



MONTEREY BAY AQUARIUM®

Seafood WATCH

Blue and Red Swimmer Crab

Portunus pelagicus and *Portunus haanii*



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China, India, Indonesia, Thailand, Vietnam

Pot, Bottom Gillnet, Bottom Trawl

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Final Seafood Recommendation

The blue (*Portunus pelagicus*) and red (*Portunus haanii*) swimmer crab fisheries are ranked as **Avoid** for all gear types in Indonesia, Thailand, India, Vietnam and China.

Stock	Fishery	Impacts on the Stock Rank (Score)	Impacts on Other Species Lowest scoring species Rank*, (Subscore, Score)	Management Rank (Score)	Habitat and Ecosystem Rank (Score)	Overall Recommendation (Score)
Blue Swimmer Crab	Indonesia bottom trawl	Yellow (2.64)	Turtles, bottom trawl Red, (1,0.8)	Red (1)	Yellow (2.45)	AVOID (1.51)
Blue Swimmer Crab	Thailand pot	Yellow (2.64)	Finfish, pot Green, (3.32,3.32)	Red (1.41)	Yellow (3)	AVOID (2.47)
Blue Swimmer Crab	Indonesia pot	Yellow (2.64)	Benthic invertebrates, pot Green, (3.32,3.32)	Red (1)	Yellow (3)	AVOID (2.26)
Blue Swimmer Crab	Vietnam pot	Yellow (2.64)	Finfish, pot Green, 3.32,3.32	Red (1)	Yellow (3)	AVOID (2.26)
Blue Swimmer Crab	Indonesia bottom gillnet	Yellow (2.64)	Mammals, bottom gillnet Red, (1.41,1.34)	Red (1)	Yellow (3)	AVOID (1.8)
Blue Swimmer Crab	India bottom gillnet	Yellow (2.64)	Mammals, bottom gillnet Red, (1.41,1.34)	Critical (0)	Yellow (3)	AVOID (0)
Blue Swimmer Crab	Thailand bottom gillnet	Yellow (2.64)	Mammals, bottom gillnet Red, (1.41,1.34)	Red (1.41)	Yellow (3)	AVOID (1.97)
Blue Swimmer Crab	India bottom trawl	Yellow (2.64)	Turtles, bottom trawl Red, (1,0.8)	Critical (0)	Yellow (2.45)	AVOID (0)
Blue Swimmer Crab	Vietnam bottom gillnet	Yellow (2.64)	Mammals, bottom gillnet Red, (1.41,1.34)	Red (1)	Yellow (3)	AVOID (1.8)
Red Swimmer Crab	China	Yellow (2.64)	Benthic invertebrates, pot Green, (3.32,3.32)	Red (1)	Yellow (3)	AVOID (2.26)

The swimming crab fisheries in Indonesia, Vietnam and Thailand are currently engaged in a Fishery Improvement Projects (FIP). The fishery in India is working to develop an FIP. Engagement in an FIP does not affect the Seafood Watch score as we base our assessments on the current situation. Monterey Bay Aquarium is a member organization of the Conservation Alliance for Seafood Solutions. The Alliance has outlined guidelines for credible Fishery Improvement Projects (<http://www.solutionsforseafood.org/cv1>). As such, Seafood Watch will support procurement from fisheries engaged in an FIP provided it can be verified by a third party that the FIP meets the Alliance guidelines. It is not the responsibility of Monterey Bay Aquarium to verify the credibility or progress of an FIP, or promote the fisheries engaged in improvement projects.

Scoring note – scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact. * Rank and color in the 'Impacts on other Species' column is defined based on the Subscore rather than the Score. See scoring rules for more information.

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Executive Summary

The blue and red swimmer crab (*Portunus pelagicus* and *Portunus haanii*, respectively) are found in the Indo-West Pacific. This report includes blue swimmer crab (BSC) fisheries in India, Vietnam, Thailand, and Indonesia and the red swimmer crab (RSC) fishery in China.

The BSC and RSC fisheries are ranked as **Avoid** for all gear types in Indonesia, Thailand, India, Vietnam and China.

For all regions, BSC and RSC mature quickly (about 1 year), have short life spans (about 3 years), and are partial brooders. The stock status and fishing mortality for all stocks is unknown because there have not been any regular stock assessments or research conducted on fishing mortality rates.

There are three primary gear types used to catch the BSC: bottom gillnets, bottom trawls, and pots. Each country, however, does not use all of these gear types. Indonesia uses primarily bottom gillnets and pots, but have also been known to use shallow, small trawls. India uses bottom trawls and bottom gillnets. Thailand and Vietnam both use bottom gillnets and pots. RSC fisheries in China use pots. Bycatch and retained species caught by these gear types are generally unknown in all of the BSC and the RSC fisheries; however, two studies in Indonesia provide general taxa information from BSC and RSC regions. Scoring for bycatch is based on the Indonesian studies, along with gear type, geographic region, peer reviewed literature, expert opinion in the region, and the Seafood Watch® criteria for use when bycatch is unknown. The taxa of concern that are most likely to interact with BSC and RSC fisheries include: fish, sharks, benthic invertebrates, marine mammals and sea turtles. Bycatch are usually discarded in a manner that has a low survival rate (e.g., gear is brought on deck, then sorted onshore, leaving all catch on deck for long periods of time, with few, if any, species released alive).

For all regions there are few management strategies in place. There is a general lack of enforcement, and monitoring and sufficient precaution used to protect RSC and BSC stocks. Of particular concern are the landings of juvenile crabs, ovigerous females, and the lack of any fishing limits.

Pots, bottom trawls and bottom gillnets are used in the BSC and RSC fisheries on the sandy/muddy seafloor where BSC crabs typically reside. Bottom trawls have the highest impact, but little information is known about the direct effects trawling has had in the BSC and RSC fishing regions. To help mitigate the impacts of fishing gear, some countries have designated fishing gear restricted areas and/or marine reserves; however, these areas are not effectively enforced and, as a result, there is no effective mitigation for benthic habitat impacts. There are no species of exceptional importance targeted, and no efforts to assess and manage ecosystem impacts are underway.

Introduction

Scope of the analysis and ensuing recommendation

The blue and red swimmer crab (*Portunus pelagicus* and *Portunus haanii*, respectively) are found in the Indo-West Pacific in countries such as India, China, Vietnam, Thailand, and Indonesia (Figure 1).

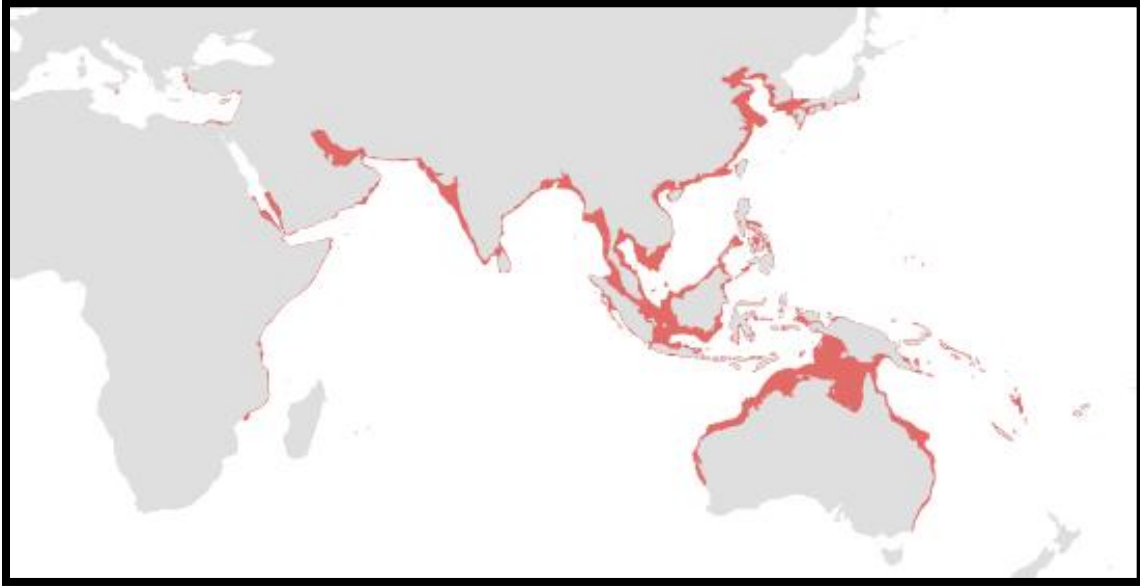


Figure 1. Distribution map of the blue swimmer crab (figure from FAO 2012a). The red swimmer crab assessed in this report are found in South China Sea, Yellow Sea, and East China Sea, also shown on map (FishSource 2013)

Overview of the species and management bodies

The blue swimmer crab (BSC) and red swimmer crab (RSC) are a part of a family of crabs called the *Portunidae*. There are several different species within this family, including the BSC and RSC. In 2010, Lai et al. revised the BSC (*P. pelagicus*) species complex into four distinct species found throughout the Indo-West Pacific. These distinct species are found in different regions, which have compounded the issues with managing the overall fishery (Lai 2012). The United States imports the RSC only from China (NMFS 2012). Despite the commercial value of BSC and RSC, there is very little information about the sustainability and environmental impacts of the fisheries (Lai 2012).

The BSC was first caught as a bycatch species in prawn and marine fish fisheries (Svane and Hooper 2004). Now, many regions have a targeted fishery in place (Josileen and Menon 2007).

In Thailand, when pot gear was introduced from Japan in 1981, fishing for the BSC increased and resulted in decreases in catch per unit effort and crab size, with an increase in sub-adult crab catch (Boutson et al. 2009). Crab size in Vietnamese, Indian, and Indonesian markets is very small and is considered a sign of being overfished (Lai 2012; Dineshbabu pers. comm. 2012).

There is no unified worldwide body that manages fisheries for the BSC and RSC. Instead, each country has its own individual management system. Thailand, India, Vietnam, and China are managed by the central government. China's system is based mostly on regulations and legislation, such as restricted zones and a licensing system (e.g., a license to fish), which is passed down from the central government to the states to follow (Yu & Yu 2008). Indonesian management consists of a vessel-limiting scheme and limiting the area of operation for bottom trawls—both instituted through the central government. However, provincial and local governments provide the management to the fishery, and small-scale vessels conduct most of the fishing (FishSource 2012a). Overall, there is a need for increased protection of females (particularly ovigerous females) and juvenile crabs throughout the region (Dineshbabu 2012).

Production statistics

The increasing global demand for the BSC and the RSC and their wide distribution throughout the Indo-West Pacific make them important species for a number of countries (Lai et al. 2010; FAO 2012a), and there has been a steady increase in global supply since the 1950s (Figure 2).

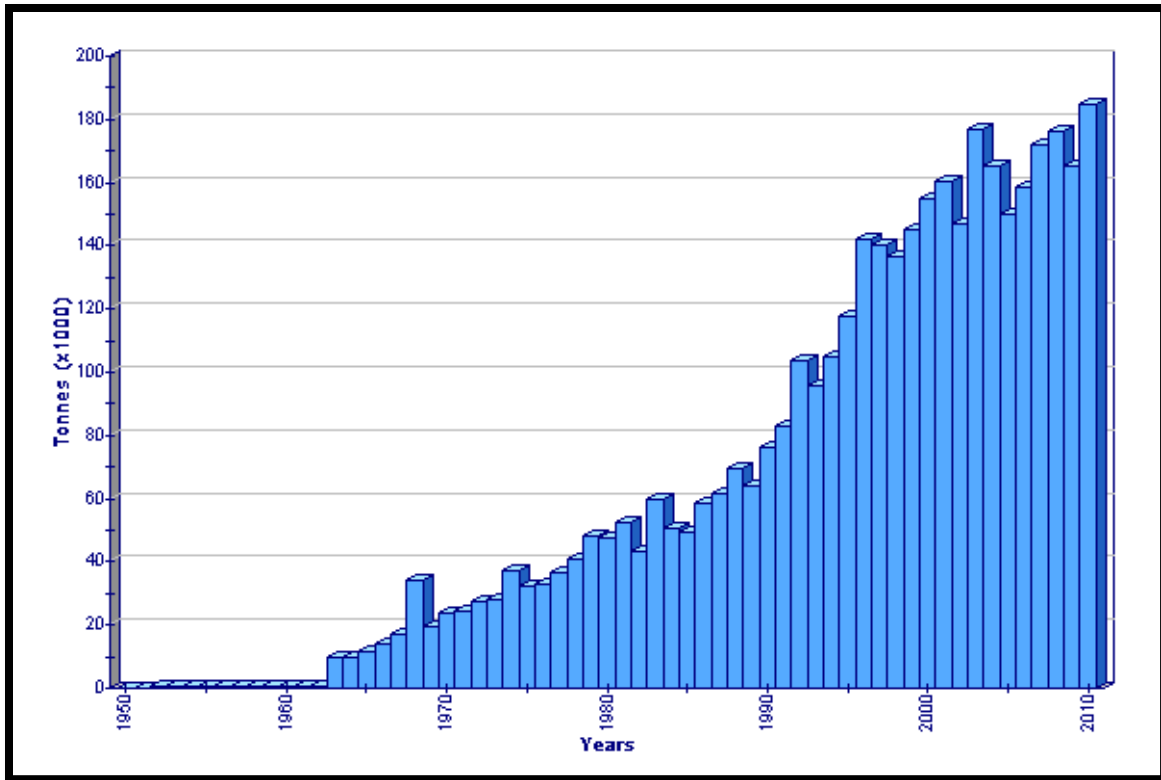


Figure 2. Global catch for BSC and RSC. Figure from FAO 2012a

Importance to the US/North American market

The supply of crabmeat from BSC and RSC is considerably larger than the amount of crabmeat available from the domestic blue crab fishery (*Callinectes sapidus*); therefore, these countries are important sources of crabmeat in the United States (Sea Fare Group 2011). In 2010, the United States imported approximately 21,000 metric tons of swimmer crabmeat. Indonesia was the largest supplier, accounting for almost 50% of the imports, followed by China (23%); Thailand (13%); the Philippines (9%) and India (6%) (Sea Fare Group 2011).

The United States has been the largest market for Indonesian crab exports, purchasing more than 50% of the total crab exports from Indonesia. Other markets include Singapore (17%), Malaysia (10%), Taiwan (7%), European Union (6%), China (5%), and Japan (2%) (FishSource 2012a).

In 2011, approximately 16,000 metric tons of the *Portunidae* crab family were imported to the US from China, the Philippines, Indonesia, Vietnam, Thailand, and India (Figure 3). It should be noted that the *Portunidae* crab family are sold interchangeably and these species can include

the BSC, RSC, and others, like *P. sanquinolentus*, and *P. trituberculatus* (Lai et al. 2010; Sea Fare Group 2011). The NMFS database does not distinguish between species in the family.

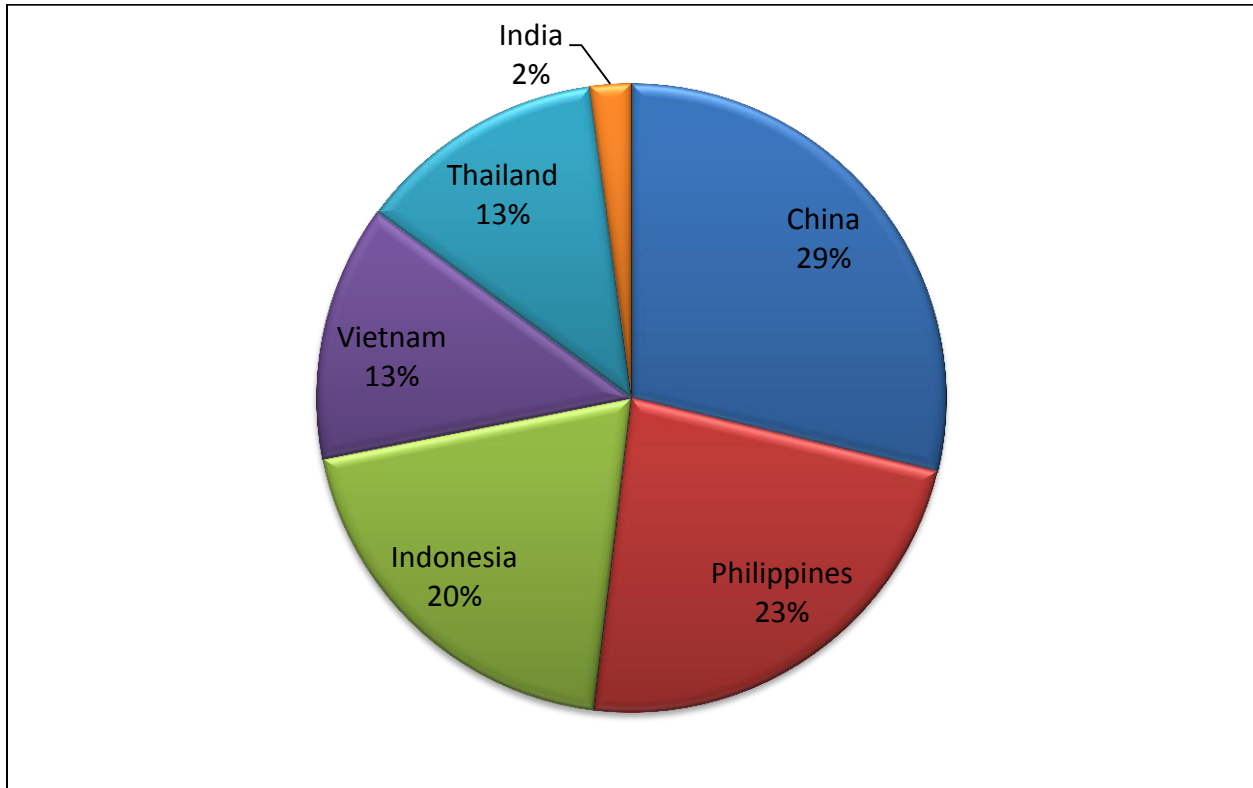


Figure 3. Major sources of swimmer crab into the United States in 2011. Data from NMFS 2012.

Common and market names

Common market names for the BSC and RSC are swimming crab, swimmer crab, canned crabmeat (with origin name, i.e., 'product of Indonesia,' etc.), Colossal, Jumbo Lump, Super Lump, Lump, Backfin Lump, Special and Claw meat. Swimming crab products may also have the country of origin's name in front (e.g., Indonesian blue swimming crab; Figure 4). The US crab (*Callinectes sapidus*) and blue swimmer crab have similar common market names, but origin of the item indicates if it is from the US or Asian waters.

Primary Product Forms

The primary product forms are pasteurized lump meat, special meat and claw meat, which can be canned, in pouches, or frozen. For example, Chicken of the Sea® sells BSC as pasteurized ‘crabmeat’ in their frozen, canned and refrigerated product line (Chicken of the Sea 2012; see: http://chickenofthesea.com/product_line_list.aspx?FID=13). In addition, there can be different grades of the meat ranging from “jumbo lumps” to “shredded” crab meat (Lai 2012; Figure 4). There is a general concern that shredded crabmeat may be from sub-adult crabs (Lai 2012).



Figure 4. Examples of red swimmer crab product (top) and blue swimmer crab (below) sold in the US market
Photos from: https://www.facebook.com/TwinTailsSeafood/photos_stream

Analysis

Scoring guide

- All scores result in a zero to five final score for the criterion and the overall final rank. A zero score indicates poor performance, while a score of five indicates high performance.
- The full Seafood Watch Fisheries Criteria that the following scores relate to are available on our website at www.seafoodwatch.org.

Criterion 1: Stock for which you want a recommendation

Guiding principles

- The stock is healthy and abundant. Abundance, size, sex, age and genetic structure should be maintained at levels that do not impair the long-term productivity of the stock or fulfillment of its role in the ecosystem and food web.
- Fishing mortality does not threaten populations or impede the ecological role of any marine life. Fishing mortality should be appropriate given current abundance and inherent resilience to fishing while accounting for scientific uncertainty, management uncertainty, and non-fishery impacts such as habitat degradation.

Stock	Fishery	Inherent Vulnerability Rank	Stock Status Rank (Score)	Fishing Mortality Rank (Score)	Criterion 1 Rank (Score)
Blue Swimmer Crab	Indonesia, Thailand, India, Vietnam	Low	Moderate Concern(3)	Moderate Concern (2.33)	Yellow (2.64)
Red Swimmer Crab	China	Low	Moderate Concern (3)	Moderate Concern (2.33)	Yellow (2.64)

Synthesis

Blue swimmer crabs (BSC) and red swimmer crabs (RSC) have a low inherent vulnerability. They mature quickly (about 1 year), have short life spans (about 3 years), and are, partially, brooders. The stock status and fishing mortality for all stocks is generally unknown because there have not been any regular assessments or research conducted on fishing mortality.

Justification of Ranking

Factor 1.1 Inherent Vulnerability: low

Detailed rationale

No information regarding RSC inherent resilience factors was available for this assessment (Zheng et al. 2003); therefore, we assume the same resilience as BSC.

Resilience attribute	BSC	Score	Source
Average age at maturity	Approximately 1 year	3	(Josileen and Menon 2007; Kangas 2000)
Average maximum age	Approximately 3 years	3	(Josileen and Menon 2007; Kangas 2000)
Reproductive strategy	Brooding (conservative)	2	(Kangas 2000)
Density dependence	No depensatory or compensatory dynamics demonstrated or likely	2	(Kangas 2000)
Score (mean of individual scores)		2.5	

Factor 1.2 Stock status

Key relevant information: **Moderate, all countries**

There are no biological reference points for the BSC and the RSC in any country; therefore, it is unknown whether the population is above or below reference points (FishSource 2011; 2012a; 2012b; 2012c; 2013).

Detailed rationale:

Though some individual, small-scale stock assessment studies have been conducted (e.g., Dineshbabu et al. 2008 for the Karnataka coast of India), there have been no formal stock assessments conducted throughout any one country of fishing region.

Factor 1.3 Fishing mortality

Key relevant information: **Moderate, all countries**

There is a lack of historic and current stock status information as well as a lack of information on the impact of fishing mortality on stocks (FishSource 2011; 2012a; 2012b; 2012c); therefore fishing mortality is unknown.

Detailed rationale:

Though some small-scale fishing mortality studies have been conducted in Thailand (Trisak et al. 2009) and India (Dineshbabu et al. 2008; Josileen and Menon 2007), the lack of historic and

current stock status information makes it difficult to conclude that a stock is or is not being overexploited.

Criterion 2: Impacts on other retained and bycatch stocks

Guiding principles

- The fishery minimizes bycatch. Seafood Watch® defines bycatch as all fisheries-related mortality or injury other than the retained catch. Examples include discards, endangered or threatened species catch, pre-catch mortality and ghost fishing. All discards, including those released alive, are considered bycatch unless there is valid scientific evidence of high post-release survival and there is no documented evidence of negative impacts at the population level.
- Fishing mortality does not threaten populations or impede the ecological role of any marine life. Fishing mortality should be appropriate given each impacted species' abundance and productivity, accounting for scientific uncertainty, management uncertainty and non-fishery impacts such as habitat degradation.

China, Indonesia, Thailand, and Vietnam pot

Stock	Inherent Vulnerability Rank	Stock Status Rank (Score)	Fishing Mortality Rank (Score)	Subscore	Score (subscore*discard modifier)	Rank (based on subscore)
Finfish	Medium	Moderate(3)	Low (3.67)	3.32	3.32	Green
Benthic invertebrates	Medium	Moderate (3)	Low (3.67)	3.32	3.32	Green

India and Indonesia Bottom Trawl

Stock	Inherent Vulnerability Rank	Stock Status Rank (Score)	Fishing Mortality Rank (Score)	Subscore	Score (subscore*discard modifier)	Rank (based on subscore)
Turtles	High	Very High Concern (1)	High Concern (1)	1.00	0.80	Red
Sharks	High	High Concern (2)	Moderate Concern (2.33)	2.16	1.73	Red
Finfish	Medium	Moderate Concern (3)	Moderate Concern (2.33)	2.64	2.12	Yellow
Benthic invertebrates	Medium	Moderate Concern (3)	Moderate Concern (2.33)	2.64	2.12	Yellow
Forage fish	Medium	Moderate Concern (3)	Moderate Concern (2.33)	3.32	2.65	Green

India, Indonesia, Thailand, and Vietnam Bottom Gillnet

Stock	Inherent Vulnerability Rank	Stock Status Rank (Score)	Fishing Mortality Rank (Score)	Subscore	Score (subscore*discard modifier)	Rank (based on subscore)
Mammals	High	High Concern (2)	High Concern (1)	1.41	1.34	Red
Turtles	High	Very High Concern (1)	Moderate Concern (2.33)	1.53	1.45	Red
Sharks	High	High Concern (2)	Moderate Concern (2.33)	2.16	2.05	Red
Finfish	Medium	Moderate Concern (3)	Moderate Concern (2.33)	2.64	2.51	Yellow
Forage fish	Medium	Moderate Concern (3)	Moderate Concern (2.33)	2.64	2.51	Yellow
Seabirds (outside albatross range)	High	High Concern (2)	Moderate Concern (2.33)	2.71	2.57	Yellow
Benthic invertebrates	Medium	Moderate Concern (3)	Low Concern (3.67)	3.32	3.15	Green

Synthesis

There are three primary gear types used in BSC fisheries: bottom gillnets, bottom trawls, and pots. Each country however, does not use the same gear types. Indonesia uses primarily bottom gillnets and pots, but has also been known to use shallow, small trawls (FishSource 2012a). India uses bottom trawls and bottom gillnets (FishSource 2012d). Thailand and Vietnam both use bottom gillnets and pots (FishSource 2012b; FishSource 2012c). RSC fisheries in China use pots (FishSource 2013). The bycatch and retained species caught by these gear types are generally unknown in all of the BSC and the RSC fisheries; however, two studies in Indonesia (Agatri 2005; Suadela 2004) looked at gear effectiveness in the BSC fishery and supply general taxa information (FishSource 2012a). Scoring for bycatch is based on Agatri (2005) and Suadela (2004), along with gear type, geographic region, peer reviewed literature, expert opinion in the region, and the Seafood Watch® criteria for use when bycatch is unknown. The taxa that are most likely to interact with the BSC and the RSC fisheries include: finfish, forage fish, sharks, benthic invertebrates, mammals, turtles, and seabirds (outside albatross range). Some common bycatch consists of fish (croakers, mackerel), shrimp, squid, and mollusks (Anggraeni pers. comm. 2012). They are usually discarded in a manner that has a low survival rate (e.g., nets are brought onshore to the landing site) (Anggraeni pers. comm. 2012). However, turtle, shark, and mammal bycatch limit the score for Criterion 2 due to their conservation status. Though it is unknown how many species of concern interact with RSC and BSC fisheries, turtles, marine mammals, and sharks are included in this assessment since they

are a high conservation concern, have low inherent resilience, lack regional information on stock health, and have the potential to be caught in swimmer crab fisheries. Coral and sponge are not assessed because BSC and RSC are found in muddy/sandy habitats and are therefore, not expected to have a great overlap with these species.

Justification of Ranking

Due to the lack of data on bycatch in the swimmer crab fisheries, this section uses the unknown bycatch matrix in the Seafood Watch criteria document (see Appendix 3, SFW Criteria 2012 for scoring explanation).

Taxa Assessed and Rationale

Sea Turtles – Five of the seven worldwide sea turtle species are found in the BSC and RSC fishing regions (State of the World’s Sea Turtles 2011). A review by Wallace et al. (2010) found that sea turtles are caught as bycatch in longlines, gillnets, and trawls in the BSC fishing regions. It is unknown how many sea turtles are actually caught as bycatch in the gillnet and trawl BSC fisheries, but their vulnerability and the potential for them to be caught includes them in this analysis. For example, the BSC fishery in Vietnam takes place close to Green and hawksbill turtle nesting sites (Fish Source 2012c). Hawksbill turtles are known to feed on BSC (Kailola et al. 1993; Poseidon 2010), which suggests that there are some risks of entanglement.

Mammals—Pompa et al. (2011) illustrates the distribution of *mysticetes* and *odontocetes* are found throughout BSC and RSC fishing regions. Irrawaddy dolphins (*Orcaella brevirostris*) are listed as ‘vulnerable’ according to the IUCN (2012) and have been documented as bycatch in gillnets throughout the BSC fishing regions, although they are not identified in BSC or RSC fisheries (Young and Ludicello 2007).

Finfish and Forage fish—Both Agatri (2005) and Suadela (2004) list ‘other fishes’ as some of the taxa that are caught as bycatch in the BSC and RSC fisheries; however, specific species are unknown.

Sharks—Sharks are known to interact with bottom gillnets and bottom trawls and, therefore, were included as a taxon that is likely to interact substantially with those fishing gear-types. In addition, sharks such as the shortfin mako (*Isurus oxyrinchus*) and the whale shark (*Rhincodon typus*), are found in the waters off of China, but it is unknown specifically if these sharks are caught in the BSC or RSC fisheries (Camhi et al. 2009). Additional sharks (e.g., thresher sharks (*Alopias* spp.) and ray species (e.g., devilrays (*Mobula* spp.)) are found in the waters off Indonesia (Camhi et al. 2009), but it is unknown which species interact with the BSC and the RSC fishery. However, there have been reports of juvenile sharks (unknown species) caught in gillnets in the BSC and RSC fishing regions (Flores 2005).

Benthic invertebrates—Both Agatri (2005) and Suadela (2004) list ‘molluscs’ and ‘echinoderms’ as some of the taxa that are caught as bycatch in the BSC and RSC fishing regions; however, specifically which species is unknown.

Seabirds (outside albatross range)—The worldwide distribution of albatross and petrels from BirdLife International (2004) shows that they are not found within the BSC fishing regions; therefore, albatross are not considered. However, there are some threatened seabird species found within the BSC and the RSC fishing range, (BirdLife International 2010); therefore, they were included as a taxon that is likely to interact with BSC fisheries. However, it should be noted that based on expert opinion, there are likely only limited interactions with seabirds (Anggraeni 2012).

Factor 2.1 Inherent Vulnerability

All Regions

Sea Turtles: **high inherent vulnerability** (SFW 2012 criteria document).

Finfish and Forage fish: **medium inherent vulnerability** (SFW 2012 criteria document).

Sharks: **high inherent vulnerability** (SFW 2012 criteria document).

Benthic invertebrates: **medium inherent vulnerability** (SFW 2012 criteria document).

Marine mammals: **high inherent vulnerability** (SFW 2012 criteria document).

Seabirds: **high inherent vulnerability** (SFW 2012 criteria document).

Factor 2.2 Stock Status

All Regions Combined

Sea Turtles—Sea turtles are listed as **endangered or threatened** throughout the world (NOAA 2012, SFW 2012 criteria document), and are therefore a **‘very high conservation concern.’**

Finfish and Forage fish—Are a **‘moderate conservation concern’** due to unknown species (SFW 2012 criteria document).

Sharks—Most pelagic sharks and rays are classified as ‘near threatened’ (Dulvy et al. 2008); therefore, they are ranked as **‘high conservation Concern.’**

Benthic invertebrates—Are ranked as a ‘**moderate conservation concern**’ due to unknown species (SFW 2012 criteria document).

Mammals—Are a ‘**high conservation concern**’ (SFW 2012 criteria document) due to the vulnerable species found within the BSC and RSC fishing regions.

Seabirds (outside albatross range)—Are a ‘**high conservation concern**’ (SFW 2012 criteria document) due to unknown species, but outside of the range of threatened albatross species (SFW 2012 criteria document).

Factor 2.3 Fishing mortality

Based on the Seafood Watch’s ‘unknown bycatch matrix,’ critical scores are not given for bycatch in fisheries where overfishing is occurring because these fisheries have either some bycatch management in place or expert opinion in the region has shown that bycatch is not likely to have population level impacts on species of special concern. However, until there are data collection and monitoring programs in place, these impacts remain largely unknown. See below for descriptions by region and section C.3.2 for details on bycatch management by region.

All Regions

Sea Turtles—Sea turtle mortality from trawl fisheries is a ‘**high conservation concern**’ (SFW 2012 criteria document, Appendix 3 p. 50; Bottom tropical shrimp category*). Regions that use trawl gear include India and Indonesia. In India, turtle excluder devices (TEDs) are required on trawlers to reduce turtle interactions; however, enforcement for TEDs is lacking (FishSource 2012d; Mathews 2009). In Indonesia, small trawls are used rarely and expert opinion has concluded that interactions with protected, endangered, and threatened (PET) species are unlikely (FishSource 2012a, Anggraeni 2012, Crawford 2012). Therefore, because there is either some management in place or PET bycatch is thought to be low, these fisheries do not receive a critical score for this factor. For gillnet fisheries, sea turtle bycatch is ranked as a ‘**moderate conservation concern**’ (SFW 2012 criteria document, Appendix 3 p. 50).

**note: When using the unknown bycatch matrix, the BSC trawls are most similar to ‘bottom tropical shrimp,’ thus this category was used for scoring*

Finfish and Forage Fish—Using the SFW 2012 criteria document (p. 50), bottom trawls and gillnets are ‘**moderate conservation concern**’ (SFW 2012 criteria document, p. 11). Pot fisheries are a ‘**low conservation concern**’ for finfish (SFW 2012 criteria document, Appendix 3 p. 50). Forage fish are not expected to interact negatively with pot fisheries, thus not ranked.

Sharks—Fishing mortality from bottom trawls and gillnets for sharks is a ‘**moderate conservation concern**’ (SFW 2012 criteria document, Appendix 3 p. 50). Pot fisheries are not expected to interact negatively with sharks and are not ranked.

Benthic invertebrates—Benthic invertebrate mortality is a ‘**moderate conservation concern**’ (SFW 2012 criteria document, Appendix 3 p. 50) for trawl gear and a ‘**low conservation concern**’ for gillnet and pot gear.

Mammals—Fishing mortality from bottom gillnets is a ‘**high conservation concern**’ (SFW 2012 criteria document, Appendix 3 p. 50). Bottom gillnets are used in Indonesia, India, Thailand and Vietnam. In Indonesia, expert opinion has concluded that interactions with PET species are unlikely (FishSource 2012a; Anggraeni pers. comm. 2012; Crawford pers. comm. 2012). India has some coastal area fishing restrictions to reduce any interactions with PET species, although there is a general lack of enforcement (Mathews 2009). Thailand prohibits gillnets to be used in dugong habitat, although this is poorly enforced (FishSource 2012b) and Vietnam PET bycatch is thought to be low, based on expert and stakeholder opinion (Poseidon 2010; FishSource 2012c); therefore, because there is either some management in place or PET bycatch is thought to be low, these fisheries did not receive a critical score for this factor. Pot fisheries and trawl fisheries are not expected to interact with marine mammals in the BSC and the RSC fishing regions and are, therefore, not ranked.

Seabirds (outside albatross range)—Fishing mortality from bottom gillnet for sea birds (outside albatross range) is a ‘**moderate conservation concern**’ (SFW 2012 criteria document, Appendix 3 p. 50). Seabirds (outside albatross range) are not expected to interact with trawls or pot gear.

Factor 2.4 Overall discard rate: Pot fisheries—12.4%
 Trawl fisheries—81.7%
 Bottom gillnet—30%

Key relevant information:

No data are available on the discard rates in the swimmer crab fisheries. The global average discard to landings ratio for pot fisheries is 12.4% (Kelleher 2005) and was used for this assessment. For trawl fisheries, the Kelleher (2005) tropical shrimp discard rate was used (81.7%) and limited research suggests that BSC gillnet fisheries have a 30% discards rate (FishSource 2012a).

Detailed rationale (optional): N/A

Criterion 3: Management effectiveness

Guiding principle

- The fishery is managed to sustain the long-term productivity of all impacted species. Management should be appropriate for the inherent resilience of affected marine life and should incorporate data sufficient to assess the affected species and manage fishing mortality to ensure little risk of depletion. Measures should be implemented and enforced to ensure that fishery mortality does not threaten the long-term productivity or ecological role of any species in the future.

Fishery	Management: Retained Species Rank (Score)	Management: Non-retained species Rank (Score)	Criterion 3 Rank (Score)
China	Very High Concern (1)	Very High Concern (1)	Red (1)
Indonesia	Very High Concern (1))	Very High Concern (1)	Red (1)
India	Critical Concern (0)	High Concern (2)	Critical (0)
Thailand	Very High Concern (1)	High Concern (2)	Red (1.41)
Vietnam	Very High Concern (1)	Very High Concern (1)	Red (1)

Summary: Factor 3.1 Management of fishing impacts on retained species

Fishery	Critical?	Mgmt strategy and implement	Recovery of stocks of concern	Scientific research and monitoring	Scientific advice	Enforce	Track record	Stakeholder inclusion	Management of Retained Species Rank (Score)
China	No	Ineffective	N/A	Ineffective	Ineffective	Ineffective	Ineffective	Ineffective	Very High Concern (1)
Indonesia	No	Ineffective	N/A	Ineffective	Moderately Effective	Ineffective	Ineffective	Moderately Effective	Very High Concern (1)
India	Yes								Critical Concern(0)
Thailand	No	Ineffective	N/A	Ineffective	Ineffective	Ineffective	Ineffective	Ineffective	Very High Concern (1)
Vietnam	No	Ineffective	N/A	Ineffective	Ineffective	Ineffective	Ineffective	Moderately Effective	Very High Concern (1)

Summary: Factor 3.2 Management of fishing impacts on bycatch species

Fishery	All Species Retained?	Critical?	Mgmt strategy and implement	Scientific research and monitoring	Scientific advice	Enforce	Management of bycatch species Rank (Score)
China	No	No	Ineffective	Ineffective	Ineffective	Ineffective	Very High Concern (1)
Indonesia	No	No	Ineffective	Ineffective	Moderately Effective	Ineffective	Very High Concern (1)
India	No	No	Moderately Effective	Ineffective	Ineffective	Ineffective	High Concern (2)
Thailand	No	No	Moderately Effective	Ineffective	Ineffective	Ineffective	High Concern (2)
Vietnam	No	No	Ineffective	Ineffective	Ineffective	Ineffective	Very High Concern (1)

Justification of Ranking

There are few management strategies for these regions and there is a general lack of enforcement and monitoring. In addition, there is insufficient management precaution to maintain BSC and RSC populations. Of particular concern, are the harvest and sale of juvenile crabs, the declining trend in crab size and catch per unit effort and the lack of fishing limits to protect stocks. Each region is described in detail below.

Factor 3.1 Management of fishing impacts on retained species

Key relevant information:

China

Management strategy and implementation—China’s government has made some efforts to reduce the number of fishing vessels (e.g., vessel scrapping program and fishing vessel registration), fishermen (e.g., fishing licenses), and deterioration of the aquatic environment (e.g., using closed seasonal zones and gear restrictions), but these are general country-wide goals and not specific to the RSC fishery (FAO 2012b; Yu & Yu 2008). China has moved its marine capture fisheries from a condition of open access to that of regulated open access (Yu and Yu 2008). Fishing quota systems have been considered to provide output controls via development of total allowable catch metrics (TACs), but these have not yet been implemented. Due to the lack of a management strategy for the RSC fishery, Seafood Watch determined that China’s management is insufficiently precautionary to protect RSC populations and, therefore, ranks this factor as ineffective.

Recovery of stocks of concern—There are no species of concern targeted and, therefore, is ranked as not applicable (N/A).

Scientific research and monitoring—Observer programs are in development in China, but catch statistics, although collected, are often unreliable (Yu and Yu, 2008), therefore, minimal data are collected and, scientific research and monitoring is deemed ineffective.

Scientific advice—The lack of scientific advice pertaining to the RSC fishery deems this sub factor to be ranked as ineffective.

Enforcement—Enforcement is intermittent in China. Vessel monitoring (VMS) technology (Chang et al. 2010) and observer programs are in development but illegal, unreported, and unregulated (IUU) fishing may still occur (Yu and Yu 2008, Mallory 2012); therefore, enforcement is lacking and ranked as ineffective.

Track record—Marine fisheries resources in China have been overfished since the late 1980s; since then, China has increased research and management measures to improve fisheries sustainability. The domestic ‘zero growth’ and ‘minus growth’ policies represent a strategic shift

from historic expansion of the fishing industry (Yu and Yu 2008). However, overcapacity remains an issue; therefore, the track record is deemed to be ineffective.

Stakeholder inclusion—Yu and Yu (2008) found China’s fisheries management system to be a command-and-control system where authority comes from the central government and is given to fishers to follow without input. Therefore, stakeholder inclusion was scored as ineffective.

Indonesia

Management strategy and implementation—There is some management in Indonesia, such as reducing the number of issued vessel licenses (FishSource 2012a); however, management strategies are general and not specifically targeted for the BSC. Currently, there are no regulations on crab size and catching juvenile crabs can lead to stock depletion since the crabs would not have a chance to reach maturity (FishSource 2012a). Some studies have suggested that the age at first maturity for BSC in Indonesia is approximately 87 to 98 mm (Sulistiono 2009). Recently, the Indonesian government has started drafting a fishery management plan for the BSC (Anggraeni 2012), but until this plan is finalized and implemented with sufficient precaution to protect BSC populations, management strategy and implementation is deemed ineffective.

Recovery of stocks of concern—There are no species of concern targeted and, therefore, are ranked as not applicable (N/A).

Scientific research and monitoring—There are little, if any, data collected; thus, scientific research and monitoring are scored as ineffective.

Scientific advice—Though there appears to be little follow-thru on scientific advice, some of this is due to the lack of specific advice (e.g., the National Commission for Fish Stocks has yet to offer any species specific recommendations (FishSource 2012a)). In 2011, the National Fisheries Institute (NFI) Crab Council recommended implementing a minimum size recommendation (FishSource 2012a). Though a recommendation is not a management strategy, the Ministry of Marine Affairs is assessing policy options to implement the minimum size restriction (FishSource 2012a). Therefore, these steps in considering scientific advice earns this sub factor as moderately effective because appears that management is willing to comply with scientific advice, but not enough time has passed to determine how the advice will be used.

Enforcement—This sub factor has been scored as ineffective as there is no enforcement.

Track record—Based on catch reports in recent years, the average size of landed BSC in Indonesia is smaller (FishSource 2012a). In many regions, juvenile crabs are being caught and sold (FishSource 2012a). Because there is no specific management system for BSC (FishSource, 2012a) and the current system and track record have shown that juvenile crabs are being

harvested, which may have resulted in overall stock depletion; therefore, the track record is considered ineffective.

Stakeholder inclusion—The Fishery Improvement Project is allowing stakeholder inclusion to create a sustainable BSC fishery (FishSource 2012a; <http://www.sustainablefish.org/fisheries-improvement/crabs/indonesian-blue-swimming-crab>), but it has limited transparency and existing management framework, including stakeholder engagement, does not provide enough positive incentives for sustainable fishing (FishSource 2012a); therefore, stakeholder inclusion was ranked as moderately effective.

India

Management strategy and implementation – India’s coastal marine fisheries are open access. There have been attempts to increase surveillance and monitoring of ships, and to limit fishing permits to manage fishing capacity (FAO 2012c), but these have been ineffective. In addition, an increasing number of semi-pelagic and mid-water trawls are regularly being introduced in India and, therefore, could affect the BSC stock unless spatial restrictions are enacted (Dineshbabu 2012). There are no regulations that will protect BSC stocks (SFP 2011). The BSC fishery in India has seen drastic reductions in stock size due to the regular harvest of juveniles and ovigerous females (Radhakrishnan et al. 2005; Anand and Soudarapandian 2011); therefore, management of the BSC fishery in India is a **critical conservation concern**; there is no management yet a clear need for management exists.

Thailand

Management strategy and implementation—Thailand has implemented some restrictions including mesh size and a closed period for fishing ovigerous females (October through December) (Trisak et al. 2009; Nitiratsuwan et al. 2006). However, management of the open access crab fishery is not well established. Poor enforcement has led to a reduction in landed crab size, thus reducing reproduction potential (Nitiratsuwan et al. 2006; FishSource 2012b). Although there are some closed periods to protect spawning females, the short-term restrictions are unlikely to prevent declines in stock (Trisak et al. 2009). Additional management measures that have been implemented for the BSC fishery include a mesh size limit of crab gill net and crab trap. However, the mesh size limit measures were established without the consideration of crab distribution, and size and will most likely be of limited value (Nitiratsuwan et al. 2006). In addition, management measures are not successfully enforced or implemented in Thailand (Nitiratsuwan et al. 2006; Project GloBAL 2012). Thus, management strategy and implementation is ineffective.

Recovery of stocks of concern—There are no species of concern targeted, therefore, ranked as not applicable (N/A).

Scientific research and monitoring—Stock assessments have been conducted in some small fishing areas; however, there is incomplete and insufficient current and historic information about the stock. Therefore, the assessments lack rigor (Trisak et al. 2009). Management of BSC fishery is not well established or based on stock assessment results (Nitiratsuwan et al. 2006; Trisak et al. 2009). Therefore, scientific research and monitoring is scored as ineffective.

Scientific advice—Some scientific advice is followed with the implantation of closed periods and mesh size restrictions to BSC populations, but no TACs or size restriction advice have been followed. In addition, it has been suggested that fishing BSC should be decreased by approximately 40%, or even to ban fishing entirely to protect stocks; however, fishery managers have not even made the advised cuts to TAC (Songrak et al. 2005; Suwasdee et al. 2009). Therefore, following scientific advice is ranked as ineffective.

Enforcement—Dockside inspections are patchy. Regulations prohibit trawlers and push-net boats from operating within 3km of shore in order to protect stocks, but this closure has not been successfully enforced (Project GloBAL 2012). In addition, mesh size restrictions have not been enforced (Nitiratsuwan, et al. 2009; FishSource 2012b). Interviews with the fishermen have implied their preference for catching egg-bearing females, as they provide higher biomass than other crabs (Trisak, et al. 2009). In addition, the number of vessels in coastal small-scale fisheries is numerous, which makes them difficult to monitor (Tokrisna 2006). Thus, enforcement is not effective.

Track record—Efforts to rationalize the fisheries are attempted via licenses that are required for commercial trawls and gillnets, but excess fishing capacity, small mesh sizes, and illegal fishing by the Thai fleet (both in restricted domestic areas and in the waters of neighboring nations) remain a concern; therefore, the track record is ranked as ineffective (FishSource 2012b; Trisak et al. 2009).

Stakeholder inclusion—There is no public information available on the FIP; therefore, there is no stakeholder inclusion, leading to a rank of ineffective.

Vietnam

Management strategy and implementation—There is a minimum landing size limit set at 100 mm carapace width (FishSource 2012c), but no other management or harvest strategy exists (World Wildlife Fund 2013). These limits are not enforced or adhered to; therefore, management strategies are not implemented successfully and management strategy and implementation are deemed ineffective.

Recovery of stocks of concern—There are no species of concern targeted and, therefore, was ranked as not applicable (N/A).

Scientific research and monitoring—There are little, if any, data collected, thus, this sub factor was scored as ineffective.

Scientific advice—The lack of scientific advice (other than the unregulated size limit) with no advice on harvest strategies (FishSource 2012c), is deemed ineffective.

Enforcement—There is no enforcement in this fishery (FishSource 2012c). The existing minimum landing size limit has not been enforced or monitored and there is known trading of undersized crabs. (FishSource 2012c). The general lack of enforcement results in this sub factor being scored as ineffective.

Track record—There has been evidence of declining CPUE coupled with moderate-to-high fishing intensity (FishSource 2012c), therefore, the track record is scored as ineffective.

Stakeholder inclusion—The Fishery Improvement Project is allowing for stakeholder inclusion (<https://sites.google.com/site/fisheryimprovementprojects/home/vietnam-blue-swimming-crab-fip>), but it has limited transparency; therefore, this sub factor is ranked as moderately effective.

Factor 3.2 Management of fishing impacts on bycatch species

Key relevant information:

China

Management strategy and implementation—There is no bycatch management even though bycatch concerns are possible (based on region and gear type). However, bycatch in pot gear used in the China RSC fishery are unknown but expected to be low (SFW Criteria document). Because pot fisheries in China are thought to have minimal impacts on bycatch and species of special concern (PET), management strategy and implementation were ranked as ineffective, not a critical conservation concern.

Scientific research and monitoring—There is no regular collection or analysis of bycatch data. Thus scientific research and monitoring and was ranked as ineffective.

Scientific advice—As in factor 3.1

Enforcement—As in factor 3.1

Indonesia

Management strategy and implementation—There are currently no data on the types of PET species caught by the blue swimming crab fishery (FishSource 2012a). However, expert opinion in the region has concluded that interactions of PET species are most likely minimal (FishSource 2012a; Anggraeni 2012; Crawford 2012). Still, there is no information available on how the BSC

fishery interacts with species of concern or other species, and bycatch is often sorted onshore of fishing regions and not released alive (FishSource 2012a). Management strategy and implementation is ranked as ineffective.

Scientific research and monitoring—There have been a few studies conducted in Indonesia on bycatch and gear effectiveness (FishSource 2012a), however, there is no regular data collection and analysis, thus scientific research and monitoring are ineffective.

Scientific advice—As in factor 3.1

Enforcement—As in factor 3.1

India

Management strategy and implementation—India requires TEDs on their trawlers in turtle distribution areas (FishSource 2012d). There is some emphasis on conservation and protecting marine biodiversity, and multiple measures are in place to conserve protected species such as sharks, marine mammals and turtles through area restrictions (FishSource 2012d; Mathew 2009). However, with minimal enforcement, there is uncertainty that these measures are effective; therefore, management strategy and implementation is moderately effective.

Scientific research and monitoring—The lack of scientific research on BSC fishery interactions with PET species causes this subfactor to be ranked as ineffective.

Scientific advice—Capture of non-targeted species are discouraged through stakeholder awareness programs (Project GloBAL 2012). However, bycatch measures are not enforced, discards and bycatch are not regulated, and the marketability of “trash fish” as fishmeal encourages the capture and retention of bycatch. Thus, scientific advice is ranked as ineffective.

Enforcement—Generally, fisheries enforcement in India is lacking. Regulations have been difficult to enforce due to the size of the coastline, and an ineffective system (Matthew 2009); therefore, enforcement is ineffective.

Thailand

Management strategy and implementation—Thailand has some fishing restrictions for gear types (e.g., gillnets, trawls, and pushnets are prohibited) in dugong habitat (FishSource 2012b). However, there is no evidence that regulations are implemented effectively or that bycatch is minimized to the greatest extent possible; therefore, Thailand’s strategies and implementations are ranked as moderately effective.

Scientific research and monitoring—Catch statistics are poorly reported and bycatch impacts of trawl fisheries are not well documented; therefore, scientific research and monitoring is ineffective.

Scientific advice—As in factor 3.1

Enforcement—As in factor 3.1

Vietnam

Management strategy and implementation—There is no bycatch management even though bycatch issues are possible (based on region and gear type); however, it is believed that there is limited bycatch in this fishery (FishSource 2012c; Poseidon 2010); therefore, management strategy and implementation was ranked as ineffective but not a critical conservation concern.

Scientific research and monitoring—Hawksbill turtles have been known to feed on BSC and there have been some reports of shark and ray species being caught in BSC gear, but no studies have been conducted to fully assess how many are being caught or entangled during fishing operations (FishSource 2012c). Therefore, this sub factor was scored as ineffective.

Scientific advice—As in factor 3.1

Enforcement—As in factor 3.1

Criterion 4: Impacts on the habitat and ecosystem

Guiding principles

- The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.
- Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity.

Fishery	Gear type and substrate	Mitigation of gear impacts	EBFM	Criterion 4
	Rank (Score)	Rank (Score)	Rank (Score)	Rank (Score)
China	Low Concern (3)	No effective mitigation (0)	Moderate (3)	Yellow (3)
Indonesia pot	Low Concern (3)	No effective mitigation (0)	Moderate (3)	Yellow (3)
Indonesia bottom trawl	Moderate Concern (2)	No effective mitigation (0)	Moderate (3)	Yellow (2.45)
Indonesia bottom gillnet	Low Concern (3)	No effective mitigation (0)	Moderate (3)	Yellow (3)
India bottom trawl	Moderate Concern (2)	No effective mitigation (0)	Moderate (3)	Yellow (2.45)
India bottom gillnet	Low Concern (3)	No effective mitigation (0)	Moderate (3)	Yellow (3)
Thailand pot	Low Concern (3)	No effective mitigation (0)	Moderate (3)	Yellow (3)
Thailand bottom gillnet	Low Concern (3)	No effective mitigation (0)	Moderate (3)	Yellow (3)
Vietnam pot	Low Concern (3)	No effective mitigation (0)	Moderate (3)	Yellow (3)
Vietnam bottom gillnet	Low Concern (3)	No effective mitigation (0)	Moderate (3)	Yellow (3)

Synthesis

Pots, bottom trawls, and bottom gillnets are used on sandy/muddy seafloor where BSC crabs typically reside. Little information is available on trawling impacts in RSC and BSC fishing region. To help mitigate the impacts of fishing gear, some countries, like Thailand and Indonesia, have designated fishing gear restricted areas and/or marine reserves. However, these closures are not always effectively enforced and do not control the spatial extent of fishing; as a result, there is no effective mitigation. Consideration of the ecosystem and food webs are considered moderate as no species of exceptional importance are caught, but no efforts to assess and manage ecosystem impacts are underway either.

Justification

Factor 4.1 Impact of the fishing gear on the substrate

Key relevant information:

Pot and bottom gillnet gear are a low conservation concern; they, generally, are fished on muddy/sandy areas where the BSC are found (Dineshbabu et al. 2008; Kangas 2000; Trisak et al. 2009; TWB 2012). Bottom trawls are a moderate conservation concern on muddy/sandy areas (SFW 2012 criteria document).

Factor 4.2 Modifying factor: Mitigation of fishing gear impacts: No effective Mitigation, all regions

Key relevant information:

Based on available information, no BSC or RSC fishing regions have effective mitigation in place to help reduce fishing gear impacts on the seafloor.

Detailed rationale:

There are a few modifying factors in place to help reduce fishing gear impacts. Some efforts to reduce the spatial extent of fishing include limiting access in dugong habitat in Thailand and the creation of marine reserves in some regions. However, marine reserves and spatial management measures are not strongly enforced (e.g., Thailand (FishSource 2012b)) and do not accomplish their purpose in reducing fishing gear impacts. The lack of enforcement leads to a ranking of no effective management in place for all regions.

Factor 4.3 Ecosystem and Food Web Considerations

Key relevant information:

No species of exceptional importance are caught; however, there is also no effort to fully assess and manage ecosystem impacts. As a result, ecosystem and food web considerations are considered moderate.

Overall Recommendation

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

The overall recommendation is as follows:

- **Best Choice** = Final Score between 3.2 and 5, **and** no Red Criteria, **and** no Critical scores
- **Good Alternative** = Final score between 2.2 and 3.199, **and** Management is not Red, **and** no more than one Red Criterion other than Management, **and** no Critical scores
- **Avoid** = Final Score between 0 and 2.199, **or** Management is Red, **or** two or more Red Criteria, **or** one or more Critical scores

Stock	Fishery	Impacts on the Stock Rank (Score)	Impacts on Other Species Lowest scoring species Rank*, (Subscore, Score)	Management Rank (Score)	Habitat and Ecosystem Rank (Score)	Overall Recommendation (Score)
Blue Swimmer Crab	Indonesia bottom trawl	Yellow (2.64)	Turtles, bottom trawl Red, (1,0.8)	Red (1)	Yellow (2.45)	AVOID (1.51)
Blue Swimmer Crab	Thailand pot	Yellow (2.64)	Finfish, pot Green, (3.32,3.32)	Red (1.41)	Yellow (3)	AVOID (2.47)
Blue Swimmer Crab	Indonesia pot	Yellow (2.64)	Benthic invertebrates, pot Green, (3.32,3.32)	Red (1)	Yellow (3)	AVOID (2.26)
Blue Swimmer Crab	Vietnam pot	Yellow (2.64)	Finfish, pot Green, 3.32,3.32	Red (1)	Yellow (3)	AVOID (2.26)
Blue Swimmer Crab	Indonesia bottom gillnet	Yellow (2.64)	Mammals, bottom gillnet Red, (1.41,1.34)	Red (1)	Yellow (3)	AVOID (1.8)
Blue Swimmer Crab	India bottom gillnet	Yellow (2.64)	Mammals, bottom gillnet Red, (1.41,1.34)	Critical (0)	Yellow (3)	AVOID (0)
Blue Swimmer Crab	Thailand bottom gillnet	Yellow (2.64)	Mammals, bottom gillnet Red, (1.41,1.34)	Red (1.41)	Yellow (3)	AVOID (1.97)
Blue Swimmer Crab	India bottom trawl	Yellow (2.64)	Turtles, bottom trawl Red, (1,0.8)	Critical (0)	Yellow (2.45)	AVOID (0)

Blue Swimmer Crab	Vietnam bottom gillnet	Yellow (2.64)	Mammals, bottom gillnet Red, (1.41,1.34)	Red (1)	Yellow (3)	AVOID (1.8)
Red Swimmer Crab	China	Yellow (2.64)	Benthic invertebrates, pot Green, (3.32,3.32)	Red (1)	Yellow (3)	AVOID (2.26)

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Appendix A: Review Schedule

The Indonesia FIP is currently at Stage 3 and has not started Stage 4. The FIP is considered in Stage 4 once the fishery achieves annual improvement milestones. Considering the recommendation to buy crabs measuring only 8cm or more started on July 1, 2011, and there should be a number of years before it is determined the FIP is in Stage 4.

Information can be found on FishSource's webpage by looking underneath the species "blue swimming crab" or accessed at this link:

<http://www.fishsource.com/fishery/identification?fishery=Blue+swimming+crab+-+stock+units+undefined+%28Country%3A+ID%3B+Gear%3A+GN%2C+FPO%3B%29>

About Seafood Watch®

Monterey Bay Aquarium's Seafood Watch® program evaluates the ecological 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. Seafood Watch® makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from www.seafoodwatch.org. 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.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Report. Each report synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices," "Good Alternatives" or "Avoid." The detailed evaluation methodology is available upon request. In producing the Seafood Reports, Seafood Watch® seeks out research published in academic, peer reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch® Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch®'s sustainability recommendations and the underlying Seafood Reports will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling 1-877-229-9990.

Disclaimer

Seafood Watch® strives to have all Seafood Reports reviewed for accuracy and completeness by external scientists with expertise in ecology, fisheries science and aquaculture. Scientific review, however, does not constitute an endorsement of the Seafood Watch® program or its recommendations on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.

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Guiding Principles

Seafood Watch™ defines sustainable seafood as originating from sources, whether fished¹ 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 capture fisheries must possess to be considered sustainable by the Seafood Watch program:

- *Stocks are healthy and abundant.*
- *Fishing mortality does not threaten populations or impede the ecological role of any marine life.*
- *The fishery minimizes bycatch.*
- *The fishery is managed to sustain long-term productivity of all impacted species.*
- *The fishery is conducted such that impacts on the seafloor are minimized and the ecological and functional roles of seafloor habitats are maintained.*
- *Fishing activities should not seriously reduce ecosystem services provided by any fished species or result in harmful changes such as trophic cascades, phase shifts, or reduction of genetic diversity.*

Based on these guiding principles, Seafood Watch has developed a set of four sustainability **criteria** to evaluate capture fisheries for the purpose of developing a seafood recommendation for consumers and businesses. These criteria are:

1. Impacts on the species/stock for which you want a recommendation
2. Impacts on other species
3. Effectiveness of management
4. Habitat and ecosystem impacts

Each criterion includes:

- Factors to evaluate and rank
- Evaluation guidelines to synthesize these factors and to produce a numerical score
- A resulting numerical score and **rank** for that criterion

Once a score and rank has been assigned to each criterion, an overall seafood recommendation is developed on additional evaluation guidelines. Criteria ranks and the overall recommendation are color-coded to correspond to the categories on the Seafood Watch pocket guide:

Best Choices/Green: Are well managed and caught or farmed in environmentally friendly ways.

¹ “Fish” is used throughout this document to refer to finfish, shellfish and other invertebrates.

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

Avoid/Red: Take a pass on these. These items are overfished or caught or farmed in ways that harm other marine life or the environment.