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SUPPLY CHAIN ANALYSIS OF BLUE SWIMMING CRAB (*Portunus pelagicus*) KARAWANG REGENCY (CASE STUDY: CILAMAYA WETAN AND TIRTAJAYA DISTRICTS)

ANALISIS RANTAI PASOK RAJUNGAN (*Portunus pelagicus*) KABUPATEN KARAWANG (STUDI KASUS: KECAMATAN CILAMAYA WETAN DAN TIRTAJAYA)

Ratih Purnama Sari*, Dendi Haris, Rakhma Fitria Larasati, Muhamad Riyono Edi Prayitno, Robet Perangin-angin, Suharyanto, R. Mohamad Adha Akbar

Study Program of Fisheries Engineering, Karawang Marine and Fisheries Polytechnic,
Jl. Lingkar Tanjung Pura KM. 3, Karangpawitan, Karawang 41315, West Java, Indonesia
*Corresponding author: ratihp.salim@gmail.com

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ABSTRACT

The blue swimming crab is a leading commodity in Karawang Regency in terms of economic value. It is marketed locally and internationally. Blue swimming crabs are sold to consumers both alive and processed, so a supply chain process is needed that can meet consumer demand quickly and maintain excellent quality. This study aims to analyze the management, structure, and costs of the blue swimming crab supply chain and evaluate its external performance using the Supply Chain Operations Reference (SCOR) method, which is considered a systematic approach for measuring supply chain performance. This study was conducted in Tirtajaya District, Cilamaya Wetan District, and at a blue swimming crab processing company in Cirebon. The results of this study include an explanation of the supply chain targets, supply chain structures, types of costs incurred by fishermen, traders, collectors, and suppliers, as well as the value of the external performance of the supply chain. The research subjects consisted of fishermen, traders, and collectors. The structure of the blue swimming crab supply chain in Karawang Regency had two different flows or chain networks from fishermen to suppliers. The costs generally incurred are operational costs, including diesel fuel, supplies, fishing gear, bait (if using traps), and transportation. External performance measurements of the blue swimming crab supply chain in Karawang Regency consistently yield superior results across all indicators. However, the order fulfillment indicator yielded parity due to the lean season.

Keywords: Karawang, *Portunus pelagicus*, SCOR analysis, supply chain

ABSTRAK

Rajungan merupakan komoditas unggulan di Kabupaten Karawang yang memiliki nilai ekonomis tinggi. Selain dipasarkan secara lokal, rajungan juga diekspor ke luar Indonesia. Rajungan dijual kepada konsumen baik dalam kondisi hidup maupun yang telah diolah, sehingga dibutuhkan proses rantai pasok yang mampu memenuhi permintaan konsumen dengan cepat dan kualitas yang baik. Penelitian ini bertujuan untuk menganalisis manajemen, struktur, dan biaya rantai pasok rajungan, serta mengevaluasi kinerja eksternalnya menggunakan metode *Supply Chain Operations Reference* (SCOR), yang dinilai sistematis dalam mengukur kinerja rantai pasok. Penelitian ini dilaksanakan di Kecamatan Tirtajaya, Cilamaya Wetan, dan pada perusahaan pengolah rajungan Cirebon. Hasil penelitian ini berupa penjelasan mengenai sasaran rantai pasok, struktur rantai pasok, jenis biaya yang dikeluarkan oleh nelayan, bakul, pengepul, dan *supplier*, serta nilai kinerja eksternal rantai pasok. Objek penelitian terdiri atas nelayan, bakul, dan pengepul. Struktur rantai pasok rajungan yang ada di Kabupaten Karawang, memiliki alur atau jaringan rantai yang berbeda-beda di mana terdapat dua saluran rantai pasok dari nelayan hingga *supplier*. Jenis biaya yang dikeluarkan umumnya adalah biaya operasional, berupa solar, perbekalan, alat tangkap, umpan (jika dengan bubu), dan biaya transportasi. Nilai pengukuran kinerja eksternal rantai pasok rajungan di Kabupaten Karawang didominasi oleh hasil *superior* pada setiap indikator. Namun pada indikator pemenuhan pesanan, diperoleh hasil *parity* karena musim paceklik.

Kata kunci: Karawang, rajungan, rantai pasok, SCOR analysis

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INTRODUCTION

Karawang Regency has a vast coastal area in the north and significant fisheries potential. Fisheries production in 2024 reached approximately 56,000 tons, with capture fisheries contributing 9,000 tons, which made fish consumption 26.01 kg per capita per year (BPS Karawang Regency 2024). One of the leading capture fishery commodities in this region is the blue swimming crab, which has high economic value.

Blue swimming crab production in Karawang Regency in 2022 was recorded at around 3,000 tons (Karawang Regency Government 2023), with most of it marketed to companies outside the region. The blue swimming crab (Portunus pelagicus) is an important export commodity, widely marketed to the United States, East Asia, and Europe. Of these three markets, the United States is the primary market, absorbing up to 60% of Indonesia's total blue swimming crab exports (Yusfiandayani and Sobari 2011; Husni *et al.* 2021). Blue swimming crab production centers in Karawang are primarily located in the Tirtajaya and Cilamaya Wetan Districts.

Blue swimming crab businesses in Karawang Regency are generally small-scale, with manual processing and limited human resources, technology, and supporting facilities (Saputra *et al.* 2022). Blue swimming crab is traded both live and processed, with live blue swimming crab being marketed to seafood companies and restaurants in Jakarta, while processed blue swimming crab is shipped to companies outside the region for export. This situation demands efficient and integrated supply chain management to ensure product quality remains aligned with consumer preferences.

The supply chain plays a crucial role in ensuring timely, accurate, and high-quality demand fulfillment, supported by effective information flow between stakeholders (Chopra and Meindl 2007; Asror *et al.* 2022). However, studies on the blue swimming crab supply chain in Karawang Regency are still limited, particularly those addressing the structure, objectives, pricing, and external performance of the supply chain. Therefore, this study aims to analyze the management, structure, and costs of the blue swimming crab supply chain, as well as evaluate its external performance using the Supply Chain Operations Reference (SCOR) method, which is considered a systematic way to measure supply chain performance.

METHODS

Time and location

This study was conducted from September to October 2024 in Tirtajaya District and Cilamaya Wetan District. In addition, the research was also carried out at the premises of a blue swimming crab supplier that distributes the product to export companies. The supplier, operating under the business name Miniplant Jojo & Wati Shifa, is located in Cirebon. The selection of the Cirebon-based crab supplier was based on information obtained from fishers in Tirtajaya and Cilamaya Wetan Districts. The supplier distributes processed boiled blue swimming crab products to export companies in the United States and Taiwan.

Types and objects of research

The type of data collected in this study is primary data, which involves direct data collection from respondents (Hardani *et al.* 2020). Data collection objects in Tirtajaya and Cilamaya Wetan Districts included blue swimming crab fishermen, traders, collectors, and suppliers. Meanwhile, data collection objects in Cirebon were Miniplant Jojo & Wati Shifa. Miniplant supplies blue swimming crab commodities from Karawang Regency, which are then resold to large companies or exporters on a fairly large scale.

Data collection technique

Data collection was conducted to obtain information to support the achievement of the research objectives, using primary and secondary data. Primary data were obtained through direct interviews with ship owners, collectors, and companies receiving blue swimming crab supplies, covering fishing operational costs, transportation costs, sales volume per shipment, transaction mechanisms, and supply chain structures and objectives. In addition, direct observations were conducted at supplier locations in Cirebon to observe operational activities. The company targeted for marketing blue swimming crab in Karawang Regency is Miniplant Jojo & Wati Shifa in Cirebon. Secondary data were collected through literature studies from various written sources relevant to the research.

This study used a descriptive approach with qualitative analysis to describe the activities and performance of the blue swimming crab

supply chain in Tirtajaya and Cilamaya Wetan Districts. Data were collected using descriptive methods by mapping field conditions and the flow of goods and information within the blue swimming crab supply chain. Respondents consisted of key actors in small-scale blue swimming crab fisheries, namely fishermen, traders, collectors, and suppliers. They were selected using purposive sampling because they were considered to understand the supply chain system being studied (Sugiyono 2015). Fishermen respondents were selected by fishermen group leaders, with 18 respondents each in Tirtajaya and Cilamaya Wetan Districts, while traders and collectors had 4 and 3 respondents, respectively.

Data processing techniques

Supply chain performance analysis was conducted using the SCOR method. Performance measurement focused on external performance, including the attributes of reliability, responsiveness, and flexibility (Dissanayake and Cross 2018), as cost and asset data are internal to the supplier. The reliability attribute describes the ability to fulfill orders on time, in the correct quantity, and according to quality standards. Responsiveness is measured through order fulfillment cycle times, while flexibility indicates the supply chain's ability to respond to changes in demand due to the dynamics of the blue swimming crab fishing season (Surjasa *et al.* 2017; Apriyani *et al.* 2018; Wulandari *et al.* 2021).

Reliability

This attribute assessed supply chain performance in customer delivery, including accuracy of product type, time, quantity, condition, and packaging (Surjasa *et al.* 2017; Apriyani *et al.* 2018). This attribute is broken down into three indicators:

- Delivery performance indicator: assesses the number of deliveries that arrive as expected by consumers (%). Deliveries of goods that arrive within the specified time can instill consumer confidence and influence business from various perspectives (Haris and Pramudita 2018).

$$Delivery\ performance = \frac{Total\ products\ delivered\ on\ time}{Total\ product\ delivery} \times 100\%$$

- The standard conformity indicator was defined as the percentage of product deliveries that meet consumer standards. This value is expressed as a percentage (Surjasa *et al.* 2017; Apriyani *et al.* 2018).

$$Standard\ compliance = \frac{Total\ delivery\ according\ to\ standards}{Total\ product\ delivery} \times 100\%$$

- The order fulfillment indicator is the percentage of the number of product deliveries according to requests and without waiting, expressed in percentage units (Surjasa *et al.* 2017; Apriyani *et al.* 2018).

$$Order\ fulfillment = \frac{Request\ are\ fulfilled\ without\ waiting}{Total\ consumer\ demand} \times 100\%$$

Responsibility

The speed at which a supply chain delivers products to customers will have a positive impact if the company's responsiveness is faster (Kurniawan *et al.* 2018; Surjasa *et al.* 2017; Apriyani *et al.* 2018). This attribute is characterized by order fulfillment (lead time): the ability to react quickly and within the appropriate timescale to fulfill customer orders, expressed in days. The order fulfillment cycle is the time required to fulfill consumer demand (in hours) (Kurniawan *et al.* 2018; Surjasa *et al.* 2017; Apriyani *et al.* 2018).

$$Order\ fulfillment\ cycle =$$
$$Planning\ time + Sorting\ time + Packaging\ time + Delivery\ time$$

Flexibility

Supply chain agility responds to changes in market share to gain or maintain a competitive advantage. A company's adaptability significantly impacts the effectiveness of its supply chain performance (Saputra 2019). Supply chain flexibility is the time required to respond to orders if there are unexpected changes (in days) (Surjasa *et al.* 2017; Apriyani *et al.* 2018).

$$Flexibility =$$
$$Cycle\ of\ searching\ for\ goods + Cycle\ of\ packing\ goods + Cycle\ of\ sending\ goods$$

The value of each indicator is calculated and adjusted to the superior Food SCOR Card value as a benchmark (Bolstorff and Rosenbaum 2011). The performance value measured is the attribute value of external performance. The external performance achievement criteria of the supply chain can determine the performance of the supply chain itself. The criteria for achieving supply chain performance are presented in Table 1.

Table 1. Criteria for achieving external performance in the supply chain based on the Food SCOR Card.

Attributes	Performance Indicators	Benchmarks		
		Parity	Advantage	Superior
External Performance				
Reliability	Delivery Performance (%)	85.00–89.00	90.00–94.00	≥ 95.00
	Order Fulfillment (%)	94.00–95.00	96.00–97.00	≥ 98.00
	Conformance to Standards (%)	80.00–84.00	85.00–89.00	≥ 90.00
Flexibility	Flexibility (days)	42.00–7.00	26.00–11.00	≤ 10.00
Responsiveness	Order fulfillment lead time (days)	7.00–6.00	5.00–4.00	≤ 3.00
	Order fulfillment cycle (days)	8.00–7.00	6.00–5.00	≤ 4.00

Source: Bolstorff and Rosenbaum (2011)

RESULTS AND DISCUSSION

Blue swimming crab supply chain structure in Karawang Regency

The blue swimming crab supply chain structure in Karawang Regency involves fishermen, traders, collectors, suppliers outside Karawang, exporters, and restaurants. Supply chain management relies on wise supplier selection. Supplier identification should be done early in the process to minimize costs, improve quality, and accelerate time to market (Akhil *et al.* 2025). The blue swimming crab supply chain structure from fishermen to consumers is presented in Figure 1.

Based on Figure 1, the blue swimming crab supply chain structure in Karawang Regency has two distinct network patterns. The main difference between the two structures lies in the presence of small traders (bakul) as additional intermediaries. In the first pattern, blue swimming crabs are distributed from fishermen to small traders, then to collectors and suppliers. In contrast, in the second pattern, fishermen sell directly to collectors without involving small traders.

Fisherman

Blue swimming crab fishermen play a key role in producing the blue swimming crab commodity. Fishermen in Tirtajaya Regency are divided into two groups: those with boats and those without. Those without boats generally catch blue swimming crabs using boats owned by merchants/collectors or other vessel owners. Most merchants/collectors in Cilamaya Wetan Regency are not vessel owners. Some fishermen who do not own boats own their own blue swimming crab fishing gear and participate in fishing activities with other vessels. These fishermen only pay for diesel fuel and boat operations. The blue swimming crab catch obtained from their own fishing gear is the catch of the fishermen themselves. Fishermen catch blue swimming crabs using traps and blue swimming crab nets. Fishing with traps produces live blue swimming crabs, while fishing with nets produces a variety of blue swimming crabs (both dead and alive).

"Bakul" (*Small Trader*)

"Bakul" are small traders who source raw blue swimming crab from fishermen and resell them at markets or to collectors. They act as intermediaries between fishermen and collectors. Small traders are domiciled in the area surrounding the fishermen. Some fishermen sell blue swimming crab to small traders because they have a relationship with them, such as a loan for capital to build fishing gear. The bakul even provides fishing gear assistance free of charge.

Collector

Collectors received blue swimming crab raw materials from traders and fishermen for distribution to suppliers. These collectors are small-scale local traders in Karawang Regency. Some collectors own boats. These boats are used by fishermen to catch blue swimming crab, and the catch is then handed over to the collectors. However, some collectors do not own boats and only accept blue swimming crab purchases from fishermen. The blue swimming crab is then resold to the company. Observations indicate that collectors sometimes have to wait until the collected blue swimming crab volume reaches a certain amount before shipping it to consumers. This can potentially lead to quality degradation, especially if the amount of blue

swimming crab produced by fishermen is low, requiring the blue swimming crab to be stored longer in the collectors' warehouses.

Supplier

Suppliers are parties who provide and distribute goods (blue swimming crab), both in the form of raw materials and processed goods, domiciled outside Karawang Regency. Companies are parties that receive/buy blue swimming crab from the bosses in the form of processed (boiled blue swimming crab), which will later be separated based on the blue swimming crab body parts and then exported, while restaurants are parties that receive/buy live blue swimming crab from the bosses. In this study, Miniplant Jojo & Wati Shifa was a supplier that received blue swimming crab commodities from Karawang and distributed them to exporters.

Exporter

The exporter is a large company that sells processed blue crab products and sends them overseas (export). This exporter received blue swimming crab commodities from the supplier Miniplant Jojo & Wati Shifa in Cirebon. The processed blue swimming crab products brought by the supplier, Miniplant Jojo & Wati Shifa, will be exported, especially to the United States, Japan, and Taiwan. A similar study conducted by Ilmi and Riniwati (2018) stated that 70% of the processed blue swimming crab products were brought by PT. Kelola Mina Laut are exported to the United States, 15% to the European Union, 5% to Japan, and the remaining 10% are marketed to other countries such as Australia, Africa, China, and the Middle East.

Management and objectives of the blue swimming crab supply chain in Karawang Regency

The centers of blue swimming crab production in Karawang Regency are located in the Cilamaya and Tirtajaya Districts, with markets differing across regions. Supply chain management encompasses product management from supplier to consumer (Christopher 2016), with blue swimming crab distribution in Karawang reaching both local and international markets. Information flows between supply chain actors through ongoing collaboration, which plays a crucial role in building trust and commitment (Simbolon *et al.* 2020).

Blue swimming crab caught by fishermen is generally sold to traders, then forwarded to collectors, and distributed to suppliers outside Karawang, such as Jakarta, Brebes, and Cirebon, before being marketed to exporters. The distribution process is still carried out traditionally using bulk ice, which has the potential to compromise quality and food safety. Limited facilities and costs for small and medium enterprises also impact supply chain effectiveness (Dwiyitno 2009).

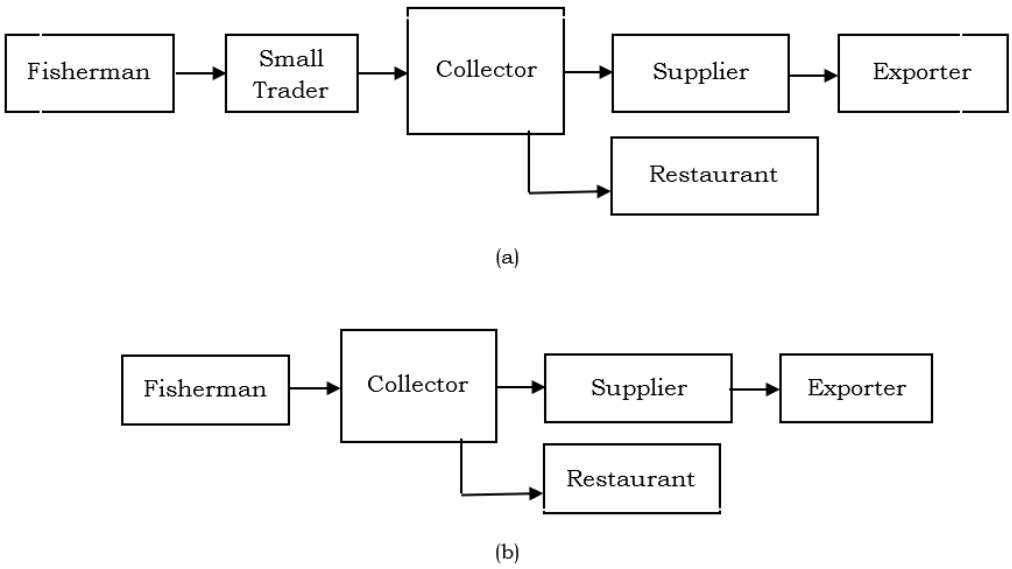


Figure 1. Supply chain structure of blue swimming crab commodities in Karawang Regency: (a) First supply chain structure, (b) Second supply chain structure.

Fishermen's dependence on traders and collectors is primarily influenced by the availability of fishing gear, particularly during the lean season. This demonstrates the crucial role of intermediaries in maintaining the sustainability of blue swimming crab fishing activities (Ilmi and Riniwati 2018). The blue swimming crabs traded include both live and processed products.

Sales mechanism

The blue swimming crab sales mechanism in Karawang Regency has a marketing channel ranging from fishermen, traders, collectors, and suppliers, to large companies/exporters. Generally, blue swimming crab sales have a similar channel pattern in each region. In a study conducted by Pamuji *et al.* (2018), the blue swimming crab marketing channel also started from fishermen as producers, traders, suppliers, exporters, foreign agents, and end consumers. The payment or transaction system is adjusted according to the agreement of both parties. The blue swimming crab sold can be either dead or alive. The live blue swimming crab catch is separated from the dead catch. The dead blue swimming crab is first boiled and then shipped. The sales and transaction mechanisms in the blue swimming crab supply chain are explained in Table 2.

Expenditure costs from fishermen to suppliers

Fishermen's expenses include operational costs, such as fuel, food supplies, fishing gear, and trap bait. Fuel is a key component of blue swimming crab fishing, with an average expenditure of around IDR 200,000 per operation (Zainuddin and Suprapti 2021). Small fish are used as bait to attract blue swimming crabs through scent stimulation, with approximately 4 kg required per operation (Agustina *et al.* 2014).

Table 2. Sales and transaction mechanisms in the blue swimming crab supply chain in Karawang Regency.

Supply chain actors	Transaction Systems	Sales Mechanisms
Fishermen with small traders	Cash payment	Fishermen sell their blue swimming crab catch to the basket traders. The basket traders don't set a minimum weight for the catch, but if the blue swimming crabs sold reach a minimum weight of 10 kg, the fishermen are provided with free blue swimming crab nets. This encourages fishermen to sell more of their catch to the basket traders.
Fishermen with collectors	Cash payment	Fishermen can sell their catch directly to collectors. Generally, fishermen sell their catch directly to collectors because they have a strong relationship with them. Some fishermen also use collectors' boats to catch blue swimming crabs. The catch is then sold to these collectors/bosses.
Small trader with a collector	Cash payment	Traders who buy blue swimming crabs from fishermen will deliver them directly to the collectors.
Collectors with suppliers	Advance payment	The traders/collectors collaborate with blue swimming crab suppliers outside Karawang Regency through a diverse network of relationships. Cooked blue swimming crabs are marketed to suppliers in Cirebon, Losari (Brebes), and other areas, with some collectors accepting deposits from the companies, calculated based on the volume (kg) of blue swimming crabs purchased. Meanwhile, live blue swimming crabs are marketed to suppliers in Jakarta, primarily to meet the needs of seafood restaurants.
Supplier with exporter	Advance payment	Suppliers collaborate with exporters based on close business relationships. During peak season, exporters set quotas for blue swimming crab purchases, while during the generally traded fresh low season, the entire supply is accepted. The processed blue swimming crabs received by exporters are selected according to established quality standards, then packaged in cans and exported to the United States, Taiwan, and other Asian countries.

Costs at the basket level include transportation to collectors and the procurement of nets for repairs to fishermen's fishing gear. Transportation costs average IDR 20,000 (approximately 1.5 liters of gasoline), while the cost of purchasing new blue swimming crab nets reaches IDR 130,000 per unit. At the collector level, costs include the purchase of ice for transporting the blue swimming crabs at IDR 25,000 per block, boiling costs, and labor costs of IDR 2,000 per kg. Meanwhile, costs at the supplier level include transportation costs from the company's location to the collector, which vary depending on the volume of blue swimming crab and vehicle capacity. Live and processed blue swimming crabs are generally picked up directly by partner companies in a patron-client relationship. This marketing pattern aligns with previous findings showing that blue swimming crabs in Indonesia are generally traded fresh (live) and processed (Zainuddin and Suprapti 2021; Laksono *et al.* 2023).

Selling price from fishermen to suppliers

The price of blue swimming crab sold by each fisherman varies. Each fisherman and collector sets their own selling price. The following table shows the average selling price of blue swimming crab from the fisherman to the exporter.

Table 3 explains that fishermen sell dead blue swimming crab to fishers for IDR 40,000/kg during the peak season and around IDR 45,000/kg during the lean season. Some fishermen in Tirtajaya and Cilamaya Wetan sell blue swimming crabs directly to collectors, who buy dead blue swimming crabs for IDR 45,000/kg during the peak season and IDR 50,000/kg during the lean season. Collectors process the dead blue swimming crab by boiling it for 25 minutes in a 20-kg container, which results in a weight loss of approximately 20%. During the peak season, the boiling process takes 1–3 days.

The boiled blue swimming crabs were then shipped to companies outside Karawang at a selling price of IDR 80,000/kg. Shipments are made using pickup trucks, packed with bulk ice in fiber boxes, and take approximately eight hours. Dead blue swimming crabs should not be stored for more than three days, as this can degrade quality and risk export failure. The quality of the blue swimming crab is determined from capture, through handling on board, and distribution to exporters (Gumilang and Susilawati 2019). Shipping costs are borne by the destination company.

Table 3. Average selling price of blue swimming crab from fishermen to exporters in Karawang Regency.

No	Supply chain actors	Small Trader	Collector	Supplier
1	**Fisherman**			
	Selling price (dead blue swimming crab)	Rp40,000/kg	Rp45,000/kg	-
		Rp45,000/kg	Rp50,000/kg	
	Selling price (live blue swimming crab 250–300 g/ individual)	Rp75,000/kg	Rp80,000/kg	-
2	**Small Trader**			
	Selling price (dead blue swimming crab)	-	Rp45,000/kg	-
			Rp50,000/kg	
	Selling price (live blue swimming crab 250–300 g/ individual)	-	Rp80,000/kg	-
3	**Collector**			
	Selling price (dead blue swimming crab)	-	-	Rp80,000/kg
	Selling Price (live swimming crab 250–300 g/individual)	-	-	Rp110,000/kg

Live blue swimming crabs are traded based on size, with approximately 1 kg for 5 individuals and 1 kg for 3 individuals. Fishermen sell live blue swimming crabs weighing 250–300 g to traders for IDR 75,000/kg, or IDR 80,000/kg if sold directly to collectors. The traders resell the blue swimming crabs to collectors for IDR 80,000/kg. The collectors then distribute the blue swimming crabs to partner companies. A good cooperative relationship between suppliers and companies plays an important role in ensuring smooth supply, cost efficiency, and product quality (Lu *et al.* 2024).

Supply chain performance measurement

The supply chain performance measure was blue swimming crab production and sales data from June to July 2024. Supply chain performance can be measured over three to six months or even a year (Apriyani *et al.* 2018). However, in this study, performance was measured only based on two months of data (June–July 2024) because the collectors were still not transparent about blue swimming crab production and profit data. This month was the lean season for blue swimming crab commodities.

A supply chain performance matrix was calculated, and then the results were compared with the superior SCORE card score as a benchmark (Bolstorff and Rosenbaum 2011). An agrifood export supply chain (ESC) can be considered successful if it has an integrated business decision-making process that is able to respond to consumer demand and enables production at lower costs without compromising quality (Haque *et al.* 2025). The blue swimming crab supply chain measurement values and their benchmark values are presented in Table 4.

The supply chain performance presented in Table 4 represents the supply chain performance of collectors in the Cilamaya Wetan and Tirtajaya regions. The values in the performance indicator matrix were taken from blue swimming crab production data during the lean season. The performance assessment results presented in Table 4 are as follows:

1. Delivery performance

   Delivery performance reflects the ability of collectors to fulfill company demand promptly. A delivery performance score of 100% indicates that blue swimming crab order fulfillment has reached the superior category. During the lean season, all blue swimming crab catches, both live and processed (boiled) products, were successfully distributed and received by the company according to the delivery schedule. This high acceptance rate is supported by the company's continued demand for live blue swimming crabs for the restaurant market and boiled blue swimming crabs for processed export products. These benchmark results align with the findings of Apriyani *et al.* (2018), who reported a 98% order fulfillment rate for partners, also categorized as superior performance. Furthermore, shorter transportation times contribute to increased company profitability (Albarran *et al.* 2013).

2. Order fulfillment performance

   The performance of the order fulfillment attribute obtained an average score of 0% because, during the lean season, blue swimming crab orders could not be shipped directly by collectors due to limited quantities and the requirement to meet minimum shipping capacity. The imbalance between demand and blue swimming crab availability resulted in an average delivery waiting time

Table 4. Average value of the blue swimming crab supply chain performance of collectors in Karawang Regency.

Attributes	Performance Indicators	Average Values	Results	Benchmarks		
				Parity	Advantage	Superior
Reliability	Delivery Performance (%)	100	Superior	85.00–89.00	90.00–94.00	≥ 95.00
	Order Fulfillment (%)	0	Parity	94.00–95.00	96.00–97.00	≥ 98.00
	Conformance to Standards (%)	100	Superior	80.00–84.00	85.00–89.00	≥ 90.00
Flexibility	Flexibility (days)	5	Superior	42.00–7.00	26.00–11.00	≤ 10.00
Responsiveness	Order fulfillment lead time (days)	3	Superior	7.00–6.00	5.00–4.00	≤ 3.00
	Order fulfillment cycle (days)	3	Superior	8.00–7.00	6.00–5.00	≤ 4.00

Source: Bolstorff and Rosenbaum (2011)

of three days. During the waiting period, live blue swimming crabs were stored in aerated ponds, while dead blue swimming crabs were boiled and stored in fiber boxes with bulk ice before being shipped to the company. The handling of fresh fishery products is highly dependent on the cold chain system, as temperature stability plays a crucial role in maintaining product quality and freshness (Tiaraningtyas *et al.* 2025).

3. Compliance with standards

The performance value of conformity to standards was obtained at an average of 100% (superior). This means that all orders sent from collectors to the company were in accordance with the company's requirements. All blue swimming crabs sold were received by the company without any products being returned. During the lean season, blue swimming crab production decreased significantly, but demand remained, so all blue swimming crab catches sold by collectors in Karawang were received by the company. The price of blue swimming crabs sold by collectors was adjusted to the quality standards set by the company. The higher the average standard conformity value, or the closer it was to 100%, the better the supply chain performance (Sari 2015).

4. Flexibility

The flexibility of the blue swimming crab supply chain demonstrates the ability of collectors to respond to changes in orders from suppliers. The flexibility value of the blue swimming crab supply chain in Karawang Regency is in the range of 1–3 days, meaning collectors can adjust orders to increase or decrease within this timeframe. During peak season, increased demand can be met in approximately one day, while during the low season, it can take up to three days because shipments must meet minimum capacity for efficient transportation. However, if capacity is not met, shipments are still made to maintain blue swimming crab quality.

The average waiting time for collectors to receive fishermen's catch is one day, in line with the general one-day fishing pattern for blue swimming crab fishing in the Cilamaya Wetan and Tirtajaya areas. The fishing process involves setting traps in the morning and lifting them in the afternoon, as reported by Perdana *et al.* (2016). Based on these conditions, the flexibility of the blue swimming crab supply chain in Karawang is considered superior because it is able to respond to changes in orders in a relatively short time.

5. Lead Time

The responsiveness attribute includes a lead time performance matrix, which indicates the waiting time to fulfill consumer orders. The lead time for the blue swimming crab supply chain in Karawang Regency is 3 days. During the dry season, blue swimming crab deliveries to the company are made within 3 days due to limited blue swimming crab production. Cooked blue swimming crabs are stored in fiber and covered with ice for 3 days while awaiting the next catch. The blue swimming crabs are shipped when the waiting time reaches 3 days. The lead time value reaches the standard limit specified in order fulfillment performance. The lower the lead time value, the better the order fulfillment performance. Time efficiency is crucial in the supply chain. Responsive supply chain activities can minimize lead time (the time required to produce goods, ship orders, and shipping errors related to incorrect shipments) (Maaz and Ahmad 2022).

6. Order fulfillment cycle

The order fulfillment cycle encompasses planning, sorting, packaging, and shipping, from the time an order is placed until the product is received by the supplier (Lepori et al. 2013). Measurements show that the planning time for blue swimming crab procurement by collectors is one day. Sorting takes one day and is performed only on live blue swimming crabs, while dead blue swimming crabs are immediately boiled, packed in 80 kg fiber boxes with bulk ice, and shipped to the supplier. Packaging and shipping each take one day.

Overall, the order fulfillment cycle for the blue swimming crab supply chain in Karawang is three days, indicating superior order fulfillment cycle performance. A lower order fulfillment cycle reflects better supply chain performance (Yolandika *et al.* 2016).

CONCLUSION

Blue swimming crab commodities from Karawang Regency have different target markets in each region. Blue swimming crab commodities from this regency are distributed to consumers both within and outside Karawang Regency, such as Jakarta, Brebes, and Cirebon. The blue swimming crab commodity supply chain in Karawang Regency began with fishermen and was distributed to consumers. The blue swimming crab supply

chain structure consists of two distinct network patterns. The main distinction between these two patterns lies in the involvement of small traders as intermediaries in the first pattern, whereas in the second pattern, fishermen sell directly to collectors. The types of costs incurred are operational costs, in the form of diesel, supplies, fishing gear, and bait; transportation costs; purchasing nets for repairing fishermen's fishing gear; ice costs; boiling costs; and labor costs. The performance measurement value of this blue swimming crab supply chain is dominated by superior values. However, in the order fulfillment indicator, parity results were obtained.

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