



The fishermen's socio-economic characteristics that support conservation among the community in Karimunjawa Marine Protected Area

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Abstract. Karimunjawa Island is part of the Karimunjawa Marine Protected Area, where the community mainly do fishing for living. It is necessary to understand the socio-economic characteristics of local communities on Karimunjawa Island in order to optimize the conservation of the area since adequate local community welfare helps achieve the conservation goals. This research gathered information from about the socio-economic characteristics of fishermen on Karimunjawa Island in relation to the conservation program. This research was conducted in July-August 2023, where primary data were collected through interviews with 234 respondents. Quantitative descriptive approach was employed in data analysis. Fishermen's profits were analyzed based on the BC ratio, which results revealed hand line as fishermen's main fishing gear with an average BC ratio of 2.39 in the normal season and a BC ratio of 7.47 in the peak season. Fishermen on Karimunjawa Island are multi-ethnic with low education background and strong respect for local figures. In terms of income, housing, energy sources, fresh water sources, access to education and health, the community could be regarded relatively prosperous. Fishermen there also have positive attitude towards conservation as they are aware that their welfare relies on the sustainability of the natural resources.

Key Words: BC ratio, fishermen, Karimunjawa island, socio-economic.

Introduction. Karimunjawa Island is the largest island of the Karimunjawa Islands which consists of 27 islands. The Karimunjawa Islands located at coordinates 5°40'39"-5°55'00" South Latitude and 110°05'57"-110°31'15" East Longitude have been designated as a marine conservation area since 1986. The area is the habitat of numerous protected aquatic biotas, including bottlenose dolphins (*Tursiops aduncus*), green turtles (*Chelonia mydas*), hawksbill turtles (*Eretmochelys imbricata*), and plive ridley turtles (*Lepidochelys olivacea*) (BTNKJ 2019; Fafurida et al 2020; Wijayanto et al 2022a). Karimunjawa Island is the center of government and economic activities for 10,116 population in 2021, 48.72% of which lived on Karimunjawa Island (BPS-Statistics of Jepara Regency 2022). Given this demographic concentration, the development and progress on Karimunjawa Island assume great significance as it directly impacts the welfare of the local population and influences the effectiveness of water conservation programs throughout the Karimunjawa Islands.

The integration of conservation efforts and the welfare of the local population is of utmost importance. Conservation programs can face failure if the well-being of the local people is not adequately addressed (Johannesen 2007; Rakotonarivo et al 2017; Zamroni 2018; Sapoetra et al 2019; Wijayanto et al 2022a). The community in Karimunjawa Islands have lived in the Karimunjawa Islands through generations. Specifically, the male population on the islands amounts to 5,183 individuals, out of which 3,846 are aged 15 years and older. Among them, 1,386 people work as fishermen (BPS-Statistics of Jepara Regency 2022, 2023). Even on small islands (among them Parang Island and Nyamuk Island), almost the entire adult male population works as fishermen. Some residents in Karimunjawa Islands do have multiple professions, such as doing fishing and farming for living. Specifically on Karimunjawa Island, more diverse professions were found such as fishing, farming, tour guiding, civil servants, and private employees. This research

overviewed the socio-economic characteristics of fishermen on Karimunjawa Island in regards to the socio-economic development of the community on Karimunjawa Island.

Material and Method

Location and time of research. This research was conducted on Karimunjawa Island from July–August 2023.

Data collection. Interviews were conducted with 234 fishermen to gain the primary data. Informants had agreed to be interviewed.

Data analysis. Data analysis was carried out using a descriptive-quantitative approach to gain insights about the living conditions, income, expenses, health, social, culture, health, and opinions about conservation. The benefit/cost (B/C) ratio of fishing business was also calculated using the following formulas (Wijayanto et al 2019; Wijayanto et al 2020; Bekoe et al 2021):

$$\pi = TR - TC \quad (1)$$

$$BC = TR/TC \quad (2)$$

π is the profit (in IDR trip⁻¹), TR is the total revenue (in IDR trip⁻¹) and TC is the total cost (in IDR trip⁻¹). While BC is the benefit cost ratio.

Results and Discussion. The Karimunjawa Islands have become a matter of concern for multiple stakeholders, encompassing marine and fishery conservation, forest conservation, tourism, settlements, and hotel development. The diverse range of interested parties has led to a high level of complexity in addressing development issues within the Karimunjawa Islands (Putro et al 2016; Fafurida et al 2020; Kennedy et al 2020; Prihantono et al 2021; Wijaya et al 2021; Wibowo et al 2022; Zharif et al 2022).

To effectively manage the islands, the conservation manager has designed a zoning plan, encompassing the core zone, marine tourism utilization zone, traditional fishing zone, and traditional marine cultivation zone. This zoning system is vital for the successful management of fisheries, ensuring both water conservation and the well-being of local resident (Yuliana et al 2016; BTNKJ 2019).

Social and culture. The survey results show that fishermen on Karimunjawa Island were mostly Javanese (the majority) followed by other ethnicities that include Bajo, Bugis, Banjar, Betawi, Buton, and Madura (Table 1). On Kemojan Island, the Javanese are also in the majority (Wibowo et al 2022) since Karimunjawa Islands are located relatively close to Java Island (area 128,297 km²) which is the center of the government and Java is also where the capital of Indonesia, Jakarta is located. Java Island, particularly Jepara Regency, is situated at a considerable distance from Karimunjawa Island, approximately 94 km apart (BPS-Statistics of Jepara Regency 2022). The inhabitants of Karimunjawa heavily rely on Java Island for their basic needs, including rice, vegetables, fruits, meat, and clothing. Conversely, Karimunjawa's marine products find their way to Java Island primarily through sea transportation, which serves as the primary route for trade and traffic between the two regions. The transportation of marine products from Karimunjawa to Java Island plays a crucial role in supporting both local livelihoods and the broader economy of the area.

Karimunjawa Island is inhabited by diverse tribes, some of which have a notable inclination for overseas travel. The Bugis tribe, originally from Sulawesi, has expanded its presence to various islands within Indonesia and even beyond its borders. On the other hand, the Bajo tribe, known as sea gypsies, possesses the exceptional skill of diving in the sea without any diving equipment. Originally hailing from the Sulu Islands in the Southern Philippines, the Bajo tribe has dispersed to numerous coastal areas in countries like the Philippines, Malaysia, Thailand, and Indonesia (Nuraini 2016; Ali et al 2019; Maulidyna et al 2021).

The coexistence of these diverse tribes on Karimunjawa Island has fostered a rich blend of cultures. The daily languages spoken vary among the tribes, though Javanese

and Indonesian serve as the common social languages (Wibowo et al 2022). As for religion, the majority of the Karimunjawa people practice Islam, and its spiritual values have left a profound influence on their traditions. This influence is evident in customs such as sea alms, earth alms, and communal prayers known as 'yasinan', all conducted in accordance with Islamic principles.

Table 1

Social and culture

<i>Categories</i>	<i>Values</i>
Education of respondents	
• Did not graduate from elementary school	27.8%
• Elementary school	59.8%
• Junior high school	9.8%
• Senior high school	2.6%
Religion	
• Islam	99.6%
• Christian	0.4%
Ethnicity	
• Java	91.0%
• Bajo	4.3%
• Bugis	1.7%
• Banjar	1.3%
• Betawi	0.4%
• Butonese	0.9%
• Madurese	0.4%
Perception of conflict intensity by respondents	
• Never	2%
• Low	97%
• High	1%
Respondent's choice of conflict resolution	
• Deliberation	91%
• Kinship	8%
• Legal	1%
Local figures respected by respondents	
• Village head	100%
• Religious head	99%
• Neighbourhood head	92%
• Traditional head	89%
• Youth leader	88%
• Subdistrict head	8%
• Village supervisory non-commissioned officers	1%
Preserved traditions	
• 'Yasinan'	100%
• Clean village	7%
• 'Gotong Royong' (social working together)	86%
• Sea alms	84%
• Earth alms	83%

Fishermen on Karimunjawa Island had relatively inadequate education, where only 59.8% of the respondents only graduated from elementary school. There are even respondents who had never attended school. Low educational background did not provide fishermen with other occupational options as they were ineligible to work in formal sector. The lack of education also affects their mindset. Fortunately, they developed the awareness about the importance of education, therefore they become motivated to send their children to school even up to university level (Wibowo et al 2022; Wijayanto et al 2022b).

Karimunjawa Island experiences relatively low levels of social conflict, and when conflicts do arise, the preferred method of resolution is through deliberation. Deliberation, or 'musyawarah' in Indonesian, is considered a democratic process where individuals engage in social communication to collaboratively find win-win solutions to problems (Herawati et al 2021). Key figures who hold significant respect among the residents of Karimunjawa Island include village heads, religious leaders, neighbourhood heads, traditional leaders, and youth leaders. Despite the sub-district head having a higher organizational position, the village head garners more respect from the island's inhabitants. This is because the village head is typically a local resident, while the sub-district head is a formal figure appointed by the Jepara Regency government to govern the Karimunjawa sub-district. The tradition of 'gotong royong,' which translates to mutual-cooperation or community assistance, remains an essential aspect of life for the people of Karimunjawa Island. Overall, the people of the Karimunjawa Islands uphold and preserve the traditions of 'musyawarah' (deliberation) and 'gotong royong,' (social working together) contributing to the harmonious social fabric and effective conflict resolution on the island (Wijayanto et al 2022a).

Fishermen welfare. The community has relatively adequate residential area of 25 m² per capita (Table 2). According to Regulation of the Minister of Public Work and Housing of the Republic of Indonesia No. 22/PERMEN/M/2008, a habitable house is required to have a minimum area of 7.2 square meters per person (KPUPR 2016; Wijayanto et al 2022a). Their houses were also considered relatively good with concrete walls, tile floors, and tile roofs. Some respondents still lived in houses with soil floor with less habitable houses as found in several areas. Results of previous research showed that the management of fishermen's residences was poor, where village becomes too crowded with poor drainage, dirty and slums (Ballesteros 2010; Marx et al 2013; Darmiwati 2016; Michiani & Asano 2019; Wijayanto et al 2022b).

The average income of the respondents is IDR 3,339,834, which exceeds the 2023 minimum wage for Jepara Regency set at IDR 2,272,626 (Decree of the Governor of Central Java No 561/54 of 2022). Despite this, some respondents still earn less than the minimum wage. This suggests that while most people's income is sufficient to meet basic living needs, there are still those who struggle to do so. A study conducted by Zharif et al (2022) on fishermen in Karimunjawa Village found that the exchange rate was 1,026, indicating that the average fisherman's income is adequate to cover subsistence needs. Generally, the respondents' budget is influenced by their income, with higher income leading to greater purchasing power and, consequently, a higher spending budget. On average, Karimunjawa fisherman respondents allocate 55% of their household budget for food consumption, while those on Kemojan Island, including both fishermen and seaweed cultivators, allocate 56.5% of their budget for food consumption (Wijayanto et al 2022a). Halim et al (2015) revealed that low-income individuals prioritize basic needs such as clothing, food, and shelter. As the income of the population increases, a larger portion of the budget becomes available for non-basic needs.

When experiencing health complaints, an overwhelming majority of respondents, 98.8%, prefer to seek treatment at the local 'Puskesmas' or public health center. Since there are no hospital facilities available on the Karimunjawa Islands, residents must travel to Java Island for hospital care. This journey requires approximately 2 hours by fast boat or 5 hours by ferry. Consequently, accessing hospital services involves a considerable sea journey for the people of Karimunjawa Island. Regarding fresh water sources, 88% of respondents rely on well water to meet their clean water needs. However, for drinking purposes, respondents tend to use refill water, municipal waterworks (springs), and branded mineral water. The reason for this preference is that seawater intrusion into the mainland has led to salinity issues in several wells on Karimunjawa Island, rendering the water unsuitable for drinking (Prihantono et al 2021). Furthermore, a significant majority of respondents, 97%, have family toilets, indicating a high level of sanitation facilities in the community.

Table 2

Fishermen welfare

<i>Indicators</i>	<i>Values</i>
Home ownership	
• One's own	99%
• Belongs to parents	1%
House building area	
• Min	35 m ²
• Average	83 m ²
• Max	130 m ²
House building area per capita	
• Min	9 m ² per capita
• Average	25 m ² per capita
• Max	80 m ² per capita
Types of house building walls	
• Wall	86%
• Half wall	3%
• Wood	8%
• Plywood	3%
Types of house floors	
• Ceramics	80%
• Cement plaster	18%
• Wood	1%
• Land	1%
Types of roofs	
• Rooftile	71.3%
• Galvalume or Zinc	0.4%
• Asbestos	28.3%
• Leaf	0.0%
Main source of household energy	
• Electricity	100%
• Other	0%
Family income	
• Min	1,700,000
• Average	3,339,834
• Max	7,000,000
% of family budget for food	
• Min	14%
• Average	55%
• Max	79%
Person/bank for loan	
• Bank	51%
• Skipper	91%
Place for treatment if sick	
• Public health center	98.8%
• Clinic	0.8%
• Hospital	0.4%
Source of drinking water	
• Drinking water refill (vendor local)	72%
• State company (spring)	60%
• Mineral water (branded)	39%
• Well	6%
Fresh water source	
• Well	88%
• State company (spring)	10%
• Communal water spring	2%

<i>Indicators</i>	<i>Values</i>
Handling household waste	
• Thrown in the trash	98.5%
• Dumped at sea	1.1%
• Burned	0.4%
Defecation	
• Family toilet	97%
• Sea	3%

In waste handling, a significant majority of respondents, 99.6%, dispose of their garbage properly by placing it in trash bins, which are then collected by cleaning staff and taken to waste processing sites. However, there are still a few respondents who engage in improper waste disposal, either by throwing garbage into the sea or burning it. The study conducted by Wijaya et al (2021) emphasizes that waste poses a serious threat to the ecosystem and affects tourism attractiveness in Karimunjawa.

The behavior of burning garbage is more prevalent among residents of Kemojan Island, as highlighted in the study by Wijayanto et al (2022b). Burning garbage not only contributes to air pollution but also poses health risks, such as respiratory diseases. Regarding borrowing money, respondents tend to seek assistance from skippers. However, this practice may lead to patron-client dynamics, where fishermen who borrow money are obligated to sell their catch to the skipper at a price set by the skipper to repay the debt. The people of Karimunjawa Island enjoy access to electricity provided by the State Company, with the Diesel Power Plant of Legon Bajak operating on Kemojan Island since 2016. The two islands, Karimunjawa and Kemojan, are connected by a 10-meter-long bridge (Wijayanto et al 2022a). In terms of educational facilities, the Karimunjawa Islands have schools that cater to early childhood through high school levels, as reported by BPS-statistics of Jepara Regency in 2022.

Fishing business. Busthanul et al (2019) set the range of productive age between 15 and 64 years. As people grow older, they gain more experience, skills, and social networks which in turn will lead to higher income. The average age of the respondents was 45.06 years, indicating that the regeneration of the fishing as profession is weak (Table 3). Being fishermen has never been a favorite job among the people living in coastal areas (Kurohman et al 2020). People who are young and highly educated prefer working in formal sector that is more prestigious than fishing. Fishing requires endurance to stay in uncomfortable situation with hot temperature and high risks (Wibowo et al 2022). As many as 98% of fishermen did not want their children to work as fishermen like them.

On Karimunjawa Island, fishermen primarily engage in small-scale fishing, using boats with an average length of 9.5 meters and equipped with 23 HP engines. In developing countries, such artisanal fisheries play a strategic role in ensuring food security, job creation, economic growth, and poverty alleviation (Ahmed et al 2021; Wijayanto et al 2022a, b). The predominant fishing gear utilized by fishermen on the island is the hand line. When compared to other fishing gear, the hand line business demonstrates a higher benefit-cost (BC) ratio. During the normal fishing season, the BC ratio for hand line fishing stands at 2.39, meaning that for every IDR 1 spent on the fishing operation, there is a return of IDR 2.39 in income. However, during the harvest season, the average BC ratio for hand line fishermen significantly increases to 7.47, indicating a much higher income generated for every IDR 1 invested. The handline fishing targets a variety of marine species, including squid (*Loligo* sp.), narrow-barred Spanish mackerel (*Scomberomorus commerson*), skipjack tuna (*Katsuwonus pelamis*), red snapper (*Lutjanus* sp.), and grouper (*Epinephelus* sp.). These species hold a high selling value in the market. In addition to hand line fishing, there are other fishing techniques used on the island. For instance, the boat lift net is employed to catch anchovies (*Stolephorus* sp.), while traps ('bubu') are utilized to target grouper and red snapper. Each of these fishing methods serves as a livelihood source for the local fishing community on Karimunjawa Island.

Due to the varying abundance of fish species in Karimunjawa waters, some fishermen choose to diversify their fishing gear accordingly. The availability of fish is influenced by multiple factors, including fish migration patterns. According to respondents, the peak fishing season occurs in January, February, November, and December when fish populations are relatively abundant. Fishermen on the island sell their catch to various buyers, including local fish traders, traders from outside the island, traditional markets, and culinary entrepreneurs. However, there are certain seasons, particularly around June and July, where fishermen face challenges due to large waves, leading to periods of scarcity known as famine seasons. As a result, many Karimunjawa residents have multiple professions to secure their livelihoods. These professions include farming, providing tour services, fish processing, crafting souvenirs, offering boat-building services, providing labor, running repair shops, engaging in fish farming, and cultivating seaweed. During the famine season, some fishermen continue to catch fish, even if it is only to meet their household's basic food needs. This multiprofessional approach is not limited to Karimunjawa Island but was also observed among fishermen from Kemojan Island (Wijayanto et al 2022a). On Kemojan Island, fishermen engage in raising livestock (chickens, goats, and cows) and cultivating various types of vegetables and fruits, which they consume or sell to support their livelihoods.

Table 3

Fishing business

<i>Categories</i>	<i>Values</i>
Age of fisherman respondent	
• Min	23 years
• Average	45.06 years
• Max	72 years
Boat length (m)	
• Min	6
• Average	9.5
• Max	17
Types of fishing gear	
• Handline	86%
• Boat lift net	1%
• 'Bubu' (trap)	6%
• Gill net	1%
• Fishing rod	1%
• Spear	12%
Average of BC ratio in peak season	6.7
• Handline	7.47
• Spear	4.12
• 'Bubu' (trap)	2.54
• Gill net	1.03
• Boat lift net	3.80
• Fishing rod	4.00
Average of BC ratio in normal season	2.37
• Handline	2.39
• Spear	2.60
• 'Bubu' (trap)	1.82
• Gill net	3.89
• Boat lift net	1.27
• Fishing rod	2.00
The hope is that the fishing profession will be replaced by his son	
• No	98%
• Yes	2%

The development of tourism in the Karimunjawa Islands holds the potential to enhance the welfare of the local population by diversifying their professions beyond traditional reliance on fisheries and agriculture. Fafurida et al (2020) emphasized that tourism generates a multiplier effect on various sectors of the economy. This effect is particularly evident due to changing lifestyles, not only in Indonesia but also among global communities. The rising interest in natural and cultural tourism from different parts of the world contributes to the growing tourism economy

Paradigm regarding conservation. The survey showed that all respondents are in favor of conservation efforts. Nevertheless, some locals may initially be hesitant to support natural resource conservation, especially when economic factors in the short term come into play. This is particularly true when conservation areas, particularly the core zone, limit the fishing grounds for fishermen. However, it is crucial to recognize that marine conservation ultimately benefits fishermen both in the short and long term. Certain fishing practices that are harmful to the environment can lead to a significant reduction in fish biomass and damage to fish habitats, as observed in previous studies (Johannesen 2007; Campbell et al 2013; Rakotonarivo et al 2017). Despite these challenges, the survey results indicate that the major respondents lean towards supporting conservation efforts. They express this support based on the consideration of preserving natural resources and their desire to secure a sustainable and thriving environment for future generations.

Wibowo et al (2022) asserted that the community welfare in Karimunjawa is most influenced by their assessment of the condition of natural resources. More positive perception regarding conservation relates to greater support for conservation initiatives (Sapoetra et al 2019). Coral reefs offer a multitude of benefits, serving as essential habitats for a wide variety of biodiversity and acting as wave barriers. Coral reefs are also raw materials for the pharmaceutical industry and attractive marine tourism destinations (Brandl et al 2019). Mangroves, on the other hand, play a crucial role in providing food, spawning grounds, and shelters for various terrestrial and marine species. They also serve as a source of wood, medicinal resources, and food for human communities. Furthermore, mangroves deliver valuable environmental services, including coastal abrasion resistance and protection against cyclones, as noted by Carugati et al (2018). However, it is essential to be cautious regarding mangrove deforestation in the Karimunjawa Islands and the conversion of mangrove forests into shrimp ponds, as highlighted by Hapsari et al (2020). This calls for careful monitoring and conservation measures to protect these vital ecosystems.

The belief in conservation and the recognition of the impact of natural resource conditions on the welfare of local communities is not limited to Karimunjawa but is also evident among the residents of Kemojan Island, as reported by Wijayanto et al (2022b). In the context of tourism in Karimunjawa, the attractiveness of its resources, including the sea, beaches, and mangrove forests, plays a pivotal role, as emphasized by Wijaya et al (2021). Regarding zoning in Karimunjawa, the study conducted by Yuliana et al (2016) reveals that local inhabitants generally perceive it as relatively good.

Conservation managers in the Karimunjawa Islands have made attempts to empower the community to support conservation programs. There are 4 community groups that support conservation in 4 villages namely Karimunjawa Village, Kemojan Village, Parang Village and Nyamuk Village. Cases of violations against conservation rules were mostly committed by fishermen from outside the Karimunjawa Islands, including purse seine and Danish seine fishermen from Java. It is unfortunate that some people still used potassium cyanide to catch fish and catch protected animals for sale (BTNKJ 2019).

The research conducted by Wijayanto et al (2022b) highlights that education and age play a positive role in fostering local community support for conservation efforts. This positive effect is attributed to the increased awareness among the local community regarding the significance of conserving natural resources.

To ensure successful conservation programs, Rakotonarivo et al (2017) emphasize the importance of providing local communities with a comprehensive understanding of

the benefits of conservation. Such awareness-building initiatives can greatly contribute to garnering support from the local population. Fafurida et al (2020) found that the quality of human resources is crucial for the success of eco-friendly tourism. This underlines the significance of actively involving and engaging local communities in the management of water conservation to ensure positive outcomes for water conservation efforts in the Karimunjawa Islands, including Karimunjawa Island.

Conclusions. The main occupation of the people on Karimunjawa Island is fishing. However, there are challenges in regenerating this profession as many fishermen are hesitant to pass it on to their children. The primary fishing gear used by Karimunjawa fishermen is the hand line, which yields an average benefit-cost (BC) ratio of 2.39 during the normal season and 7.47 during the peak season. The fishermen on Karimunjawa Island come from diverse ethnic backgrounds, with the majority being Javanese. Education levels among the fishermen tend to be relatively low. The community highly respects figures such as village heads, religious leaders, neighborhood heads, traditional leaders, and youth leaders. In terms of living standards, the people of Karimunjawa enjoy relative prosperity, with satisfactory income, housing, access to energy and fresh water sources, and availability of education and health services. Furthermore, Karimunjawa fishermen generally show support for conservation efforts led by the Indonesian government and other stakeholders.

Acknowledgement. The research team is grateful to LPPM Universitas Diponegoro for funding this research (the RPI scheme No 569-77/UNJ.D2/PP/IV/2023).

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

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Received: 30 July 2023. Accepted: 16 September 2023. Published online: 01 October 2023.

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How to cite this article:

Wijayanto D., Kurohman F., Nugroho R. A., 2023 The fishermen's socio-economic characteristics that support conservation among the community in Karimunjawa Marine Protected Area. *AACL Bioflux* 16(5):2517-2527.