MONTEREY BAY AQUARIUM®

Seafood WATCH

Southern king crab

Lithodes santolla

Argentine waters

Traps

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Final Seafood Recommendation

Southern king crab (*Lithodes santolla*) from trap fisheries within Argentine waters is assessed as a **Good Alternative**.

Stock	**Fishery**	**Impacts on the Stock** Rank (Score)	**Impacts on other Species** (Lowest scoring species Rank*, Subscore, Score)	**Manage-ment** Rank (Score)	**Habitat and Ecosystem** Rank (Score)	**Overall Recommendation** (Score)
Southern king crab	Trap	Yellow (2.64)	No other main species caught Green, (5,4.5)	Red (2)	Yellow (3.12)	**GOOD ALTERNATIVE (2.93)**

Scoring note – scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

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Executive Summary

Southern king crab from trap fisheries within Argentine waters is assessed as a Good Alternative.

The southern king crab (*Lithodes santolla*) is a benthic crustacean inhabiting the Southwest Atlantic from Chile through Argentina to Uruguay and discontinuously around the Falkland Islands. This report addresses the commercial trap fishery for this species off of Argentina, primarily in San Jorge Gulf.

The southern king crab has a medium inherent vulnerability based on its reproductive mode, age at sexual maturity, and average maximum age. There is no relevant stock assessment for this fishery therefore there are no reference points to utilize. Both the stock status and fishing mortality are unknown due to a dearth of available data.

No significant bycatch exists for this fishery. The most significant bycatch are undersized king crabs and female southern king crabs, which are released overboard due to fishery regulations. However, trap modifications (escape rings and biodegradable net) are being implemented where undersized crabs may escape before being brought up to the vessel, and ghost fishing is being reduced. Also, the survival rate of released crabs is generally high. Marine mammals possibly occur as bycatch in this fishery, but only through entanglement in the crab trap lines. Entanglement of marine mammals in trap lines is assumed to be low in this fishery as well as the rate of mortality from entanglements. The marine mammal species that overlap the fishery are generally not stocks of concern; therefore, marine mammals are not assessed as bycatch in this report.

The southern king crab fishery has reasonable management strategies in place, but their effectiveness is uncertain. More data is required to properly assess the target stock status and ensure that current regulations are appropriate. There is no significant bycatch in this fishery therefore management of bycatch is not applicable.

Trap gear contacts the seafloor and can occasionally disturb the benthic habitat when dragging along the bottom. Companies fishing for southern king crab in Argentina will be required to use biodegradable nets and escape rings to reduce ghost fishing and bycatch. But these gear changes are only in the process of being implemented, therefore, there is minimal mitigation in place for this fishery. There are no current efforts to incorporate ecosystem effects into management approaches, but southern king crab is not considered a species of exceptional importance to the ecosystem.

Introduction

Scope of the analysis and ensuing recommendation
The southern king crab (*Lithodes santolla*) is a benthic crustacean inhabiting the Southwest Atlantic from Chile through Argentina to Uruguay and discontinuously around the Falkland Islands. This report addresses the commercial trap fishery for this species off of Argentina, which occurs primarily in San Jorge Gulf.

Overview of the species and management bodies
The southern king crab (*Lithodes santolla*) is a benthic crustacean inhabiting the Southwest Atlantic from Tierra del Fuego, Argentina to Uruguay and discontinuously around the Falkland Islands (Wyngaard and Iorio 2000). Argentina supports two stocks: one in the Beagle Channel in southern Argentina and the other is centered in the San Jorge Gulf (J. Wyngaard pers. comm.). They attain 198 mm carapace length (CL) and occur down to 700 m depth (Boschi et al. 1992). This species reproduces annually with mating in November and December and females carrying eggs for 9-10 months before the eggs hatch into lecithotrophic larvae (Lovrich and Vinuesa 1999; Calcagno et al. 2004). The larval stage lasts for 19-129 days depending on temperature before they settle to the benthos (Lovrich and Vinuesa 1999, Calcagno et al. 2005). Female fecundity increases with size and ranges from 5,500 to 32,000 eggs per batch (Calcagno et al. 2005).

Fishing for the southern king crab began in the Beagle Channel, Argentina in the 1930s using gillnets, but these were banned and replaced with trap fishing after 1975 (Goodall et al. 1994, Lovrich 1997). The management of this fishery in Argentina's federal waters is conducted by the Federal Fisheries Council (Consejo Federal Pesquero: CFP) and the provinces of Chubut and Santa Cruz for territorial waters (CeDePesca 2010). A decline in the yield and mean size of captured individuals from 1988 to 1994 (Bertuche et al. 1990) caused a closure of the fishery in the Beagle Channel at the end of 1994 (Lovrich 1997). In 2004, Argentina allowed an experimental fishery to open for the southern king crab, and in 2008 this fishery officially opened as a commercial fishery in national waters from 44° to 48° S; essentially the Gulf of San Jorge (CeDePesca 2010).

Production statistics.
The southern king crab landings for 2011 and 2012 in Argentina (up to 18 October 2012) have totaled almost 3000 tonnes (MinAgri 2012a). Landings for 2008-2010 were reported as less than 750 tonnes (MinAgri 2012a).

Importance to the US/North American market

The southern king crab is experiencing an increase in imports to the USA and Canada, by way of the USA, due to the allegations of illegal and unsustainable fishing of Russian caught king crab (red king crab, *Paralithodes camtschaticus*, blue king crab, *P. platypus*, and golden king crab, *L. aequispinus*; R. Simon pers. comm.). Argentina's exports for 2011 were 1,580 tonnes to the United States, 274 tonnes to China, and 24 tonnes to other countries (Min Agri 2012b).

Common and market names

Southern king crab, king crab, southern red king crab, centolla in Spanish. The direct translation of centolla into English is 'any marine crab.'

Primary product forms.

Frozen crab meat is available as whole legs and claws, split legs and claws, window cut legs and claws, and extracted crab meat (novafish.com).

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.

Summary

Stock	**Fishery**	**Inherent Vulnerability** Rank	**Stock Status** Rank (Score)	**Fishing Mortality** Rank (Score)	**Criterion 1** Rank (Score)
Southern king crab	Trap	Medium	Moderate Concern (3)	Moderate Concern (2.33)	Yellow (2.64)

Justification of Ranking

Southern king crab

Factor 1.1 Inherent Vulnerability: Medium vulnerability

Key relevant information:
The southern king crab is oviparous and the females brood the eggs for ~10 months (Lovrich and Vinuesa 1999). Sexual maturity is reached at approximately five years old (Lovrich and Vinuesa 1999). The average maximum age is unknown, but the age at legal size (110 mm CL) is

estimated at 8-9 years old and the maximum size is 190 mm CL (Lovrich and Vinuesa 1999). Therefore, it is reasonable to assume that the average maximum age is over 10 years old. It is suggested that they live to 14 years old, but this is based on male molting in the Beagle Channel and is uncertain (Wyngaard and Iorio 2000). The density dependence of this population is unknown, so this is not taken into consideration in the calculation of inherent vulnerability. The reproductive strategy, age at maturity, and maximum age were scored and averaged using the Seafood Watch criteria to determine inherent vulnerability. The combination of these characters resulted in a Seafood Watch score of 2 , corresponding to medium inherent vulnerability.

Detailed rationale:

Inherent Vulnerability Scores from Seafood Watch Criteria:

Resilience attribute	**Invertebrates**		
	Score = 1	**Score = 2**	**Score = 3**
Average age at maturity	>15 yrs	**5–15 yrs**	< 5 yrs
Average maximum age	> 25 yrs	**10–25 yrs**	< 10 yrs
Fecundity	< 100 eggs/ yr	NA	NA
Reproductive strategy	Live bearer	**Demersal egg layer or brooder**	Broadcast spawner
Density dependence	Depensatory dynamics at low population sizes (Allee effects) demonstrated or likely	No depensatory or compensatory dynamics demonstrated or likely	Compensatory dynamics at low population sizes demonstrated or likely

Factor 1.2 Stock status: Moderate concern

Key relevant information:

The only stock assessment to occur for the southern king crab was conducted in 1981−1982 for the Beagle Channel fishery (Boschi et al. 1984). This fishery was closed in 1994 (Vinuesa et al. 1996) and no assessment has been conducted for the crab population elsewhere in Argentine waters. Surveys of the Beagle Channel fishery, which started in the 1930s (Lovrich 1997), displayed a decrease in southern king crab yield and decrease in mean size of both sexes from 1988 to 1994 indicating overexploitation of the stock (Bertuche et al. 1990). This species has

exhibited a recovering trend since 2004 (Lovrich and Tapella 2006), but there is no scientific assessment for the San Jorge Gulf.

Factor 1.3 Fishing mortality: Moderate concern

Key relevant information:
There is no recent stock assessment for the southern king crab and therefore no fishing mortality reference points. Reported landings for 2011 and 2012 (up to Oct 18 2012) were almost 3000 tonnes (MinAgri 2012a). This is significantly higher than 2010 (713 tonnes), 2009 (255 tonnes), and 2008 (535 tonnes; MinAgri 2012a). How these landings compare to the available crab biomass is unknown.

The southern king crab is significant bycatch in the Patagonian red shrimp (*Pleoticus mulleri*) and Argentine hake (*Merluccius hubbsi*) trawl fisheries in the San Jorge Gulf (Pettovello 1999). It is estimated that 2000 tonnes of crab per year are bycaught and discarded in the San Jorge Gulf shrimp fishery (J. Wyngaard pers. comm.). During fishing in 1996 and 1997, 0.31% of the biomass from 34 observed Patagonian red shrimp tows was southern king crab (Pettovello 1999). Discard mortality with trawl gear is higher than with trap gear, estimated at 70% for the southern king crab due to increased stress experienced during trawling, haul back, and sorting on deck (J. Wyngaard pers. comm.). Although not comprehensively covered in this report, the bycatch of southern king crab in these trawl fisheries is significant.

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.

Summary

Stock	**Inherent Vulnerability** Rank	**Stock Status** Rank (Score)	**Fishing Mortality** Rank (Score)	**Subscore**	**Score** (subscore*discard modifier)	**Rank** (based on subscore)
No other main species caught				5.00	4.50	Green

An initial assessment of all species caught in any fishery in this report is provided in Appendix A. This serves to identify the species for which additional assessment is required.

Justification of Ranking
No significant bycatch exists for this fishery.

Marine mammals are not caught in traps, but have the potential to be entangled in buoy lines of crab traps, especially derelict ones (Donaldson et al. 2010). Entanglement in lines from pots is not necessarily lethal; in fact Johnson et al. (2005) found that only 18% of 17 entanglements of humpback (*Megaptera novaeangliae*) and North Atlantic right whales (*Eubalaena glacialis*) in the western North Atlantic resulted in death. It is possible that individuals who survive an entanglement will prematurely die based on their sustained injuries. Still, Johnson et al. (2005) claims 71% of whales the observed entangled by pot gear in the western North Atlantic had positive outcomes. The Alaska crab pot fishery operating in the Bering Sea, Aleutian Islands, and the Gulf of Alaska have reported no marine mammal interactions with almost 600 vessels operating in the fishery and the Office of Protected Resources has listed this fishery as a

category III—remote likelihood or no known interactions (National Marine Fisheries Service (NMFS) 2012). The Southeast Alaska crab trap fishery has reported interactions with humpback whales, but this fishery is still a category III fishery (NMFS 2012). The Alaska crab trap fishery is larger and more extensive than the Argentine fishery and thus the southern king crab fishery likely has fewer interactions with marine mammals than the Alaskan fishery. The northeast Atlantic lobster trap fishery is a category I fishery—frequent interactions with marine mammals—but this fishery is ranked this way due to the local marine mammal populations affected: North Atlantic right whales, humpback whales, and minke whales (*Balaenoptera acutorostrata*) (NMFS 2012). These affected populations do not occur off Argentina, but this highlights that marine mammal interactions in the southern king crab fishery must be recorded. Rankings by experts of trap gear's influence on marine mammals are low to medium in US and Canadian fisheries (Chuenpagdee et al. 2003, Fuller et al. 2008). Additionally, according to the IUCN red list of threatened species (iucnredlist.org), only four of at least 30 marine mammals that occur in Argentine waters are vulnerable or endangered: the sperm whale (*Physeter macrocephalus*), the blue whale (*B. borealis*), the sei whale (*B. borealis*) and the fin whale (*B. physalus*). The global range of these species in tandem with the infrequency of trap line entanglements and the rarity of mortality from entanglements renders the assessment of marine mammals as bycatch unnecessary for the fishery covered in this report.

Factor 2.4 Overall discard rate: 40%–60%

Key relevant information:

Releases of the target species, southern king crab, do occur since regulations prohibit the landing of female crabs or any crab under 110 mm CL (CeDePesca 2010). The amount of releases is high, 70% of individuals or 50% by weight (J. Wyngaard pers. comm.). Escape rings allow undersize crabs to escape the trap, and are in the process of being implemented into the fishery (J. Wyngaard pers. comm.). Also, the survival of crabs brought to the surface and subsequently discarded is high in other crab trap fisheries (93.8% survival in Tallack 2007; 88.8% survival with exposure of -4˚ x hours or less in Stoner 2009) and although not well studied, is likely high in this fishery as well. Due to the low mortality of discards in combination with the high discards, the discard to landings ratio is deemed 40%−60%.

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.

Summary

Fishery	**Management: Harvest Strategy** Rank (Score)	**Management: Bycatch** Rank (Score)	**Criterion 3** Rank (Score)
Trap	High Concern (2)	All species retained (N/A)	Red (2)

Justification of Ranking

Factor 3.1 Management of fishing impacts on retained species: High concern

Fishery	**Critical?**	Mgmt strategy and implement	Recovery of stocks of concern	Scientific research and monitoring	Scientific advice	Enforce	Track record	Stakeholder inclusion
Trap	No	Moderately Effective	N/A	Ineffective	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective

Key relevant information:
The commercial southern king crab fishery is a young fishery and the management strategies and regulations in place are untested for long-term sustainability of the fishery (CeDePesca 2010). There are no stocks of concern affected by this fishery, but more research and monitoring are required to understand the status of the target stock at this time. Most subsections are deemed 'moderately effective,' but could use improvement starting with

current data of the fishery and the affected stock. Fishery and enforcement regulations are in place, but their effectiveness in practice are highly uncertain (CeDePesca 2010).

Detailed rationale:

Management Strategy and Implementation: Moderately Effective

The fishery is conducted strictly with traps and all female and undersized crab and fish bycatch must be released (CeDePesca 2010). The fishery is closed from 15 June to 30 September each year for stock protection, and a maximum number of traps per boat is in place (CeDePesca 2010). It is currently undergoing a full sustainability assessment under the Marine Stewardship Council (MSC; http://www.msc.org/track-a-fishery/in-assessment/south-atlantic/southern-red-king-crab-bottom-trap-argentina). The effectiveness of the management is unknown since no stock assessments have been conducted and the fishery is relatively new (commercially opened in 2008). The CFP has implemented some management strategies outlined above (CeDePesca 2010), but there is a lack of evidence that management strategies are sufficient to promote long-term sustainability at this time.

Recovery of Stocks of Concern: N/A

There are no stocks of concern in this fishery, therefore, the recovery of stocks of concern is deemed N/A.

Scientific Research and Monitoring: Ineffective

There is knowledge of the reproduction of the southern king crab (Lovrich and Vinuesa 1999, Calcagno et al. 2004, 2005), but there is no fishery stock assessment in the San Jorge Gulf to date. Catch data are being collected from fishery observers that will enable a stock assessment to be undertaken (CeDePesca 2010). The data available to date, external to the Argentine government, are currently insufficient to determine stock status.

Scientific Advice: Moderately Effective

The CFP has taken most scientific recommendations and implemented them into the fishery regulations. There is a trap limit per boat (4,500 traps), a fishing season, some implementation of mitigation to disable traps from ghost fishing, mandatory onboard observers (CeDePesca 2010; R. Simon *pers. comm.*), but there are many areas where regulations could be stricter. Some areas to be improved include mitigation to prevent traps from capturing undersized crabs, complete follow-through to reduce ghost fishing, observers record species-specific bycatch and marine mammal sightings and interactions, and there is some concerns on the amount of fishing effort occurring, but no discussion of regulating it further (CeDePesca 2010)..

Enforcement: Moderately Effective

Each vessel must carry an observer on board (CeDePesca 2010). Effectiveness of enforcement is overall unknown.

Track Record: Moderately Effective

The current fishery has been commercially active since only 2008, so trends of crab population are not known (CeDePesca 2010). The previous southern king crab fishery in the Beagle

Channel, Argentina underwent severe declines in crabs, but has shown signs of recovery after 10 years of closure although abundances are unknown. (Lovrich and Tapella 2006).

Stakeholder Inclusion: Moderately Effective
Stakeholders currently have an active role in the MSC certification that is underway for the southern king crab fishery (R. Simon pers. comm.). The management of the fishery is under the jurisdiction of the Argentine government and the input of stakeholders at the management level is unknown.

Factor 3.2 Management of fishing impacts on bycatch species: N/A (All species retained)

Fishery	**All Species Retained?**	**Critical?**	Mgmt strategy and implement	Scientific research and monitoring	Scientific advice	Enforce
Trap	Yes					

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.

Summary

Fishery	**Impact of gear on the substrate** Rank (Score)	**Mitigation of gear impacts** Rank (Score)	**EBFM** Rank (Score)	**Criterion 4** Rank (Score)
Trap	Low Concern (3)	Minimal mitigation (0.25)	Moderate Concern (3)	Yellow (3.12)

Justification

Trap

Factor 4.1 Impact of the fishing gear on the substrate: Low concern

Key relevant information:
This fishery is conducted using traps or pots. Traps fishing for crustaceans affect the ecosystem by resting on, and incidentally dragging across, the seafloor, which can destroy habitat and crush benthic organisms (Donaldson et al. 2010). Ecosystem damage by traps was deemed 38/100 from expert ranking for US fisheries (Chuenpagdee et al. 2003) and 44/100 for Canadian fisheries (Fuller et al. 2008). Similar impacts are assumed to occur in this fishery.

Factor 4.2 Modifying factor: Mitigation of fishing gear impacts: Minimal mitigation

Key relevant information:
The fishery is in the process of utilizing biodegradable net and implementing escape rings for undersized crabs to escape to reduce ghost fishing from lost traps (R. Simon pers. comm.). Biodegradable net would also reduce the impact on the habitat through reduced entangling of benthic organisms, but reducing derelict crab traps entirely is still necessary. Measures to reduce ghost fishing of derelict crab traps have been shown to be effective (Virginia Institute of

Marine Science (VIMS) 2009). Therefore the gear modifications are effective, but are not known to be employed for the entire fishery so there is 'minimal mitigation' of fishing gear impacts.

Factor 4.3 Ecosystem and Food Web Considerations: Moderate concern

Key relevant information:
The southern king crab is not an exceptional species according to the Seafood Watch criteria. There are no regulations of fishing effort beyond 1) a total trap per vessel limit (4,500 traps), 2) daylight fishing only, and 3) the fishery is closed from 15 June to 30 September each year (CeDePesca 2010). There are no efforts to assess the ecological impacts of this fishery at this time (CeDePesca 2010).

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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: All Species Included in Assessment

This table presents a first filter of all species caught in all fisheries assessed in this report. Stocks in blue are those for which this report provides a recommendation. A full assessment of each of these species can be found in Criterion 1. Species in red are those which likely score most poorly of the remaining species and so are fully evaluated under Criterion 2. The assessment text for only the lowest scoring species(s) is presented in the Criterion 2 section of this report. Species in black are those for which there is no recommendation provided and there is no particular concern over their status. They are not assessed further in this report.

Species/Stock	Fishbase vulnerability score (fish only)	B/BMSY and/or mgmt classification	F/FMSY and/or mgmt classification	Fishery Specific Fishing Mortality (optional)	Sources
Southern king crab	N/A	unknown	unknown		Bertuche et al 1990; Vinuesa et al 1996; MinAgri 2012a
Marine mammals	N/A	Data deficient, least concern, vulnerable, endangered	Data deficient, least concern, vulnerable, endangered	Assumed very low	Iucnredlist.org
False king crab	N/A	unknown	unknown		Lovrich and Vineusa 1999; Tapella and Lovrich 2006; MinAgri 2012a

False king crab (*Paralomis granulosa*) were not evaluated in this report because they did not constitute a significant (> 5%) percent of the bycatch in the southern king crab fishery (MinAgri 2012a). The false king crab is not a stock of concern based on its medium inherent resilience, and unknown stock status and fishing mortality. It has a medium inherent resilience based on its reproductive mode (brooder), approximate age at maturation (8-9 years) and estimated average maximum age (between 10 and 25 years; Lovrich and Vinuesa 1999).

Appendix B: Review Schedule

The MSC certification process is expected to be completed within the next six months (R. Simon *pers. comm.*). After the completion of this certification and after the approval of a stock assessment of the southern king crab, re-assessment by the Seafood Watch team is suggested.

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.