Blue swimming crab

Portunus pelagicus

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Indonesia

Bottom gillnet, Pots

Report ID 27964

August 7, 2023

Seafood Watch Standard used in this assessment: Fisheries Standard v3

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About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the environmental sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Seafood Watch's science-based ratings are available at www.SeafoodWatch.org. Each rating is supported by a Seafood Watch assessment, in which the fishery or aquaculture operation is evaluated using the Seafood Watch standard.

Seafood Watch standards are built on our guiding principles, which outline the necessary environmental sustainability elements for fisheries and aquaculture operations. The guiding principles differ across standards, reflecting the different impacts of fisheries and aquaculture.

- Seafood rated Best Choice comes from sources that operate in a manner that's consistent with our guiding principles. The seafood is caught or farmed in ways that cause little or no harm to other wildlife or the environment.

- Seafood rated Good Alternative comes from sources that align with most of our guiding principles. However, one issue needs substantial improvement, or there's significant uncertainty about the impacts on wildlife or the environment.

- Seafood rated Avoid comes from sources that don't align with our guiding principles. The seafood is caught or farmed in ways that have a high risk of causing harm to wildlife or the environment. There's a critical conservation concern or many issues need substantial improvement.

Each assessment follows an eight-step process, which prioritizes rigor, impartiality, transparency and accessibility. They are conducted by Seafood Watch scientists, in collaboration with scientific, government, industry and conservation experts and are open for public comment prior to publication. Conditions in wild capture fisheries and aquaculture operations can change over time; as such assessments and ratings are updated regularly to reflect current practice.

More information on Seafood Watch guiding principles, standards, assessments and ratings are available at www.SeafoodWatch.org.

Guiding Principles

Seafood Watch defines sustainable seafood as originating from sources, whether fished[1] or farmed, that can maintain or increase production in the long term without jeopardizing the structure or function of affected ecosystems.

The following guiding principles illustrate the qualities that fisheries must possess to be considered sustainable by the Seafood Watch program (these are explained further in the Seafood Watch Standard for Fisheries):

- Follow the principles of ecosystem-based fisheries management.
- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable levels.
- Minimize bycatch.
- Have no more than a negligible impact on any threatened, endangered, or protected species.
- Managed to sustain the long-term productivity of all affected species.
- Avoid negative impacts on the structure, function, or associated biota of aquatic habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.

These guiding principles are operationalized in the four criteria in this standard.Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and rating

Once a rating has been assigned to each criterion, Seafood Watch develops an overall recommendation. Criteria ratings and the overall recommendation are color coded to correspond to the categories on the Seafood Watch pocket guides and online guide:

Best Choice/Green: Buy first; they're well managed and caught or farmed responsibly.

Good Alternative/Yellow: Buy, but be aware there are concerns with how they're caught, farmed or managed.

Avoid/Red: Take a pass on these for now; they're caught or farmed in ways that harm other marine life or the environment.

[1] "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

Summary

This report includes recommendations for blue swimming crab (*Portunus pelagicus*), which is a large-bodied, benthic crustacean caught by collapsible crab pot and bottom-set gillnet. The Indonesian blue swimming crab fishery occurs in Jawa (Java), Sulawesi, and Sumatera (Sumatra).

A number of data-limited stock assessments were conducted in Jawa, Sulawesi, and Sumatera, using the length-based spawning potential ratio (LB-SPR); however, these showed contradictory results. Therefore, a productivity-susceptibility analysis (PSA) was conducted in all three regions for both gillnets and pots. The analysis indicated that the blue swimming crab stock in each region was highly vulnerable. Thus, abundance is a high concern. The relative fishing mortality rates (F/M) are >4, and the exploitation rates are 0.55–0.88 without biological reference points; these results indicate that overfishing is also occurring.

Small-scale to medium-scale variations exist in the bycatch species and the amounts of bycatch in the different blue swimming crab fishing areas in Indonesia. These variations are directly related to the fishing gear used, biodiversity, and seasonal differences. Gillnet and pot fisheries interact with some species of concern (e.g., rays and horseshoe crab). Some crab, snail, and finfish species were also included because they made up >5% of the total catch for gillnets and pots (in Jawa). Sea turtles and dugong limit the Criterion 2 scores for the gillnet fishery in all three fishing areas.

The Blue Swimming Crab Fishery Management Plan has been in place since 2014 and was published in 2022. Although there is currently a harvest strategy for blue swimming crab in Indonesia, some measures have been introduced but not reviewed, and there is limited monitoring. Further, although harvest control rules have recently been developed in East Jawa, similar rules have not been developed in other regions, and it is unclear whether the rules have been implemented or are effective. Because these measures are in the process of being determined but are not yet implemented, management is considered ineffective.

The Indonesia blue swimming crab fishery has an overall moderate impact on ocean habitats and ecosystems. Although there are no gear-specific modifications to reduce impacts to the seafloor, Indonesia's Blue Swimming Crab Processors Association (APRI) is considering implementing protected areas for spawning stock habitats, which would serve to mitigate impacts of fishing on those habitats that are within spawning areas. Overall, the gillnet and pot fisheries in Jawa, Sulawesi, and Sumatera are rated Red or Avoid.

Final Seafood Recommendations

SPECIES | FISHERY	C 1 TARGET SPECIES	C 2 OTHER SPECIES	C 3 MANAGEMENT	C 4 HABITAT	OVERALL	VOLUME (MT) YEAR
Blue swimming crab | Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa	1.000	1.000	1.000	3.000	**Avoid (1.316)**	Unknown
Blue swimming crab | Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera	1.000	1.000	1.000	3.000	**Avoid (1.316)**	Unknown
Blue swimming crab | Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi	1.000	1.000	1.000	3.000	**Avoid (1.316)**	Unknown
Blue swimming crab | Eastern Indian Ocean | Pots | Indonesia | Jawa	1.000	1.732	1.000	3.000	**Avoid (1.510)**	Unknown
Blue swimming crab | Eastern Indian Ocean | Pots | Indonesia | Sumatera	1.000	1.732	1.000	3.000	**Avoid (1.510)**	Unknown
Blue swimming crab | Western Central Pacific | Pots | Indonesia | Sulawesi	1.000	1.732	1.000	3.000	**Avoid (1.510)**	Unknown

Summary

Blue swimming crab (*Portunus pelagicus*) is a large-bodied, benthic crustacean common throughout the Indo-Pacific. This report covers blue swimming crab caught by collapsible crab pot and bottom-set gillnets in Jawa, Sulawesi, and Sumatera in Indonesia. The Avoid ranking for blue swimming crab from all three localities is driven by high conservation concerns over stock status, the impacts on bycatch species, and management of the fishery's impacts on crab populations.

Scoring Guide

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

Best Choice/Green = Final Score >3.2, and no Red Criteria, and no Critical scores

Good Alternative/Yellow = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern2, and no more than one Red Criterion, and no Critical scores

Avoid/Red = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

[2] Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

Introduction

Scope of the analysis and ensuing recommendation

This report includes recommendations for blue swimming crab (*Portunus pelagicus*), a large-bodied, benthic crustacean caught by collapsible crab pot and bottom-set gillnet. The fisheries occur in Indonesia, specifically in Jawa (Fishing Management Area [FMA] WPP-712), Sulawesi (FMA WPP-RI 716), and Sumatera (FMA WPP-RI 572).

Species Overview

Blue swimming crab is a brachyuran crab in the Portunidae family. Crabs from this family are usually recognized by their flat, disc-shaped hind legs, which are used as paddles for swimming, and by the nine spikes (aka horns) along their carapace, on either side of their eyes (GWA DOF 2011). Males are bright blue in color with white spots and characteristically long chelipeds; the females are a duller green/brown, with a more rounded carapace (BFAR 2012). Spawning occurs year-round, with peak spawning seasons in Indonesia typically between May and October (Ihsan et al. 2014). Female blue crabs mate only during molting, and the male crabs carry and protect them until molting and mating occurs. Blue swimming crab is common throughout the Indo-Pacific in inshore and continental shelf habitats, including sand, mud, algae, and seagrass near reefs and mangrove areas, and is found from the intertidal zone to depths of 70 m (Ingles 1988)(Germano et al. 2006). Blue swimming crab is a focal point of fishing industries in the region, such as in Indonesia, the Philippines, Vietnam, Cambodia, Malaysia, Thailand, India, and Sri Lanka (Figure 1) (Creech et al. 2016)(FAO 2022). In Indonesia, the major blue swimming crab fishing grounds spread from the northern coastal waters of Jawa to South Sulawesi, the Malacca Strait, and Eastern Sumatera (FPIK-UNDIP and APRI 2014). The species matures quickly (about 1 year), has a short lifespan (about 3 years), and is a partial brooder (Kangas 2000)(Josileen and Menon 2007).

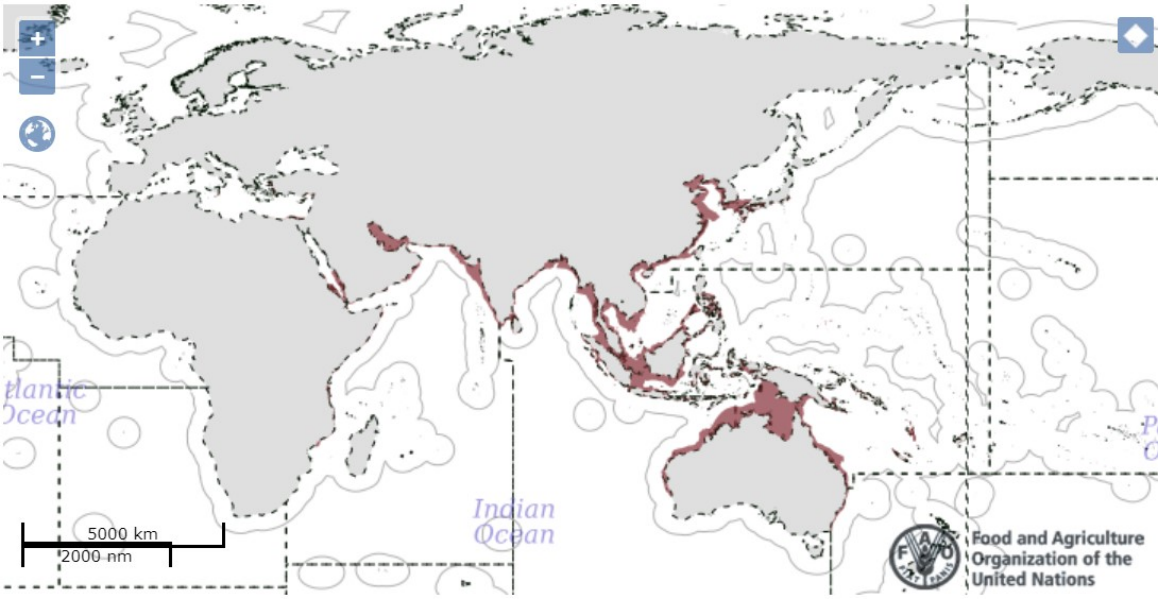


Figure 1: Global distribution of blue swimming crab. Taken from (FAO 2022).

Indonesian blue swimming crab fishery locations and gear

There are 11 Fishing Management Areas (FMA) in Indonesia (Figures 2 and 3), and blue swimming crab catches are reported from all the FMAs except north Sulawesi and the Pacific areas. Indonesian blue swimming crab is mostly caught with bottom gillnets (*pukat rajungan*) and collapsible traps (*bubu lipat*) that are set by fishers using a 5–15 hp outboard motor fishing boat (P4KSI and APRI 2015a). Bottom gillnets are made of monofilament nylon and have mesh sizes between 7.5 and 12.5 cm. Gillnets are 5 m deep and weighted to the shallow bottom into sets of 140 to 210 m (sets of three; Figure 4). They are usually hauled after 11 to 13 hours (P4KSI and APRI 2015a). Because the gillnets that are used closely resemble entangling nets, they have been categorized as "gillnets and entangling nets" in this assessment. Collapsible traps are round or square-shaped (depending on the locality), usually measure 32 × 51 × 21 cm, are made of wire mesh or a galvanized steel frame with two funnel entrances, and are sometimes covered by a polyethylene, green, square- or diamond-shaped net (Figure 5). Typically, there are 150 to 400 baited traps (with fish pieces)—the number limited only by the size of the boat—that are connected to a main line, and these are set by boat on sandy bottoms to depths of 20–50 m (P4KSI and APRI 2015a). Traps are soaked overnight and the catch is collected on-site (P4KSI and APRI 2015a).

	Fishing Management Area	Location
1	WPP-RI 571	Malacca Strait and Andaman Sea
2	WPP-RI 572	Indian Ocean of Western Sumatra and Sunda Strait
3	WPP-RI 573	(Indian Ocean of Southern Java, Southern Nusa Tenggara, Sawu) Sea, and Western of Timor Sea
4	WPP-RI 711	Karimata Strait, Natuna Sea, and South China Sea
5	WPP-RI 712	Java Sea
6	WPP-RI 713	Makassar Sea, Bone Bay, Flores Sea, and Bali Sea
7	WPP-RI 714	Tolo Bay and Banda Sea (Tiworo Strait)
8	WPP-RI 715	Tomini Bay, Maluku Sea, Halmahera Sea, Seram Sea, and Berau Bay
9	WPP-RI 716	Sulawesi Sea and Northern of Halmahera Island
10	WPP-RI 717	Cendrawasih Bay and Pacific Ocean
11	WPP-RI 718	Aru Bay, Arafuru Sea, and Eastern of Timor Sea

Figure 2: List of Indonesia's Fishing Management Areas. From {MMAF 2015}.

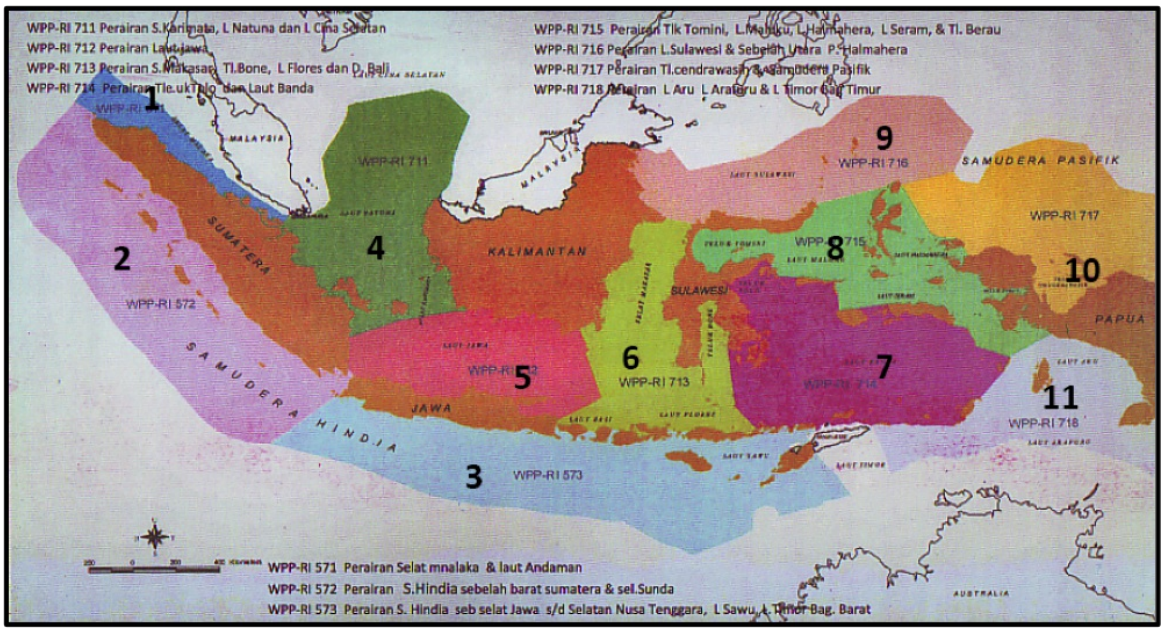


Figure 3: Map of Indonesia's Fishing Management Areas. From (FAO 2016c).

Illegal shallow bottom trawls (mini-trawls) and dredge nets are still used by small boats (<10 gross tons) in coastal small-scale fisheries, but to a lesser extent (MRAG Americas 2015)(P4KSI and APRI 2015a). Blue swimming crab is also a retained bycatch species in several other fisheries, such as those using trawl nets, drift gillnets, lift nets, seine nets, and purse seines (MRAG Americas 2015).

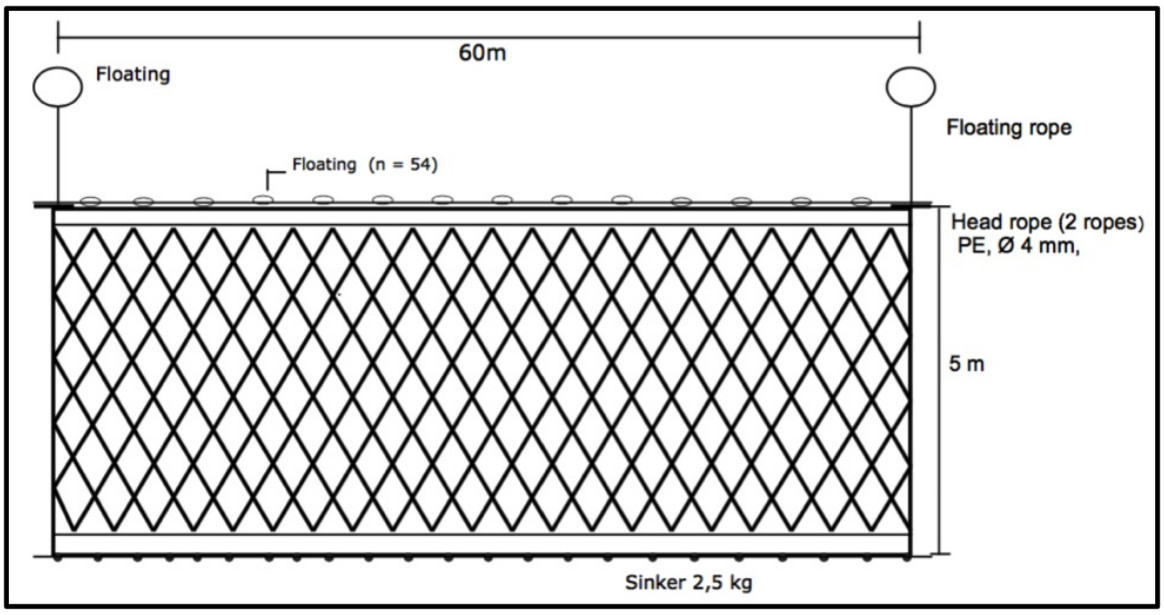


Figure 4: Construction of a bottom gillnet. From (P4KSI and APRI 2015a).

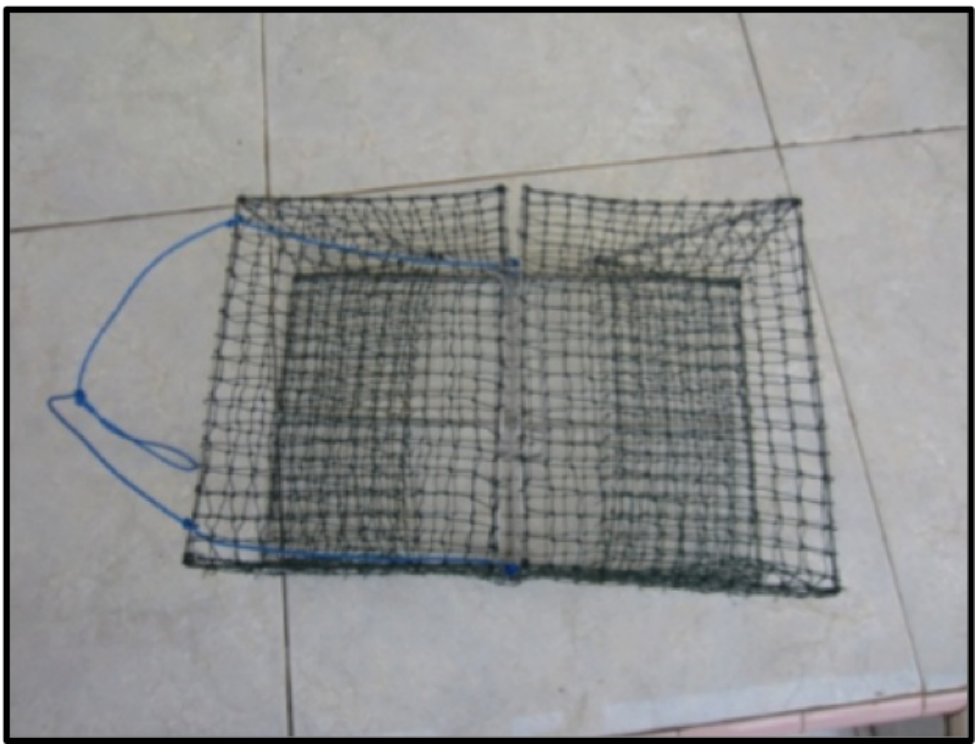


Figure 5: Collapsible trap used in north Jawa for catching blue swimming crab. From (P4KSI and APRI 2015a).

History of the fishery

The blue swimming crab fishery in Indonesia was unregulated before the involvement of the Sustainable Fisheries Partnership (SFP) and the implementation of the Fisheries Improvement Project (FIP) (SFP 2016). Before the 1990s, blue swimming crab was caught only for local consumption and the price was quite low; hence, the lack of regulation was not a dominant issue. But during the mid-1990s (starting in 1994), the export market for blue swimming crab developed when a major United States crab supplier discovered that white meat from the Southeast Asian blue swimming crab was the perfect substitute for the declining Chesapeake Bay blue crab (*Callinectes sapidus*). Soon, other processors followed suit, and demand for this product increased substantially, which in turn increased fishing pressure. As a result, the Indonesia blue swimming crab stock started to become overfished, and fishers found it increasingly hard to catch large crab (SFP 2016). Since the 1990s, when processors became concerned about the stock's overfishing status and involved the SFP to help improve sustainability, the catch has been mostly increasing, and reached a peak of 52,488 tonnes in 2014 (Figure 6) (SDI 2015).

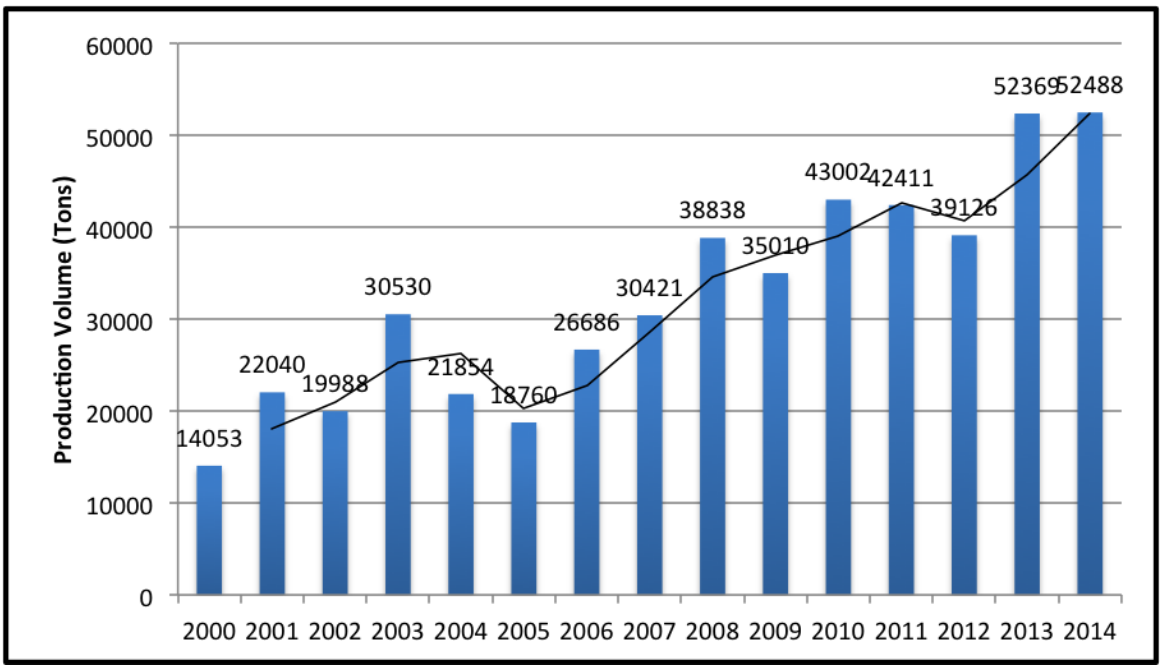


Figure 6: Indonesian blue swimming crab capture production volumes from 2000 to 2014. Bars represent the production volume (tons) per year and the line represents the overall trend of production during the period. Data from (MMAF and DGCF 2015).

Geographical patterns of blue swimming crab landings have changed over the years. During the early 1990s, landings were primarily from North Jawa, South Sulawesi, and the Malacca Strait. During the mid-1990s to 2000, the Malacca Strait and East Sumatera landings increased, while those in North Jawa remained constant. Since 2000, East Sumatera contributes the largest volume of the landings, while the Malacca Strait landings declined (SFP 2009). In 2014, East Sumatera produced the most blue swimming crab (14,201 t), followed by the Malacca Strait (10,156 t), Jawa (7,759 t), Sulawesi (6,470 t), South/West Kalimantan (4,865 t), Bali–Nusa Tenggara (4,763 t), Maluku–Papua (1,781 t), West Sumatra (1,326 t), and East Kalimantan (645 t) (MMAF and DGCF 2015). Maluku and Papua are relatively isolated, and harvesting and processing blue swimming crab are more costly and difficult there compared to other parts of Indonesia. But, future expansion in that region is anticipated as stocks elsewhere in Indonesia decline (SFP 2009).

Management

There is no unified worldwide body that manages fisheries for blue swimming crab. Instead, each country has its individual management system. In Indonesia, the Directorate General of Capture Fisheries (DGCF) of the Ministry of Marine Affairs and Fisheries (MMAF) is responsible for the management of fisheries, with formulating policies for capture fisheries management as its core function. But, most of the fisheries management authority is delegated to the district and provincial governments (under national policy or guidance) {FPIK-UNDIG and APRI 2014}. Until 2014, no management specific to blue swimming crab was implemented or regulated by a local government.

FIP

A fishery improvement project (FIP) led by the Asosiasi Pengelolaan Rajungan Indonesia (APRI), Indonesia's Blue Swimming Crab Processors Association, which represents more than 90% of the blue

swimming crab industry, was initiated in 2007 with the help of the Sustainable Fisheries Partnership (SFP) (NFICC 2016). The aim of the FIP is to gather all those associated with the Indonesian blue swimming crab fishery to create and implement a local plan that will improve the economic, social, and ecological sustainability of the fishery. A Marine Stewardship Council (MSC) pre-assessment was carried out in 2009, which concluded that there was a dearth of information regarding Indonesian blue swimming crab stock status, the fishery's impacts on bycatch and habitat, and fisheries governance (FPIK-UNDIP and APRI 2014). Because these Indonesian fisheries span a wide geographical area, only some of the sites are covered under the FIP. These are: Jawa (Betahwalang, Madura), Sulawesi (Kendari and surroundings in Tiworo Strait) and Sumatera (Lampung).

Production Statistics

The increasing global demand for blue swimming crab and its wide distribution throughout the Indo-Pacific makes it an important species for a number of countries (Creech 2013)(FAO 2016a), and there has been a steady increase in global supply since the 1960s until 2018, after which global production has slightly declined (Figure 7) (FAO 2022b). In 2020, the global production of blue swimming crab was 277,687.89 tons (live weight), of which Indonesia contributed 108,583.90 tons (FAO 2022).

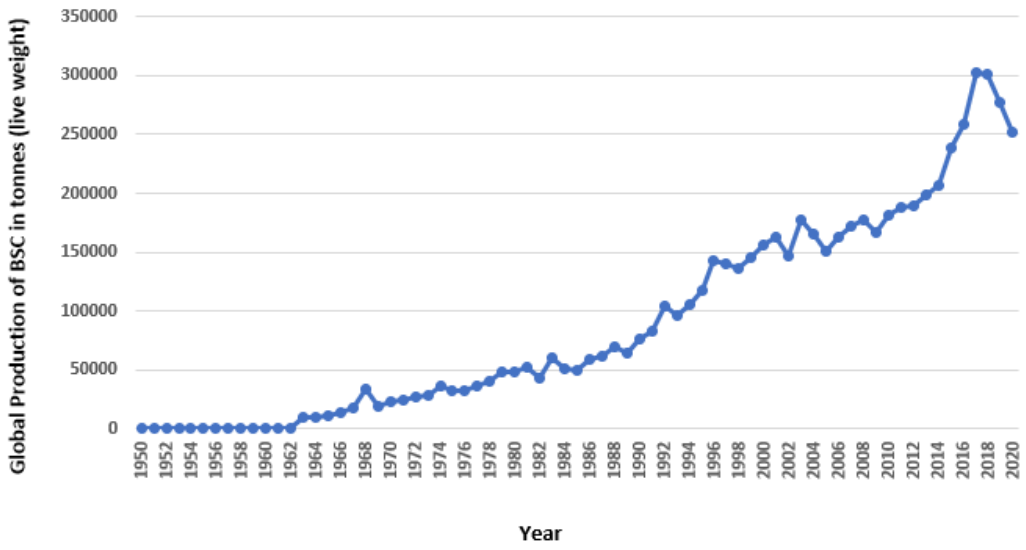


Figure 7: Global production of blue swimming crab in tonnes (live weight). Taken from (FAO 2022b).

Blue swimming crab has been Indonesia's third-largest seafood export by weight (following shrimp and tuna) and its most valuable seafood export commodity (because it fetches a high market value) (FPIK-UNDIP and APRI 2014). The total export volume of blue swimming crab in 2012 was 28,212 t, with a value of approximately USD 329 million (Figure 8) (MMAF 2016)(DJP2HP 2016). Blue swimming crab also fetches increasingly high prices, which have ranged from Indonesia rupiah (IDR) 2,000/kg (≈USD0.15) in 1990 to IDR20,000/kg (≈USD1.50) in 2012, and approximately IDR100,000/kg (≈USD7.52) in 2014 (FPIK-UNDIP and APRI 2014).

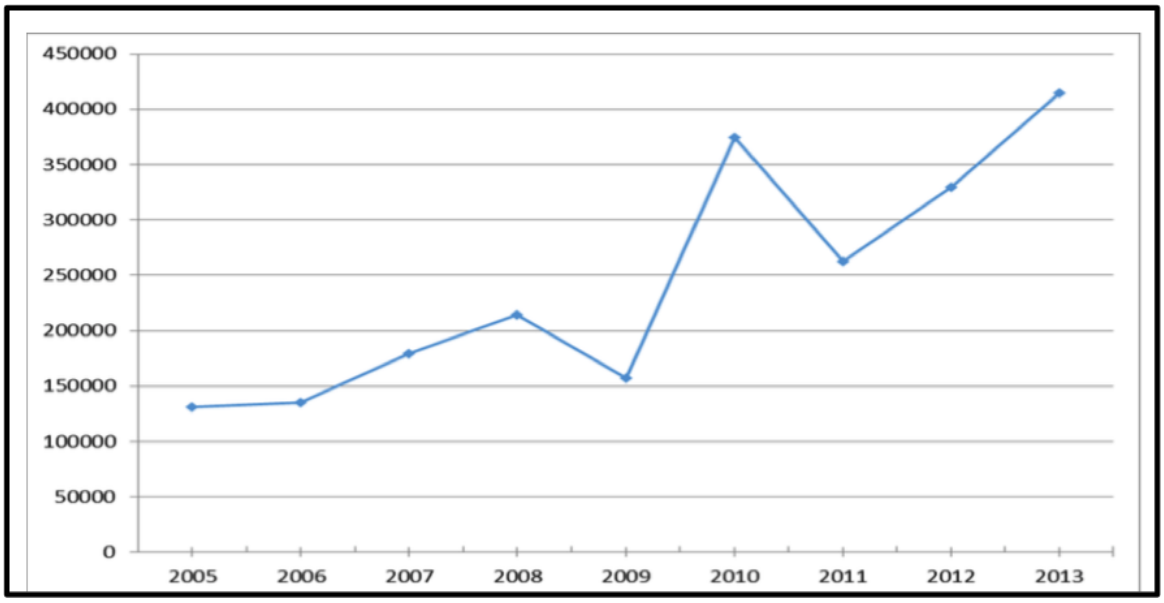


Figure 8: Indonesia's blue swimming crab export values (in USD) from 2005 to 2013. From (DJP2HP 2016).

Importance to the US/North American market.

The United States has been the biggest market for Indonesian crab exports, purchasing up to (and sometimes more than) 50% of the total crab export from Indonesia. In 2011, the United States purchased 10,021 t of blue swimming crab from Indonesia (43% of the total) (Figure 9) (MMAF 2016). Other markets for Indonesia crab exports (values from 2011) include China (19%), Singapore (0.1%), Malaysia (0.1%), Japan (0.05%), Hong Kong (0.4%), the European Union (0.03%), Canada, Taiwan, France, and Australia (all below 0.01%) {MMAF 2015}. On the U.S. market, 16% of crab and 42% of swimming crab (species unspecified) are from Indonesia (NMFS 2016).

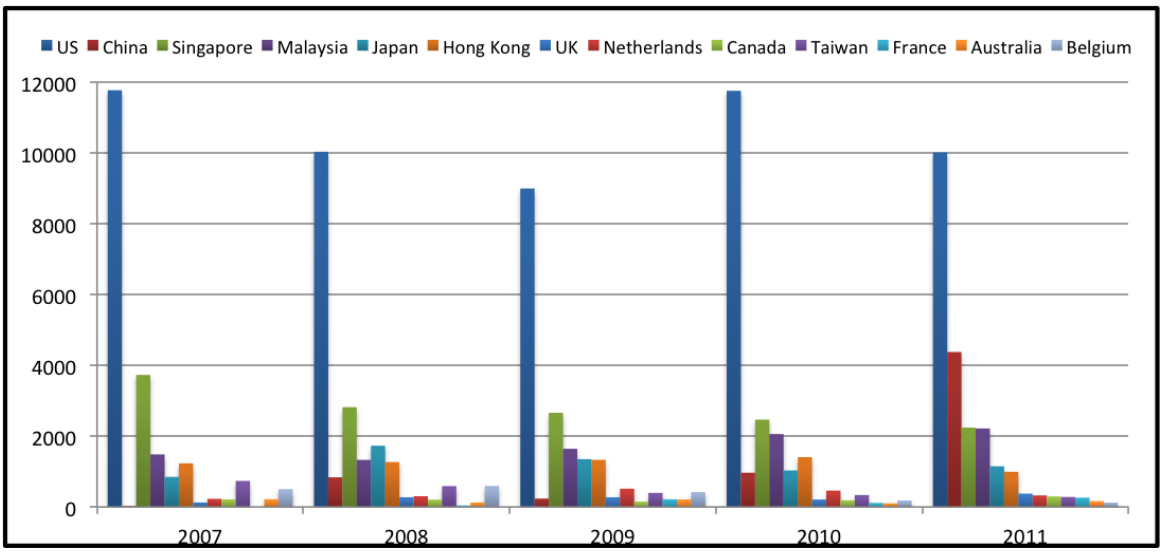


Figure 9: Main export destinations of Indonesia's blue swimming crab from 2007 to 2011. Data from (DJP2HP 2016).

The U.S. Customs report listed 28 Indonesian crab exporters to the U.S. market in 2008. The biggest crab exporters from Indonesia are Phillips Seafoods Indonesia, Tonga Tiur Putra, Windika Utama, Kelola Mina Laut, Mina Global Mandiri, Bumi Menara Internusa, Toba Surimi, Nuansa Citpta Magello, Dahlia Mitra Global, and Rex Canning. Altogether, they contribute more than 80% of the total crab export from Indonesia to the United States (SFP 2009). Between 2000 and 2014, the exports of portunid crabs from Indonesia to the United States remained stable; then in 2015–16, there was an exponential increase in these imports, after which they have continued to remain high (Figure 10) (NMFS 2022b). Indonesia is currently the largest supplier of portunid crab imports into the United States; in 2021, 13,867.29 tons of portunid crabs were imported into the United States from Indonesia, with a value of about USD379.8 million, which represent 48% of portunid crab imports by volume and 52% by value (Figures 11 and 12) (NMFS 2022)(NMFS 2022b).

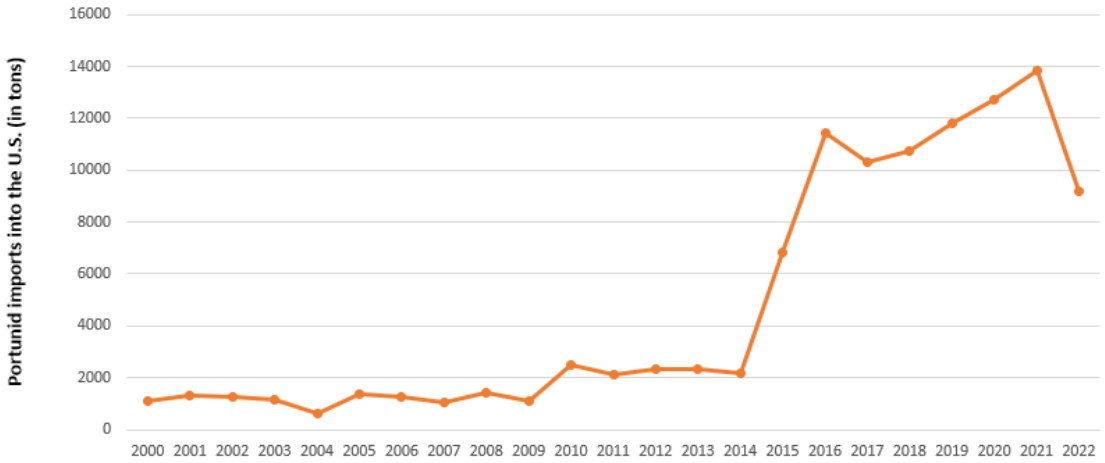


Figure 10: Portunidae imports into the United States from Indonesia by weight (tons) from 2000 to 2022. Data taken from (NMFS 2022b).

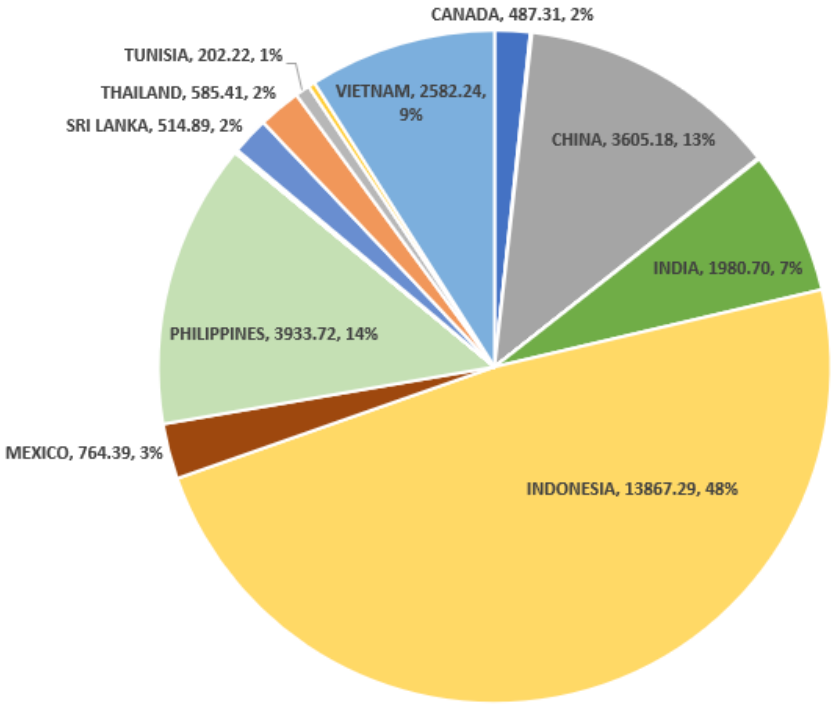


Figure 11: Global portunid crab imports into the United States by weight (tons) in 2021. Data from (NMFS 2022).

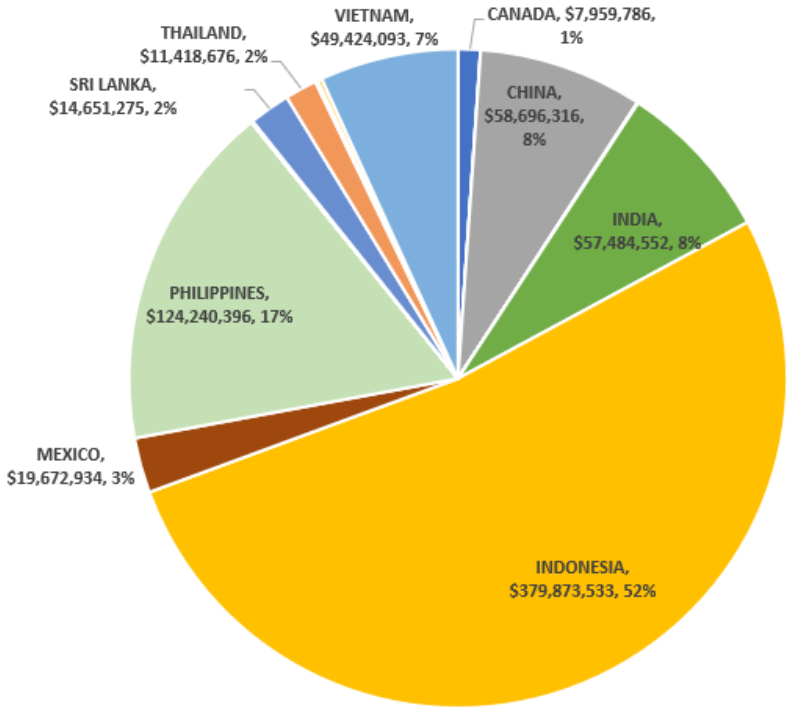


Figure 12: Global portunid crab imports into the United States by value (USD) in 2021. Data from (NMFS 2022).

Common and market names.

Blue swimming crab is also known as flower crab, blue crab, blue swimmer crab, blue manna crab, horse crab, sand crab, and swimming crab (GWA DOF 2011)(FDA 2016) (FishSource 2016). Blue swimming crab is locally referred to as "Rajungan" (FPIK-UNDIP and APRI 2014).

Primary product forms

Portunid crabs are sold interchangeably, and these species can include red swimming crab, blue swimming crab, and others, such as *Portunis sanguinolentus* and *P. trituberculatus* {Lai et al. 2010}(Sea Fare Group 2011). Swimming crab is exported by seafood companies as fresh, frozen, and canned products. Fresh crab is either exported as "head on" or "cut crab" products. Cut crabs are processed by removing the top shell, guts, and gills, then brushed clean and cut into two sections. Canned crab is a pasteurized product that involves picking the meat from boiled crabs. Crabmeat is graded according to type and size. Grades include colossal, jumbo, B jumbo, flower, lump, special, claw, B claw, and finger. Canned crab products include the designations fancy, special, jumbo lump, back fin, lump, white, and claw (Creech 2013).

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at www.seafoodwatch.org. The specific standard used is referenced on the title page of all Seafood Watch assessments.

Criterion 1: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. When abundance is unknown, abundance is scored based on the species' inherent vulnerability, which is calculated using a Productivity-Susceptibility Analysis. The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical.

Guiding principles

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level*

Criterion 1 Summary

BLUE SWIMMING CRAB			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa	1.000: High Concern	1.000: High Concern	Red (1.000)
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera	1.000: High Concern	1.000: High Concern	Red (1.000)
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi	1.000: High Concern	1.000: High Concern	Red (1.000)
Eastern Indian Ocean | Pots | Indonesia | Jawa	1.000: High Concern	1.000: High Concern	Red (1.000)
Eastern Indian Ocean | Pots | Indonesia | Sumatera	1.000: High Concern	1.000: High Concern	Red (1.000)
Western Central Pacific | Pots | Indonesia | Sulawesi	1.000: High Concern	1.000: High Concern	Red (1.000)

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - Abundance
Goal: Stock abundance and size structure of native species is maintained at a level that does not impair recruitment or productivity.

- *5 (Very Low Concern) — Strong evidence exists that the population is above an appropriate target abundance level (given the species' ecological role), or near virgin biomass.*
- *3.67 (Low Concern) — Population may be below target abundance level, but is at least 75% of the target level, OR data-limited assessments suggest population is healthy and species is not highly vulnerable.*
- *2.33 (Moderate Concern) — Population is not overfished but may be below 75% of the target abundance level, OR abundance is unknown and the species is not highly vulnerable.*
- *1 (High Concern) — Population is considered overfished/depleted, a species of concern, threatened or endangered, OR abundance is unknown and species is highly vulnerable.*

Factor 1.2 - Fishing Mortality

Goal: Fishing mortality is appropriate for current state of the stock.

- *5 (Low Concern) — Probable (>50%) that fishing mortality from all sources is at or below a sustainable level, given the species ecological role, OR fishery does not target species and fishing mortality is low enough to not adversely affect its population.*
- *3 (Moderate Concern) — Fishing mortality is fluctuating around sustainable levels, OR fishing mortality relative to a sustainable level is uncertain.*
- *1 (High Concern) — Probable that fishing mortality from all source is above a sustainable level.*

Blue swimming crab

Factor 1.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

High Concern

There are conflicting indicators of abundance in the region over the past 5 years. In 2020, the Marine and Fisheries Ministry of Indonesia published a blue swimming crab harvest strategy document, which presented the results of a data-limited stock assessment using the length-based spawning potential ratio (LB-SPR) analysis (MFMI 2020). SPR values of blue swimming crab in the Jawa Sea in 2016, 2017, and 2018 were 30%, 19%, and 21%, respectively, which shows that abundance declined greatly from 2016 to 2017, and the final SPR value in 2018 was only just above the limit reference point of 20% (MFMI 2020). But, an assessment conducted in Jawa, in the regions of Gresik, Pati, Pemalang, and Pamekasan, using data from 2017 to 2018 and the LB-SPR method showed that the SPR in all regions was below 20%, which would indicate that the blue swimming crab stock from these regions was below the limit reference point and it risks recruitment impairment, indicating that it is overfished (Prince et al. 2020). Following this publication, a more recent data-limited stock assessment was conducted by APRI in 2021, using data from 2019 and 2020, in the regions of Cirebon, Pemalang, Pati, Rembang, Pamekasan, and Gresik in Jawa (APRI 2021). According to this updated assessment, the SPR in Cirebon was 25%, Pemalang was 44%, Pati was 32%, Rembang was 31%, Pamekasan was 28%, and Gresik was 18% (APRI 2021). In all these regions, undersized crabs were <10% of the catch, except for Gresik, where they were >20% (APRI 2021).

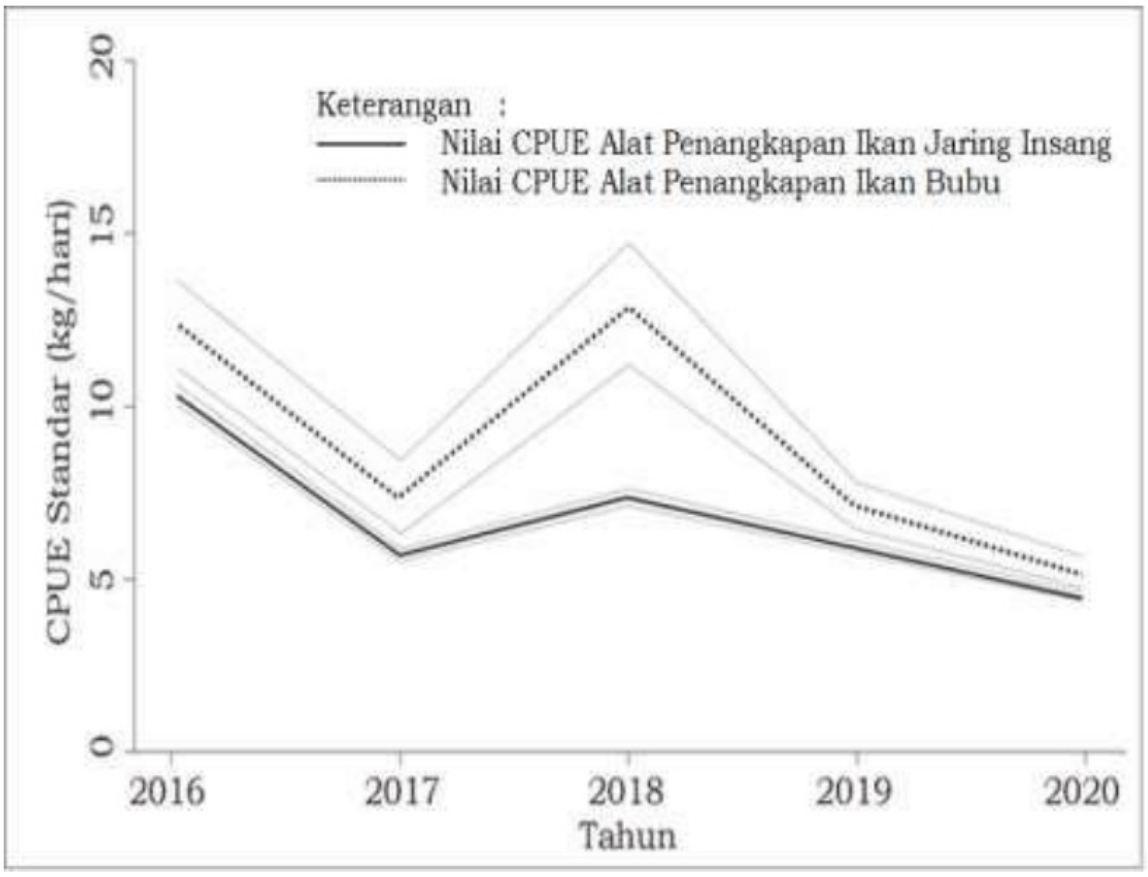
The most recent official SPR values published by the Marine and Fisheries Ministry of Indonesia, with data from 2017–20, indicate that the SPR values in East and Central Jawa were most recently all above the limit reference point of 20%, but only the regions of Pemalang and Rembang were above 30% (Table 1) (MFMI 2022). In contrast, the catch per unit effort (CPUE) from 2016–20 has declined (Figure 13), and approximately 15% of crabs caught were juveniles (<10 cm) (MFMI 2022). The various sources of SPR values show contradictory results, and the latest publication from the Marine and Fisheries Ministry of Indonesia (MFMI 2022) shows contrasting indicators, with a declining CPUE trend and the proportion of juveniles in the catch being >10%, but with SPR values being above the limit reference point (MFMI 2022). Hence, a productivity-susceptibility analysis (PSA) was conducted to score abundance of blue swimming crab in Jawa. The PSA score was 3.386 for both gillnets and pots, indicating that the stock is highly vulnerable. Therefore, abundance has been scored a high concern.

Justification:

Table 1: SPR values of blue swimming crab in Jawa. From (MFMI 2022).

Location of fishery	SPR in 2017	SPR in 2018	SPR in 2019	SPR in 2020
Demak, Central Jawa Province	21%	24%	29%	—
Pemalang, Central Jawa Province	26%	25%	37%	34%
Pati, Central Jawa Province	—	16%	31%	28%

Rembang, Central Jawa Province	—	—	42%	37%
Pameskasan, East Jawa Province	23%	20%	28%	27%
Sumenep, East Jawa Province	17%	33%	—	22%



Source: PIPP, DJPT, Ministry marine And Fishery, 2021.

Figure 13: Catch per unit effort of blue swimming crab in WPPNRI 712 (which includes Jawa). Taken from (MFMI 2022).

Productivity-Susceptibility Analysis

Scoring Guidelines

1) Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 [finfish only], p5 [finfish only], p6, p7, and p8 [invertebrates only])

2) Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: S = (s1 × s2 × s3 × s4 – 1) ÷ 40 + 1.

3) Vulnerability score (V) = the Euclidean distance of P and S using the following formula: $V = \sqrt{(P^2 + S^2)}$

Productivity Attribute	Relevant Information	Score (1 = low, 2 = medium, 3 = high)
Average age at maturity	Approximately 1 year (Kangas 2000)	1
Average maximum age	<3 years {Ernawati et al. 2017}	1
Fecundity	Between 60,000 and 1,976,398 in crabs with carapace widths of 100 to 190 mm (Jose 2013)	1
Reproductive strategy	Females are ovigerous and partial brooders (Kangas 2000)	2
Trophic level	Average 2.91 {Jiajia et al. 2016}	2
Density dependence	No depensatory or compensatory dynamics demonstrated or likely	2
Quality of habitat	Habitat has been moderately altered by nonfishing impacts	2
Total Productivity (average)		**1.571**

Susceptibility Attribute	Relevant Information	Score (1 = low, 2 = medium, 3 = high)
Areal overlap	Default score used	3
Vertical overlap	Default score used	3
Selectivity of fishery	Juveniles are caught in both gillnets and pots (MFMI 2022)	3
Post-capture mortality	Retained species	3
Total Susceptibility (multiplicative)		**3**

$V = \sqrt{(P^2 + S^2)}$

$V = \sqrt{(1.571^2 + 3^2)}$

$V = 3.386$

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Eastern Indian Ocean | Pots | Indonesia | Sumatera

High Concern

In 2020, the Marine and Fisheries Ministry of Indonesia published a blue swimming crab harvest strategy document, which presented the results of a data-limited stock assessment using the length-based spawning potential ratio (LB-SPR) analysis (MFMI 2020). SPR values of blue swimming crab in the Jawa Sea in 2016, 2017, and 2018 were 30%, 19%, and 21%, respectively, which shows that abundance declined greatly from 2016 to 2017, and the final SPR value in 2018 was only just above the limit reference point of 20% (MFMI 2020). A blue swimming crab stock assessment using the LB-SPR analysis and data from 2019 and 2020 from Sumatera was conducted for the Batubara and Kuala Penet (Lampung) Regions (APRI 2021). Results showed that the average LB-SPR in Batubara was 24%, whereas in Kuala Penet it was 56% (APRI 2021). The percentage of undersized crabs in the catch ranged from 5% to 16% in Batubara, and was <5% in Kuala Penet (APRI 2021). By contrast, another study conducted using the LB-SPR method from Lampung showed a declining trend in abundance, because SPR values were 27%, 25%, and 17% in 2019, 2020, and 2021 (Figure 14) (KPPRB 2021). This study also showed that the average CPUE declined from 2019 to 2021 for gillnets (Figure 15) (APRI 2021).

The most recent official SPR values published by the Marine and Fisheries Ministry of Indonesia, with data from 2017–20, indicate that the SPR values in East Lampung were 27% and 25% in 2019 and

2020, respectively (MFMI 2022). In contrast, catch per unit effort from 2016 to 2020 has declined (see Figure 13 in Factor 1.1 for Jawa), and approximately 15% of crabs caught were juveniles (<10 cm) (MFMI 2022). The various sources of SPR values show contradictory results, and the latest publication from the Marine and Fisheries Ministry of Indonesia (MFMI 2022) shows contrasting indicators, with a declining CPUE trend and the proportion of juveniles in the catch being >10%, but with SPR values above the limit reference point (MFMI 2022). Therefore, a PSA was conducted to score the abundance of blue swimming crab in Sumatera. The score was 3.386 for both gillnets and pots, indicating that the stock is highly vulnerable. Thus, abundance has been scored a high concern.

Justification:

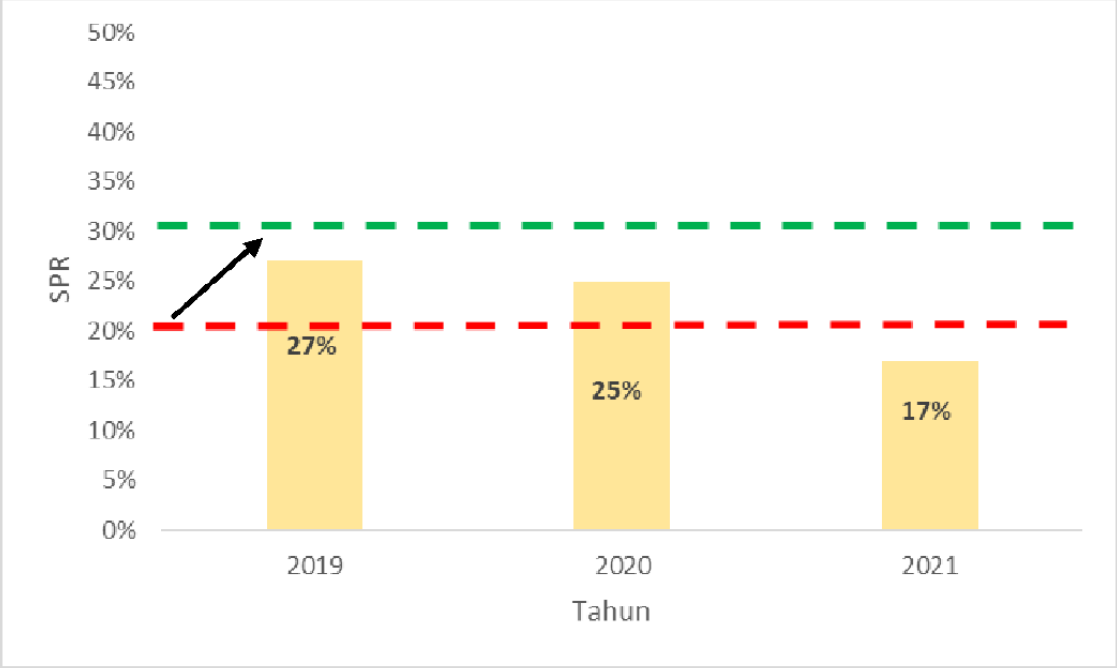


Figure 14: Declining spawning potential trend in Lampung, showing that the 2021 value is below the limit reference level of 20%. Taken from (KPPRB 2021).

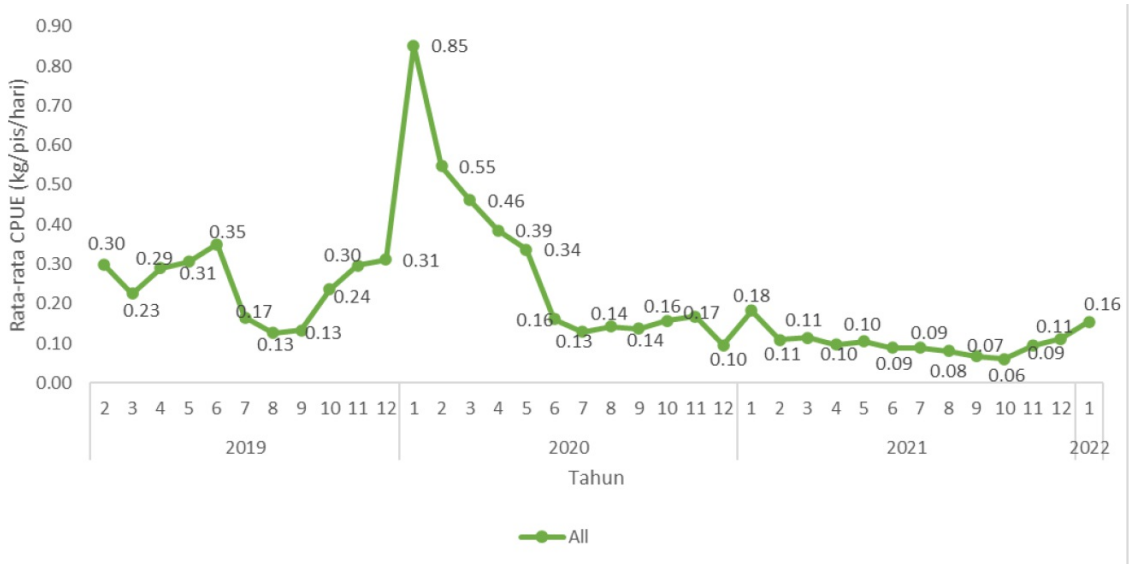


Figure 15: Average CPUE per month from all data collection locations of gillnets in Lampung in kg/pis/day, where 1 pis of net is 100 meters. Taken from (KPPRB 2021).

Productivity-Susceptibility Analysis

Productivity Attribute	**Relevant Information**	**Score (1 = low, 2 = medium, 3 = high)**
Average age at maturity	Approximately 1 year (Kangas 2000)	1
Average maximum age	<3 years {Ernawati et al. 2017}	1
Fecundity	Between 60,000 and 1,976,398 in crabs with carapace widths of 100 to 190 mm (Jose 2013)	1
Reproductive strategy	Females are ovigerous and partial brooders (Kangas 2000)	2
Trophic level	Average 2.91 {Jiajia et al. 2016}	2
Density dependence	No depensatory or compensatory dynamics demonstrated or likely	2
Quality of habitat	Habitat has been moderately altered by nonfishing impacts	2
Total Productivity (average)		**1.571**

Susceptibility Attribute	**Relevant Information**	**Score (1 = low, 2 = medium, 3 = high)**
Areal overlap	Default score used	3
Vertical overlap	Default score used	3
Selectivity of fishery	Juveniles are caught in both gillnets and pots (MFMI 2022)	3
Post-capture mortality	Retained species	3
Total Susceptibility (multiplicative)		**3**

$V = \sqrt{(P^2 + S^2)}$

$V = \sqrt{1.571^2 + 3^2)}$

$V = 3.386$

Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Western Central Pacific | Pots | Indonesia | Sulawesi

High Concern

The blue swimming crab data-limited stock assessment conducted by Prince et al. in 2020, using data from 2017–18, in the regions of Kasiputeh, Kendari, and Pamandati in Sulawesi, also used the LB-SPR analysis (Prince et al. 2020). According to this assessment, the LB-SPR in all regions were below 20%, which would indicate that the stock from these regions is below the limit reference point, risks recruitment impairment, and is overfished (Prince et al. 2020). But, the more recent stock assessment conducted by APRI in 2021 in the regions of Pamandati and Pangkajene of Sulawesi (APRI 2021) indicates that the average LB-SPR in Pamandati was 19% and in Pangkajene was 25% (APRI 2021). Whereas the percent of undersized crabs in the catch in Pamandati was very high at >20%, undersized crabs were <5% of the catch in Pangkajene (APRI 2021). The most recent official SPR values published by the Marine and Fisheries Ministry of Indonesia, with data from 2017–20, indicate that the SPR values in Pamandati Province, South Sulawesi were 22% and 21% in 2019 and 2020, respectively (MFMI 2022), which is just above the limit reference point of 20%. In contrast, the catch per unit effort from 2016 to 2020 has declined (see Figure 13 in Factor 1.1 for Jawa), and approximately 15% of crabs caught were juveniles (<10 cm) (MFMI 2022).

The SPR values of the fisheries in Sulawesi were either below 20% (the limit reference level) or just above 20%, CPUE was declining, and the proportion of undersized crabs caught in some regions was >10%, so a PSA was conducted to score abundance of blue swimming crab in Sulawesi. The score was 3.386 for both gillnets and pots, indicating that the stock is highly vulnerable. Hence, abundance has been scored a high concern.

Justification:

Productivity-Susceptibility Analysis

Productivity Attribute	**Relevant Information**	**Score (1 = low, 2 = medium, 3 = high)**
Average age at maturity	Approximately 1 year (Kangas 2000)	1
Average maximum age	<3 years {Ernawati et al. 2017}	1
Fecundity	Between 60,000 and 1,976,398 in crabs with carapace widths of 100 to 190 mm (Jose 2013)	1
Reproductive strategy	Females are ovigerous and partial brooders (Kangas 2000)	2
Trophic level	Average 2.91 {Jiajia et al. 2016}	2
Density dependence	No depensatory or compensatory dynamics demonstrated or likely	2
Quality of habitat	Habitat has been moderately altered by nonfishing impacts	2
Total Productivity (average)		**1.571**

Susceptibility Attribute	**Relevant Information**	**Score (1 = low, 2 = medium, 3 = high)**

Areal overlap	Default score used	3
Vertical overlap	Default score used	3
Selectivity of fishery	Juveniles are caught in both gillnets and pots (MFMI 2022)	3
Post-capture mortality	Retained species	3
Total Susceptibility (multiplicative)		**3**

$V = \sqrt{(P^2 + S^2)}$

$V = \sqrt{(1.571^2 + 3^2)}$

$V = 3.386$

Factor 1.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

High Concern

In Jawa, relative fishing mortality, F/M, was found to be >4 in Gresik, Pati, Pemalang, and Pamekasan (Figure 16) (Prince et al. 2020). The exploitation rate in the Jawa Sea was between 0.55 and 0.88 (FishChoice 2021); however, there were no reference points set to ascertain whether the fishery was experiencing overfishing. Because the fishing mortality according to Prince et al. was high, and in subsequent reports, there were no reference points mentioned to ascertain whether overfishing was occurring, fishing mortality in Jawa is considered a high concern.

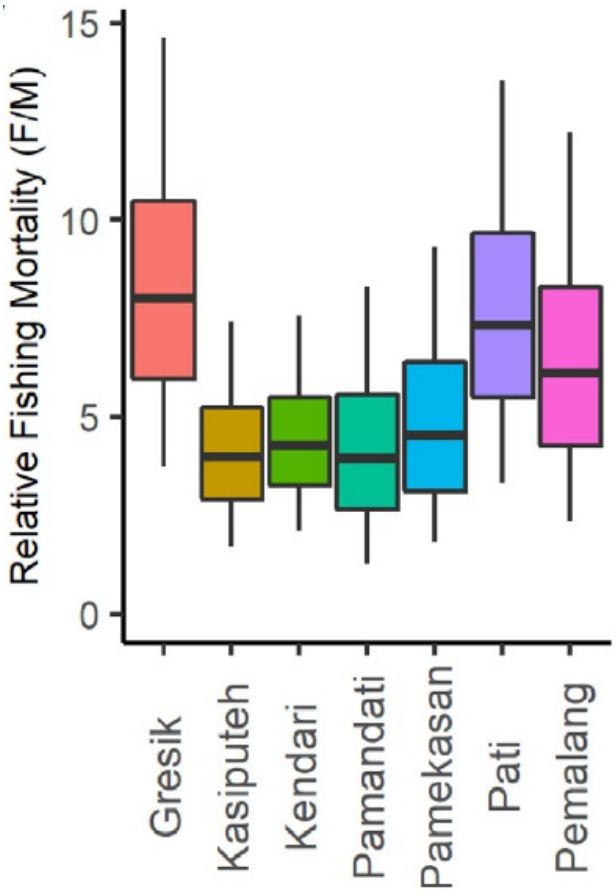


Figure 16: Relative fishing mortality in Jawa (Gresik, Pati, Pemalang, and Pamekasan) and Sulawesi (Kasiputeh, Kendari, and Pamandati). Taken from (Prince et al. 2020).

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Eastern Indian Ocean | Pots | Indonesia | Sumatera

High Concern

Although there are no fishing mortality estimates from Sumatera, it is likely that the results are similar to those in Jawa and Sulawesi. Thus, fishing mortality in Sumatera is considered a high concern.

Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Western Central Pacific | Pots | Indonesia | Sulawesi

High Concern

The relative fishing mortality, F/M, was found to be >4 in Kasiputeh, Kendari, and Pamandati in Sulawesi (Prince et al. 2020) (see Figure 16), which was high. Hence, fishing mortality in Sulawesi is considered a high concern.

Criterion 2: Impacts on Other Species

All main retained and bycatch species in the fishery are evaluated under Criterion 2. Seafood Watch defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing. Species are evaluated using the same guidelines as in Criterion 1. When information on other species caught in the fishery is unavailable, the fishery's potential impacts on other species is scored according to the Unknown Bycatch Matrices, which are based on a synthesis of peer-reviewed literature and expert opinion on the bycatch impacts of each gear type. The fishery is also scored for the amount of non-retained catch (discards) and bait use relative to the retained catch. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard/bait score. The Criterion 2 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 2.3 (Fishing Mortality) is Crtitical

Guiding principles

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level.*
- *Minimize bycatch.*

Criterion 2 Summary

Criterion 2 score(s) overview

This table(s) provides an overview of the Criterion 2 subscore, discards+bait modifier, and final Criterion 2 score for each fishery. A separate table is provided for each species/stock that we want an overall rating for.

BLUE SWIMMING CRAB			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa	1.000	1.000: < 100%	Red (1.000)
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera	1.000	1.000: < 100%	Red (1.000)
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi	1.000	1.000: < 100%	Red (1.000)
Eastern Indian Ocean | Pots | Indonesia | Jawa	1.732	1.000: < 100%	Red (1.732)
Eastern Indian Ocean | Pots | Indonesia | Sumatera	1.732	1.000: < 100%	Red (1.732)
Western Central Pacific | Pots | Indonesia | Sulawesi	1.732	1.000: < 100%	Red (1.732)

Criterion 2 main assessed species/stocks table(s)

This table(s) provides a list of all species/stocks included in this assessment for each 'fishery' (as defined by a region/method combination). The text following this table(s) provides an explanation of the reasons the listed species were selected for inclusion in the assessment.

EASTERN INDIAN OCEAN | GILLNETS AND ENTANGLING NETS | INDONESIA | JAWA			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Blue swimming crab	1.000: High Concern	1.000: High Concern	Red (1.000)
Dugong	1.000: High Concern	1.000: High Concern	Red (1.000)
Rays	1.000: High Concern	1.000: High Concern	Red (1.000)
Sea turtles	1.000: High Concern	1.000: High Concern	Red (1.000)
Sharks	1.000: High Concern	1.000: High Concern	Red (1.000)
Croaker	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Finfish	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Herrings	2.330: Moderate Concern	1.000: High Concern	Red (1.526)
Hermit crabs	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Horseshoe crabs	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Snails	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
True crabs	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

EASTERN INDIAN OCEAN | GILLNETS AND ENTANGLING NETS | INDONESIA | SUMATERA			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Blue swimming crab	1.000: High Concern	1.000: High Concern	Red (1.000)
Dugong	1.000: High Concern	1.000: High Concern	Red (1.000)
Rays	1.000: High Concern	1.000: High Concern	Red (1.000)
Sea turtles	1.000: High Concern	1.000: High Concern	Red (1.000)
Sharks	1.000: High Concern	1.000: High Concern	Red (1.000)

EASTERN INDIAN OCEAN | POTS | INDONESIA | JAWA			
SUB SCORE: 1.732	DISCARD RATE: 1.000	**SCORE: 1.732**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Blue swimming crab	1.000: High Concern	1.000: High Concern	Red (1.000)
Marine mammals	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Hermit crabs	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Horseshoe crabs	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Snails	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
True crabs	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

EASTERN INDIAN OCEAN | POTS | INDONESIA | SUMATERA			
SUB SCORE: 1.732	DISCARD RATE: 1.000	**SCORE: 1.732**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Blue swimming crab	1.000: High Concern	1.000: High Concern	Red (1.000)
Marine mammals	1.000: High Concern	3.000: Moderate Concern	Red (1.732)

WESTERN CENTRAL PACIFIC | GILLNETS AND ENTANGLING NETS | INDONESIA | SULAWESI			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Blue swimming crab	1.000: High Concern	1.000: High Concern	Red (1.000)
Dugong	1.000: High Concern	1.000: High Concern	Red (1.000)
Rays	1.000: High Concern	1.000: High Concern	Red (1.000)
Sea turtles	1.000: High Concern	1.000: High Concern	Red (1.000)
Sharks	1.000: High Concern	1.000: High Concern	Red (1.000)
Finfish	2.330: Moderate Concern	1.000: High Concern	Red (1.526)

WESTERN CENTRAL PACIFIC | POTS | INDONESIA | SULAWESI			
SUB SCORE: 1.732	DISCARD RATE: 1.000	**SCORE: 1.732**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Blue swimming crab	1.000: High Concern	1.000: High Concern	Red (1.000)
Marine mammals	1.000: High Concern	3.000: Moderate Concern	Red (1.732)

Catch composition information for blue swimming crab fisheries is available for bottom-set gillnets in Cirebon waters (West Jawa) and for both traps and bottom-set gillnets in Bungkutoko (Sulawesi) and northeast and southern Tiworo Strait (Sulawesi). A recent report studied bycatch from traps, trammel nets,

and other unspecific gear at several sites in Jawa (Rembang, Lancang, and Pamekasan) {APRI 2016}. It is important to note that small- to medium-scale variation exists in the bycatch species and amounts of bycatch in the different blue swimming crab fishing areas/habitats. This is directly related to the fishing gear used, biodiversity in certain areas, and seasonal differences (Zairion 2015).

Data from Rembang (Central Jawa), Lancang (Northwest Jawa), and Pamekasan (East Jawa) show that blue swimming crab accounts for approximately 76%, 87%, and 71% of the catch, respectively, with retained bycatch ranging from 2% to 21% (APRI 2016b). Species that made up more than 5% of the total catch were *Scylla serrata* (true crab), *Loxorhynchus grandis* (true crab), *Carcinoplax vestita* (true crab), *Dardanus* sp. (hermit crab), *Carcinoscorpius rotundicauda* (horseshoe crab), *Babylonia spirata* (marine snail), and *Latisipho* sp. (marine snail) (APRI 2016b). It is unclear which gear type each species is caught in.

The data from Cirebon waters (West Jawa) from December 2014 to January 2015 show that blue swimming crab accounts for ≈38% of the catch (by number) for gillnet. Croaker species (*Johnius* sp.) account for ≈26%, shad species (*Hilsa toli*) ≈10%, conch (Strombidae/marine snail) ≈7%, horseshoe crab (*Trachypleus gigas*) ≈4%, and the remaining ≈15% comprises other true crab species (*Charybdis feriata*, *Charybdis affinis*, Geryonidae), fish species (*Polydactylus* spp., *Pampus* spp., *Atrobucca* spp., *Synodus* spp., *Arius thalassinus*, and Platycephalidae), shrimp species (*Harpiosquilla harpax*), and marine/sea snails (Muricidae) (Figure 17) (P4KSI and APRI 2015b). The ratio of blue swimming crab to bycatch is 1:2.47 by number.

The data from Bungkutoko, Eastern Kendari Bay (Sulawesi) show that blue swimming crab accounts for over 90% of the catch (by weight): 94.63% for traps and 98.53% for gillnets. The remainder of the retained species (none over 5% of total catch) comprises various crabs, lobsters, sea snails, and finfishes (APRI 2015). Blue swimming crab in Northeast Tiworo Strait (Sulawesi) accounted for 88.34% of the catch, with other fishes at 10.8% and squids (Loliginidae) at 0.85%. In Southern Tiworo Strait, blue swimming crab catch ranged from 83.41% (Galal and Pajala) to 93.67% (P. Bangko), with other fishes dominating the bycatch (7.79% and 5.76%, respectively). Rigid swimming crab (*Charybdis natator*) and flathead lobster (*Thenus orientalis*) represented less than 5% (APRI 2015). None of the species caught are endangered, threatened, or protected (ETP) species. Juvenile crabs ≤100 mm (≤10 cm) carapace width (CW) made up 8% to 20% (by number) of the bycatch in each of the subfishing areas, and the percentage of berried to nonberried females was approximately 1.5% to 19.75% (APRI 2015).

APRI (2013) reports that bycatch from gillnets in Southeast Sulawesi includes assorted fish (croakers, mackerel), shrimp, squid, and mollusc species, including ribbontail stingray (*Taeniura lymma*), flathead lobster (*Thenus orientalis*), bream species (*Nemipters* spp.), and jacks (*Caranx* spp.). Bycatch from gillnets includes long-eyed swimming crab (*Phodopthalmus vigil*), mangrove swimming crab (*Thallamita crenata*), sixbar grouper (usually juveniles) (*Nemipterus* spp. and *Epinephelus sexfasciatus*), orange-spotted grouper (*Ephinephelus coioides*), and large-scaled terapon (*Therapon theraps*). There is no indication of bycatch volumes from this report.

Zairion (2015) reported that the mean percentage of nontargeted species caught by gillnet in blue swimming crab fisheries in East Lampung (Sumatera) coastal waters was 38% (by weight/year) and 68% (by number/year). Horseshoe crab (*Trachypleus gigas*), a protected species, was caught as bycatch in the blue swimming crab fishery each month, although few in number (Zairion 2015). The highest proportion of bycatch was during the east monsoon/dry season and seemingly has a connection with wind-driven

current. There are no data on specific species caught, or their volumes.

Interactions of ETP species with legal gear are thought to be negligible. Interaction of sea turtles with bottom-set gillnets is possible, although the characteristics of the gillnets used limit the risk to turtles. At this time, there are no data on how the blue swimming crab fishery interacts with ETP species. In general, there is a ban on the use of certain gear types within the 12-mile zone, and there is an overall ban on the use of destructive fishing practices (MRAG Americas 2015).

There have been no bycatch studies conducted in Sumatera.

Because assorted finfish were found in more than 5% of gillnet catches in both Jawa and Sulawesi, we have included unknown finfish as a Criterion 2 species, using the SFW Unknown Bycatch Matrix. Other Criterion 2 species that made up more than 5% of catch in gillnets and traps are sciaenids (croaker species [*Johnius* sp.]; Jawa), clupeids (shad species [*Hilsa*/*Tenualosa toli*]; Jawa), and marine snails (conch [Strombidae]; Jawa). Sea turtles and dugong were also included as Criterion 2 species in all three fishing areas and are the lowest-scoring species because of the their vulnerability and the potential for them to be caught in gillnets.

It is unknown how many species of concern interact with the blue swimming crab fishery; however, turtles, sharks, and rays are included in this assessment because they are a high conservation concern, have low inherent resilience, lack regional information on stock health, and have the potential to be caught in blue swimming crab gillnet fisheries. Marine mammals, corals, and sponges are also assessed in the blue swimming crab pot fishery for these reasons. Sea turtles, dugong, marine mammals, coral and other biogenic habitats, sharks, and rays limit the score for Criterion 2 because of their conservation status.

Refer to Appendix A for the updated catch composition analysis.

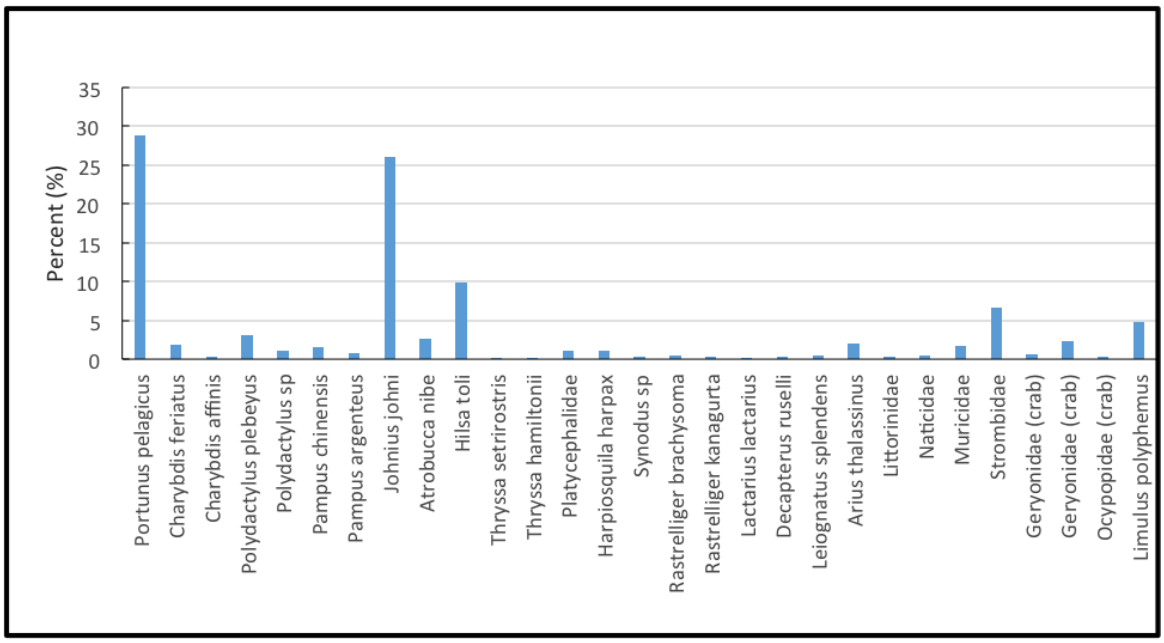


Figure 17: Catch composition of bottom-set gillnets in Cirebon waters (P4KSI 2015).

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Abundance
(same as Factor 1.1 above)

Factor 2.2 - Fishing Mortality
(same as Factor 1.2 above)

Factor 2.3 - Modifying Factor: Discards and Bait Use
Goal: Fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss. For fisheries that use bait, bait is used efficiently.

Scoring Guidelines: The discard rate is the sum of all dead discards (i.e. non-retained catch) plus bait use divided by the total retained catch.

Ratio of bait + discards/landings	Factor 2.3 score
<100%	1
>=100	0.75

Croaker

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa

Moderate Concern
According to the SFW criteria, finfish abundance is scored a moderate concern.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa

High Concern
Finfish caught as bycatch in bottom-set gillnets receive a fishing mortality of 2 out of 5, or high concern, using the Unknown Bycatch Matrix.

Dugong

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern
Dugong is listed as "Vulnerable" by the International Union for the Conservation of Nature (IUCN 2016). Therefore, dugong is scored a high concern, using the SFW criteria.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern
For bottom-set gillnet fisheries in Southeast Asia, marine mammals are scored 1 out of 5, or high concern, for fishing mortality, using the SFW Unknown Bycatch Matrix.

Finfish

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

Moderate Concern
Finfish are scored here according to the Unknown Bycatch Matrix (pp. 55–61 in the Seafood Watch Standard for Fisheries), which allows for scoring the risk of bycatch impacts by taxon, gear, and region where no data are available on the composition of the catch (including discards). Bony fish are scored a moderate concern using the Unknown Bycatch Matrix, unless there is reason to think that the species likely caught are highly vulnerable or depleted; in this case, they are not.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern
Finfish caught as bycatch in bottom-set gillnets receive a fishing mortality score of 2 out of 5, or high concern, using the Unknown Bycatch Matrix.

Hermit crabs

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

Moderate Concern
Benthic invertebrates are ranked a moderate concern for abundance, based on the SFW criteria.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

Moderate Concern
According to the SFW criteria, benthic invertebrates are ranked 3 out of 5, or moderate concern, for bottom gillnets.

Herrings

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa

Moderate Concern
According to the SFW criteria, finfish abundance is scored a moderate concern.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa

High Concern

There is no official stock assessment of *Tenualosa toli* (one of the finfish caught in over 5% of the total catch), but a study by Rahim et al. (2014) on *T. toli* in Malaysia implies that this stock is subject to heavy fishing pressure because of overfishing. Although the data on the population of *T. toli* obtained in the study are inadequate to provide the specific status of the population, they show that the *T. toli* population is moving toward depletion. In addition, landings have been declining since the 1980s {Rahim et al. 2014}. For these reasons, we have deemed this factor a high concern.

Horseshoe crabs

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

Moderate Concern

Benthic invertebrates are ranked a moderate concern for abundance, based on the SFW criteria.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

Moderate Concern

According to the SFW criteria, benthic invertebrates are ranked 3 out of 5, or moderate concern, for bottom gillnets.

Marine mammals

Factor 2.1 - Abundance

Eastern Indian Ocean | Pots | Indonesia | Sumatera
Eastern Indian Ocean | Pots | Indonesia | Jawa
Western Central Pacific | Pots | Indonesia | Sulawesi

High Concern

Marine mammals are considered highly vulnerable according to the SFW criteria; therefore, an abundance score of high concern is given.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Pots | Indonesia | Sumatera
Eastern Indian Ocean | Pots | Indonesia | Jawa
Western Central Pacific | Pots | Indonesia | Sulawesi

Moderate Concern
It is unlikely that marine mammals such as dugong are retained. Marine mammal fishing mortality is scored a moderate concern, because there are no known interactions, as well as limited monitoring; however, there is insufficient evidence to support a low concern or to remove them from the report entirely.

Rays

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern
According to the SFW Unknown Bycatch Matrix, rays have a high stock status concern for bottom-set gillnet fisheries. Rays also have high inherent vulnerability, according to the SFW criteria. For these reasons, their abundance is ranked a high concern.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern
According to the SFW Unknown Bycatch Matrix, rays score 2 out of 5, or high concern, for fishing mortality in bottom-set gillnets.

Sea turtles

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern
Sea turtles are listed as "Endangered" or "Threatened" throughout the world (NOAA 2016), so they are scored a high concern, using the SFW criteria.

Justification:

Six of the seven worldwide sea turtle species are found in blue swimming crab fishing regions (SWOT 2016). A review by Wallace et al. (2010) found that sea turtles are caught as bycatch in longlines, gillnets, and trawls in blue swimming crab fishing regions. It is unknown how many sea turtles are actually caught as bycatch in the gillnet fisheries, but their vulnerability and the potential for them to be caught includes them in this analysis.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern

For bottom gillnet fisheries in Southeast Asia, sea turtle fishing mortality is scored 1 out of 5, or high concern, using the SFW Unknown Bycatch Matrix.

Sharks

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern

According to the SFW Unknown Bycatch Matrix, sharks have a high stock status concern for bottom-set gillnet fisheries. Sharks also have high inherent vulnerability, according to the SFW criteria. For these reasons, their abundance is ranked a high concern.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

High Concern

According to the SFW Unknown Bycatch Matrix, sharks score 2 out of 5, or high concern, for fishing mortality in bottom-set gillnets.

Snails

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

Moderate Concern

Benthic invertebrates are ranked a moderate concern for abundance, based on the SFW criteria.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

Moderate Concern

According to the SFW criteria, benthic invertebrates are ranked 3 out of 5, or moderate concern, for bottom gillnets.

True crabs

Factor 2.1 - Abundance

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

Moderate Concern

Benthic invertebrates are ranked a moderate concern for abundance, based on the SFW criteria.

Factor 2.2 - Fishing Mortality

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Jawa

Moderate Concern

According to the SFW criteria, benthic invertebrates are ranked 3 out of 5, or moderate concern, for bottom gillnets.

Factor 2.3 - Discard Rate/Landings

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera

< 100%

Discards in the Jawa (and likely the Sumatera) gillnet fishery have a lower chance of survival because they are only released after the net is untangled at the landing. It has been reported that blue swimming crab accounts for between 38% (West Java-Cirebon waters) to 87% (Rembang, Lancang, Pamekasan) of specimens caught by set gillnets, with the retained bycatch ranging from 2% to 21% (P4KSI and APRI 2015b)(APRI 2016b). Therefore, we have assumed that the dead discards relative to total landings are less than 100%, which leads to a multiplying factor of 1.

Eastern Indian Ocean | Pots | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Sumatera
Western Central Pacific | Pots | Indonesia | Sulawesi

< 100%

Discards from the Jawa and Sulawesi (and likely the Sumatera) trap fisheries are minimal (<5%) and have higher survival rates because they are released at sea. Therefore, we have assumed that the dead discards relative to total landings do not exceed 100%, and a multiplying factor of 1 is given.

Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi

< 100%

Discards from the Sulawesi bottom-set gillnet fishery are minimal (<5%), so they are assumed to have a multiplying factor of 1.

Criterion 3: Management Effectiveness

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

- *5 (Very Low Concern) — Meets the standards of 'highly effective' for all five factors considered.*
- *4 (Low Concern) — Meets the standards of 'highly effective' for 'management strategy and implementation' and at least 'moderately effective' for all other factors.*
- *3 (Moderate Concern) — Meets the standards for at least 'moderately effective' for all five factors.*
- *2 (High Concern) — At a minimum, meets standards for 'moderately effective' for Management Strategy and Implementation and Bycatch Strategy, but at least one other factor is rated 'ineffective.'*
- *1 (Very High Concern) — Management Strategy and Implementation and/or Bycatch Management are 'ineffective.'*
- *0 (Critical) — Management Strategy and Implementation is 'critical'.*

The Criterion 3 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

- The fishery is managed to sustain the long-term productivity of all impacted species.

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	RESEARCH AND MONITORING	ENFORCEMENT	INCLUSION	SCORE
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa	Ineffective	Ineffective	Moderately Effective	Ineffective	Moderately Effective	**Red (1.000)**
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera	Ineffective	Ineffective	Moderately Effective	Ineffective	Moderately Effective	**Red (1.000)**
Eastern Indian Ocean | Pots | Indonesia | Jawa	Ineffective	Ineffective	Moderately Effective	Ineffective	Moderately Effective	**Red (1.000)**

Eastern Indian Ocean | Pots | Indonesia | Sumatera	Ineffective	Ineffective	Moderately Effective	Ineffective	Moderately Effective	**Red (1.000)**
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi	Ineffective	Ineffective	Moderately Effective	Ineffective	Moderately Effective	**Red (1.000)**
Western Central Pacific | Pots | Indonesia | Sulawesi	Ineffective	Ineffective	Moderately Effective	Ineffective	Moderately Effective	**Red (1.000)**

Management of the Malacca Strait and the Andaman Sea are under the authority of three local government (pemda) provinces: Provincial Government Aceh, North Sumatera, and Riau (MMAF 2016).

Management of the Java Sea (eight local government provinces): Provincial Government of Lampung, Banten, West Jawa, Jakarta, Central Jawa, East Jawa, South Kalimantan, Central Kalimantan, and 52-City district (MMAF 2016).

Management of Karimata Strait, Natuna Sea, and South China Sea (seven local government provinces): Provincial Government of Riau Islands, Riau, Jambi, South Sumatera, Bangka Belitung, West Kalimantan, and Central Kalimantan (MMAF 2016).

Management of Makassar Strait, Bone Bay, Flores Sea, and the Sea of Bali (10 local government provinces): Provincial Government of East Kalimantan, South Kalimantan, East Jawa, Bali, West Nusa Tenggara, East Nusa Tenggara, South Sulawesi, Central Sulawesi, North Sulawesi, and West Sulawesi (MMAF 2016).

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Management Strategy and Implementation

Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? Do manages follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.

Factor 3.2 - Bycatch Strategy

Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.

Factor 3.3 - Scientific Research and Monitoring

Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are met.

Factor 3.4 - Enforcement of Management Regulations

Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.

Factor 3.5 - Stakeholder Inclusion

Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.

Factor 3.1 - Management Strategy And Implementation

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Eastern Indian Ocean | Pots | Indonesia | Jawa
Western Central Pacific | Pots | Indonesia | Sulawesi

Ineffective

Indonesian blue swimming crab fisheries operate under Fisheries Law No. 31/2004 (2004), as amended by Act 45/2009, which emphasizes the importance of the sustainable use of aquatic resources in the development of fisheries (according to Articles 6.1 and 6.2 of the Code of Conduct for Responsible Fisheries [CCRF]) {FAO 1995}, and by the MMAF regulation No. 02/2011, which relates to the use of fishing gear/equipment in FMAs in order to reduce conflict and increase sustainability (MMAF 2016).

Ministerial decrees defining implementation arrangements related to the Fisheries Law and MMAF Regulation have been issued (see following paragraphs). In addition, there are numerous customary arrangements reflecting the rich diversity of the vast span of the country (MRAG Americas 2015).

The institutional framework for fisheries management includes the MMAF/DPK and the Provincial and District Fisheries Services, which are government agencies that are responsible for fisheries administration, development, and management (MMAF 2016). The governor at the provincial level and the bupati (head of district) or the mayor at the district or municipal level are responsible for the administration of local fisheries. These regional offices, which are under the authority of the Department of Home Affairs (Law No.22/1999 on Regional Administration, 1999), implement the fisheries program under the technical guidance of MMAF (MMAF 2016). The local government is the main body for conflict and dispute resolution, although the mechanism for this is not currently known, nor is the effectiveness known (MRAG Americas 2015).

The FMP (RPP) for blue swimming crab fisheries in all WPPs in Indonesia has recently been published by the Ministry (MFMI 2022). The national government has delegated powers to the provincial governments, which have already implemented management in line with the national FMP (since 2014). Four provinces are currently under development to establish a fishery management committee (following Southeast Sulawesi), including Lampung, Central Jawa, and East Jawa (pers. comm., H. Madduppa December 29, 2016). The RPP states that the management plan will be evaluated annually and reviewed every 5 years using an ecosystem-based approach to fisheries management.

A recently legislated harvest strategy has been developed for blue swimming crab in Indonesia (MFMI 2020)(FishChoice 2021), with two key objectives: to ensure that the LB-SPR increases to the target reference level of 30% in 5 years, and 90% of crabs caught should be above the MLS of 10 cm over the next 5 years. In addition, no berried females are to be retained in the fisheries (MFMI 2020)(FishChoice 2021). A broad total allowable catch (TAC) for each species group is also implemented, but there is no guidance for stakeholders on how this needs to be achieved (FishChoice 2021). Further, the recently published blue swimming crab FMP encourages

implementation of management through the development of action plans in the provinces through their authorities (MFMI 2022). For instance, the village of Pagagan in Pamekesan has developed village regulations to ensure management of the blue swimming crab fishery by coopting the community (Pagagan village community 2020); other villages have also developed local decrees. The Indonesian government has also banned trawling, and has promoted a fishing gear swap: 3,000 traps are provided in exchange for a trawler (FishChoice 2021).

Nevertheless, implementation of blue swimming crab rules depends on the province and the budget of each province, so effectiveness on the whole is unknown (FishChoice 2021). Catching undersized crabs and berried females is still an issue that has not been adequately managed, and excessive fishing pressure is still unresolved (MFMI 2022). In addition, although harvest control rules have been developed and legalized in East Jawa (Province of East Jawa 2021), there are still no harvest control rules developed in other regions, and it is unknown whether the harvest control rules that have been developed are being implemented and are effective. Further, literature indicates that there may be up to 5 clades of blue swimming crab around the islands of Indonesia (Madduppa et al. 2021); if there are multiple blue swimming crab stocks, then management strategies need to be targeted toward each stock. For all these reasons, management strategy and implementation has been scored ineffective.

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Eastern Indian Ocean | Pots | Indonesia | Sumatera

Ineffective

Indonesian blue swimming crab fisheries operate under Fisheries Law No. 31/2004 (2004), as amended by Act 45/2009, which emphasizes the importance of the sustainable use of aquatic resources in the development of fisheries (according to Articles 6.1 and 6.2 of the Code of Conduct for Responsible Fisheries [CCRF] {FAO 1995}), and by the MMAF regulation No. 02/2011, which relates to the use of fishing gear/equipment in FMAs in order to reduce conflict and increase sustainability (MMAF 2016).

Ministerial decrees defining implementation arrangements related to the Fisheries Law and MMAF Regulation have been issued (see the following paragraphs). In addition, there are numerous customary arrangements reflecting the rich diversity of the vast span of the country (MRAG Americas 2015).

The institutional framework for fisheries management includes the MMAF/DPK and the Provincial and District Fisheries Services, which are government agencies that are responsible for fisheries administration, development, and management (MMAF 2016). The governor at the provincial level and the bupati (head of district) or mayor at the district or municipal level are responsible for the administration of local fisheries. These regional offices, which are under the authority of the Department of Home Affairs (Law No.22/1999 on Regional Administration, 1999), implement the fisheries program under the technical guidance of MMAF (MMAF 2016). The local government is the main body for conflict and dispute resolution, although the mechanism for this is not currently known, nor is the effectiveness (MRAG Americas 2015).

The FMP (RPP) for blue swimming crab fisheries in all WPPs in Indonesia has recently been

published by the Ministry (MFMI 2022). The national government has delegated powers to the provincial governments, which have already implemented management in line with the national FMP (since 2014). The RPP states that the management plan will be evaluated annually and reviewed every 5 years, using an ecosystem-based approach to fisheries management.

Beginning in 2017, the Lampung Blue Swimming Crab Fishery Management Team was formed to create an FMP for the blue swimming crab fishery in Lampung, Sumatera. It was designed under the leadership of the Ministry of Marine Affairs and Fisheries (MMAF or KKP), the Lampung Province Fisheries Agency (DKP Lampung), the association of blue swimming crab processors (APRI), as well as local fishers, supply chain actors, academics, and CSO organizations (pers. comm., E. Litsinger November 2018). The plan is intended to support the national blue swimming crab FMP (Ministerial Decree of Marine Affairs and Fisheries Number 70, Year 2016), industry goals and objectives, and local livelihoods. The action plan in Lampung helps to accelerate the implementation of blue swimming crab management at the provincial level, in the nearshore waters that blue swimming crab primarily inhabit, and the appropriate scale for management. The blue swimming crab fishery management area in the eastern coast of Lampung, within waters up to 12 nautical miles, is under the authority of the Lampung Province government (Law 23 2014), and is around 480,000 hectares (ha). The Regional Regulation of Lampung Province No. 1, Year 2018, Concerning the Zonation Plan of Coasts and Small Islands Area of Lampung Province for 2017–2036 includes a capture fisheries zone and establishes a location for sustainable blue swimming crab fishery management in the eastern part of Lampung (Article 17 Section 4b).

A recently legislated harvest strategy has been developed for blue swimming crab in Indonesia (MFMI 2020)(FishChoice 2021), with two key objectives: to ensure that the LB-SPR increases to the target reference level of 30% in 5 years, and 90% of crabs caught should be above the MLS of 10 cm over the next 5 years. In addition, no berried females are to be retained in the fisheries (MFMI 2020)(FishChoice 2021). A broad TAC for each species group is also implemented, but there is no guidance for stakeholders on how this needs to be achieved (FishChoice 2021). Further, the recently published blue swimming crab FMP encourages implementation of management through the development of action plans in the provinces through their authorities (MFMI 2022), and some villages have already developed local decrees. The Indonesian government has also banned trawling, and has promoted a fishing gear swap: 3,000 traps are provided in exchange for a trawler (FishChoice 2021)(MFMI 2022).

Nevertheless, implementation of blue swimming crab rules depends on the province and the budget of each province, so the effectiveness on the whole is unknown (FishChoice 2021)(MFMI 2022). Catching undersized crabs and berried females is still an issue that has not been adequately managed, and excessive fishing pressure is still unresolved (MFMI 2022). In addition, there are still no harvest control rules developed, and it is unknown whether the harvest control rules that have been developed are being implemented and are effective. Illegal trawling is still an issue that occurs and is a cause of conflict between fisher groups (KPPRB 2021). Further, literature indicates that there may be up to 5 clades of blue swimming crab around the islands of Indonesia (Madduppa et al. 2021); if there are multiple blue swimming crab stocks, then management strategies need to be targeted toward each stock. For all these reasons, management strategy and implementation has been scored ineffective.

Factor 3.2 - Bycatch Strategy

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Eastern Indian Ocean | Pots | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Sumatera
Western Central Pacific | Pots | Indonesia | Sulawesi

Ineffective

Government regulations No 20/2018 and No. 106/2018 aim to protect ETP species caught in fisheries (FishChoice 2021). There are some initiatives in place to protect horseshoe crab and release them from fisher nets; for instance, the Government of south Sumatera has added horseshoe crab to its biodiversity strategy and action plan (FishChoice 2021). In addition, APRI has conducted awareness programs on ghost gear among the fisher community, and some fishers have started collecting ghost gear and handing it over to the enumerators (FishChoice 2021)(APRI 2021c). There is a policy in place to swap fishing gear from gillnets to collapsible traps, because gillnets have more bycatch and produce lesser-quality crabs (due to the catch method). But, it is unclear whether sea turtles and dugong, which are ETP species, are commonly caught as bycatch in the gillnet fishery, and whether marine mammals are entangled due to traps, because no bycatch risk assessments have been conducted. Bycatch data are being collected and monitored by APRI (APRI 2020)(APRI 2021b); however, there are few measures in place to regulate fisheries bycatch, and some ETP species (such as horseshoe crab and rays) are caught as bycatch in both gillnets and traps. Government records from 2021 indicate that 10,712 tons of rays were caught as bycatch in the blue swimming crab fishery (MFMI 2022), indicating that bycatch is still not being adequately managed.

Although there are some measures and regulations in place to reduce bycatch, it is unclear whether these regulations are being appropriately implemented, and the effectiveness of these regulations and initiatives is unknown, because the bycatch of rays and other species appears to be an issue. For these reasons, a score of ineffective is considered appropriate for this factor.

Factor 3.3 - Scientific Research And Monitoring

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Eastern Indian Ocean | Pots | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Sumatera
Western Central Pacific | Pots | Indonesia | Sulawesi

Moderately Effective

Data collection and monitoring of stocks are regularly conducted: stocks are assessed using the LB-SPR analysis (MFMI 2020)(Prince et al. 2020)(APRI 2021)(KPPRB 2021)(MFMI 2022), which is a data-limited assessment method. Bycatch data that are collected are incomplete, and for vessels <5

GT usually fishing with pots, bycatch data have typically not been collected (APRI 2020). Licensing and logbook reporting have only recently been made mandatory for these small vessels by way of a recent government order, but this order is still in the process of being implemented (FishChoice 2021). Further, there are challenges created by the various streams of data (collected by the government, nongovernmental organizations, and the industry), which has resulted in multiple data sets, sometimes with contradictory results, indicating that there is a need for coordination and cooperation when collecting data and presenting results. Still further, if there are in fact multiple blue swimming crab stocks, as is suggested in the recent genetic study by Madduppa et al. 2021, then stock assessments may need to be conducted for each separate stock (Madduppa et al. 2021). Taken together, a score of moderately effective is awarded for this factor.

Factor 3.4 - Enforcement Of Management Regulations

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Eastern Indian Ocean | Pots | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Sumatera
Western Central Pacific | Pots | Indonesia | Sulawesi

Ineffective

The Directorate General of Surveillance, Control and Monitoring monitors fishing activity in Indonesian waters beyond 12 nm on the coast, with the help of the Indonesian navy (FishChoice 2021). Provincial governments monitor fisheries within 12 nm of the coast, along with the marine police (FishChoice 2021). Both blue swimming crab fishers and processors are monitored (FishChoice 2021). In particular, there is monitoring by both government officers and the processors to ensure that crabs under the minimum landing size of 10 cm and berried females are not harvested. The Fishery Act 31/2004 outlines penalty schedules with options that include fines, suspension or cancellation of licenses, refusal of new licenses, and removal from the fishery (FishChoice 2021). Fines could be up to USD1.5 million and/or jail time up to 10 years (FishChoice 2021). An upcoming amendment to the fisheries law will propose new sanctions, such as written warnings and new fines (FishChoice 2021). Nevertheless, progress toward improving enforcement and compliance currently appears to be slow, enforcement is lacking in provincial waters, and the capacity for enforcement within provincial waters is also lacking (MFMI 2022). Fishing pressure is still high, IUU fishing still takes place, and juveniles are still fished (MFMI 2022). Of the enforcement measures that do exist, it is not clear to what extent they are being implemented, and what their effectiveness is (FishChoice 2021). There is also evidence of some noncompliance among fishers involved in the blue swimming crab fisheries (FishChoice 2021). Because of these reasons, a score of ineffective has been assigned to this factor.

Factor 3.5 - Stakeholder Inclusion

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Eastern Indian Ocean | Pots | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Sumatera
Western Central Pacific | Pots | Indonesia | Sulawesi

Moderately Effective

In general, Indonesia follows an inclusive management process. The Ministry of Marine Affairs and Fisheries is consulted by the National Committee on Fish stock assessment, which comprises independent fishery experts, university scientists, members from fisher communities, nongovernmental organizations, and members of the provincial governments (FishChoice 2021). Consultations on fisheries management takes place through councils that include similarly diverse stakeholders (FishChoice 2021). When the blue swimming crab harvest strategy was developed, seven meetings were held, which included all these stakeholders, providing ample opportunity for effective communication and input (FishChoice 2021). The blue swimming crab FMP clearly outlines the roles and responsibilities of various stakeholders (FishChoice 2021)(MFMI 2022). But, the FMP also points out that there is a lot of conflict between various fisher groups, and there is no conflict resolution mechanism suggested (MFMI 2022). Because it is unknown whether management decisions are made transparently and whether all stakeholders are included, and because there is no conflict resolution mechanism in place, this factor has been rated moderately effective.

Criterion 4: Impacts on the Habitat and Ecosystem

This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment. The final score is the geometric mean of the impact of fishing gear on habitat score (factor 4.1 + factor 4.2) and the Ecosystem Based Fishery Management score. The Criterion 4 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Guiding principles

- Avoid negative impacts on the structure, function or associated biota of marine habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.
- Follow the principles of ecosystem-based fisheries management.

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	SCORE
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Eastern Indian Ocean | Pots | Indonesia | Jawa	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Eastern Indian Ocean | Pots | Indonesia | Sumatera	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Western Central Pacific | Pots | Indonesia | Sulawesi	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**

Criterion 4 Assessment

SCORING GUIDELINES

Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate
Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Or bottom seine on resilient mud/sand habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.*
- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 - Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*
  Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts
Goal: Damage to the seafloor is mitigated through protection of sensitive or vulnerable seafloor habitats, and limits on the spatial footprint of fishing on fishing effort.

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.*
- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

Factor 4.3 - Ecosystem-Based Fisheries Management
Goal: All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web. Fishing activities should not seriously reduce ecosystem services provided by any retained species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity. Even non-native species should be considered with respect to ecosystem impacts. If a fishery is managed in order to eradicate a non-native, the potential impacts of that strategy on native species in the ecosystem should be considered and rated below.

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect*

spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.

- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect species' ecological roles and ecosystem functioning.*
- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.*
- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Eastern Indian Ocean | Pots | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Sumatera
Western Central Pacific | Pots | Indonesia | Sulawesi

Score: 3

The blue swimming crab trap and bottom-set gillnet fisheries take place over sand/mud. According to the SFW criteria, crab traps and bottom-set gillnets that come into contact with substrates other than boulders/coral reef (e.g., mud, sand, and other nonsensitive/resilient substrates) are scored 3 out of 5, or low concern.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Eastern Indian Ocean | Pots | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Sumatera
Western Central Pacific | Pots | Indonesia | Sulawesi

Score: 0

It is thought that the Indonesian blue swimming crab fishery has a minimal impact on fishing habitat; a recent study found that there was no correlation between coral reef health and the blue swimming crab trap fishery around Mandangin Island in East Jawa (Ardiansah et al. 2021). But, there are no studies on the impact of blue swimming crab fishing on habitat from other locations, nor are there specific strategies in place to ensure that the fishery does not pose a risk of serious or irreversible habitat damage. APRI is considering implementing protected areas for spawning stock habitats, which would serve to mitigate the impacts of fishing on those habitats that are enclosed within spawning areas {SFP 2013}. In 2013, nursery and habitat conservation measures were launched in the Demak Regency (APRI 2016a), but the results from this measure have not yet been made available.

Other than the zoning system (which appears to be weakly enforced), where bottom trawls are prohibited within the 12-mile zone, there is no strategy in place to prevent damage, if any, to habitats. For these reasons, the fishery is deemed to have no mitigation measures in place.

Factor 4.3 - Ecosystem-based Fisheries Management

Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Jawa
Eastern Indian Ocean | Gillnets and entangling nets | Indonesia | Sumatera
Western Central Pacific | Gillnets and entangling nets | Indonesia | Sulawesi
Eastern Indian Ocean | Pots | Indonesia | Jawa
Eastern Indian Ocean | Pots | Indonesia | Sumatera
Western Central Pacific | Pots | Indonesia | Sulawesi

Moderate Concern

Blue swimming crab is often considered an opportunistic, bottom-feeding carnivore and scavenger. It primarily consumes various sessile and slow-moving prey such as worms, mollusks, and crustaceans (Batoy et al. 1987), as well as smaller fish, but not much is known about the role of blue swimming crab as prey in Indonesian waters. In Australia, blue swimming crab is prey to turtles, sharks, rays, large fish, birds, and other blue swimming crabs (GWA DOF 2011). Intense fishing pressure on blue swimming crab could alter the trophic structure and species composition by reducing predation on crab prey, and/or by reducing food for higher-level predators.

The full extent of the blue swimming crab fishery's impacts on the ecosystem is also not well known. The effects of the fishery on the ecosystem are thought to include ghost fishing and traps without escape vents and biodegradable panels (which could allow small incidental species and juvenile crabs to escape). In addition, it is unclear whether ETP species such as sea turtles are commonly caught in the gillnet fishery. But, it was APRI's goal (in 2016) to review modified collapsible trap designs with escape vents in attempts to start addressing bycatch management and EBFM (NFICC 2016).

Because the Indonesian blue swimming crab fishery's impact on the ecosystem is unknown, and there are no measures in place for the fishery to ensure that serious or irreversible harm is not caused to ecosystem structure and function, we have deemed this factor a moderate concern.

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Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Appendix A: Review Schedule

Appendix B: 2023 Update Summary

Updates to the Blue Swimming Crab Indonesia report:

Updates to the December 19, 2018 Blue Swimming Crab report were made from March 24, 2022 to February 28, 2023. The report was updated in version 3 of the Seafood Watch Fisheries Standard. **The overall recommendations for the blue swimming crab gillnet and pot fisheries in Indonesia are still Red or Avoid.** Additional updates, if any, are described below.

Criterion 1

Blue swimming crab remained Red. Although a new stock assessment was conducted, abundance (Factor 1.1) remained a moderate concern and fishing mortality (Factor 1.2) remained a high concern, because the stocks were not overfished but overfishing was occurring.

Criterion 2

Although recent catch composition data were available, the new information has not been incorporated into the text of this assessment because it does not change the rating of Criterion 2, which remains Red. Catch composition data were analyzed from APRI 2020 and APRI 2021b; however, the data were incomplete, so the Seafood Watch Unknown Bycatch Matrix was applied to the analysis. The following species were identified as main species from APRI 2020, APRI 2021, and using the SFW UBM:

Jawa—gillnets: *Himantura walga*, *Chiloscyllium griseum*, *Cynoglossus lingua*, *Arius* spp., *Tachypleus gigas*, forage fish, marine mammals, sea turtles, seabirds, and sharks.

Jawa—pots: *Himantura walga*, *Tachypleus gigas*, benthic invertebrates, corals and other biogenic habitats, marine mammals.

Sulawesi—gillnets: Finfish, forage fish, marine mammals, sea turtles, seabirds, and sharks.

Sulawesi—pots: Benthic invertebrates, corals and other biogenic habitats, finfish, and marine mammals.

Sumatera—gillnets: Finfish, forage fish, marine mammals, sea turtles, seabirds, and sharks.

Sumatera—pots: *Tachypleus gigas*, *Carcharhinus limbatus*, benthic invertebrates, corals and other biogenic habitats, finfish, and marine mammals.

The table presents the final C2 score for each fishery, using the analysis conducted:

Fishery	lowest C2.1	lowest C2.2	C2.3	C2 score
Jawa gillnets	1.000	1.000	1	1.000
Jawa pots	1.000	1.000	1	1.000
Sulawesi gillnets	1.000	1.000	1	1.000
Sulawesi pots	1.000	1.000	1	1.000
Sumatera gillnets	1.000	1.000	1	1.000
Sumatera pots	1.000	1.000	1	1.000

Criterion 3

There was no improvement in the overall Criterion 3 score, which remained Red. But, new information was added to the text in Management Strategy and Implementation (Factor 3.1) and Bycatch Strategy (Factor 3.2). A moderately effective rating was assigned to Research and Monitoring (Factor 3.3), Enforcement (Factor 3.4), and Stakeholder Inclusion (Factor 3.5).

Rating Review Summary Table:

Report: Blue swimming crab (Indonesia)		
Criteria	**Previous report (2018)**	**Current report (2022)**
Who conducted the stock assessment? When was it conducted?	Java: P4KSI and APRI 2015 Sulawesi: Prince et al. 2014. Sumatera: N/A	Java: MFMI 2020; Prince et al. 2020; APRI 2021; MFMI 2022 Sulawesi: MFMI 2020; Prince et al. 2020; APRI 2021; MFMI 2020 Sumatera: MFMI 2020; APRI 2021; KPPRB 2021; MFMI 2020
Where/what are the catch composition data source(s)?	APRI 2013, 2015, 2016, 2016b; Zairion 2015; P4KSI and APRI 2015b.	APRI 2020; APRI 2021b
Who manages the fishery?	Directorate General of Capture Fisheries, provincial governments, and local governments.	Directorate General of Capture Fisheries, provincial governments, and local governments.
What is the date of the published management plan?	2014	2014
Are there any updates or amendments?	N/A	• A recent harvest strategy has been implemented for blue swimming crab in Indonesia, to ensure that the LB-SPR increases to the target reference level of 30% in 5 years, and 90% of crabs are >10 cm MLS over the next 5 years. • It is prohibited to retain berried females. • Trawling has been banned and a gear swap with traps has been implemented. • Harvest control rules have been developed in East Jawa.