; Yj - total capture fishery production at Pariaman City level; Yi - total production of type i fish in West Sumatera Province; Y - total capture fisheries production in West Sumatera Province; o - initial period (2014); t - end period (2018).

If Gj-Nj<0, the fishery growth in area j (Pariaman City) is slower than in West Sumatera Province. If Gj-Nj>0, the fishery growth in area j (Pariaman City) is faster than in West Sumatera Province. If Djt>0, the type of fish i in area j (Pariaman City) grows faster than the same fish species in West Sumatera Province. If Djt<0, the fish species i in area j (Pariaman City) has a slower growth compared to the growth of the same fish species in West Sumatera Province. Djt shows the differential shift component used to measure the amount of net shift caused by certain species of fish that grow faster or slower in the concerned area.

Analysis of the contribution of capture fisheries production. Shift Share analysis is used to determine the growth of capture fisheries production. According to Susanto (2008), the formula used for the Shift Share analysis is as follows:

$$SI = \left[\frac{vi}{vt} - \frac{Vi}{Vt}\right] x\ 100\ \%$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fisheries production at Pariaman City level; Vi - total production of fish species i in West Sumatera Province; Vt - total capture fisheries production at the level of West Sumatera Province.

Results and Discussion. Capture fisheries resources have an important role in the economic turnover of coastal communities in Pariaman City. Among the most important species are *Thunnus* spp., *Euthynnus affinis*, *Katsuwonus pelamis*, *Sardinella* spp., *Rastrelliger* spp., *Atule mate*, *Engraulidae* spp. and some reef fish, with of high economic value. Capture fisheries represent the main livelihood for some coastal communities in coastal villages in Pariaman City. The number of fishermen in Pariaman City in 2017 reached 1183 people.

Analysis of the amount of capture fisheries production. Irnawati et al (2011) stated that the LQ method makes a comparison of the relative share of sector i revenue at the regional level to total regional income in the relative share of sector i revenue at the provincial level to provincial revenue. In this study, the determination of LQ with income criteria is replaced by production criteria and fish production value. LQ analysis is used to determine a capture fishery commodity in Pariaman City, whether the fish species is a basic or non-basic commodity by comparing it to a wider area, namely the province. If the value of LQ>1, type i fish is the leading commodity in Pariaman City, whereas if the value of LQ<1, type i fish is not the leading commodity in Pariaman City.

Based on Table 1, the fish that have an LQ>1 include *Trichiurus lepturus*, *Makaira* sp., *E. tetradactylum*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*. These types of fish are commodities representing the base sector for capture fisheries in Pariaman City. The highest LQ value was found in *Makaira* sp., namely 2.81, followed by *E. tetradactylum* (2.76) and *K. pelamis* (2.59). This is because the production of *Makaira* sp. in Pariaman City is the largest in West Sumatera Province. The fish with an LQ<1 are not included in the catch fishery base commodity in Pariaman City, because the fishery production is still low when compared to other areas in West Sumatera Province. These commodities include *Atule mate*, *Trachinotus* spp., *Decapterus* spp., *Engraulidae*, *Lutjanus campechanus*, *Litopenaeus vannamei, Epinephelus* spp., *Rastrelliger* spp. and *Loligo* spp.

Table 1

Capture fisheries commodities in Pariaman City based on the Location Quotient (LQ) analysis in 2018

Types of fish	*LQ*	*Information*
Atule mate	0.68	Non prime
Trachinotus spp.	0.94	Non prime
Decapterus spp.	0.27	Non prime
Trichiurus lepturus	1.85	Prime
Engraulidae	0.37	Non prime
Makaira sp.	2.81	Prime
Lutjanus campechanus	0.60	Non prime
Eleutheronema tetradactylum	2.76	Prime
Auxis rochei	2.21	Prime
Auxis thazard	1.48	Prime
Katsuwonus pelamis	2.59	Prime
Rastrelliger spp.	0.45	Non prime
Epinephelus spp.	0.27	Non prime
Litopenaeus vannamei	0.22	Non prime
Loligo spp.	0.39	Non prime

Capture fisheries production growth analysis. Shift Share analysis is a very useful technique in analyzing the growth of capture fisheries production in Pariaman City compared to the fishery production in West Sumatera Province, or commonly known as the Net Shift component. The Net Shift Component of capture fisheries commodities in Pariaman City in the 2014–2018 period amounted to 205661.14 kg. So it can be concluded that the Net Shift component (Gj - Nj)> 0, and in 2014-2018 the growth of fishery production in Pariaman City was faster than in West Sumatera Province. According to Mangilelang et al (2015), Shift Share analysis is a very useful technique in analyzing changes in the regional economic structure compared to the provincial economy.

The purpose of this analysis (Table 2) is to determine the performance or work productivityof the regional economy by comparing it with a larger region (regional/province). To determine the types of fish that have the potential to be

developed into superior capture fisheries commodities, it is necessary to calculate the Djt for each fish.

Table 2
The catch fishery commodity in Pariaman City based on the Shift Share (SS) analysis in 2018

Types of fish	SS	Information
Atule mate	-25.4	Slow
Trachinotus spp.	-10.8	Slow
Decapterus spp.	40.4	Fast
Trichiurus lepturus	-10	Fast
Engraulidae	40	Fast
Makaira sp.	-16.6	Fast
Lutjanus campechanus	-4.6	Fast
Eleutheronema tetradactylum	59.4	Fast
Auxis rochei	85.4	Fast
Auxis thazard	229.2	Fast
Katsuwonus pelamis	186.2	Fast
Rastrelliger spp.	-46.2	Slow
Epinephelus spp.	-22.2	Slow
Litopenaeus vannamei	-16	Slow
Loligo spp.	-9	Slow

Based on Table 2, several capture fisheries commodities in Pariaman City experienced faster growth when compared to the same commodity at the provincial level, which means that the value of Djt>0. These fishery commodities include *Decapterus* spp., Engraulidae, *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*. The highest value of Djt occurred for *K. pelamis*, namely 229.2; this occurred because the production of *K. pelamis* was the largest compared to other fish species in Pariaman City, and when compared to other areas in West Sumatera province.

If capture fisheries commodities have a Djt value less than 0, then the fisheries commodity growth is slower than that of the same fish species at the provincial level. This fishery commodity has lower competitiveness when compared to the same fish species in other districts in West Sumatera Province. These fishery commodities include *A. mate*, *Trachinotus* spp., *T. lepturus*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Analysis of the contribution of capture fisheries production. The specialization analysis (Table 3) is used to determine the existence of specialization in capture fisheries production in certain fish species in Pariaman City. If SI>1, then there is a specialization of fishery production in Pariaman City relatively comparable to the province, while if SI<1, there is no specialization in fishery production in Pariaman City relative to that of West Sumatera Province.

Table 3
The catch fishery commodity in Pariaman City based on the Specialization (SI) analysis in 2018

Fish	SI	Information

Atule mate	-4.44	No Specialization
Trachinotus spp.	-2.32	No Specialization
Decapterus spp.	1.07	Specialization
Trichiurus lepturus	-1.96	No Specialization
Engraulidae	-2.95	No Specialization
Makaira sp.	0.9	No Specialization
Lutjanus campechanus	0.49	No Specialization
Eleutheronema tetradactylum	4.25	Specialization
Auxis rochei	5.25	Specialization
Auxis thazard	5.53	Specialization
Katsuwonus pelamis	9.42	Specialization
Rastrelliger spp.	-3.66	No Specialization
Epinephelus spp.	0.45	No Specialization
Litopenaeus vannamei	-2.04	No Specialization
Loligo spp.	0.5	No Specialization

Based on Table 3, there fish that experience specialization in production, which means that they contribute to economic growth in Pariaman City, including *Decapterus* spp., *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*, the latter having the highest specialization value (SI) (9.42%).

The fish with specialization value (SI) less than 1 do not experience specialization in fishery production in Pariaman City when compared to the production of West Sumatera Province. This fishery commodity has low competitiveness when compared to other areas in West Sumatera Province, so that there is no specialization of capture fisheries activities for these fish commodities in Pariaman City (*A. mate*, *Trachinotus* spp., *Trichiurus lepturus*, Engraulidae, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Prime capture fisheries commodity in Pariaman City. The prime catch fisheries commodities in Pariaman City are obtained from the results of the analysis of (LQ), (SS), and (SI) found in (Table 4).

Table 4

Results of the analysis of location quotient (LQ), shift share (SS), and specialization (SI) of capture fisheries commodities in Pariaman City in 2018

Types of fish	*LQ*	*Djt*	*SI (%)*	*Information*
Atule mate	0.68	-25.4	-4.44	Not prime
Trachinotus spp.	0.94	-10.8	-2.32	Not prime
Decapterus spp.	0.27	40.4	1.07	Not prime
Trichiurus lepturus	1.85	-10	-1.96	Not prime
Engraulidae	0.37	40	-2.95	Not prime
Makaira sp.	2.81	-16.6	0.9	Not prime
Lutjanus campechanus	0.6	-4.6	0.49	Not prime
Eleutheronema tetradactylum	2.76	59.4	4.25	Prime
Auxis rochei	2.21	85.4	5.25	Prime
Auxis thazard	1.48	229.2	5.53	Prime
Katsuwonus pelamis	2.59	186.2	9.42	Prime
Rastrelliger spp.	0.45	-46.2	-3.66	Not prime
Epinephelus spp.	0.27	-22.2	0.45	Not prime
Litopenaeus vannamei	0.22	-16	-2.04	Not prime
Loligo spp.	0.39	-9	0.5	Not prime

Note: Djt - diferential shift component in Pariaman City.

Table 4 shows that the superior capture fisheries commodities in Pariaman City include *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*. This commodity is a large pelagic fish, except for *E. tetradactylum*, which are demersal fish. The fish that are not included in the superior capture fisheries commodity in Pariaman City are *A. mate*, *Trachinotus* spp., *Decapterus* spp., *T. lepturus*, *Engraulidae*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp. Determination of the superior capture fisheries commodity is based on the amount of production.

Eleutheronema tetradactylum. *E. tetradactylum* (Figure 1) is one of the capture fisheries prime commodities in Pariaman City. The results of the analysis show that the (LQ) value of *E. tetradactylum* is 2, 76, which means that the fish is the base for capture fisheries in Pariaman City. The Djt value of *E. tetradactylum*, 59.4, indicates that the fish production growth is faster than that of the same fish species from West Sumatera Province, so that it has a competitive edge when compared to other regions. The SI of *Eleutheronema tetradactylum* in Pariaman City reaches 4.25%, which means that the fish is relatively specialized in production in Pariaman City. This fish is an important consumption fish in Kuwait, India, Thailand, Vietnam, Malaysia, Singapore and Indonesia (Motomura 2004).

E. tetradactylum belongs to the Polynemidae family, which consists of 41 species in 8 genera, which are epibenic fish and can be found in all tropical and subtropical marine waters. *E. tetradactylum* is a protandrous hermaphrodite fish (Motomura 2004). The number of fishing activities causes this fish stock to rapidly decline, marked by a drastic decrease in catch (Wijopriyono et al 2012). Wijopriyono et al (2012), states that In 2012, the production of *E. tetradactylum* was only 9273 kg with a very significant decrease in production, namely 49822 kg when compared to the production in 2008. The optimum sustainable production value (Catch Maximum Sustainable Yield) of *E. tetradactylum* was 4067 kg per year within an optimum fishing effort of 497 trips per year. Fishing effort in 2012 was 849 trips (170.8% of the optimum fishing effort), so there has been an overfishing of *E. tetradactylum* (Indra et al 2013).

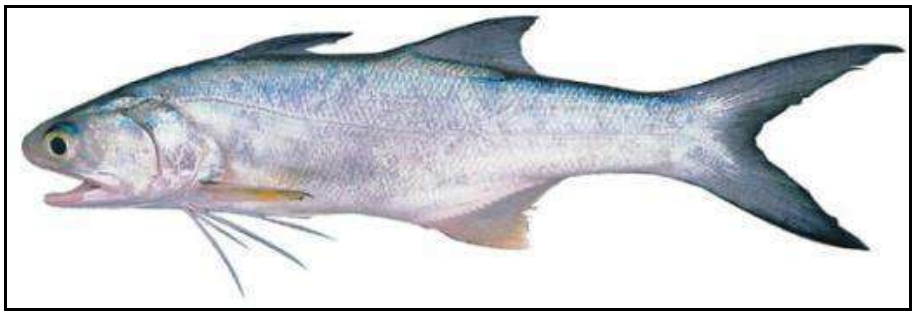

Figure 1. *Eleutheronema tetradactylum* (source: FishBase).

Auxis rochei. *A. rochei* (Figure 2) production in 572 Fisheries Management Area has been recorded in capture fisheries statistics starting from 2005. In the previous year, the production of all tuna species was recorded in statistical data for "tuna" only, without distinguishing the species. According to Pariaman City marine and fisheries statistics data (2018), *A. rochei* production from 2005-2012 showed a fluctuating trend, the lowest was in 2005-2007 and increased rapidly in 2008-2012. *A. rochei* only contributes 2% of all neritic tuna production originating from the waters of West Sumatera (Anonymous 2013). This value is very small compared to the percentage of other types of mackerel, such as *A. thazard* by 26%. There is a possibility that the data recording officer in the field misidentifies it because morphologically, *A. rochei* and *A. thazard* are very similar. Apart from being marketed in the local market, neritic tuna has been caught by fishermen which also enter the industry and are exported. The level of cultivation of *A. rochei* that is continuous without the existence of control can cause its sustainability to be threatened, therefore accurate and precise scientific information is needed.

The length of the first ripe gonads (Lm) of *A. rochei* is 24.6 cm (Research Institute for Marine Fisheries 2013). Based on the Lm value, the length distribution of *A. rochei* caught in the waters of West Sumatera shows that adult fish are 53% and immature fish are 47%. Setyadji et al (2013) obtained a more different range, namely 23-32 cm for mini purse seines and 20-28 cm for large purse seines (industrial scale) in the South Indian Ocean. One of the differences in the length of the fish caught is caused by the difference in the size of the mesh used. *A. rochei* population will be sustainable if the size caught is above the length of the first time the gonads mature. Continuous exploitation of juvenile *A. rochei* by means of non-selective purse seine fishing gear will cause the sustainability of *A. rochei* to be threatened.

Figure 2. *Auxis rochei* (FishBase).

Auxis thazard. *A. thazard* (Figure 3) is a pelagic fish from the Scombridae family. This fish can be found in almost all tropical and subtropical waters (Collette & Aadland 1996; Liu 2008). *A. thazard* is included in neritic tuna with sea surface habitats up to a depth of 50 meters (Collette & Nauen 1983; Maguireet al 2006; Herera & Pierre 2009). The migration pattern is local with the optimum temperature between 27-27.9ºC. The catch of *A. thazard* is increasing every year with a variety of fishing gears (gill nets, purse seines and pole and line). IOTC (2014) reports that more than 90% of *A. thazard* catch is concentrated in four countries, namely Indonesia (59%), India (14%), Sri Lanka (11%) and Iran (7%). Thus, *A. thazard* is an economically important fish in Indonesia and one of its distribution areas in Western Sumatera, especially in the waters around Sibolga.

According to Ghosh et al (2012), the size of the fish first reached gonad maturity at a fork length of 29.7 cm. According to Prawira et al (2016), *A. thazard* in the waters of western Sumatra have a standard length of 34.89 cm. Based on the research of Ghosh et al (2012), the frequency of mature tuna landed at the Kusamba fish auction is only 12% of the total sample. This can be caused by the size of the mesh used by the fishermen, which is too small, causing immature fish to be unable to escape from the net.

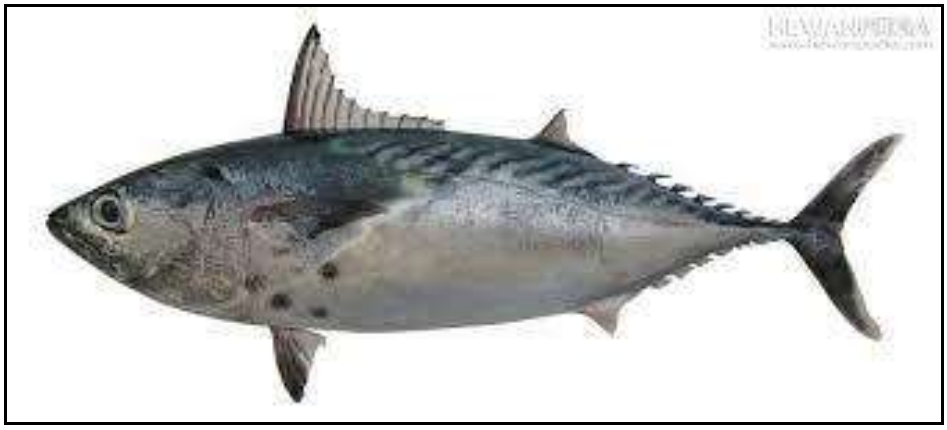

Figure 3. *Auxis thazard* (FishBase).

Katsuwonus pelamis. *K. pelamis* (Figure 4) is a highly migratory species and occupies tropical and sub-tropical waters Arai et al (2005). Their distribution, movement and vulnerability are influenced by their preferred habitat. The presence of prey, suitable temperature and sufficient oxygen significantly affect the survival of *K. pelamis*. As a consequence, the spatial distribution of *K. pelamis* is seasonal and has an annual pattern (Mugo et al 2010).

The distribution of *K. pelamis* in Indonesia includes the Indonesian Ocean, the west coast of Sumatera, South Java, Bali, Nusa Tenggara, East Indonesian waters including the Banda Sea, Flores Sea, Maluku Sea, Makassar Sea (Uktolseja 1989). The fishing location for *K. pelamis* is determined by different seasons in each water. Catching *K. pelamis* can be conducted all year round. The results obtained differ from season to season and also vary according to the fishing location. According to Supriana et al (2014), the distribution areas for tuna and *K. pelamis* in Indonesia include the Banda Sea, Maluku Sea, Flores Sea, Sulawesi Sea, Indian Sea, Halmahera Sea, northern Aceh waters, west Sumatera, southern Java, northern Sulawesi, Tomini Bay, Cendrawasih Bay, and the Arafura Sea.

Rochman et al (2015) stated that the continuous use of *K. pelamis* in the Indian Ocean, especially in Indonesia's territorial areas, results in the utilization rate of *K. pelamis* in optimum conditions so that it needs caution and accuracy in its management. According to IOTC (2016), the status of *K. pelamis* stocks in 2014 in the Indian Ocean was in good condition. One aspect to support efforts to manage fish resources is basic knowledge regarding aspects of reproductive biology (Jatmiko et al 2015) and the spawning season (Suwarsoet al 2015).

Research results of Rochman et al (2015), Zedta et al (2017) and Nurdin & Panggabean (2017) shpw that the capture length of *K. pelamis* in the South Indian Ocean, Java was 38.73, 39.4, and 40 cm, respectively, while the results of Hidayat et al (2017) in the Pacific Ocean showed a capture length of 40.1 cm. The difference in the length value of first catch in each region is strongly influenced by the fishing gear used. The average length in this study was 42.5 cm. The results of Nikijuluw (2009) and Jatmiko et al (2015) showed that the Lm of *K. pelamis* at maturity was between 41-43 cm in the Indian Ocean. Indian Ocean Tuna Commission (2013) reported that the Lm of *K. pelamis* is 44 cm. The Lm in the Western Indian Ocean is 37.8 cm (Grande et al 2010) and 44.7 cm in the Southern Indian Ocean, Bali (Hartaty & Arnenda 2019). According to Udupa (1986), these differences can occur because of the suitability of environmental conditions (Lambert et al 2003). In this study, *K. pelamis* caught in the Southern Indian Ocean, Java and Nusa Tenggara, had not yet reached gonad maturity. A large number of young fish caught will put the fish stock at risk.

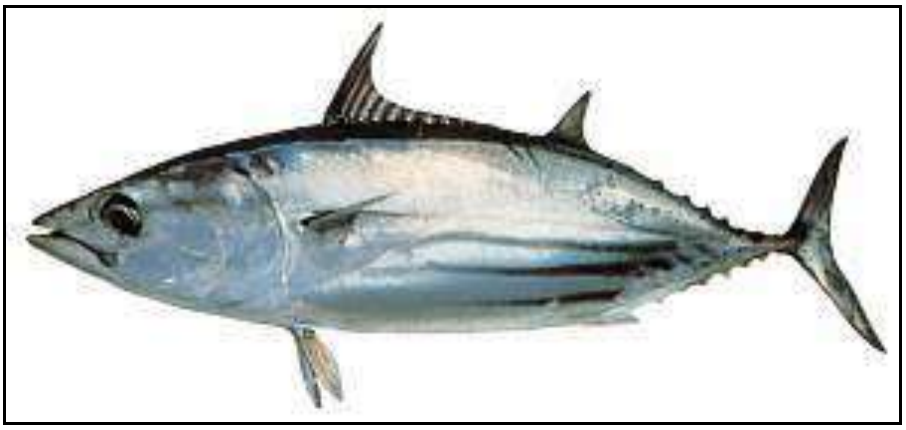

Figure 2. *Katsuwonus pelamis* (FishBase).

Government efforts to increase fishery potential. According to Suharno & Tri (2015), there are several problems in fisheries on the coast of Pariaman City, namely the

lack of welfare of fishermen, indications of over fishing, fluctuating fishery production, use of various kinds of fishing gear, fishing fleets which are still dominated. Small-scale/community fisheries and generally fishermen in small-scale fisheries have not been able to use the appropriate input as they should (unable to combine inputs optimally).

Government efforts to increase the potential for superior capture fisheries commodities in Pariaman City include diversification of prime fishery products, increasing public awareness in participating in fisheries and marine management, increasing supervision in the utilization of fishery resources and building and developing industrial estates for prime capture fisheries commodities.

Conclusions. Main catch fisheries commodities in Pariaman City include *Eleutheronema tetradactylum* with a location quotient value of 2.76, differential shift of 59.4 and specialization of 4.25%. *Auxis rochei* present a location quotient value of 2.21, differential shift of 85.4 and specialization of 5.25%. *Auxis thazard* presents a location quotient of 1.48, differential shift of 229.2 and specialization of 5.53%. *Katsuwonus pelamis* had a location quotient value of 2.59, differential shift of 186.2 and specialization of 9.42%.

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Analysis of capture fisheries prime commodities in Pariaman City, West Sumatera, Indonesia

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Abstract. Capture fisheries of Pariaman City consist of sea capture fisheries and general water capture fisheries, which have the potential to be developed. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources, with marine fish resources of 7892 tons. Potential marine fish resources consist of pelagic, demersal, coral, and hard-skinned and soft-skinned fish resources. Of the potential marine fish resources, 2841.12 tons per year are represented by large pelagic fish, 3156 tons per year are small pelagic fish and 236.76 tons per year are demersal fish. In 2018, Pariaman City targeted a capture fisheries production of 6588 tonnes. With such large capture fisheries resources, the city of Pariaman has a superior commodity which is a regional economic development sector. The purpose of this study is to analyze the superior commodities in the capture fisheries sector in Pariaman City. The research was conducted in August 2020. The method used in this research is a descriptive method using primary and secondary data. Data collection was conducted by direct observations, interviews, and literature study. The data analysis methods used are Location Quotient (LQ) analysis, Shift Share (SS) analysis, and Specialization analysis (SI). Main catch fishery commodities in Pariaman City include *Eleutheronema tetradactylum*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*.

Key Words: prime commodities, capture Fisheries, *Eleutheronema tetradactylum, Auxis rochei, Auxis thazard, Katsuwonus pelamis*.

Introduction. Pariaman City is located on the Western Coast of Sumatera Island, which is geographically south of the equator, between 33'00''-40'43''S longitude and $100^0$10'33''-100^0 10'55''BT. Thus, Pariaman City has a tropical climate with sufficient rainfall. The land area is located at an altitude between 2-35 m above sea level (asl), with an average height between 0-15 m asl. Thus, Pariaman City is a lowland stretch with few hills.

The marine and fisheries potential of Pariaman City is diverse according to the location of the Unitary State of the Republic of Indonesia, which is located at the equator and between two continents and two oceans. The fishery potential consists of fishing and cultivation. The dominant catch is fishing in the sea, while fishing in public waters is limited to certain hobbies and traditions such as fishing at a certain time. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources, with marine fish resources of 7892 tons. Potential marine fish resources consist of pelagic, demersal, coral fish and crustaceans and molluscs. Of the potential marine fish resources, 2841.12 tons per year are large pelagic fish, 3156 tons per year are small pelagic fish and 236.76 tons per year are demersal fish. In 2018, Pariaman City targeting a capture fisheries production of 6588 tonnes.

Determining prime fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to gain comparative and competitive advantages in the face of globalization of trade. A superior commodity is a commodity that is in high demand, has a high selling value and is expected to be able to provide a large income compared to other types. The marketing activities can be divided into local and export superior commodities. The existence of

prime exports is expected to increase foreign exchange for the country from the non-oil and gas sector and can also increase regional income (Kohar 2012). According to Sembiring (2009), the existence of a superior commodity means that a country is able to produce products with distinctive attributes, which are due to domestic resource factors. Provision of quality products must be carried out followed by increased productivity and efficiency, so that these commodities have high competitiveness.

Prime commodities are expected to provide a greater income compared to other commodities. According to Resosudarmo et al (2002), if utilized optimally and sustainably, the potential of Indonesia's marine resources can become the main capital for national development in the future. Determination of superior fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to achieve comparative and competitive advantages in the face of globalization of trade. Steps towards efficiency can be taken by determining fish commodities that have comparative advantages, both in terms of supply and demand, as well as high competitive advantages (Alit 2017). Kohar (2012) stated that the criteria for superior fisheries commodities are the following: high production and selling prices; high public taste; high market demand; economically important fish/non-fish species; the flesh is tender/soft, chewy, not prickly, and highly nutritious.

The purpose of this research is to analyze the superior capture fisheries commodities in Pariaman City, including: (1) determining the amount of capture fisheries production; (2) determining the growth of capture fisheries production; and (3) determining the contribution of capture fisheries.

Material and Method

Description of the study sites. The method used in this study uses descriptive methods, namely direct observation of the field through surveys and interviews with fishery port parties and fishermen to obtain primary data. The primary data is processed and strengthened by secondary data, with some reinforcement in the form of references and literature studies, aiming to determine the superior commodity of capture fisheries in Pariaman City. This research was conducted for 1 month, in August 2020. According to Arifin (2008), the descriptive method is a research method where the researcher or writer comes directly to the data source and analyzes the data as it is. Data collection in this study is primary data collection and secondary data. Primary data collection was carried out by means of observation, interviews, and literature study.

Primary data. The primary data required includes data on the price of fish, which is a prime commodity, continuity of production, and government policies regarding follow-up on superior commodities in Pariaman City. Primary data was obtained by direct observation and interviews with related parties, including the Pariaman City Marine and Fisheries Service to local fishermen.

Secondary data. Secondary data collected is from the Department of Marine Affairs and Fisheries and the Central Statistics Agency for the City of Pariaman and West Sumatera Province in the 2014-2018 period. The data obtained include the following: production data and production value per type of fish each year in Pariaman City, and production data and production value per type of fish in West Sumatera Province.

Analysis of the capture amount of fisheries production. Location quotiens analysis (LQ) was used to determine the amount of capture fisheries production. According to Budiharsono (2001), the formula for calculating LQ is:

$$LQ = \frac{vi/_{vt}}{Vi/_{Vt}}$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fishery production at Pariaman City level; Vi - total production of species i fish at national level; Vt - total capture fisheries production at national level. If LQ≥1, type i fish is a prime commodity in Pariaman City; if LQ≤1, type i fish is not a prime commodity in Pariaman City.

Capture fisheries production growth analysis. Shift Share analysis was used to determine the growth of capture fisheries production. According to Susanto (2008), the formulas used for the Shift Share analysis are as follows:

Gj =Yjt – Yjo

Nj = Yjo (Yt/Yo) – Yjo

(G-N)j = Yjt – (Yt/Yo) –Yjo

Djt = {(Yijt – (Yit/Yio) Yijo)}

Where: Gj - total fishery production growth in Pariaman City; Nj - regional share component in Pariaman City; (G-N)j - net shift component in Pariaman City; Dj - diferential shift component in Pariaman City; Yij - total production of type i fish at Pariaman City level; Yj - total capture fishery production at Pariaman City level; Yi - total production of type i fish in West Sumatera Province; Y - total capture fisheries production in West Sumatera Province; o - initial period (2014); t - end period (2018).

If Gj-Nj<0, the fishery growth in area j (Pariaman City) is slower than in West Sumatera Province. If Gj-Nj>0, the fishery growth in area j (Pariaman City) is faster than in West Sumatera Province. If Djt>0, the type of fish i in area j (Pariaman City) grows faster than the same fish species in West Sumatera Province. If Djt<0, the fish species i in area j (Pariaman City) has a slower growth compared to the growth of the same fish species in West Sumatera Province. Djt shows the differential shift component used to measure the amount of net shift caused by certain species of fish that grow faster or slower in the concerned area.

Analysis of the contribution of capture fisheries production. Shift Share analysis is used to determine the growth of capture fisheries production. According to Susanto (2008), the formula used for the Shift Share analysis is as follows:

$$SI = \left[\frac{vi}{vt} - \frac{Vi}{Vt}\right] x\ 100\ \%$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fisheries production at Pariaman City level; Vi - total production of fish species i in West Sumatera Province; Vt - total capture fisheries production at the level of West Sumatera Province.

Results and Discussion. Capture fisheries resources have an important role in the economic turnover of coastal communities in Pariaman City. Among the most important species are *Thunnus* spp., *Euthynnus affinis*, *Katsuwonus pelamis*, *Sardinella* spp., *Rastrelliger* spp., *Atule mate*, *Engraulidae* spp. and some reef fish, with high economic value. Capture fisheries represent the main livelihood for some coastal communities in coastal villages in Pariaman City. The number of fishermen in Pariaman City in 2017 reached 1183 people.

Analysis of the amount of capture fisheries production. Irnawati et al (2011) stated that the LQ method makes a comparison of the relative share of sector i revenue at the regional level to total regional income in the relative share of sector i revenue at the provincial level to provincial revenue. In this study, the determination of LQ with income criteria is replaced by production criteria and fish production value. LQ analysis is used to

determine a capture fishery commodity in Pariaman City, whether the fish species is a basic or non-basic commodity by comparing it to a wider area, namely the province. If the value of LQ>1, type i fish is the leading commodity in Pariaman City, whereas if the value of LQ<1, type i fish is not the leading commodity in Pariaman City.

Table 1
Capture fisheries commodities in Pariaman City are based on the Location Quotient (LQ) analysis in 2018

Types of fish	*LQ*	*Information*
Atule mate	0.68	Non prime
Trachinotus spp.	0.94	Non prime
Decapterus spp.	0.27	Non prime
Trichiurus lepturus	1.85	Prime
Engraulidae	0.37	Non prime
Makaira sp.	2.81	Prime
Lutjanus campechanus	0.60	Non prime
Polynemidae	2.76	Prime
Auxis rochei	2.21	Prime
Auxis thazard	1.48	Prime
Katsuwonus pelamis	2.59	Prime
Rastrelliger spp.	0.45	Non prime
Epinephelus spp.	0.27	Non prime
Litopenaeus vannamei	0.22	Non prime
Loligo spp.	0.39	Non prime

Based on Table 1, the types of fish that have an LQ value>1 include *Trichiurus lepturus*, *Makaira* sp., *Polynemidae*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*. These types of fish are commodities repreesnting the base sector for capture fisheries in Pariaman City. The highest LQ value was found in setuhuk fish, namely 2.81, followed by Polynemidae (2.76) and *K. pelamis* (2.59); this is because the production of *Makaira* sp. in Pariaman City is the largest in West Sumatera Province. The fish with an LQ value<1 are not included in the catch fishery base commodity in Pariaman City; this is because the fishery production is still low when compared to other areas in West Sumatera Province. These commodities include *Atule mate*, *Trachinotus* spp., *Decapterus* spp., Engraulidae, *Lutjanus campechanus*, *Litopenaeus vannamei, Epinephelus* spp., *Rastrelliger* spp. and *Loligo* spp.

Capture fisheries production growth analysis. Shift Share analysis is a very useful technique in analyzing the growth of capture fisheries production in Pariaman City compared to the fishery production in West Sumatera Province, or commonly known as the Net Shift component. The Net Shift Component of capture fisheries commodities in Pariaman City in the 2014-2018 period amounted to 205661.14. So it can be concluded that the Net Shift component (Gj-Nj)>0, and in 2014-2018 the growth of fishery production in Pariaman City was faster than in West Sumatera Province. According to Mangilelang et al (2015), Shift Share analysis is a very useful technique in analyzing changes in the regional economic structure compared to the provincial economy.

The purpose of this analysis is to determine the performance or work productivity of the regional economy by comparing it with a larger region (regional/province). To determine the types of fish that have the potential to be developed into superior capture fisheries commodities, it is necessary to calculate the differential shift (Djt) of each type of fish.

Table 2
The catch fishery commodity in Pariaman City is based on the Shift Share (SS) analysis in 2018

Types of fish	SS	Information
Atule mate	-25.4	Slow
Trachinotus spp.	-10.8	Slow
Decapterus spp.	40.4	Fast
Trichiurus lepturus	-10	Fast
Engraulidae	40	Fast
Makaira sp.	-16.6	Fast
Lutjanus campechanus	-4.6	Fast
Polynemidae	59.4	Fast
Auxis rochei	85.4	Fast
Auxis thazard	229.2	Fast
Katsuwonus pelamis	186.2	Fast
Rastrelliger spp.	-46.2	Slow
Epinephelus spp.	-22.2	Slow
Litopenaeus vannamei	-16	Slow
Loligo spp.	-9	Slow

Based on Table 2, several capture fisheries commodities in Pariaman City experienced faster growth when compared to the same commodity at the provincial level, which means that the value of Differential Shift (Djt)>0. These fishery commodities include *Decapterus* spp., Engraulidae, Polynemidae, *A. rochei*, *A. thazard* and *K. pelamis*. The highest value of Differential Shift (Djt) occurred for *K. pelamis*, namely 229.2; this occurred because the production of *K. pelamis* was the largest compared to other fish species in Pariaman City, and when compared to other areas in West Sumatera province.

If capture fisheries commodities have a Differential Shift (Djt) value less than 0, then the fisheries commodity growth is slower than that of the same fish species at the provincial level. This fishery commodity has lower competitiveness when compared to the same fish species in other districts in West Sumatera Province. These fishery commodities include *A. mate*, *Trachinotus* spp., *T. lepturus*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Analysis of the contribution of capture fisheries production. The specialization analysis is used to determine the existence of specialization in capture fisheries production in certain fish species in Pariaman City. If SI>1, then there is a specialization of fishery production in Pariaman City relatively comparable to the province, while if SI<1, there is no specialization in fishery production in Pariaman City relative to that of West Sumatera Province.

Table 3
The catch fishery commodity in Pariaman City is based on the Specialization (SI) analysis in 2018

Types of fish	SI	Information
Atule mate	-4,44	No Specialization
Trachinotus	-2,32	No Specialization
Decapterus	1,07	Specialization
Trichiurus lepturus	-1,96	No Specialization
Engraulidae	-2,95	No Specialization
Makaira sp	0,90	No Specialization
Lutjanus campechanus	0,49	No Specialization
Polynemidae	4,25	Specialization

Auxis rochei	5,25	Specialization
Auxis thazard	5,53	Specialization
Katsuwonus pelamis	9,42	Specialization
Rastrelliger	-3,66	No Specialization
Epinephelus	0,45	No Specialization
Litopenaeus vannamei	-2,04	No Specialization
Loligo	0,50	No Specialization

Based on Table 3, there are types of fish that experience specialization in production, which means that they contribute to economic growth relatively in Pariaman City, including *Decapterus* spp., Polynemidae, *A. rochei*, *A. thazard* and *K. pelamis*, the latter having the highest specialization value (SI) (9.42%).

The types of fish with specialization value (SI) less than 1 do not experience specialization in fishery production in Pariaman City when compared to the production of West Sumatera Province. This fishery commodity has low competitiveness when compared to other areas in West Sumatera Province, so that there is no specialization of capture fisheries activities for these fish commodities in Pariaman City (*A. mate*, *Trachinotus* spp., *Trichiurus lepturus*, Engraulidae, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Prime capture fisheries commodity in Pariaman City. The prime catch fisheries commodities in Pariaman City are obtained from the results of the analysis of LQ, SS, and SI, where the capture fisheries commodity which all results are positive in all of these analyzes, the captured fishery commodity is included in the prime commodity capture fisheries in Pariaman City.

Table 4
Results of the analysis of location quotient (LQ), shift share (SS), and specialization (SI) of capture fisheries commodities in Pariaman City in 2018

Types of fish	*LQ*	*Djt*	*SI (%)*	*Information*
Atule mate	0.68	-25.4	-4.44	Not prime
Trachinotus spp.	0.94	-10.8	-2.32	Not prime
Decapterus spp.	0.27	40.4	1.07	Not prime
Trichiurus lepturus	1.85	-10	-1.96	Not prime
Engraulidae	0.37	40	-2.95	Not prime
Makaira sp.	2.81	-16.6	0.9	Not prime
Lutjanus campechanus	0.6	-4.6	0.49	Not prime
Polynemidae	2.76	59.4	4.25	Prime
Auxis rochei	2.21	85.4	5.25	Prime
Auxis thazard	1.48	229.2	5.53	Prime
Katsuwonus pelamis	2.59	186.2	9.42	Prime
Rastrelliger spp.	0.45	-46.2	-3.66	Not prime
Epinephelus spp.	0.27	-22.2	0.45	Not prime
Litopenaeus vannamei	0.22	-16	-2.04	Not prime
Loligo spp.	0.39	-9	0.5	Not prime

Note: Djt - diferential shift component in Pariaman City.

Table 4 shows that the superior capture fisheries commodities in Pariaman City include Polynemidae, *A. rochei*, *A. thazard* and *K. pelamis*. This commodity is a large pelagic fish, except for kuro fish which is a demersal fish. The types of fish that are not included in the superior capture fisheries commodity in Pariaman City are such as *A. mate*, *Trachinotus* spp., *Decapterus* spp., *Trichiurus lepturus*, Engraulidae, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp. Determination of the superior capture fisheries commodity is based on the amount of production so that it is superior when compared to other commodities with lower production.

Eleutheronema tetradactylum. *Eleutheronema tetradactylum* is one of the capture fisheries prime commodities in Pariaman City (Directorate General of Capture Fisheries 2014). The results of the analysis show that the LQ value of *E. tetradactylum* is 2.76, which means that the fish is the base for capture fisheries in Pariaman City. The differential shift (Djt) value of *E. tetradactylum* (59.4) indicates that the fish production growth is faster than that of the same fish species from West Sumatera Province, so that it has a competitive edge when compared to other regions. The specialization level (SI) of *E. tetradactylum* in Pariaman City reaches 4.25%, which means that the fish is relatively specialized in production in Pariaman City. This fish is an important consumption fish in Kuwait, India, Thailand, Vietnam, Malaysia, Singapore and Indonesia (Motomura 2004).

E. tetradactylum belongs to the Polynemidae family, which consists of 41 species in eight genera, which are epibenic fish and can be found in all tropical and subtropical marine waters. *E. tetradactylum* is a protandrous hermaphrodite fish (Motomura 2004). The high number of fishing activities causes this fish stock to rapidly decline, marked by a drastic decrease in catch (Wijopriyono et al 2012). In 2012, the production of *E. tetradactylum* was only 9273 kg (228% of the optimum sustainable value) with a very significant decrease in production, from 49822 kg in 2008. The optimum sustainable production value (Catch Maximum Sustainable Yield) of *E. tetradactylum* was 4067 kg per year and the optimum fishing effort (Effort Maximum Sustainable Yield) was 497 trips per year. Fishing effort in 2012 was 849 trips (170.8% of the optimum fishing effort), so there has been an overfishing of *E. tetradactylum* (Indra et al 2013).

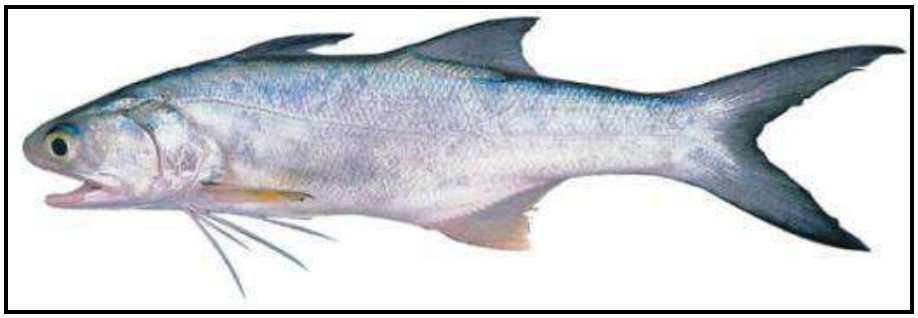

Figure 1. *Eleutheronema tetradactylum*.

Auxis rochei. *A. rochei* production in WPP 572 has been recorded in capture fisheries statistics starting from 2005. In the previous year, the production of all tuna species was recorded in statistical data in "tuna species" only, without distinguishing the species. *A. rochei* production from 2005 to 2012 showed a fluctuating trend; the lowest was in 2005-2007 and it increased rapidly in 2008-2012. *A. rochei* only contributes with 2% to all neritic tuna production originating from the waters of West Sumatera (Anonymous 2013). This value is very small compared to the percentage of other species of mackerel, such as krai krai by 26%. There is a possibility that the data recording officers in the field misidentify species because morphologically, *A. rochei* and *A. thazard* are very similar. Apart from being marketed in the local market, neritic tuna caught by fishermen also enter the industry and are exported. The level of cultivation of *A. rochei* cobs that is continuous without the existence of control can cause its sustainability to be threatened, therefore accurate and precise scientific information is needed.

The length at first maturity (Lm) of *A. rochei* is 24.6 cm (Research Institute for Marine Fisheries 2013). Based on the Lm value, the length distribution of *A. rochei* caught in the waters of West Sumatera shows that adult fish represent 53% and immature fish are 47%. Setyadji et al (2013) obtained a different range, namely 23-32 cm for mini purse seines and 20-28 cm for large purse seines (industrial scale) in the South Indian Ocean. One of the differences in the length of the fish caught is caused by the difference in the size of the mesh used. *A. rochei* population will be sustainable if the size caught is above Lm. Continuous exploitation of juvenile *A. rochei* by means of non-selective purse seine fishing will cause the sustainability of *A. rochei* to be threatened.

Figure 2. *Auxis rochei*.

Auxis thazard. *A. thazard* is a pelagic fish from the Scombridae family. This fish can be found in almost all tropical and subtropical waters (Collette & Aadland 1996; Liu 2008). *A. thazard* is part of neritic tunas with sea surface habitats up to a depth of 50 meters (Herera & Pierre 2009; Maguireet al 2006; Collette & Nauen 1983). The migration pattern is local with the optimum temperature between 27-27.9ºC. The catch of *A. thazard* is increasing every year with a variety of fishing gears (gill nets, purse seines and pole and line). IOTC (2014) reports that more than 90% of cayenne cobs catch is concentrated in four countries, namely Indonesia (59%), India (14%), Sri Lanka (11%) and Iran (7%). Thus, *A. thazard* is an economically important fish in Indonesia and one of its distribution areas is in Western Sumatera, especially in the waters around Sibolga.

According to Ghosh et al (2012), the fork length of the fish at first maturity is 29.7 cm. According to Prawira et al (2016), *A. thazard* in the western waters of Sumatera is around long 34.89 cm. Based on the research of Ghosh et al (2012), the frequency of adult tuna landed at the Kusamba fish auction place is only 12% of the total catch. This can be caused by the size of the mesh used by the fishermen, which is too small, causing the immature fish to be unable to escape from the net; the fishing season also coincides with the spawning season.

Figure 2. *Auxis thazard*.

Katsuwonus pelamis. *K. pelamis* is a highly migratory species and occupies tropical and sub-tropical waters (Arai et al 2005). Their distribution, movement and vulnerability are influenced by their preferred habitat. The presence of prey, suitable temperatures and sufficient oxygen significantly affect the survival of *K. pelamis*. As a consequence, the spatial distribution of *K. pelamis* is seasonal and has an annual pattern (Mugo et al 2010). The distribution of *K. pelamis* in Indonesia includes the Indonesian Ocean, the west coast of Sumatera, South Java, Bali, Nusa Tenggara, East Indonesian waters including the Banda Sea, Flores Sea, Maluku Sea, Makassar Sea (Uktolseja 1989). The fishing location for *K. pelamis* is determined by different seasons for each waters. Catching *K. pelamis* can be conducted all year round. The results obtained differ from season to season and also vary according to the fishing location. According to Supriana et

al (2014), the distribution areas for tuna and *K. pelamis* in Indonesia include the Banda Sea, Maluku Sea, Flores Sea, Sulawesi Sea, Indian Sea, Halmahera Sea, northern Aceh waters, west Sumatera, southern Java, northern Sulawesi, Tomini Bay, Cendrawasih Bay, and the Arafura Sea.

Rochman et al (2015) stated that the continuous use of *K. pelamis* in the Indian Ocean, especially in Indonesia's territorial areas, results in the utilization rate of *K. pelamis* in optimum conditions so that it needs caution and accuracy in its management. According to IOTC (2016), the status of *K. pelamis* stocks in 2014 in the Indian Ocean was in good condition and there had not been any catching more. One aspect to support efforts to manage fish resources is basic knowledge regarding aspects of reproductive biology (Jatmiko et al 2015) and the spawning season (Suwarsoet al 2015).

Research results of Rochman et al (2015), Zedta et al (2017), and Nurdin & Panggabean (2017) in the South Indian Ocean, Java, show that the value of Lc was 38.73, 39.4, and 40 cm, respectively, while the results of Hidayat et al (2017) in the Pacific Ocean showed an Lc of 40.1 cm. The difference in the length value first caught in each region is strongly influenced by the fishing gear used. The average Lm in this study was 42.5 cm. The results of Nikijuluw (2009) and Jatmiko et al (2015) in the Indian Ocean showed that the Lm of *K. pelamis* was between 41-43 cm. Indian Ocean Tuna Commission (2013) reported that the Lm of *K. pelamis* is 44 cm. The Lm in the Western Indian Ocean is 37.8 cm (Grande et al 2010) and 44.7 cm in the Southern Indian Ocean, Bali (Hartaty & Arnenda 2019). According to Udupa (1986), these differences can occur because of the suitability of environmental conditions (Lambert et al 2003). In this study, *K. pelamis* caught in the Southern Indian Ocean, Java and Nusa Tenggara, had not yet reached gonad maturity. A large number of young fish caught will put the fish stock at risk.

Figure 2. *Katsuwonus pelamis*.

Government efforts to increase fishery potential. According to Suharno & Tri (2015), there are several problems in fisheries on the coast of Pariaman City, namely the lack of welfare of fishermen, indications of over fishing, fluctuating fishery production, use of various kinds of fishing gear, fishing fleets which are still dominated by small-scale/community fisheries and generally fishermen in small-scale fisheries have not been able to use the appropriate input as they should (unable to combine inputs optimally).

Government efforts to increase the potential for superior capture fisheries commodities in Pariaman City include diversification of prime fishery products, increasing public awareness in participating in fisheries and marine management, increasing supervision in the utilization of fishery resources and building and developing industrial estates for prime capture fisheries commodities.

Conclusions. Main catch fisheries commodities in Pariaman City include *Eleutheronema tetradactylum* with a Location Quotient (LQ) value of 2.76, Differential Shift (Djt) of 59.40 and specialization (SI) of 4.25%, *Auxis rochei* with a Location Quotient (LQ) value of 2.21, Differential Shift (Djt) of 85.40 and specialization (SI) of 5.25%, *Auxis thazard* with a Location Quotient (LQ) of 1.48, Differential Shift (Djt) of 229.20 and specialization

(SI) of 5.53% and *Katsuwonus pelamis* with a Location Quotient (LQ) value of 2.59, Differential Shift (Djt) of 186.20 and specialization (SI) of 9.42%.

Conflict of Interest. The authors declare that there is no conflict of interest.

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Analysis of capture fisheries prime commodities in Pariaman City, West Sumatera, Indonesia

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Abstract. Capture fisheries of Pariaman City consist of sea capture fisheries and general water capture fisheries, which have the potential to be developed. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources, with marine fish resources of 7892 tons. Potential marine fish resources consist of pelagic, demersal, coral fish, as well as crustaceans and molluscs. Of the potential marine fish resources, 2841.12 tons year^{-1} are represented by large pelagic fish, 3156 tons year^{-1} are small pelagic fish, and 236.76 tons year^{-1} are demersal fish. In 2018, Pariaman City targeted a capture fisheries production of 6588 tonnes. With such large capture fisheries resources, Pariaman City has a prime commodity in the regional economic development sector. The purpose of this study is to analyze the superior commodities in the capture fisheries sector in Pariaman City. The research was conducted in August 2020. The method used in this research is a descriptive method using primary and secondary data. Data collection was conducted by direct observations, interviews, and literature study. The data analysis methods used are Location Quotient (LQ) analysis, Shift Share (SS) analysis, and Specialization analysis (SI). Main catch fishery commodities in Pariaman City include *Eleutheronema tetradactylum*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*.
Key Words: *Auxis rochei, Auxis thazard,* capture fisheries, *Eleutheronema tetradactylum, Katsuwonus pelamis*.

Introduction. According to Pariaman City marine and fisheries statistics (MFS) (2018), Pariaman City is located on the Western Coast of Sumatera Island, which is geographically south of the equator, latitude $00^{0}33'00''$-$00^{0}40'43''$S and longitude $100^{0}10'33''$-$100^{0}10'55''$E. Thus, Pariaman City has a tropical climate with sufficient rainfall. The land area is located at an altitude between 2 - 35 m above sea level (asl), with an average height between 0 - 15 m asl. Thus, Pariaman City is a lowland stretch with few hills.

The marine and fisheries potential of Pariaman City is diverse according to the location of the Unitary State of the Republic of Indonesia, which is located at the equator and between two continents and two oceans. The fishery potential consists of fishing and cultivation. The dominant fishing is sea fishing. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources with marine fish resources of 7892 tons (MFS 2018). Potential marine fish resources consist of pelagic, demersal, coral fish and crustaceans and molluscs. According to Pariaman City marine and fisheries statistics data (2018), of the potential marine fish resources, 2841.12 tons per year are large pelagic fish, 3156 tons per year are small pelagic fish, and 236.76 tons per year are demersal fish. In 2018, Pariaman City targeting a capture fisheries production of 6588 tonnes (MFS 2018).

Kohar & Paramartha (2012) stated that determining prime fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to gain comparative and competitive advantages in the face of globalization of trade. A superior commodity is a commodity that is in high demand, has a high selling value and is expected to be able to provide a large income

compared to other types (Sembiring 2009). According to Kohar & Paramartha (2012), the marketing activities can be divided into local and export superior commodities. The existence of prime exports is expected to increase foreign exchange for the country from the non-oil and gas sector and can also increase regional income (Kohar & Paramartha 2012). According to Sembiring (2009), the existence of a superior commodity means that a country is able to produce products with distinctive attributes, which are due to domestic resource factors. Provision of quality products must be carried out followed by increased productivity and efficiency, so that these commodities have high competitiveness.

Prime commodities are expected to provide a greater income compared to other commodities. According to Resosudarmo et al (2002), if utilized optimally and sustainably, the potential of Indonesia's marine resources can become the main capital for national development in the future. According to Kohar & Paramartha (2012), determination of superior fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to achieve comparative and competitive advantages in the face of globalization of trade. Steps towards efficiency can be taken by determining fish commodities that have comparative advantages, both in terms of supply and demand, as well as high competitive advantages (Alit et al 2017). Kohar & Paramartha (2012) stated that the criteria for superior fisheries commodities are the following: high production and selling prices; high public taste; high market demand; economically important fish/non-fish species; the flesh is tender/soft, chewy, not prickly, and highly nutritious.

The purpose of this research is to analyze the superior capture fisheries commodities in Pariaman City, including: (1) determining the amount of capture fisheries production; (2) determining the growth of capture fisheries production; and (3) determining the contribution of capture fisheries.

Material and Method

Description of the study sites. The method used in this study uses descriptive methods, namely direct observation of the field through surveys and interviews with fishery port parties and fishermen to obtain primary data. The primary data is processed and strengthened by secondary data, with some reinforcement in the form of references and literature studies, aiming to determine the superior commodity of capture fisheries in Pariaman City. This research was conducted for 1 month, in August 2020. According to Arifin (2008), the descriptive method is a research method where the researcher or writer comes directly to the data source and analyzes the data as it is. Data collection in this study is primary data collection and secondary data. Primary data collection was carried out by means of observation, interviews, and literature study.

Primary data. The primary data required includes data on the price of fish which is a prime commodity, continuity of production, and government policies regarding follow-up on superior commodities in Pariaman City. Primary data was obtained by direct observation and interviews (30 respondents) with related parties, including the Pariaman City Marine and Fisheries Service to local fishermen.

Secondary data. Secondary data collected is from the Department of Marine Affairs and Fisheries and the Central Statistics Agency for the City of Pariaman and West Sumatera Province in the 2014-2018 period. The data obtained include the following: production data and production value per type of fish each year in Pariaman City, and production data and production value per type of fish in West Sumatera Province.

Analysis of the capture amount of fisheries production. Location quotiens analysis (LQ) was used to determine the amount of capture fisheries production. According to Budiharsono (2001), the formula for calculating LQ is:

$$LQ = \frac{vi/_{vt}}{Vi/_{Vt}}$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fishery production at Pariaman City level; Vi - total production of species i fish at national level; Vt - total capture fisheries production at national level. If LQ≥1, type i fish is a prime commodity in Pariaman City; if LQ≤1, type i fish is not a prime commodity in Pariaman City.

Capture fisheries production growth analysis. Shift Share analysis was used to determine the growth of capture fisheries production. According to Susanto (2008), the formulas used for the Shift Share analysis are as follows:

Gj =Yjt – Yjo

Nj = Yjo (Yt/Yo) – Yjo

(G-N)j = Yjt – (Yt/Yo) –Yjo

Djt = {(Yijt – (Yit/Yio) Yijo)}

Where: Gj - total fishery production growth in Pariaman City; Nj - regional share component in Pariaman City; (G-N)j - net shift component in Pariaman City; Djt - diferential shift component in Pariaman City; Yij - total production of type i fish at Pariaman City level; Yj - total capture fishery production at Pariaman City level; Yi - total production of type i fish in West Sumatera Province; Y - total capture fisheries production in West Sumatera Province; o - initial period (2014); t - end period (2018).

If Gj-Nj<0, the fishery growth in area j (Pariaman City) is slower than in West Sumatera Province. If Gj-Nj>0, the fishery growth in area j (Pariaman City) is faster than in West Sumatera Province. If Djt>0, the type of fish i in area j (Pariaman City) grows faster than the same fish species in West Sumatera Province. If Djt<0, the fish species i in area j (Pariaman City) has a slower growth compared to the growth of the same fish species in West Sumatera Province. Djt shows the differential shift component used to measure the amount of net shift caused by certain species of fish that grow faster or slower in the concerned area.

Analysis of the contribution of capture fisheries production. Shift Share analysis is used to determine the growth of capture fisheries production. According to Susanto (2008), the formula used for the Shift Share analysis is as follows:

$$SI = \left[\frac{vi}{vt} - \frac{Vi}{Vt}\right] x\ 100\ \%$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fisheries production at Pariaman City level; Vi - total production of fish species i in West Sumatera Province; Vt - total capture fisheries production at the level of West Sumatera Province.

Results and Discussion. Capture fisheries resources have an important role in the economic turnover of coastal communities in Pariaman City. Among the most important species are *Thunnus* spp., *Euthynnus affinis*, *Katsuwonus pelamis*, *Sardinella* spp., *Rastrelliger* spp., *Atule mate*, *Engraulidae* spp. and some reef fish, with of high economic value. Capture fisheries represent the main livelihood for some coastal communities in coastal villages in Pariaman City. The number of fishermen in Pariaman City in 2017 reached 1183 people.

Analysis of the amount of capture fisheries production. Irnawati et al (2011) stated that the LQ method makes a comparison of the relative share of sector i revenue at the regional level to total regional income in the relative share of sector i revenue at the provincial level to provincial revenue. In this study, the determination of LQ with income criteria is replaced by production criteria and fish production value. LQ analysis is used to determine a capture fishery commodity in Pariaman City, whether the fish species is a basic or non-basic commodity by comparing it to a wider area, namely the province. If the value of LQ>1, type i fish is the leading commodity in Pariaman City, whereas if the value of LQ<1, type i fish is not the leading commodity in Pariaman City.

Based on Table 1, the fish that have an LQ>1 include *Trichiurus lepturus*, *Makaira* sp., *E. tetradactylum*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*. These types of fish are commodities representing the base sector for capture fisheries in Pariaman City. The highest LQ value was found in *Makaira* sp., namely 2.81, followed by *E. tetradactylum* (2.76) and *K. pelamis* (2.59). This is because the production of *Makaira* sp. in Pariaman City is the largest in West Sumatera Province. The fish with an LQ<1 are not included in the catch fishery base commodity in Pariaman City, because the fishery production is still low when compared to other areas in West Sumatera Province. These commodities include *Atule mate*, *Trachinotus* spp., *Decapterus* spp., *Engraulidae*, *Lutjanus campechanus*, *Litopenaeus vannamei, Epinephelus* spp., *Rastrelliger* spp. and *Loligo* spp.

Table 1
Capture fisheries commodities in Pariaman City based on the Location Quotient (LQ) analysis in 2018

Types of fish	*LQ*	*Information*
Atule mate	0.68	Non prime
Trachinotus spp.	0.94	Non prime
Decapterus spp.	0.27	Non prime
Trichiurus lepturus	1.85	Prime
Engraulidae	0.37	Non prime
Makaira sp.	2.81	Prime
Lutjanus campechanus	0.60	Non prime
Eleutheronema tetradactylum	2.76	Prime
Auxis rochei	2.21	Prime
Auxis thazard	1.48	Prime
Katsuwonus pelamis	2.59	Prime
Rastrelliger spp.	0.45	Non prime
Epinephelus spp.	0.27	Non prime
Litopenaeus vannamei	0.22	Non prime
Loligo spp.	0.39	Non prime

Capture fisheries production growth analysis. Shift Share analysis is a very useful technique in analyzing the growth of capture fisheries production in Pariaman City compared to the fishery production in West Sumatera Province, or commonly known as the Net Shift component. The Net Shift Component of capture fisheries commodities in Pariaman City in the 2014–2018 period amounted to 205661.14 kg. So it can be concluded that the Net Shift component (Gj-Nj)>0, and in 2014-2018 the growth of fishery production in Pariaman City was faster than in West Sumatera Province. According to Mangilelang et al (2015), Shift Share analysis is a very useful technique in analyzing changes in the regional economic structure compared to the provincial economy.

The purpose of this analysis (Table 2) is to determine the performance or work productivityof the regional economy by comparing it with a larger region (regional/province). To determine the types of fish that have the potential to be

developed into superior capture fisheries commodities, it is necessary to calculate the Djt for each fish.

Table 2
The catch fishery commodity in Pariaman City based on the Shift Share (SS) analysis in 2018

Types of fish	SS	Information
Atule mate	-25.4	Slow
Trachinotus spp.	-10.8	Slow
Decapterus spp.	40.4	Fast
Trichiurus lepturus	-10	Fast
Engraulidae	40	Fast
Makaira sp.	-16.6	Fast
Lutjanus campechanus	-4.6	Fast
Eleutheronema tetradactylum	59.4	Fast
Auxis rochei	85.4	Fast
Auxis thazard	229.2	Fast
Katsuwonus pelamis	186.2	Fast
Rastrelliger spp.	-46.2	Slow
Epinephelus spp.	-22.2	Slow
Litopenaeus vannamei	-16	Slow
Loligo spp.	-9	Slow

Based on Table 2, several capture fisheries commodities in Pariaman City experienced faster growth when compared to the same commodity at the provincial level, which means that the value of Djt>0. These fishery commodities include *Decapterus* spp., Engraulidae, *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*. The highest value of Djt occurred for *K. pelamis*, namely 229.2; this occurred because the production of *K. pelamis* was the largest compared to other fish species in Pariaman City, and when compared to other areas in West Sumatera province.

If capture fisheries commodities have a Djt value less than 0, then the fisheries commodity growth is slower than that of the same fish species at the provincial level. This fishery commodity has lower competitiveness when compared to the same fish species in other districts in West Sumatera Province. These fishery commodities include *A. mate*, *Trachinotus* spp., *T. lepturus*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Analysis of the contribution of capture fisheries production. The specialization analysis (Table 3) is used to determine the existence of specialization in capture fisheries production in certain fish species in Pariaman City. If SI>1, then there is a specialization of fishery production in Pariaman City relatively comparable to the province, while if SI<1, there is no specialization in fishery production in Pariaman City relative to that of West Sumatera Province.

Based on Table 3, there fish that experience specialization in production, which means that they contribute to economic growth in Pariaman City, including *Decapterus* spp., *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*, the latter having the highest specialization value (SI) (9.42%).

The fish with specialization value (SI) less than 1 do not experience specialization in fishery production in Pariaman City when compared to the production of West Sumatera Province. This fishery commodity has low competitiveness when compared to other areas in West Sumatera Province, so that there is no specialization of capture fisheries activities for these fish commodities in Pariaman City (*A. mate*, *Trachinotus* spp., *Trichiurus lepturus*, Engraulidae, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Table 3
The catch fishery commodity in Pariaman City based on the Specialization (SI) analysis in 2018

Fish	SI	Information
Atule mate	-4.44	No Specialization
Trachinotus spp.	-2.32	No Specialization
Decapterus spp.	1.07	Specialization
Trichiurus lepturus	-1.96	No Specialization
Engraulidae	-2.95	No Specialization
Makaira sp.	0.9	No Specialization
Lutjanus campechanus	0.49	No Specialization
Eleutheronema tetradactylum	4.25	Specialization
Auxis rochei	5.25	Specialization
Auxis thazard	5.53	Specialization
Katsuwonus pelamis	9.42	Specialization
Rastrelliger spp.	-3.66	No Specialization
Epinephelus spp.	0.45	No Specialization
Litopenaeus vannamei	-2.04	No Specialization
Loligo spp.	0.5	No Specialization

Prime capture fisheries commodity in Pariaman City. The prime catch fisheries commodities in Pariaman City are obtained from the results of the analysis of LQ, SS, and SI, found in Table 4.

Table 4
Results of the analysis of location quotient (LQ), shift share (SS), and specialization (SI) of capture fisheries commodities in Pariaman City in 2018

Types of fish	*LQ*	*Djt*	*SI (%)*	*Information*
Atule mate	0.68	-25.4	-4.44	Not prime
Trachinotus spp.	0.94	-10.8	-2.32	Not prime
Decapterus spp.	0.27	40.4	1.07	Not prime
Trichiurus lepturus	1.85	-10	-1.96	Not prime
Engraulidae	0.37	40	-2.95	Not prime
Makaira sp.	2.81	-16.6	0.9	Not prime
Lutjanus campechanus	0.6	-4.6	0.49	Not prime
Eleutheronema tetradactylum	2.76	59.4	4.25	Prime
Auxis rochei	2.21	85.4	5.25	Prime
Auxis thazard	1.48	229.2	5.53	Prime
Katsuwonus pelamis	2.59	186.2	9.42	Prime
Rastrelliger spp.	0.45	-46.2	-3.66	Not prime
Epinephelus spp.	0.27	-22.2	0.45	Not prime
Litopenaeus vannamei	0.22	-16	-2.04	Not prime
Loligo spp.	0.39	-9	0.5	Not prime

Note: Djt - diferential shift component in Pariaman City.

Table 4 shows that the superior capture fisheries commodities in Pariaman City include *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*. This commodity is a large pelagic fish, except for *E. tetradactylum*, which are demersal fish. The fish that are not included in the superior capture fisheries commodity in Pariaman City are *A. mate*, *Trachinotus* spp., *Decapterus* spp., *T. lepturus*, *Engraulidae*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp. Determination of the superior capture fisheries commodity is based on the amount of production.

Eleutheronema tetradactylum. *E. tetradactylum* (Figure 1) is one of the capture fisheries prime commodities in Pariaman City. The results of the analysis show that the LQ value of *E. tetradactylum* is 2.76, which means that the fish is the base for capture fisheries in Pariaman City. The Djt value of *E. tetradactylum*, 59.4, indicates that the fish production growth is faster than that of the same fish species from West Sumatera Province, so that it has a competitive edge when compared to other regions. The SI of *Eleutheronema tetradactylum* in Pariaman City reaches 4.25%, which means that the fish is relatively specialized in production in Pariaman City. This fish is an important consumption fish in Kuwait, India, Thailand, Vietnam, Malaysia, Singapore and Indonesia (Motomura 2004).

E. tetradactylum belongs to the Polynemidae family, which consists of 41 species in 8 genera, which are epibenic fish and can be found in all tropical and subtropical marine waters. *E. tetradactylum* is a protandrous hermaphrodite fish (Motomura 2004). The number of fishing activities causes this fish stock to rapidly decline, marked by a drastic decrease in catch (Wijopriyono et al 2012). Wijopriyono et al (2012) state that In 2012, the production of *E. tetradactylum* was only 9273 kg with a very significant decrease in production, namely 49822 kg when compared to the production in 2008. The optimum sustainable production value (Catch Maximum Sustainable Yield) of *E. tetradactylum* was 4067 kg per year within an optimum fishing effort of 497 trips per year. Fishing effort in 2012 was 849 trips (170.8% of the optimum fishing effort), so there has been an overfishing of *E. tetradactylum* (Indra et al 2013).

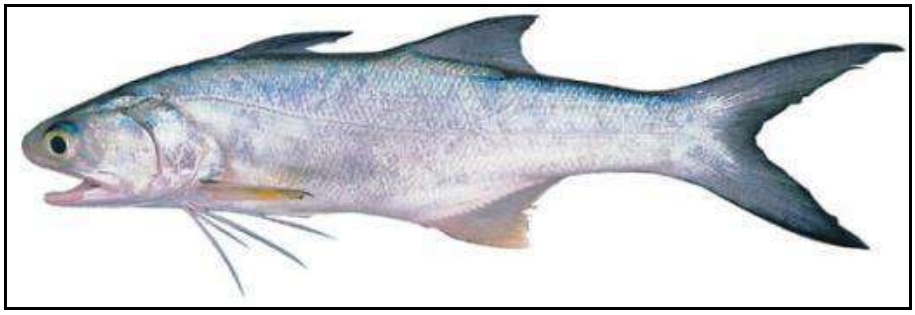

Figure 1. *Eleutheronema tetradactylum* (source: FishBase).

Auxis rochei. *A. rochei* (Figure 2) production in 572 Fisheries Management Area has been recorded in capture fisheries statistics starting from 2005. In the previous year, the production of all tuna species was recorded in statistical data for "tuna" only, without distinguishing the species. According to Pariaman City marine and fisheries statistics data (2018), *A. rochei* production from 2005-2012 showed a fluctuating trend, the lowest was in 2005-2007 and increased rapidly in 2008-2012. *A. rochei* only contributes 2% of all neritic tuna production originating from the waters of West Sumatera (Directorate General of Capture Fisheries 2013). This value is very small compared to the percentage of other types of mackerel, such as *A. thazard* by 26%. There is a possibility that the data recording officer in the field misidentifies it because morphologically, *A. rochei* and *A. thazard* are very similar. Apart from being marketed in the local market, neritic tuna has been caught by fishermen which also enter the industry and are exported. The level of cultivation of *A. rochei* that is continuous without the existence of control can cause its sustainability to be threatened, therefore accurate and precise scientific information is needed.

The length of the first ripe gonads (Lm) of *A. rochei* is 24.6 cm (Marine Fisheries Institute 2013). Based on the Lm value, the length distribution of *A. rochei* caught in the waters of West Sumatera shows that adult fish are 53% and immature fish are 47%. Setyadji et al (2013) obtained a more different range, namely 23-32 cm for mini purse seines and 20-28 cm for large purse seines (industrial scale) in the South Indian Ocean. One of the differences in the length of the fish caught is caused by the difference in the size of the mesh used. *A. rochei* population will be sustainable if the size caught is above the length of the first time the gonads mature. Continuous exploitation of juvenile *A.*

rochei by means of non-selective purse seine fishing gear will cause the sustainability of *A. rochei* to be threatened.

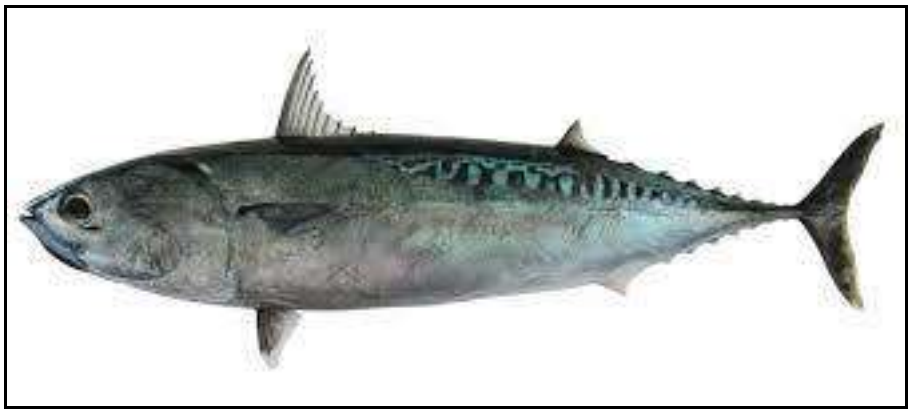

Figure 2. *Auxis rochei* (FishBase).

Auxis thazard. *A. thazard* (Figure 3) is a pelagic fish from the Scombridae family. This fish can be found in almost all tropical and subtropical waters (Collette & Aadland 1996; Liu 2008). *A. thazard* is included in neritic tuna with sea surface habitats up to a depth of 50 meters (Collette & Nauen 1983; Maguire et al 2006; Herera & Pierre 2009). The migration pattern is local with the optimum temperature between 27-27.9ºC. The catch of *A. thazard* is increasing every year with a variety of fishing gears (gill nets, purse seines and pole and line). IOTC (2014) reports that more than 90% of *A. thazard* catch is concentrated in four countries, namely Indonesia (59%), India (14%), Sri Lanka (11%) and Iran (7%). Thus, *A. thazard* is an economically important fish in Indonesia and one of its distribution areas in Western Sumatera, especially in the waters around Sibolga.

According to Ghosh et al (2012), the size of the fish first reached gonad maturity at a fork length of 29.7 cm. According to Tampubolon et al (2016), *A. thazard* in the waters of western Sumatra have a standard length of 34.89 cm. Based on the research of Ghosh et al (2012), the frequency of mature tuna landed at the Kusamba fish auction is only 12% of the total sample. This can be caused by the size of the mesh used by the fishermen, which is too small, causing immature fish to be unable to escape from the net.

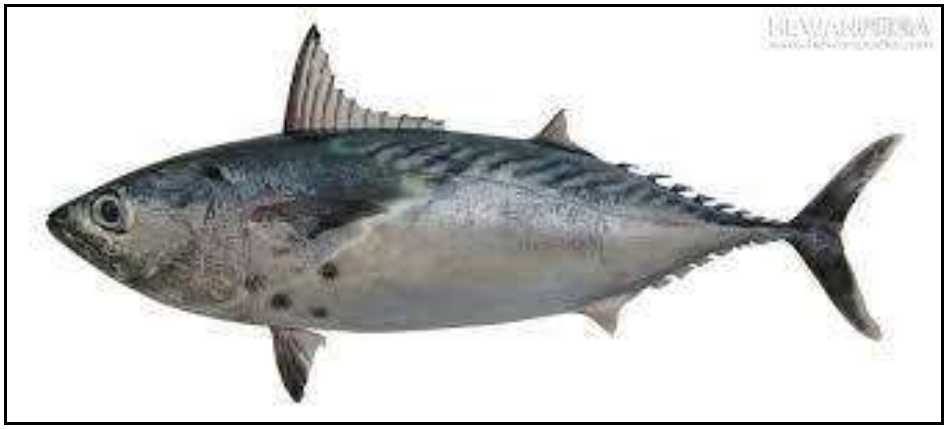

Figure 3. *Auxis thazard* (FishBase).

Katsuwonus pelamis. *K. pelamis* (Figure 4) is a highly migratory species and occupies tropical and sub-tropical waters (Arai et al 2005). Their distribution, movement and vulnerability are influenced by their preferred habitat. The presence of prey, suitable temperature and sufficient oxygen significantly affect the survival of *K. pelamis*. As a consequence, the spatial distribution of *K. pelamis* is seasonal and has an annual pattern (Mugo et al 2010).

The distribution of *K. pelamis* in Indonesia includes the Indonesian Ocean, the west coast of Sumatera, South Java, Bali, Nusa Tenggara, East Indonesian waters including the Banda Sea, Flores Sea, Maluku Sea, Makassar Sea (Uktolseja 1987). The fishing location for *K. pelamis* is determined by different seasons in each water. Catching *K. pelamis* can be conducted all year round. The results obtained differ from season to season and also vary according to the fishing location. According to Supriana et al (2014), the distribution areas for tuna and *K. pelamis* in Indonesia include the Banda Sea, Maluku Sea, Flores Sea, Sulawesi Sea, Indian Sea, Halmahera Sea, northern Aceh waters, west Sumatera, southern Java, northern Sulawesi, Tomini Bay, Cendrawasih Bay, and the Arafura Sea.

Rochman et al (2015) stated that the continuous use of *K. pelamis* in the Indian Ocean, especially in Indonesia's territorial areas, results in the utilization rate of *K. pelamis* in optimum conditions so that it needs caution and accuracy in its management. According to IOTC (2016), the status of *K. pelamis* stocks in 2014 in the Indian Ocean was in good condition. One aspect to support efforts to manage fish resources is basic knowledge regarding aspects of reproductive biology (Jatmiko et al 2015) and the spawning season (Suwarso et al 2015).

Research results of Rochman et al (2015), Zedta et al (2017) and Nurdin & Panggabean (2017) shpw that the capture length of *K. pelamis* in the South Indian Ocean, Java was 38.73, 39.4, and 40 cm, respectively, while the results of Hidayat et al (2017) in the Pacific Ocean showed a capture length of 40.1 cm. The difference in the length value of first catch in each region is strongly influenced by the fishing gear used. The average length in this study was 42.5 cm. The results of Nikijuluw (2009) and Jatmiko et al (2015) showed that the Lm of *K. pelamis* at maturity was between 41-43 cm in the Indian Ocean. Indian Ocean Tuna Commission (2014) reported that the Lm of *K. pelamis* is 44 cm. The Lm in the Western Indian Ocean is 37.8 cm (Grande et al 2010) and 44.7 cm in the Southern Indian Ocean, Bali (Hartaty & Arnenda 2019). These differences can occur because of the suitability of environmental conditions (Udupa 1986; Lambert et al 2003). In this study, *K. pelamis* caught in the Southern Indian Ocean, Java and Nusa Tenggara, had not yet reached gonad maturity. A large number of young fish caught will put the fish stock at risk.

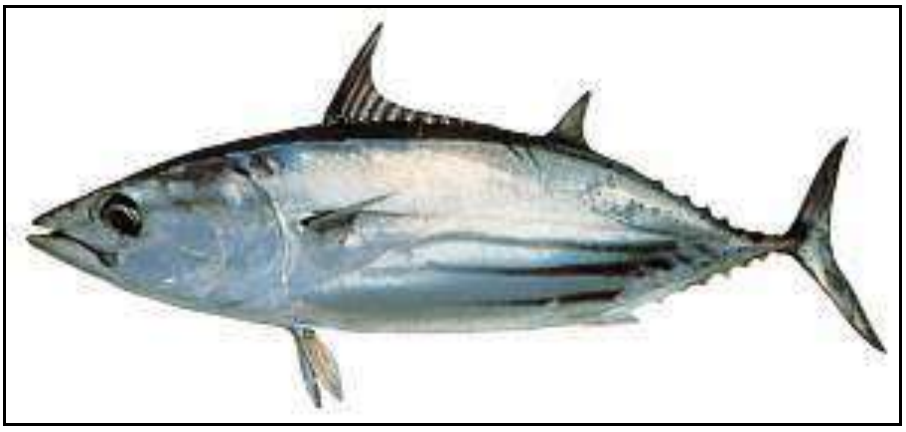

Figure 2. *Katsuwonus pelamis* (FishBase).

Government efforts to increase fishery potential. According to Suharno & Widayati (2015), there are several problems in fisheries on the coast of Pariaman City, namely the lack of welfare of fishermen, indications of over fishing, fluctuating fishery production, use of various kinds of fishing gear, fishing fleets which are still dominated. Small-scale/community fisheries and generally fishermen in small-scale fisheries have not been able to use the appropriate input as they should (unable to combine inputs optimally).

Government efforts to increase the potential for superior capture fisheries commodities in Pariaman City include diversification of prime fishery products, increasing public awareness in participating in fisheries and marine management, increasing

supervision in the utilization of fishery resources and building and developing industrial estates for prime capture fisheries commodities.

Conclusions. Main catch fisheries commodities in Pariaman City include *Eleutheronema tetradactylum* with a location quotient value of 2.76, differential shift of 59.4 and specialization of 4.25%. *Auxis rochei* present a location quotient value of 2.21, differential shift of 85.4 and specialization of 5.25%. *Auxis thazard* presents a location quotient of 1.48, differential shift of 229.2 and specialization of 5.53%. *Katsuwonus pelamis* had a location quotient value of 2.59, differential shift of 186.2 and specialization of 9.42%.

Conflict of Interest. The authors declare that there is no conflict of interest.

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Analysis of capture fisheries prime commodities in Pariaman City, West Sumatera, Indonesia

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Abstract. Capture fisheries of Pariaman City consist of sea capture fisheries and general water capture fisheries, which have the potential to be developed. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources, with marine fish resources of 7892 tons. Potential marine fish resources consist of pelagic, demersal, coral fish, as well as crustaceans and molluscs. Of the potential marine fish resources, 2841.12 tons year^{-1} are represented by large pelagic fish, 3156 tons year^{-1} are small pelagic fish, and 236.76 tons year^{-1} are demersal fish. In 2018, Pariaman City targeted a capture fisheries production of 6588 tonnes. With such large capture fisheries resources, Pariaman City has a prime commodity in the regional economic development sector. The purpose of this study is to analyze the superior commodities in the capture fisheries sector in Pariaman City. The research was conducted in August 2020. The method used in this research is a descriptive method using primary and secondary data. Data collection was conducted by direct observations, interviews, and literature study. The data analysis methods used are Location Quotient (LQ) analysis, Shift Share (SS) analysis, and Specialization analysis (SI). Main catch fishery commodities in Pariaman City include *Eleutheronema tetradactylum*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*.
Key Words: *Auxis rochei, Auxis thazard,* capture fisheries, *Eleutheronema tetradactylum, Katsuwonus pelamis*.

Introduction. According to Pariaman City marine and fisheries statistics (MFS) (2018), Pariaman City is located on the Western Coast of Sumatera Island, which is geographically south of the equator, latitude $00^{0}33'00''$-$00^{0}40'43''$S and longitude $100^{0}10'33''$-$100^{0}10'55''$E. Thus, Pariaman City has a tropical climate with sufficient rainfall. The land area is located at an altitude between 2 - 35 m above sea level (asl), with an average height between 0 - 15 m asl. Thus, Pariaman City is a lowland stretch with few hills.

The marine and fisheries potential of Pariaman City is diverse according to the location of the Unitary State of the Republic of Indonesia, which is located at the equator and between two continents and two oceans. The fishery potential consists of fishing and cultivation. The dominant fishing is sea fishing. Pariaman City is located on the coast of the Indian Ocean, being a coastal area with various potential fish resources with marine fish resources of 7892 tons (MFS 2018). Potential marine fish resources consist of pelagic, demersal, coral fish and crustaceans and molluscs. According to Pariaman City marine and fisheries statistics data (2018), of the potential marine fish resources, 2841.12 tons per year are large pelagic fish, 3156 tons per year are small pelagic fish, and 236.76 tons per year are demersal fish. In 2018, Pariaman City targeting a capture fisheries production of 6588 tonnes (MFS 2018).

Kohar & Paramartha (2012) stated that determining prime fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to gain comparative and competitive advantages in the face of globalization of trade. A superior commodity is a commodity that is in high demand, has a high selling value and is expected to be able to provide a large income

compared to other types (Sembiring 2009). According to Kohar & Paramartha (2012), the marketing activities can be divided into local and export superior commodities. The existence of prime exports is expected to increase foreign exchange for the country from the non-oil and gas sector and can also increase regional income (Kohar & Paramartha 2012). According to Sembiring (2009), the existence of a superior commodity means that a country is able to produce products with distinctive attributes, which are due to domestic resource factors. Provision of quality products must be carried out followed by increased productivity and efficiency, so that these commodities have high competitiveness.

Prime commodities are expected to provide a greater income compared to other commodities. According to Resosudarmo et al (2002), if utilized optimally and sustainably, the potential of Indonesia's marine resources can become the main capital for national development in the future. According to Kohar & Paramartha (2012), determination of superior fish commodities in an area is the first step towards the development and management of capture fisheries based on the concept of efficiency to achieve comparative and competitive advantages in the face of globalization of trade. Steps towards efficiency can be taken by determining fish commodities that have comparative advantages, both in terms of supply and demand, as well as high competitive advantages (Alit et al 2017). Kohar & Paramartha (2012) stated that the criteria for superior fisheries commodities are the following: high production and selling prices; high public taste; high market demand; economically important fish/non-fish species; the flesh is tender/soft, chewy, not prickly, and highly nutritious.

The purpose of this research is to analyze the superior capture fisheries commodities in Pariaman City, including: (1) determining the amount of capture fisheries production; (2) determining the growth of capture fisheries production; and (3) determining the contribution of capture fisheries.

Material and Method

Description of the study sites. The method used in this study uses descriptive methods, namely direct observation of the field through surveys and interviews with fishery port parties and fishermen to obtain primary data. The primary data is processed and strengthened by secondary data, with some reinforcement in the form of references and literature studies, aiming to determine the superior commodity of capture fisheries in Pariaman City. This research was conducted for 1 month, in August 2020. According to Arifin (2008), the descriptive method is a research method where the researcher or writer comes directly to the data source and analyzes the data as it is. Data collection in this study is primary data collection and secondary data. Primary data collection was carried out by means of observation, interviews, and literature study.

Primary data. The primary data required includes data on the price of fish which is a prime commodity, continuity of production, and government policies regarding follow-up on superior commodities in Pariaman City. Primary data was obtained by direct observation and interviews (30 respondents) with related parties, including the Pariaman City Marine and Fisheries Service to local fishermen.

Secondary data. Secondary data collected is from the Department of Marine Affairs and Fisheries and the Central Statistics Agency for the City of Pariaman and West Sumatera Province in the 2014-2018 period. The data obtained include the following: production data and production value per type of fish each year in Pariaman City, and production data and production value per type of fish in West Sumatera Province.

Analysis of the capture amount of fisheries production. Location quotiens analysis (LQ) was used to determine the amount of capture fisheries production. According to Budiharsono (2001), the formula for calculating LQ is:

$$LQ = \frac{vi/_{vt}}{Vi/_{Vt}}$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fishery production at Pariaman City level; Vi - total production of species i fish at national level; Vt - total capture fisheries production at national level. If LQ≥1, type i fish is a prime commodity in Pariaman City; if LQ≤1, type i fish is not a prime commodity in Pariaman City.

Capture fisheries production growth analysis. Shift Share analysis was used to determine the growth of capture fisheries production. According to Susanto (2008), the formulas used for the Shift Share analysis are as follows:

Gj =Yjt – Yjo

Nj = Yjo (Yt/Yo) – Yjo

(G-N)j = Yjt – (Yt/Yo) –Yjo

Djt = {(Yijt – (Yit/Yio) Yijo)}

Where: Gj - total fishery production growth in Pariaman City; Nj - regional share component in Pariaman City; (G-N)j - net shift component in Pariaman City; Djt - diferential shift component in Pariaman City; Yij - total production of type i fish at Pariaman City level; Yj - total capture fishery production at Pariaman City level; Yi - total production of type i fish in West Sumatera Province; Y - total capture fisheries production in West Sumatera Province; o - initial period (2014); t - end period (2018).

If Gj-Nj<0, the fishery growth in area j (Pariaman City) is slower than in West Sumatera Province. If Gj-Nj>0, the fishery growth in area j (Pariaman City) is faster than in West Sumatera Province. If Djt>0, the type of fish i in area j (Pariaman City) grows faster than the same fish species in West Sumatera Province. If Djt<0, the fish species i in area j (Pariaman City) has a slower growth compared to the growth of the same fish species in West Sumatera Province. Djt shows the differential shift component used to measure the amount of net shift caused by certain species of fish that grow faster or slower in the concerned area.

Analysis of the contribution of capture fisheries production. Shift Share analysis is used to determine the growth of capture fisheries production. According to Susanto (2008), the formula used for the Shift Share analysis is as follows:

$$SI = \left[\frac{vi}{vt} - \frac{Vi}{Vt}\right] x\ 100\ \%$$

Where: vi - total production of type i fish at Pariaman City level; vt - total capture fisheries production at Pariaman City level; Vi - total production of fish species i in West Sumatera Province; Vt - total capture fisheries production at the level of West Sumatera Province.

Results and Discussion. Capture fisheries resources have an important role in the economic turnover of coastal communities in Pariaman City. Among the most important species are *Thunnus* spp., *Euthynnus affinis*, *Katsuwonus pelamis*, *Sardinella* spp., *Rastrelliger* spp., *Atule mate*, *Engraulidae* spp. and some reef fish, with of high economic value. Capture fisheries represent the main livelihood for some coastal communities in coastal villages in Pariaman City. The number of fishermen in Pariaman City in 2017 reached 1183 people.

Analysis of the amount of capture fisheries production. Irnawati et al (2011) stated that the LQ method makes a comparison of the relative share of sector i revenue at the regional level to total regional income in the relative share of sector i revenue at the provincial level to provincial revenue. In this study, the determination of LQ with income criteria is replaced by production criteria and fish production value. LQ analysis is used to determine a capture fishery commodity in Pariaman City, whether the fish species is a basic or non-basic commodity by comparing it to a wider area, namely the province. If the value of LQ>1, type i fish is the leading commodity in Pariaman City, whereas if the value of LQ<1, type i fish is not the leading commodity in Pariaman City.

Based on Table 1, the fish that have an LQ>1 include *Trichiurus lepturus*, *Makaira* sp., *E. tetradactylum*, *Auxis rochei*, *Auxis thazard* and *Katsuwonus pelamis*. These types of fish are commodities representing the base sector for capture fisheries in Pariaman City. The highest LQ value was found in *Makaira* sp., namely 2.81, followed by *E. tetradactylum* (2.76) and *K. pelamis* (2.59). This is because the production of *Makaira* sp. in Pariaman City is the largest in West Sumatera Province. The fish with an LQ<1 are not included in the catch fishery base commodity in Pariaman City, because the fishery production is still low when compared to other areas in West Sumatera Province. These commodities include *Atule mate*, *Trachinotus* spp., *Decapterus* spp., *Engraulidae*, *Lutjanus campechanus*, *Litopenaeus vannamei, Epinephelus* spp., *Rastrelliger* spp. and *Loligo* spp.

Table 1
Capture fisheries commodities in Pariaman City based on the Location Quotient (LQ) analysis in 2018

Types of fish	*LQ*	*Information*
Atule mate	0.68	Non prime
Trachinotus spp.	0.94	Non prime
Decapterus spp.	0.27	Non prime
Trichiurus lepturus	1.85	Prime
Engraulidae	0.37	Non prime
Makaira sp.	2.81	Prime
Lutjanus campechanus	0.60	Non prime
Eleutheronema tetradactylum	2.76	Prime
Auxis rochei	2.21	Prime
Auxis thazard	1.48	Prime
Katsuwonus pelamis	2.59	Prime
Rastrelliger spp.	0.45	Non prime
Epinephelus spp.	0.27	Non prime
Litopenaeus vannamei	0.22	Non prime
Loligo spp.	0.39	Non prime

Capture fisheries production growth analysis. Shift Share analysis is a very useful technique in analyzing the growth of capture fisheries production in Pariaman City compared to the fishery production in West Sumatera Province, or commonly known as the Net Shift component. The Net Shift Component of capture fisheries commodities in Pariaman City in the 2014–2018 period amounted to 205661.14 kg. So it can be concluded that the Net Shift component (Gj-Nj)>0, and in 2014-2018 the growth of fishery production in Pariaman City was faster than in West Sumatera Province. According to Mangilelang et al (2015), Shift Share analysis is a very useful technique in analyzing changes in the regional economic structure compared to the provincial economy.

The purpose of this analysis (Table 2) is to determine the performance or work productivityof the regional economy by comparing it with a larger region (regional/province). To determine the types of fish that have the potential to be

developed into superior capture fisheries commodities, it is necessary to calculate the Djt for each fish.

Table 2
The catch fishery commodity in Pariaman City based on the Shift Share (SS) analysis in 2018

Types of fish	SS	Information
Atule mate	-25.4	Slow
Trachinotus spp.	-10.8	Slow
Decapterus spp.	40.4	Fast
Trichiurus lepturus	-10	Fast
Engraulidae	40	Fast
Makaira sp.	-16.6	Fast
Lutjanus campechanus	-4.6	Fast
Eleutheronema tetradactylum	59.4	Fast
Auxis rochei	85.4	Fast
Auxis thazard	229.2	Fast
Katsuwonus pelamis	186.2	Fast
Rastrelliger spp.	-46.2	Slow
Epinephelus spp.	-22.2	Slow
Litopenaeus vannamei	-16	Slow
Loligo spp.	-9	Slow

Based on Table 2, several capture fisheries commodities in Pariaman City experienced faster growth when compared to the same commodity at the provincial level, which means that the value of Djt>0. These fishery commodities include *Decapterus* spp., Engraulidae, *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*. The highest value of Djt occurred for *K. pelamis*, namely 229.2; this occurred because the production of *K. pelamis* was the largest compared to other fish species in Pariaman City, and when compared to other areas in West Sumatera province.

If capture fisheries commodities have a Djt value less than 0, then the fisheries commodity growth is slower than that of the same fish species at the provincial level. This fishery commodity has lower competitiveness when compared to the same fish species in other districts in West Sumatera Province. These fishery commodities include *A. mate*, *Trachinotus* spp., *T. lepturus*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Analysis of the contribution of capture fisheries production. The specialization analysis (Table 3) is used to determine the existence of specialization in capture fisheries production in certain fish species in Pariaman City. If SI>1, then there is a specialization of fishery production in Pariaman City relatively comparable to the province, while if SI<1, there is no specialization in fishery production in Pariaman City relative to that of West Sumatera Province.

Based on Table 3, there fish that experience specialization in production, which means that they contribute to economic growth in Pariaman City, including *Decapterus* spp., *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*, the latter having the highest specialization value (SI) (9.42%).

The fish with specialization value (SI) less than 1 do not experience specialization in fishery production in Pariaman City when compared to the production of West Sumatera Province. This fishery commodity has low competitiveness when compared to other areas in West Sumatera Province, so that there is no specialization of capture fisheries activities for these fish commodities in Pariaman City (*A. mate*, *Trachinotus* spp., *Trichiurus lepturus*, Engraulidae, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp.

Table 3
The catch fishery commodity in Pariaman City based on the Specialization (SI) analysis in 2018

Fish	SI	Information
Atule mate	-4.44	No Specialization
Trachinotus spp.	-2.32	No Specialization
Decapterus spp.	1.07	Specialization
Trichiurus lepturus	-1.96	No Specialization
Engraulidae	-2.95	No Specialization
Makaira sp.	0.9	No Specialization
Lutjanus campechanus	0.49	No Specialization
Eleutheronema tetradactylum	4.25	Specialization
Auxis rochei	5.25	Specialization
Auxis thazard	5.53	Specialization
Katsuwonus pelamis	9.42	Specialization
Rastrelliger spp.	-3.66	No Specialization
Epinephelus spp.	0.45	No Specialization
Litopenaeus vannamei	-2.04	No Specialization
Loligo spp.	0.5	No Specialization

Prime capture fisheries commodity in Pariaman City. The prime catch fisheries commodities in Pariaman City are obtained from the results of the analysis of LQ, SS, and SI, found in Table 4.

Table 4
Results of the analysis of location quotient (LQ), shift share (SS), and specialization (SI) of capture fisheries commodities in Pariaman City in 2018

Types of fish	*LQ*	*Djt*	*SI (%)*	*Information*
Atule mate	0.68	-25.4	-4.44	Not prime
Trachinotus spp.	0.94	-10.8	-2.32	Not prime
Decapterus spp.	0.27	40.4	1.07	Not prime
Trichiurus lepturus	1.85	-10	-1.96	Not prime
Engraulidae	0.37	40	-2.95	Not prime
Makaira sp.	2.81	-16.6	0.9	Not prime
Lutjanus campechanus	0.6	-4.6	0.49	Not prime
Eleutheronema tetradactylum	2.76	59.4	4.25	Prime
Auxis rochei	2.21	85.4	5.25	Prime
Auxis thazard	1.48	229.2	5.53	Prime
Katsuwonus pelamis	2.59	186.2	9.42	Prime
Rastrelliger spp.	0.45	-46.2	-3.66	Not prime
Epinephelus spp.	0.27	-22.2	0.45	Not prime
Litopenaeus vannamei	0.22	-16	-2.04	Not prime
Loligo spp.	0.39	-9	0.5	Not prime

Note: Djt - diferential shift component in Pariaman City.

Table 4 shows that the superior capture fisheries commodities in Pariaman City include *E. tetradactylum*, *A. rochei*, *A. thazard* and *K. pelamis*. This commodity is a large pelagic fish, except for *E. tetradactylum*, which are demersal fish. The fish that are not included in the superior capture fisheries commodity in Pariaman City are *A. mate*, *Trachinotus* spp., *Decapterus* spp., *T. lepturus*, *Engraulidae*, *Makaira* sp., *L. campechanus*, *Rastrelliger* spp., *Epinephelus* spp., *L. vannamei* and *Loligo* spp. Determination of the superior capture fisheries commodity is based on the amount of production.

Eleutheronema tetradactylum. *E. tetradactylum* (Figure 1) is one of the capture fisheries prime commodities in Pariaman City. The results of the analysis show that the LQ value of *E. tetradactylum* is 2.76, which means that the fish is the base for capture fisheries in Pariaman City. The Djt value of *E. tetradactylum*, 59.4, indicates that the fish production growth is faster than that of the same fish species from West Sumatera Province, so that it has a competitive edge when compared to other regions. The SI of *Eleutheronema tetradactylum* in Pariaman City reaches 4.25%, which means that the fish is relatively specialized in production in Pariaman City. This fish is an important consumption fish in Kuwait, India, Thailand, Vietnam, Malaysia, Singapore and Indonesia (Motomura 2004).

E. tetradactylum belongs to the Polynemidae family, which consists of 41 species in 8 genera, which are epibenic fish and can be found in all tropical and subtropical marine waters. *E. tetradactylum* is a protandrous hermaphrodite fish (Motomura 2004). The number of fishing activities causes this fish stock to rapidly decline, marked by a drastic decrease in catch (Wijopriyono et al 2012). Wijopriyono et al (2012) state that In 2012, the production of *E. tetradactylum* was only 9273 kg with a very significant decrease in production, namely 49822 kg when compared to the production in 2008. The optimum sustainable production value (Catch Maximum Sustainable Yield) of *E. tetradactylum* was 4067 kg per year within an optimum fishing effort of 497 trips per year. Fishing effort in 2012 was 849 trips (170.8% of the optimum fishing effort), so there has been an overfishing of *E. tetradactylum* (Indra et al 2013).

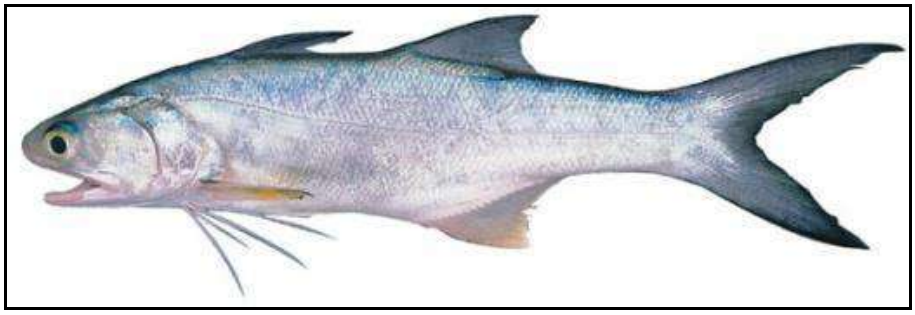

Figure 1. *Eleutheronema tetradactylum* (source: FishBase).

Auxis rochei. *A. rochei* (Figure 2) production in 572 Fisheries Management Area has been recorded in capture fisheries statistics starting from 2005. In the previous year, the production of all tuna species was recorded in statistical data for "tuna" only, without distinguishing the species. According to Pariaman City marine and fisheries statistics data (2018), *A. rochei* production from 2005-2012 showed a fluctuating trend, the lowest was in 2005-2007 and increased rapidly in 2008-2012. *A. rochei* only contributes 2% of all neritic tuna production originating from the waters of West Sumatera (Directorate General of Capture Fisheries 2013). This value is very small compared to the percentage of other types of mackerel, such as *A. thazard* by 26%. There is a possibility that the data recording officer in the field misidentifies it because morphologically, *A. rochei* and *A. thazard* are very similar. Apart from being marketed in the local market, neritic tuna has been caught by fishermen which also enter the industry and are exported. The level of cultivation of *A. rochei* that is continuous without the existence of control can cause its sustainability to be threatened, therefore accurate and precise scientific information is needed.

The length of the first ripe gonads (Lm) of *A. rochei* is 24.6 cm (Marine Fisheries Institute 2013). Based on the Lm value, the length distribution of *A. rochei* caught in the waters of West Sumatera shows that adult fish are 53% and immature fish are 47%. Setyadji et al (2013) obtained a more different range, namely 23-32 cm for mini purse seines and 20-28 cm for large purse seines (industrial scale) in the South Indian Ocean. One of the differences in the length of the fish caught is caused by the difference in the size of the mesh used. *A. rochei* population will be sustainable if the size caught is above the length of the first time the gonads mature. Continuous exploitation of juvenile *A.*

rochei by means of non-selective purse seine fishing gear will cause the sustainability of *A. rochei* to be threatened.

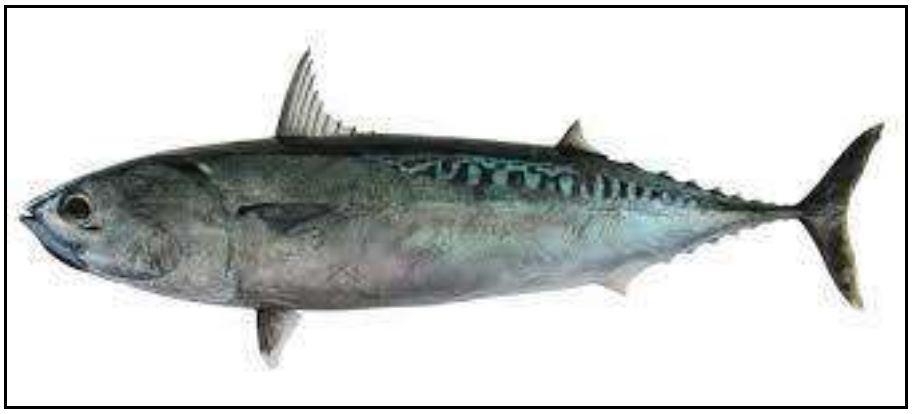

Figure 2. *Auxis rochei* (FishBase).

Auxis thazard. *A. thazard* (Figure 3) is a pelagic fish from the Scombridae family. This fish can be found in almost all tropical and subtropical waters (Collette & Aadland 1996; Liu 2008). *A. thazard* is included in neritic tuna with sea surface habitats up to a depth of 50 meters (Collette & Nauen 1983; Maguire et al 2006; Herera & Pierre 2009). The migration pattern is local with the optimum temperature between 27-27.9ºC. The catch of *A. thazard* is increasing every year with a variety of fishing gears (gill nets, purse seines and pole and line). IOTC (2014) reports that more than 90% of *A. thazard* catch is concentrated in four countries, namely Indonesia (59%), India (14%), Sri Lanka (11%) and Iran (7%). Thus, *A. thazard* is an economically important fish in Indonesia and one of its distribution areas in Western Sumatera, especially in the waters around Sibolga.

According to Ghosh et al (2012), the size of the fish first reached gonad maturity at a fork length of 29.7 cm. According to Tampubolon et al (2016), *A. thazard* in the waters of western Sumatra have a standard length of 34.89 cm. Based on the research of Ghosh et al (2012), the frequency of mature tuna landed at the Kusamba fish auction is only 12% of the total sample. This can be caused by the size of the mesh used by the fishermen, which is too small, causing immature fish to be unable to escape from the net.

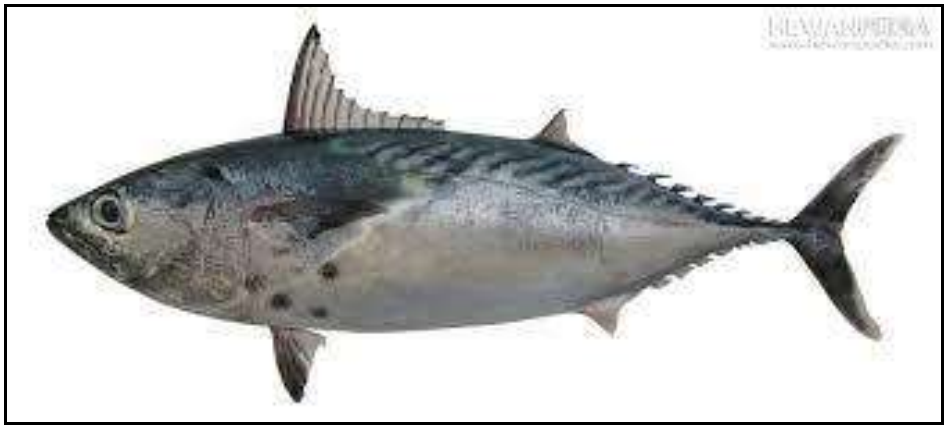

Figure 3. *Auxis thazard* (FishBase).

Katsuwonus pelamis. *K. pelamis* (Figure 4) is a highly migratory species and occupies tropical and sub-tropical waters (Arai et al 2005). Their distribution, movement and vulnerability are influenced by their preferred habitat. The presence of prey, suitable temperature and sufficient oxygen significantly affect the survival of *K. pelamis*. As a consequence, the spatial distribution of *K. pelamis* is seasonal and has an annual pattern (Mugo et al 2010).

The distribution of *K. pelamis* in Indonesia includes the Indonesian Ocean, the west coast of Sumatera, South Java, Bali, Nusa Tenggara, East Indonesian waters including the Banda Sea, Flores Sea, Maluku Sea, Makassar Sea (Uktolseja 1987). The fishing location for *K. pelamis* is determined by different seasons in each water. Catching *K. pelamis* can be conducted all year round. The results obtained differ from season to season and also vary according to the fishing location. According to Supriana et al (2014), the distribution areas for tuna and *K. pelamis* in Indonesia include the Banda Sea, Maluku Sea, Flores Sea, Sulawesi Sea, Indian Sea, Halmahera Sea, northern Aceh waters, west Sumatera, southern Java, northern Sulawesi, Tomini Bay, Cendrawasih Bay, and the Arafura Sea.

Rochman et al (2015) stated that the continuous use of *K. pelamis* in the Indian Ocean, especially in Indonesia's territorial areas, results in the utilization rate of *K. pelamis* in optimum conditions so that it needs caution and accuracy in its management. According to IOTC (2016), the status of *K. pelamis* stocks in 2014 in the Indian Ocean was in good condition. One aspect to support efforts to manage fish resources is basic knowledge regarding aspects of reproductive biology (Jatmiko et al 2015) and the spawning season (Suwarso et al 2015).

Research results of Rochman et al (2015), Zedta et al (2017) and Nurdin & Panggabean (2017) shpw that the capture length of *K. pelamis* in the South Indian Ocean, Java was 38.73, 39.4, and 40 cm, respectively, while the results of Hidayat et al (2017) in the Pacific Ocean showed a capture length of 40.1 cm. The difference in the length value of first catch in each region is strongly influenced by the fishing gear used. The average length in this study was 42.5 cm. The results of Nikijuluw (2009) and Jatmiko et al (2015) showed that the Lm of *K. pelamis* at maturity was between 41-43 cm in the Indian Ocean. Indian Ocean Tuna Commission (2014) reported that the Lm of *K. pelamis* is 44 cm. The Lm in the Western Indian Ocean is 37.8 cm (Grande et al 2010) and 44.7 cm in the Southern Indian Ocean, Bali (Hartaty & Arnenda 2019). These differences can occur because of the suitability of environmental conditions (Udupa 1986; Lambert et al 2003). In this study, *K. pelamis* caught in the Southern Indian Ocean, Java and Nusa Tenggara, had not yet reached gonad maturity. A large number of young fish caught will put the fish stock at risk.

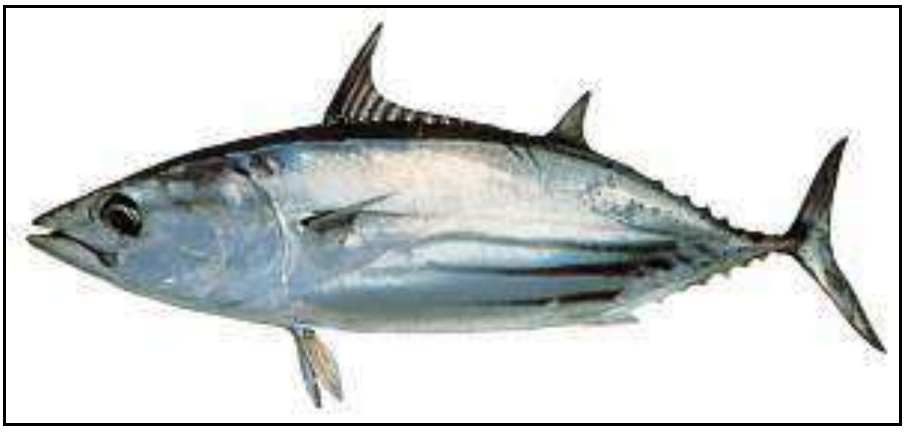

Figure 2. *Katsuwonus pelamis* (FishBase).

Government efforts to increase fishery potential. According to Suharno & Widayati (2015), there are several problems in fisheries on the coast of Pariaman City, namely the lack of welfare of fishermen, indications of over fishing, fluctuating fishery production, use of various kinds of fishing gear, fishing fleets which are still dominated. Small-scale/community fisheries and generally fishermen in small-scale fisheries have not been able to use the appropriate input as they should (unable to combine inputs optimally).

Government efforts to increase the potential for superior capture fisheries commodities in Pariaman City include diversification of prime fishery products, increasing public awareness in participating in fisheries and marine management, increasing

supervision in the utilization of fishery resources and building and developing industrial estates for prime capture fisheries commodities.

Conclusions. Main catch fisheries commodities in Pariaman City include *Eleutheronema tetradactylum* with a location quotient value of 2.76, differential shift of 59.4 and specialization of 4.25%. *Auxis rochei* present a location quotient value of 2.21, differential shift of 85.4 and specialization of 5.25%. *Auxis thazard* presents a location quotient of 1.48, differential shift of 229.2 and specialization of 5.53%. *Katsuwonus pelamis* had a location quotient value of 2.59, differential shift of 186.2 and specialization of 9.42%.

Conflict of Interest. The authors declare that there is no conflict of interest.

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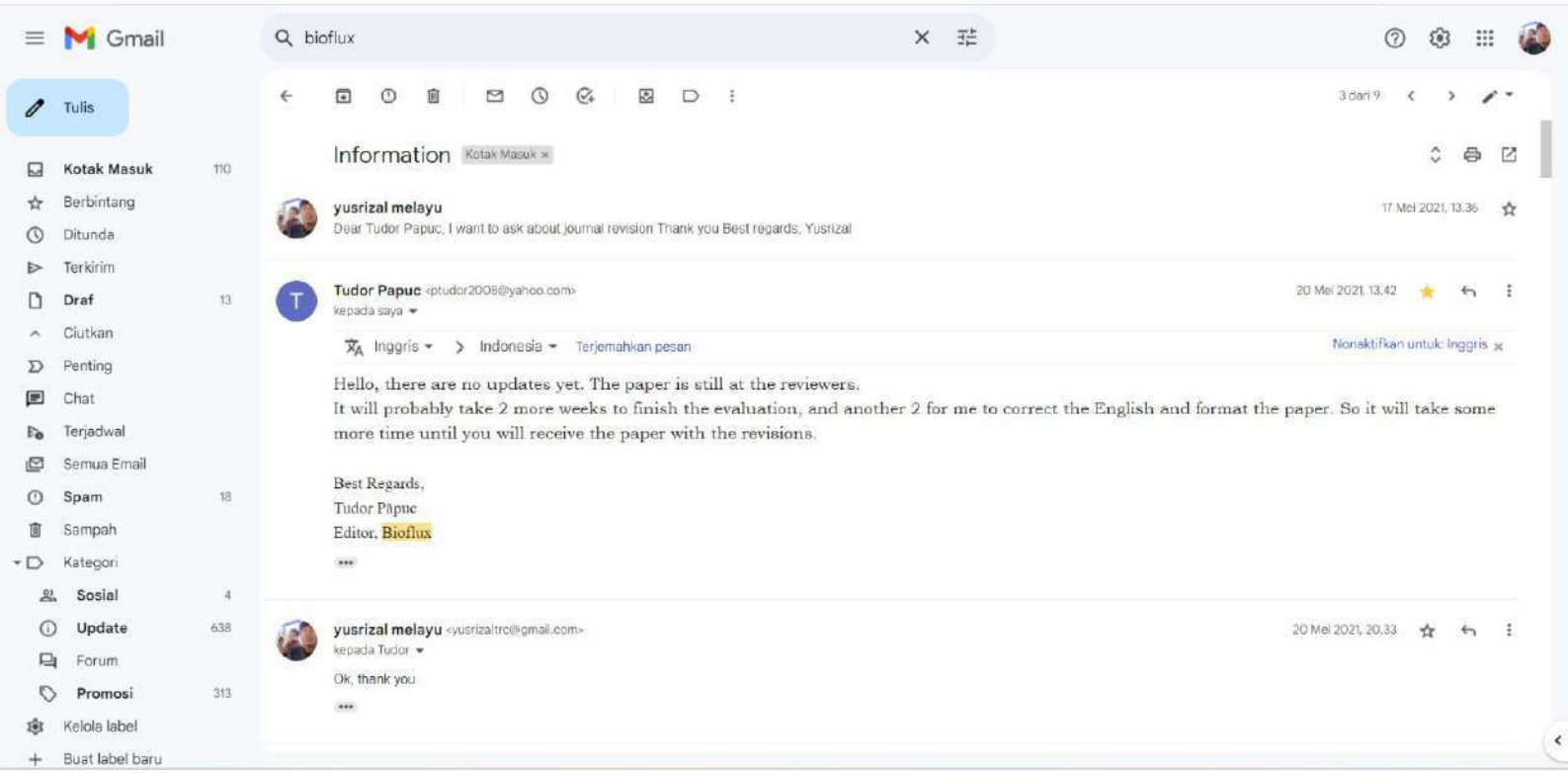
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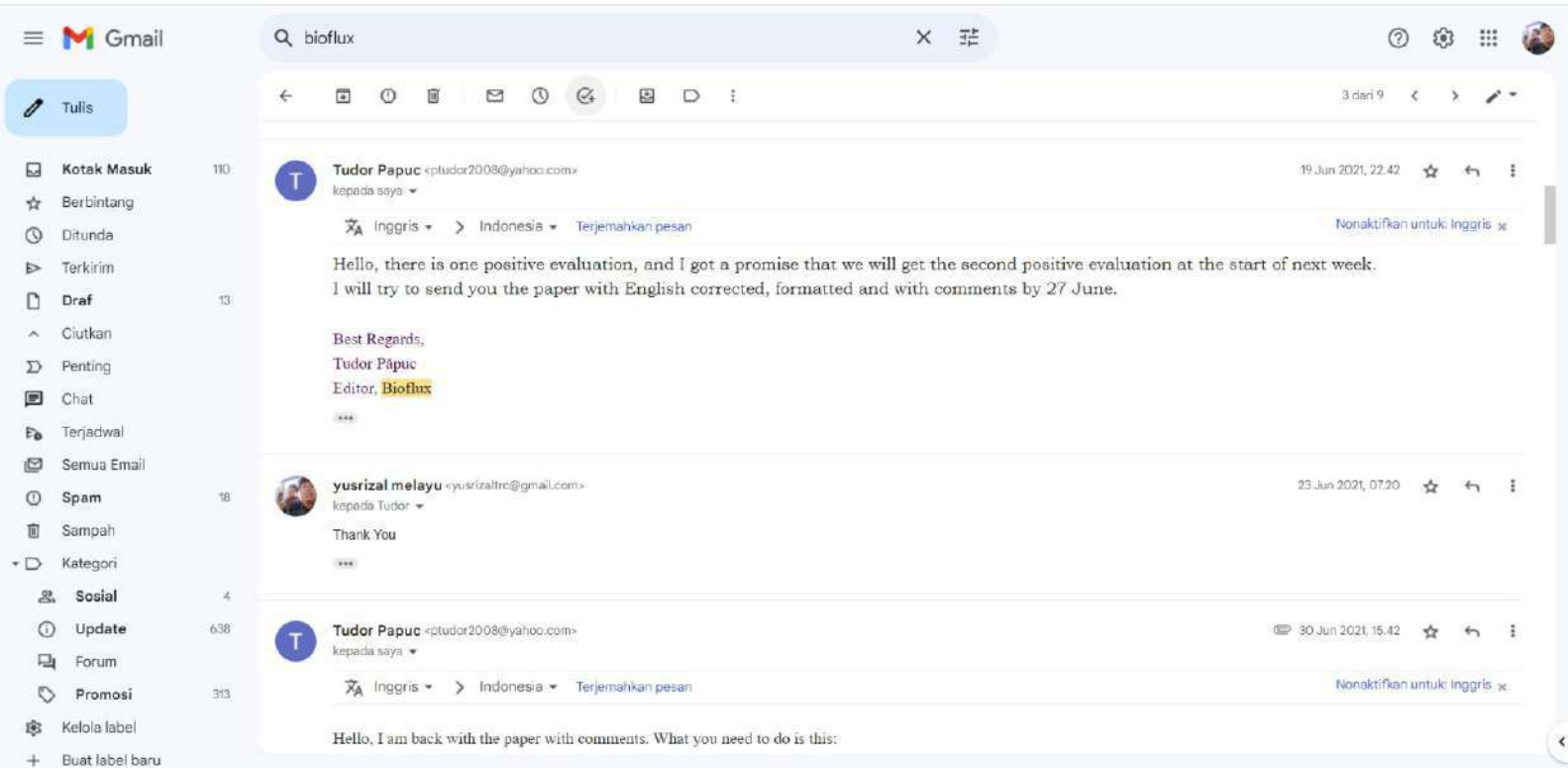
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Editor, Bioflux
yusrizal melayu <yusrizaltrc@gmail.com>
kepada Tudor
23 Jun 2021, 07.20
Thank You
Tudor Papuc <ptudor2008@yahoo.com>
kepada saya
30 Jun 2021, 15.42
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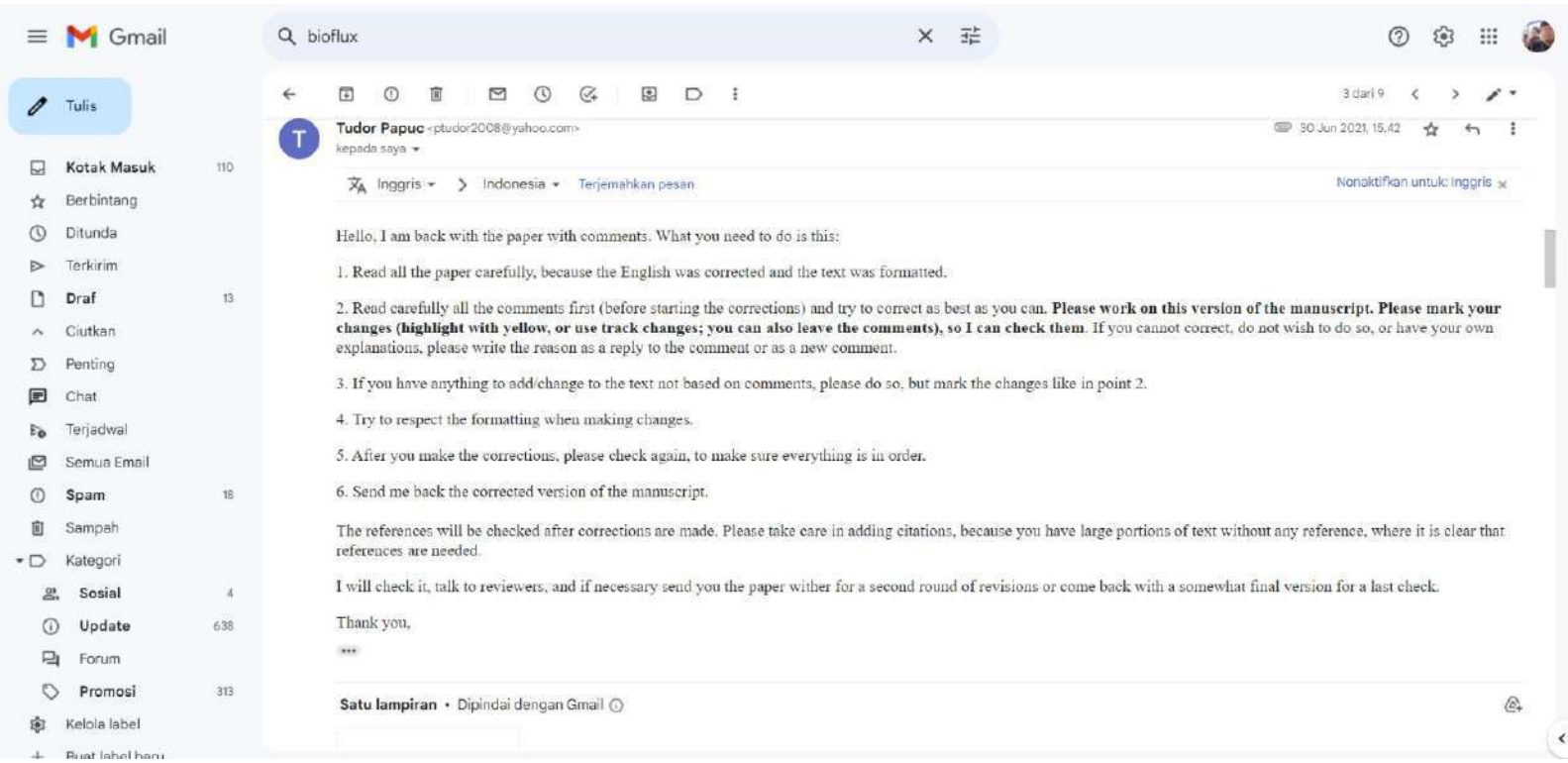
Hello, I am back with the paper with comments. What you need to do is this: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Tudor Papuc <ptudor2008@yahoo.com>
kepada saya
30 Jun 2021, 15.42
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Hello, I am back with the paper with comments. What you need to do is this:
1. Read all the paper carefully, because the English was corrected and the text was formatted.
2. Read carefully all the comments first (before starting the corrections) and try to correct as best as you can. Please work on this version of the manuscript. Please mark your changes (highlight with yellow, or use track changes; you can also leave the comments), so I can check them. If you cannot correct, do not wish to do so, or have your own explanations, please write the reason as a reply to the comment or as a new comment.
3. If you have anything to add/change to the text not based on comments, please do so, but mark the changes like in point 2.
4. Try to respect the formatting when making changes.
5. After you make the corrections, please check again, to make sure everything is in order.
6. Send me back the corrected version of the manuscript.
The references will be checked after corrections are made. Please take care in adding citations, because you have large portions of text without any reference, where it is clear that references are needed.
I will check it, talk to reviewers, and if necessary send you the paper wither for a second round of revisions or come back with a somewhat final version for a last check.
Thank you,
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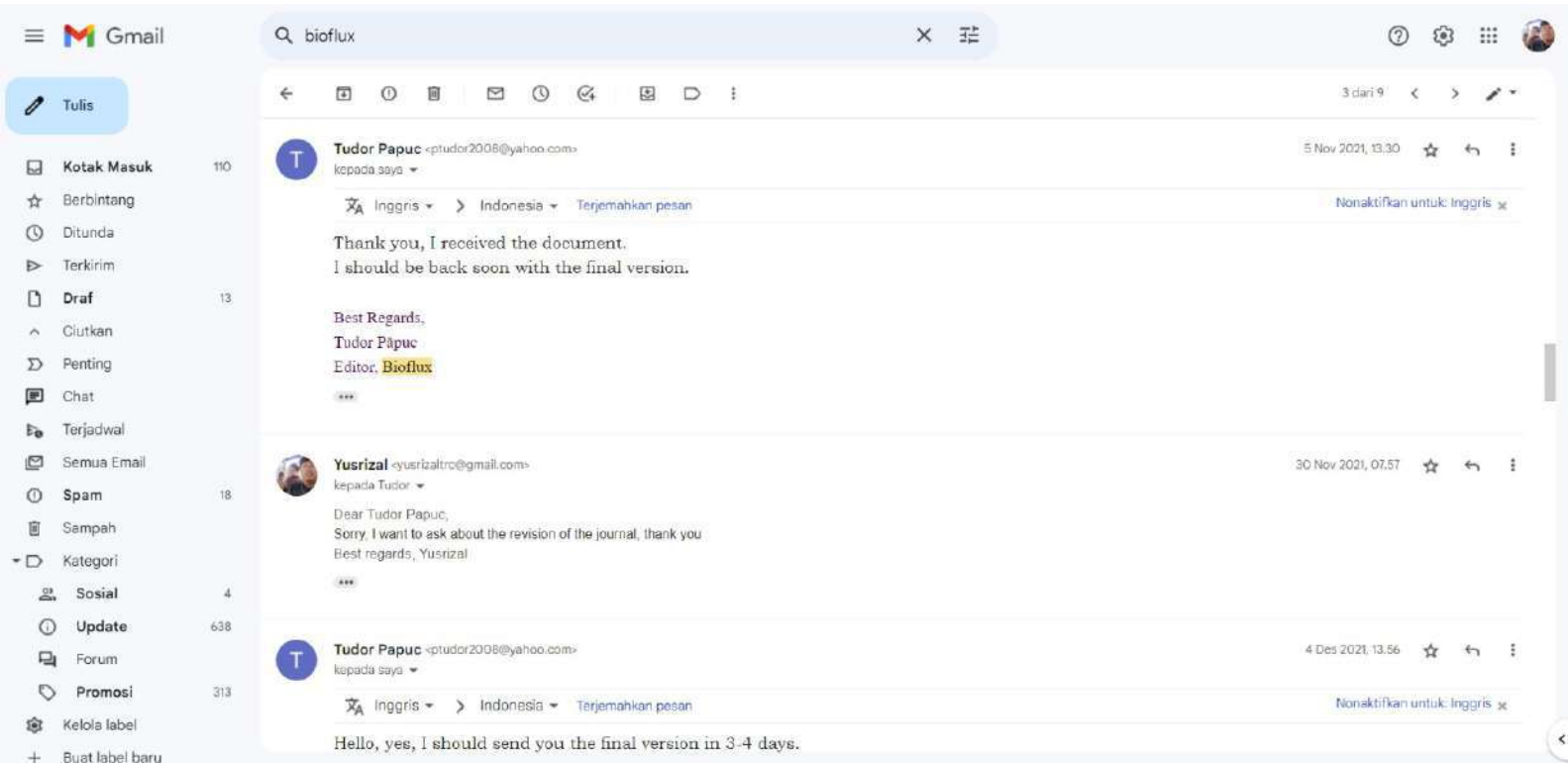
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Tudor Papuc <ptudor2008@yahoo.com>
kepada saya
5 Nov 2021, 13.30
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Thank you, I received the document.
I should be back soon with the final version.
Best Regards,
Tudor Păpuc
Editor, Bioflux
Yusrizal <yusrizaltrc@gmail.com>
kepada Tudor
30 Nov 2021, 07.57
Dear Tudor Papuc,
Sorry, I want to ask about the revision of the journal, thank you
Best regards, Yusrizal
Tudor Papuc <ptudor2008@yahoo.com>
kepada saya
4 Des 2021, 13.56
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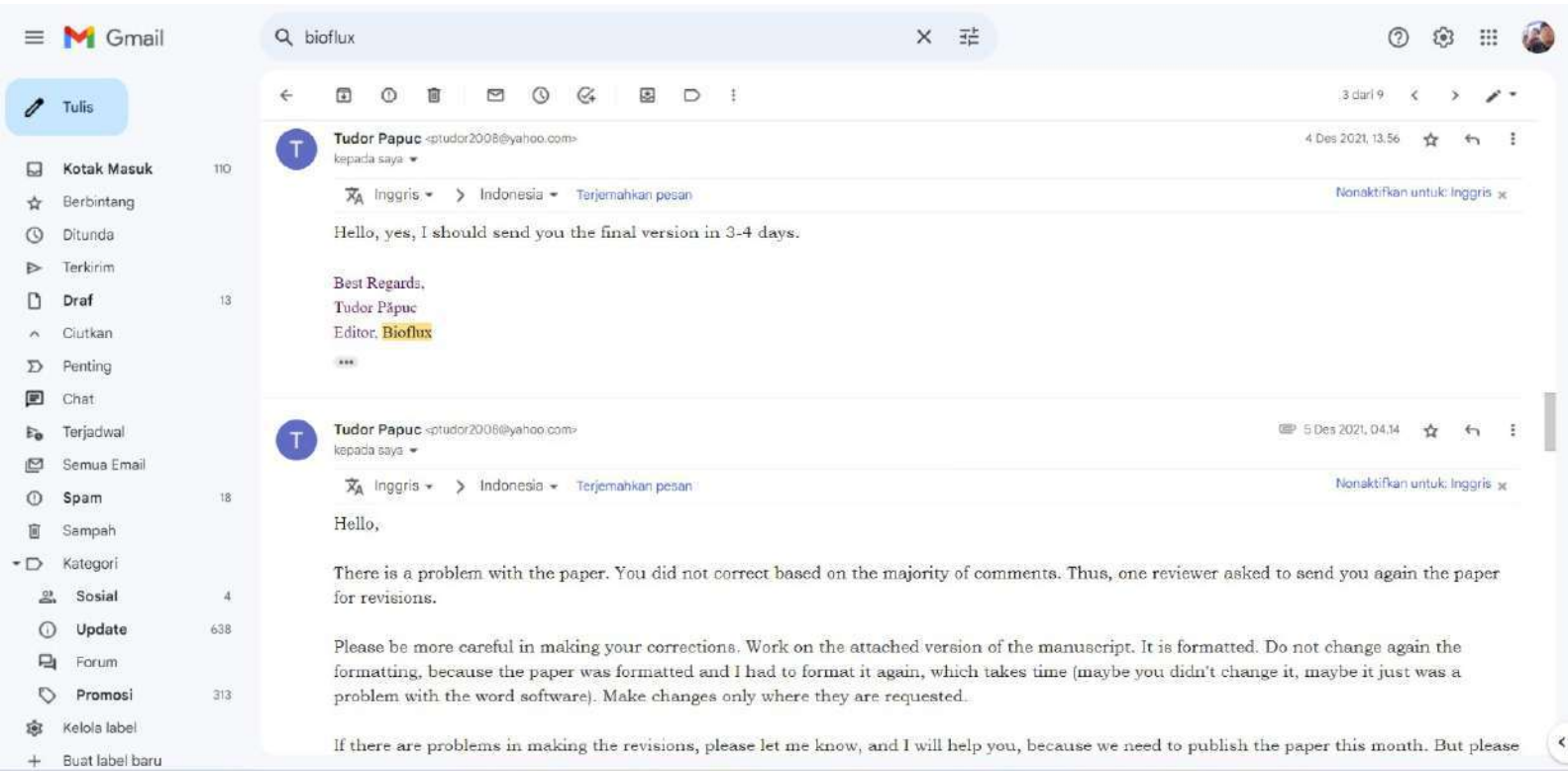
Hello, yes, I should send you the final version in 3-4 days.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Tudor Papuc <ptudor2008@yahoo.com>
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Hello, yes, I should send you the final version in 3-4 days.
Best Regards,
Tudor Păpuc
Editor, Bioflux
Tudor Papuc <ptudor2008@yahoo.com>
kepada saya
5 Des 2021, 04.14
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Hello,
There is a problem with the paper. You did not correct based on the majority of comments. Thus, one reviewer asked to send you again the paper for revisions.
Please be more careful in making your corrections. Work on the attached version of the manuscript. It is formatted. Do not change again the formatting, because the paper was formatted and I had to format it again, which takes time (maybe you didn't change it, maybe it just was a problem with the word software). Make changes only where they are requested.
If there are problems in making the revisions, please let me know, and I will help you, because we need to publish the paper this month. But please

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If there are problems in making the revisions, please let me know, and I will help you, because we need to publish the paper this month. But please be more careful, because we (authors, editor, reviewers) are all spending time on this paper, and it should correspond to the standards of the journal.

So make the changes, mark them with yellow, as you did before, and send me back the paper.

Thank you,

Best Regards,
Tudor Păpuc
Editor, Bioflux

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Yusrizal for revisi...