

SOCIAL PERSPECTIVE AND TECHNICAL FISHING OF TREVALLIES (*Caranx* sp) JUVENILES IN AMBON BAY

Perspektif Sosial dan Teknis Penangkapan Benih Ikan Kuwe (*Caranx Sp*) di Teluk Ambon

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ABSTRACT

Juvenile Trevallies (*Caranx* sp) fishing provides superior natural seeds for fish farmers using floating cages. Seeds from nature have a lower mortality rate than from hatcheries, but the activity of fishing and availability of natural seeds has not been a scientific concern. We tried to involve in the process of juveniles trevallies fishing in Ambon bay and interviewed fishers who caught the fish aiming to learn their fishing technique to catch juvenile trevallies, map the fishing ground of *Caranx* sp in Ambon Bay, and analyze the catches based on social and technical perspectives. Data collection was carried out from May to July 2022. Direct interviews were conducted to respondents from Galala Village, Ambon Municipality. The respondents were fishers who captured juvenile trevallies as seeds, so we could be able to participate in their fishing trips. Respondents were consisted of junior to senior fishers and varied in fishing experience. Since the floating cages were operated at Ambon Bay, the fishing on juvenile trevallies have been started around 2013. Seagrass beds in the inner part of Ambon Bay are the habitats for juvenile trevallies. The small size of juveniles is more abundant than the bigger fish, and the average catch during 5-years interval increased slowly. Based on the social and technical perspective, the practice of juvenile trevallies fishing is categorized as sustainable fishing due to the proportional harvesting to the population productivity. Maintaining trevally population in Ambon Bay, its biological perspectives should be continuedly studied.

Keywords: Ambon Bay; *Caranx* sp; Catch of juveniles; Trevallies aquaculture.

ABSTRAK

Penangkapan benih ikan kuwe (*Caranx* sp) membantu ketersediaan benih alam yang unggul bagi nelayan pembudidaya di keramba jaring apung (KJA). Benih dari alam mempunyai tingkat mortalitas lebih rendah dibandingkan benih dari *hatchery*, namun aktifitas penangkapan dan ketersediaan benih alami belum menjadi perhatian ilmiah. Kami mencoba mengikuti proses penangkapan benih ikan kuwe di teluk Ambon dan mewawancarai nelayan penangkap benih dengan tujuan mempelajari teknik penangkapan benih ikan kuwe yang beroperasi di teluk

Ambon, memetakan daerah penangkapan ikan kuwe, *Caranx sp* di Teluk Ambon, menganalisis hasil tangkapan benih ikan kuwe berbasis perspektif social dan teknis. Pengumpulan data dilaksanakan pada bulan Mei hingga Juli 2022. Wawancara langsung dilakukan terhadap responden dari Desa Galala, Kotamadya Ambon. Responden merupakan nelayan penangkap benih sehingga kami dapat mengikuti operasi penangkapan benih. Responden terdiri dari nelayan junior hingga senior dengan pengalaman menangkap benih ikan kuwe yang bervariasi. Diperkirakan penangkapan benih ikan kuwe dimulai sejak adanya usaha KJA di Teluk Ambon pada tahun 2013. Hampir semua pantai berlamun di Teluk Ambon Bagian Dalam merupakan habitat benih ikan kuwe. Hasil tangkapan benih berukuran kecil lebih melimpah dan semakin besar ukuran benih hasil tangkapan berkurang. Estimasi jumlah rata-rata benih tertangkap selama interval waktu 5 tahun menunjukkan peningkatan yang rendah. Berbasis persepektif social dan teknis, kami menyimpulkan bahwa perikanan benih ikan kuwe mempraktekkan perikanan yang berkelanjutan, karena menangkap benih proporsional dengan produktifitas populasi yang ada di alam. Untuk menjaga populasi ikan kuwe di teluk Ambon, pengamatan biologi ikan kuwe masih perlu dilaksanakan.

Kata kunci: Budidaya ikan kuwe; *Caranx sp.*; Penangkapan benih; Teluk Ambon

INTRODUCTION

The capture of pompano (*Carangidae*) seeds from a body of water is a fact of the recruitment process occurring in that water. Recruitment can be defined as the number of fish from a certain cohort or age class (year class) that enter the exploitation phase of a fishery where individuals that are smaller than the stock in a certain time period will grow to be large (Ricker, 1954). In other words, the number of fish from a cohort or age class that will be ready for exploitation in a period of time (for example in years). Recruitment is important for fisheries entrepreneurs because it has a direct effect on the subsequent abundance of fish, and the size of the harvest that can be caught.

Fishing for trevally in nature is increasing, one of which is tiger trevally (*Gnathanodon speciosus*), causing disruption to sustainability and causing damage to the coral environment due to inappropriate fishing methods such as the use of cyanide poison (Setiadharmas *et al.*, 2009). These trevally fish fry can reach juveniles at the age of 30-35 days and grow relatively quickly with a length of 23.9-26.6 cm. Catches of pompano continue to increase in line with the growth of cultivation. Even though pompano fish seeds can be hatched in hatcheries, wild seeds still have higher survival rates with lower mortality rates.

Pompano is a type of fish that belongs to the Carangidae family. This fish usually lives in shallow coastal waters, corals and rocks, and can naturally spawn, and is not seasonal. This pompano grows relatively quickly, the lifespan of juveniles can reach 30-35 days, and also reaches a length of 23.9-26.6cm at a weight of 282.2-383.9g. Randall *et al.*, (1990) stated that pompano are pelagic and active at night (nocturnal). Generally forms large groups although there are also types that are found living solitary lives. This group of fish is often found in brackish waters, coral reefs and offshore waters to a depth of 350 m, but sometimes some enter rivers (Myers, 1991; John & Lythgoe, 1992). The distribution of fish in the genus *Caranx* covers all tropical and subtropical waters (Masuda *et al.*, 1984).

Marine fish farming has been developing for quite a long time in Ambon Bay, supported by the availability of fish seeds for rearing. The availability of local seeds is very helpful for fish farmers because the durability of the seeds is better than seeds hatched in laboratories (hatcheries). From a capture fisheries perspective, selective fishing for juvenile-sized fish can reduce population numbers because the fish are not given the opportunity to spawn. Although naturally the population of juvenile fish is greater than the population of adult fish, if fishing is carried out continuously it will result in a decrease in the overall population. What needs to be

considered is how much selective fishing there is for juvenile fish and to what extent the condition of the seed fishery is, whether it is still under exploited, fully exploited or already over exploited. There have been almost no observations of cultivated fish seed capture fisheries operating in Ambon Bay. Monitoring the availability of cultivated fish seeds must be carried out immediately before seeds for cultivation become increasingly scarce.

Until now, the main issue regarding the availability of seeds in nature for cultivation needs has not been supported by accurate data about seed potential. Information about seed distribution, seasons, fluctuations in seed catches and fishermen catching seeds is very necessary in managing the potential of seeds in nature due to the lack of well-conducted research (Erlania *et al.*, 2017). The aim of this research is to study the fishing techniques for pompano fish operating in Ambon Bay, to map the fishing areas for pompano, *Caranx* sp in Ambon Bay, to analyze the catch of pompano fish seeds based on social and technical perspectives. Considering that the effort to catch pompano fish seeds is increasing in line with the effort to cultivate trevally fish in floating net cages, the results of this research are useful for managing the catch of pompano fish both in terms of the type of fishing gear and also for maintaining the sustainability of the pompano fish population.

METHODS

This research was carried out in May - July 2022, located in Ambon Bay, precisely in Galala Village. Galala Village is one of the domiciles of fishermen catching trevally fish seeds. Galala is a village or country located in Sirimau District, Ambon City, Maluku, Indonesia. Led by a king, Galala has long been known as a culinary village for seafood, namely *Ikang Asar* or fish cooked by smoking. The area of Galala Country is 1.2 Ha. The waters of Galala beach are sandy beaches and have a seagrass ecosystem (Rosmawati *et al.*, 2020). As an estuary with a fairly large supply of fresh water from the Galala River, Galala Beach is also a fishing area for trevally.

The material used was a questionnaire to interview fishermen who caught tern. The questionnaire contains a series of questions which are divided into 5 parts, namely: (i) profile of fishermen catching trevally seeds, (ii) fishing area, (iii) fishing gear, (iv) catch results and finally (v) is an important agenda or event that has occurred and has an impact on catching seeds such as COVID-19 and others.

Two sampling methods were used, including interviewing respondent fishermen and monitoring the catching of trevally by fishermen who caught the seeds. In four villages that have fishermen catching seeds, this research was carried out from one place to another to see how pompano fish are caught. There are various methods of catching pompano fish carried out by local village fishermen using nets and fishing rods. The bait used also varies, artificial nipple bait and snail bait.

Respondents consisted of fishermen who had carried out and were currently carrying out operations to catch pompano fish seeds in Ambon Bay. Questionnaire-based interviews were conducted face-to-face while following fishing operations to observe fishing techniques. Through previous respondents, the names of other respondents in Galala Village were obtained so they could be interviewed. The interview results were tabulated into an Excel application data sheet with variables of respondent profile, fishing area, fishing gear and catch. Data from interviews were tabulated and analyzed descriptively.

RESULT

Profile of Respondent Fishermen

The number of respondents in this study were 10 fishermen who caught pompano (*Caranx* sp). Of the respondents, 50% had their livelihood only as fishermen catching seeds while the

other 50% had additional jobs as construction workers (30%), cultivating fishermen (10%) and traders (10%) (Table 1).

The age of the respondent fishermen ranged from 34 years to 71 years (average 49.2 years with a deviation of 10.4 years) with length of experience catching fry ranging from 5 years to 30 years (average 4.8 years with a deviation of 8.8 years). Respondent fishermen informed that fishermen started catching seeds from 1980 to 2018 with an average of 2008. These results provide an illustration that the need for trevally fish seeds to support the floating net cage (KJA) cultivation business has been going on since 2008 and the number of fishermen has increased after 2010.

Table 1. Data on the profile of fishermen respondents catching trevally fish seeds (*Caranx* sp)

No	Respondent Code	Another job	Age (years)	Experience catching seeds (years)	year of catching seeds
1.	Galala01	Construction laborers	52	5	2015
2.	Galala02	Construction laborers	52	23	1994
3.	Galala03	There isn't any	48	17	2005
4.	Galala04	There isn't any	45	8	2014
5.	Galala05	There isn't any	41	4	2018
6.	Galala06	Trader	59	30	2012
7.	Galala07	There isn't any	41	12	2010
8.	Galala08	Cultivation	34	22	2014
9.	Galala09	Construction laborers	49	7	2015
10	Galala10	There isn't any	71	20	1980

Tools and Methods for Catching Pompano Fish Seeds

The tools used by respondent fishermen to catch trevally fish seeds consisted of nets (20%) and fishing rods (100%) considering that there were 2 fishermen who used both fishing tools. The hook sizes used range from number 11 to 20, targeting various sizes of trevally. The average number of fishing rods owned by fishermen is 1 fishing rod with different operating techniques: (i) tackle and rod fishing techniques (50%), hand line fishing techniques (40%) and trolling poles (10%) (Table 4). The bait used is natural bait such as hermit crabs or sea creatures (Figure 1).

The trolling method used by the oldest fisherman respondent (71 years) is to troll a fishing line that is released in estuary waters or river mouths. The fishing line is pulled slowly, pulled while combing the mouth of the river, starting from the Mardika river to the mouth of the Lateri river.



Figure 1. Beetle bait (*Gastropoda*) and Rubber nipple bait (artificial bait) which is used to catch pompano fish fry

Table 2. Fishing gear in the pompano fishery in Ambon Bay

Respondent code	Catching tool	Capture method	Number of tools	Year usage	Hook number
Galala01	fishing rod	Huhate	1	2015	18,20
Galala02	fishing rod	Huhate	1	1994	19,20
Galala03	fishing rod	Huhate	1	2005	20
Galala04	fishing rod	Huhate	1	2014	19,20
Galala05	fishing rods and nets	Hand fishing line	2	2018	16,20
Galala06	fishing rod	Huhate	1	2012	19,20
Galala07	fishing rods and nets	Hand fishing line	2		18,20
Galala08	fishing rod	Hand fishing line	1	2014	16,17,18,19,20
Galala09	fishing rod	Hand fishing line	1	2015	20
Galala10	fishing rod	Fishing rod	1	1980	11,15,16,20

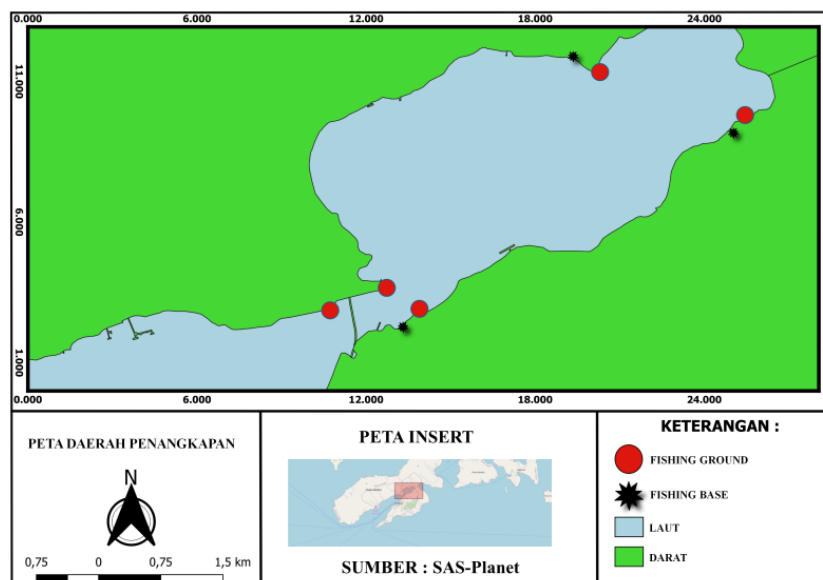


Figure 2. Location of catching pompano fish seeds in Ambon Bay

Table 3. Location of catching pompano fish seeds in Ambon Bay

Respondent code	Arrest location	Number of trips/week	Sign of the presence of seeds
Galala01	Galala Beach, Kapaha, Poka	3	There isn't any
Galala02	Galala Beach	7	There isn't any
Galala03	Galala, Tanjung Marthafons	3	See the fish on the surface of the water
Galala04	Poka (Bawah JMP), Tanjung Marthafons	4	Water brightness
Galala05	Nania, Passo, Negri Lama	4	There isn't any
Galala06	Galala, Lateri, Waiheru, Passo	7	See the fish on the surface of the water
Galala07	Nania, Passo, Negeri Lama	4	There isn't any
Galala08	Galala, Hatiwe kecil, Kapaha, Losari Beach	7	There isn't any
Galala09	Galala, bawah JMP	4	Water brightness
Galala10	All Places	7	ups and down

JMP: Jembatan Merah Putih

The fishing locations for pompano fish fry were quite diverse among respondent fishermen (Table 3). There are fishermen who focus on just one (1) area, such as Galala Beach, and will move to fishing points that are still in the waters of Galala Village. There are also fishing areas at Tanjung Marthafons, under the Red and White bridge, Waiheru, Negeri Lama, Nania, Passo and Lateri. Figure 1 shows the points in the catching areas for trevally fish seeds by the respondent fishermen and the ordinate points of the researcher's observations. These fishing points are dominated by seagrass habitat supported by estuary waters. The number of trips to catch pompano fish seeds was an average of 5 days (± 1.7 days standard deviation) in 1 week. As many as 40% of respondent fishermen have 7 day trips per week, they are senior

fishermen with work experience of more than 20 years, the rest have less than 5 day trips per week.

Half of the respondents did not use general or specific signs to determine the fishing area for trevally (Table 5). The remaining 20% of fishermen see signs of fish from the surface of the water, 20% rely on the brightness of the water so they can see the presence of trevally in the water and 10% use tidal benchmarks.

Catch of pompano fish seeds

Respondent fishermen reported that the types of pompano caught on average consisted of 3 types. The type of pompano fish with the characteristic yellow color with black vertical stripes is *Caranx ignobilis*. The type characterized by blue color and thin skin is *Caranx melampygus*. There is also a pompano fish that is silver on the dorsal side and black on the ventral side, namely *Caranx sexfaciatus*. The first two types are more commonly reported to be caught by fishermen. It was also reported by fishermen that this type of pompano fish has red eyes and is given the local name bobara taifly.

The number of fish seeds caught per fishing trip in different time periods shows an increase (Figure 5). Interview results show that before 2010, the average catch of seeds per trip reached 400 individuals, increasing to 790 individuals in 2010-2015. At the interval of the next 5 years, the catch of seeds increased to 1045 individuals but decreased in the last 2 years to 607 individuals. The large standard deviation of catches illustrates that the diversity in the number of catches per respondent fisherman is very high and indicates diversity in the ability to catch pompano fish seeds. The size selectivity of fish caught is dominated by fry measuring 40-60mm. On average, 264 fish were caught with a size of 40-60mm, 51 individuals for a size of 61-80mm, 55 individuals for 81-100mm and 47 individuals for 101-120mm. The availability of seeds in nature is dominated by small fish so they are more vulnerable to fishing.

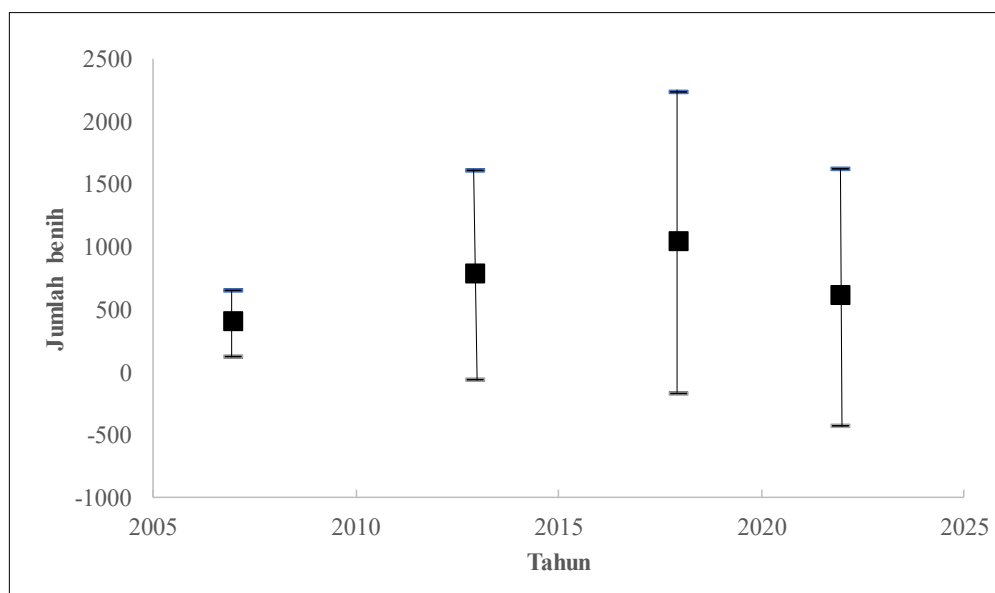


Figure 3. Average number of pompano fingerlings (\pm standard deviation) per fishing trip at 5 year intervals since 2005

DISCUSSION

According to the results of interviews, in Ambon City there are 4 fishing villages that collect fish seeds, including Waiheru Village, Galala Village, Negeri Rumah Tiga and Negeri Lateri, but the largest number of fishermen is in Galala village. The number of fishermen catching fish seeds has not been recorded in Ambon City fisheries statistics compared to fishermen cultivating trevally. The number of cultivating fishermen in Ambon City is 448 (statistic.kkp.go.id). This indicates that fishermen who catch trevally fish seeds are not yet categorized as fishermen with certain specifications, but are only classified as marine fishermen. In sustainable fisheries management, the development of the number of fishermen according to specifications is needed to represent the distribution of catches (Basurto *et al.*, 2017), to estimate catches (Zeller & Pauly, 2015), estimate the amount of fishing activity (Cohen & Alexander, 2013) and suspecting overfishing (Finkbeiner *et al.*, 2017). Monitoring the development of the number of fishermen catching pompano seeds needs to be carried out in order to maintain the sustainability of the availability of seeds in nature.

Fishermen who catch trevally seeds have an important role in the floating net cage business. From a fishermen's perspective, fish seeds from hatcheries are less durable so the mortality rate is high when kept in cages. The results of natural seeds are more durable during maintenance (Mosse & Hutubessy, 2023).

It is thought that the catching of pompano fish was initiated by senior fishermen who have been fishing for pompano since 1980, represented by 20% of respondents. The seeds are of a size suitable for consumption so they are not sold as seeds. And when the KJA business emerged, the catch of finger-sized trevally fish increased even more. Based on publications and available data, fish production from KJA was only recorded in 2013 (Maluku Fisheries Annual Report 2013). Research on parasites of pompano fish kept in marine cages in Ambon Bay was also carried out in 2014 (Ode, 2014). Thus, it can be estimated that seed capture to support KJA cultivation took place before 2013, although there is still no definite information. With the opening of fish rearing cultivation activities in KJA, other business opportunities can also be developed, such as catching pompano fish seeds.

Judging from the number of fishing trips, fishermen who catch trevally seeds are artisanal fishermen, namely fishermen with simple equipment and capital who carry out short fishing trips (one day fishing trips) (Retnowati, 2011). Experienced fishermen will rely on their memory to look for fish so they do not need signs (Salas *et al.*, 2004). They also rely on tides which are related to fish eating activities (Yunita & Zainuri, 2021). When the tide reaches its peak, the current moves quite fast, bringing food in and out of shallow water, triggering increased fish eating activity, and that is when fishermen believe that fish will be easily caught by fishing rods (Forbes, 2020). Pompano fish seeds can be seen in shallow waters. In areas overgrown with seagrass, juvenile pompano can clearly be seen swimming and swooping among the seagrass and their bodies have a prominent silvery color. By placing snail or nipple bait around the seagrass, juvenile pompano can quickly be attracted and grab the hook. Pompano are carnivorous fish that can swim faster than other types of marine fish. With its fast swimming ability (103.2 cm/second), this fish is very efficient in utilizing available bait (Telleng *et al.*, 2013). Unfortunately, this arrest process has not been exposed to the public. In contrast to the fishing for lobster and eel seeds, it has been published (Imron *et al.*, 2018; Nurdin *et al.*, 2023).

According to information obtained from respondent fishermen, catching pompano fish seeds can be done in almost all coastal waters of the inner Ambon bay, including the waters in front of the Mardika Ambon market. The availability of pompano fish seeds in the inner Ambon Bay cannot be separated from the understanding that Ambon Bay is a recruitment area and nursery ground for juvenile pompano. The fertility of the waters of Ambon Bay has been

proven in the results of previous research which shows that the inner part of Ambon Bay is a breeding area for beronang fish with living areas of seagrass beds (Mosse and Hutubessy 1996). Ambon Bay is also a rearing area for anchovy and sardine larvae (Hutubessy, 2009; 2022).

Based on the size of the seeds caught and the number of production in a 5 year interval, the larger the size of the seeds, the number caught decreases and the number of production only shows a small increase, almost level-off. In accordance with the natural productivity of a fish population, productivity decreases following an increase in fish size (Garcia *et al.*, 2012; Kolding & Van Zwieten, 2014). Thus, fishing for pompano is an ecosystem-based fishing, namely fishing is proportional to the productivity of the existing population (Bundy *et al.*, 2005; Jacobsen *et al.*, 2013; Law *et al.*, 2016; Plank *et al.*, 2017). This is one of the sustainable fisheries practices (Suman *et al.*, 2017)(Tapilatu, 2018)(Imelda *et al.*, 2019). In addition, the production of pompano fish seeds in Ambon Bay has not shown a significant increase, it can be concluded that the current fishing for pompano fish seeds (*Caranx* sp) in Ambon Bay will not disturb the stock of the pompano fish population in nature. There is also a need for the availability of pompano fish seeds for grow-out cultivation which are seeded in laboratories or hatcheries so that the pompano fish population in Ambon Bay is not disturbed, the needs of cultivating fishermen are still met and the income of fishermen catching seeds is not reduced.

CONCLUSION

The fishing locations for pompano are spread from Poka beach, Waiheru, Nania, Negeri Lama, Passo, Lateri, Galala, Hative Kecil to Mardika market. All of them have seagrass ecosystems which are breeding grounds for trevally (Assa *et al.*, 2015). When compared to the seagrass beds outside Ambon Bay, it is not certain that young pompano can be found. There are other factors that also influence the existence of trevally, and we suspect that this is the influence of estuary areas where there is freshwater input into the seagrass ecosystem. All of the fishing areas above have small rivers that empty into the beach.

From a social perspective, the existence of pompano fish fishermen has existed since KJA began operating in Ambon Bay. Although there is no certainty that KJA will start operating in Ambon Bay, it is estimated that in 2008 KJA activities will start to become busy and this will be followed by catching seeds to meet the needs of this business. The small number of fishermen who catch seeds have diverse ages, experiences and educational backgrounds. Based on the facilities and fishing effort carried out, seed fishing fishermen are categorized as traditional commercial fishermen, both part-time fishermen and full-time fishermen.

From the technical perspective of catching pompano fish seeds in Ambon Bay, the abilities of fishermen are quite varied, some rely on signs but others do not need signs. This indicates that catching seeds in shallow waters is more certain (certainty) than in deeper waters. The fishing location is in the estuary area (at the mouth of the river) which is the growing area for trevally. By knowing the time of fish activity (around 6 – 9 am), fishermen can make catches.

The trevally fish (*Caranx* sp) seed fishery in Ambon Bay is considered a sustainable fishery, but the availability of hatchery seeds must also be increased so that the trevally fish population in Ambon Bay is not disturbed and the income of fishermen who catch the seeds remains stable. Research on the biology of pompano fish in Ambon Bay is still needed to be able to prove the adequacy of natural pompano fish seeds needed by cultivating fishermen and the adequacy of adult pompano fish stocks for catch fishermen.

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