SEAFOOD GUIDEBOOK 2014

12%

12% of Hong Kong's Ecological Footprint comes from our seafood consumption

2

Hong Kong is now the second largest per capita consumer of seafood in Asia

170+

Hong Kong consumes seafood coming from over 170 countries and territories around the globe

90%

90% of commercially important wild caught fisheries are either fully fished or over exploited

©Cat Holloway/WWF-Canon

WWF

Why we are here

To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

wwf.org.hk

WWF-Hong Kong, 1 Tramway Path, Central, Hong Kong.
Tel: (852) 2526 1011 Fax: (852) 2845 2734 Email: wwf@wwf.org.hk
註冊名稱 Registered Name: 世界自然(香港)基金會 World Wide Fund for Nature Hong Kong
(Incorporated in Hong Kong with limited liability by guarantee)

WWF · SEAFOOD GUIDEBOOK 2014

HK

WWWF.ORG.HK

WWF

GUIDEBOOK

HK

2014

SEAFOOD GUIDEBOOK

SEAFOOD GUIDEBOOK

Ask for sustainable seafood for our future generations

ACKNOWLEDGEMENTS

We would like to express our gratitude to the following individuals for their professional advice on seafood assessments:
Lars Andresen, Janine Basson, Markus Burgener, Earnest Chiam, Andy Cornish, He Cui, Piers Hart, Jose Ingles, Philipp Kanstinger, Tobi Lau, Samantha Lee, Karin Lüdemann, Geoffrey Muldoon, Georg Respondek, Yvonne Roessner, Yvonne Sadovy, Stanley Shea, Peter Trott, Juan Vilata, Irwin Wong, Aiko Yamauchi, Cynthia Yau, and Catherine Zucco.

We would like to thank Merlinda Ng and Keith Tsui for their professional advice on seafood trade in Hong Kong.

We are grateful for the dedicated support of Emma Leung, Fontane Lau, Gavin Edwards, Kerry Lee, and Yan Law in the production of this book.

Contributors to this book: Allen To, CW Cheung, Stephanie Cheung

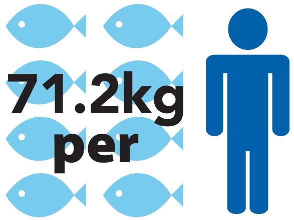
Publisher: WWF-Hong Kong

WWF

WWF is one of the world's most respectable conservation organizations, with a network active in more than 100 countries. WWF's mission is to build a future in which humans live in harmony with nature. WWF-Hong Kong has been working since 1981 to deliver solutions for a living planet through Conservation, Footprint and Education programmes.

CONTENTS

INTRODUCTION



Seafood consumption in Hong Kong

People in Hong Kong love seafood. The Food and Agriculture Organization of the United Nations (FAO) reported that people in Hong Kong consumed about 505,553 tonnes of seafood in 2011, meaning that every single person in Hong Kong ate 71.2kg of seafood in that year alone. That is 4.1 times higher than the global average and more than double the per capita consumption in mainland China. It makes Hong Kong the second largest per capita consumer of seafood in Asia, and the seventh largest in the world. So while Hong Kong may be a small place, with a population of a little more than seven million, it consumes considerable quantities of seafood and, as a result, exerts huge pressure on marine resources.

Local seafood supply

The seas around Hong Kong once contained rich resources – the city developed into a fishing port more than a century ago – with nearly 1,000 marine fish species, of which about one-third lived in or close to reefs. After World War II, the fisheries industry started to develop and the level of exploitation of wild-caught seafood increased, amid rising demand for seafood driven by population growth. The advancement of fishing technologies such as mechanical engines and nets in the 1970s, along with the lack of fisheries management, led to overfishing. In this connection, the amount of seafood caught in Hong Kong peaked in the late 1980s and began to decline in the 1990s, with far fewer and smaller catches. Today, the fishing boats of Hong Kong only supply about 10 to 15% of the total seafood consumed here.

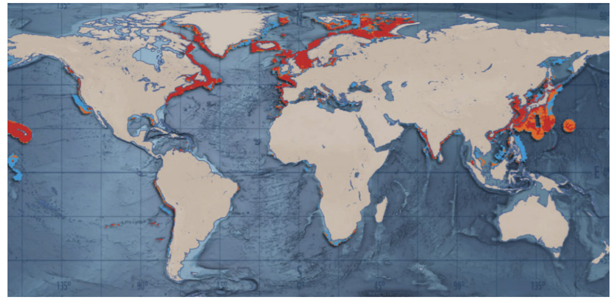
The South China Sea outside Hong Kong has been going the same way in recent decades. Research shows that most fish caught there are small juveniles, and fishermen have to spend longer time at sea to catch the same quantity of fish.

Aquaculture, or fish farming, in Hong Kong began in the 1940s. Initially, the focus was on freshwater fish such as snakehead, carp and grass carp, which were raised in ponds in the New Territories. Farming of marine species began in the late 1960s, in open floating cages, located in sheltered bays, so that they could withstand typhoons and other severe weather conditions. It is a farming method still in practice today, mainly for grouper, pompano and snapper. Production peaked in 1991, when 3,860 tonnes of fish were produced. However, with competition from other places such as mainland China and Southeast Asia, pollution of seawater and urban development, among other factors, production has quickly declined.

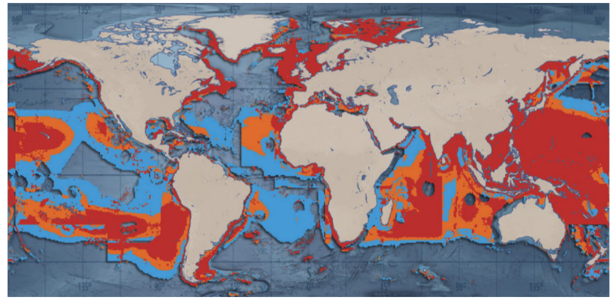
The result is that our demand for seafood is much more than what our local water can supply and our local fish farms can produce. From 1992 to 2011, seafood consumed in Hong Kong came from over 170 countries around the globe – some as close as the Pearl River Delta in mainland China, some as far away as Antarctica. The impact brought by Hong Kong on marine resources is felt way beyond our border.

Global seafood supply - from the sea

The overall global capture fisheries production has remained stable at around 90 million tonnes in recent years. According to the FAO, the global catch in 2012 was 91.3 million tonnes, with nearly 90% of the individuals harvested from the oceans and the remainder coming from inland areas. The most caught species were Peruvian anchovy, Alaska pollock, skipjack tuna, sardine and Atlantic herring. The top fishing countries in the world were China, Indonesia, the USA, Peru, and Russia.



1950



2006 *Expansion of World Fishing Fleets, Data Source: Swartz el al 2010*

Although the global wild-catch total has remained stable over the past two decades, this stability is masked by the fact that global fishing vessels have been exploring more and more fishing grounds, which are farther and farther away from continents in order to keep up with the demand. The maps show the geographical expansion of world fishing fleets from 1950 to 2006 (the latest available data). Since 1950, the size of the areas fished by global fishing fleets has increased 10-fold. By 2006, around one-third of the ocean's surface was already heavily impacted by fishing. The colours in the map show how intensively these areas are fished, with blue denoting relatively lightly, red most intensively and potentially overfished, and orange somewhere in-between.

Worst still, the size of the catch in general has reduced and fishermen have to spend longer time at sea in order to catch the same amount of fish. The FAO also reported that in 2011, around 61% (up from 52% in 2005) of commercially important wild capture fishery stocks were already fished to their maximum limit with no room for further expansion. About 29% (up from 25% in 2005) of the wild-caught seafood stocks were overfished. The rest (about 10%, down from 23% in 2005) of the stocks were non-fully exploited, meaning there was still potential to catch more.

With no significant increase in the global marine catch despite increasing fishing effort, a strong message is conveyed: the state of the world marine fisheries is in peril and has had a negative impact on fishery production. Some scientists

INTRODUCTION

have even speculated that major marine fish stocks of the world would collapse within the next few decades if no urgent action is taken to reverse this trend. Because of fishing activities, more marine fish, including sharks and groupers, have recently been listed as "Threatened" by the International Union for Conservation of Nature (IUCN) or have the respective global trade restricted by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Despite the grave outlook, there have been examples proving that if effective fisheries management practices are put in place, fish stocks will have the capacity to recover. Many of the marine fish that Hong Kong people enjoy, however, actually come from South East Asia, where destructive fishing methods such as cyanide and dynamite fishing methods are still used. There is a lot of room for improvement in terms of fisheries management.

Aquaculture as an alternative?

With wild seafood production reaching its limit, aquaculture has been growing rapidly to meet the ever-increasing demand. In 2011, the most commonly cultured species were clam, oyster, shrimp, carp and salmon. China is the world's largest aquaculture producer, accounting for over 60% of the world's production, followed by India, Vietnam, Indonesia and Bangladesh.

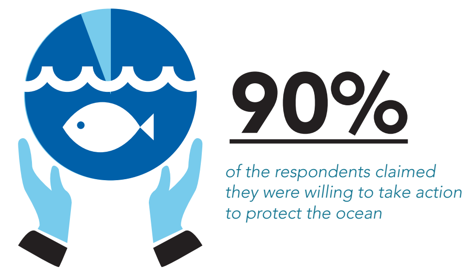
Over the last three decades, capture fisheries production has increased, from 69 million tonnes in 1981 to 91 million tonnes in 2012. During the same period, world aquaculture production increased from five million tonnes in 1981 to nearly 67 million tonnes in 2012. According to the World Bank, total fish supply will likely be equally split between capture and aquaculture by 2030, and aquaculture would dominate the future global fish supply beyond 2030.

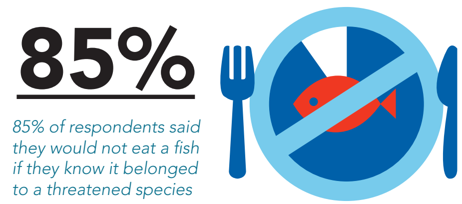
There is a general belief that aquaculture should be more environmentally friendly. In reality, however, the rapid development of aquaculture has also had a big impact on the marine environment. Aquacultures, such as those for shrimps in Asia, are often established in sensitive coastal areas with a high conservation value including mangroves, causing serious damage to these important natural habitats and nursery grounds for fish. Escaped farmed individuals, such as the Atlantic salmon, are often in poorer health and can affect the health of their wild counterparts by spreading diseases and parasites from aquaculture farms to the natural environment.

The use of marine organisms to feed the farmed species is also an issue. An example is the use of already overexploited fish species as feed to groupers farmed in Hong Kong and South China. Without proper practices and management, aquaculture can be as detrimental to the environment as capture fisheries, if not worse.

Sustainable seafood in Hong Kong

According to a survey conducted by the University of Hong Kong in 2011, nearly 40% of the respondents saw the ocean as a source of unlimited seafood, in stark contrast to the already depleted state of many fisheries in the world, including those in Hong Kong and South China Sea. Nevertheless, it is encouraging to see that 90% of the respondents claimed they were willing to take action to protect the ocean, and 85% of them said they would not eat a fish if they know it belonged to a threatened species. Despite the need for improvement in their understanding of the challenges facing the ocean, Hong Kong people are conscious of the role that they can play to help solve these global issues.





We have also observed an increase in awareness concerning sustainable seafood among consumers and businesses since WWF-Hong Kong launched the Seafood Choice Initiative in 2007. However, more work needs to be done to further transform public awareness into action, support sustainable seafood sourcing by retailers and catering businesses, and also make sustainable seafood, including MSC (Marine Stewardship Council) and ASC (Aquaculture Stewardship Council) certified seafood, become more accessible on the market.

An increase in support for sustainable seafood in Hong Kong, which is one of the largest seafood consumers in Southeast Asia, will encourage producers in the region to adopt more sustainable capture and aquaculture fisheries practices. This will have a significant conservation impact on the oceans in the region and can also help ensure that seafood will be available for the generations to come.

In early 2007, WWF released the first seafood guide in Asia. It was then revised in 2013 to reflect the results of new assessments on seafood items. The WWF-Hong Kong Seafood Guide listed more than 70 commonly available seafood species found in supermarkets, Chinese and Western restaurants, seafood restaurants, hotels, frozen food shops and wet markets. Its aim is to help people in Hong Kong choose sustainable seafood and avoid seafood that is harvested or produced in ways that significantly damage the marine environment. The guide adopts rigorous criteria to assess the sustainability of both wild-caught and farmed seafood species, and its assessments are reviewed by local and international marine scientists and experts. This WWF-Hong Kong Seafood Guidebook supplements the pocket guide, providing more information on all of the assessed seafood species.

ASSESSMENT OF SEAFOOD SPECIES FROM WILD-CAPTURE FISHERIES

In order to determine the sustainability of wild-caught seafood species, WWF checked each species against a set of necessary information listed below. For detailed information on individual seafood species, please consult the summary pages in relation to each of the seafood species included in this guidebook.

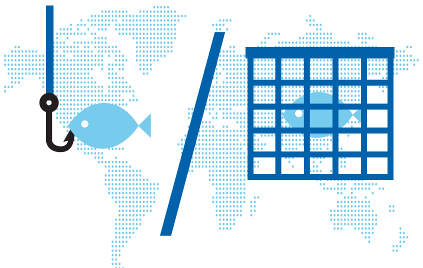
1. Common name

The common name of a seafood species can change from place to place. The common names used in this guidebook are those mainly used in Hong Kong or listed by FishBase, the global fish database.

2. Scientific species name

Scientific species names are given to plant and animal species by taxonomists. Each species has only one scientific name in Latin. This is the most consistent way to refer to a seafood species.

3. Origin



Harvested from the sea, wild-caught seafood species can be naturally found in more than one place, region or country. As different fishing methods are used in different places to catch the same seafood species, and countries have differing fisheries management systems, it is vital to know where the seafood species comes from in order to assess whether it is sustainably produced.

4. Biology

Fish and shellfish have developed special biological or behavioural characteristics that help them survive in their own unique ecosystem, but these characteristics may also make them more susceptible to overfishing. Here are some of the characteristics:

Age of sexual maturity

Species that take a long time, for example up to eight years, to reach maturity are likely to be more susceptible to being caught before they can reproduce, compared with a species that matures within a year. For example, Atlantic bluefin tuna takes eight to 12 years to mature.

Aggregation (to reproduce or feed)

Some species will gather together at predictable times and places to reproduce or feed. This makes them an easy catch, and stocks can be decimated rapidly if not properly managed. For example, camouflage grouper forms spawning aggregation in some places.

Rarity

Naturally, rare seafood species are very sensitive to fishing: the removal of even small numbers of animals can have a big impact on the entire population. For example, giant grouper is a naturally rare species even in waters unexploited by fishing.

Growth rate

Slow-growing species are usually more vulnerable to fishing pressure. An example is Chilean sea bass.

Sex change

When fish undergo sex change, they will be vulnerable to fishing activities because overfishing of either sex will cause imbalance of the gender ratio, and lead to reproduction difficulties. An example is humphead wrasses, which change sex from female to male as they grow.

Geographic distribution

For a seafood species that is endemic only to a particular place or is relatively narrowly distributed, overfishing in that place can threaten the survival of the whole species, as its local population also represents totally or considerably its global population. For example, Hong Kong grouper is only found in southern Japan, Korea, Taiwan and southern China.

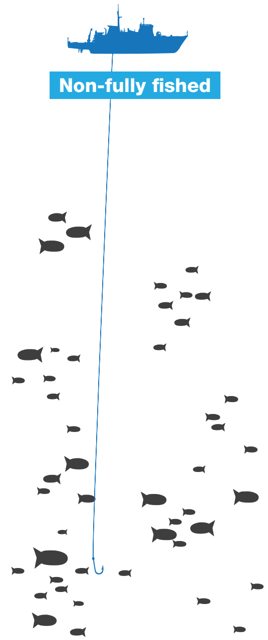
Migration

Some seafood species such as swordfish and tuna travel over a long distance in the ocean to reproduce or search for food. Since they may travel through the waters of many countries and international waters, the fisheries management of these species is particularly difficult.

Some fish will even migrate from the seas to the rivers or vice versa to reproduce. Since these species travel at predictable times and through specific areas, fishermen can easily find and catch them. Without proper management, overfishing easily occurs.

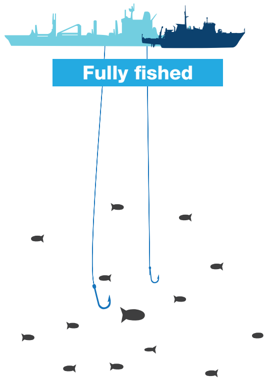
5. Stock status

In order to ensure the long-term survival of seafood species, it is important to maintain their population at a level where they are not fished faster than the rate at which they can regenerate. In financial terms, it would be to take only the interest and not the principal so as to allow a stock to remain at a healthy level. According to FAO, the status of wild fish and shellfish populations is classified as below:

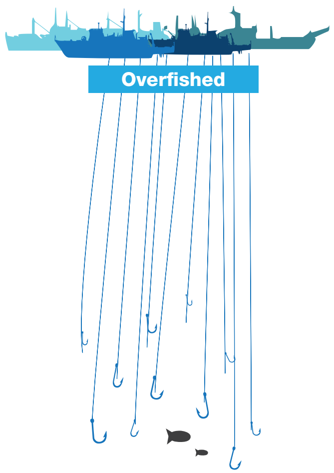


This occurs when the regeneration rate of a seafood species is higher than the rate at which it is fished. There is some potential to increase their production, and proper fisheries management plans should be established.

ASSESSMENT OF SEAFOOD SPECIES FROM WILD-CAPTURE FISHERIES



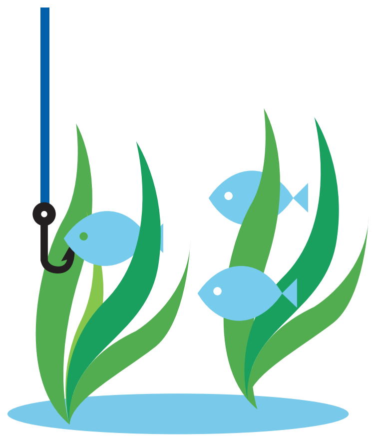
This occurs when the fishing rate is around the rate that a species can regenerate. There is no room for further expansion in catch, and the population may even be at some risk of decline unless fisheries are properly managed.



This occurs when the fishing rate is higher than the rate at which a seafood species can regenerate. This produces lower yields than what they potentially could generate. Strict fisheries management plans are needed to rebuild the fisheries and regain its productivity.

As these animals live in the sea, it is not easy to estimate the rate at which they regenerate. It is even harder with species that are naturally rare, highly migratory or live in the deep seas. The population of any species can also be greatly affected by changes in sea conditions: seawater temperature, salinity, water current direction and so on. Nevertheless, there are some widely recognized methods to estimate the status of wild populations of seafood species, including: a) monitoring changes in the quantity of a species landed by fishermen; b) monitoring changes in the size of species that are landed; c) sampling the population of a species in a given area of the sea and then calculating the size of the total population.

6. Ecological effects



Fishing activities are bound to have various degrees of impact on the ecosystems in which fisheries operate. Fishing method, the amount of bycatch it generates and the impact on the environment need to be considered.

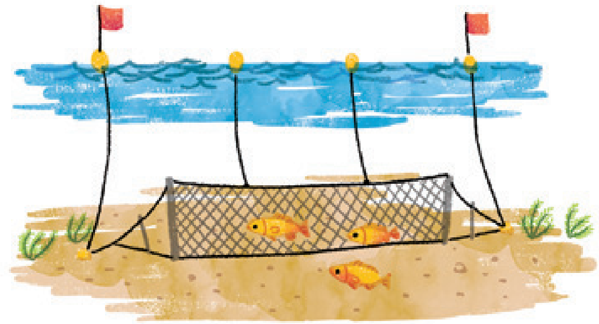
Fishing method for wild-caught seafood

Wild-caught seafood is harvested from the sea using a variety of methods. The related information, which also refers to the source of seafood, is important and is a crucial factor to consider when assessing the sustainability of fisheries because the impact of fishing methods on the ecosystem varies. There are many ways of catching fish in the wild, and many types of fishing gear are used. The following are the most common ones:

Dredging

Heavy metal frames with bags attached to them are dragged along the seabed to stir up shellfish so they can be caught in the bags. Mud, sand and other marine organisms will pass through the mesh if they are small enough and large animals will go into the bags. This method is commonly used to catch shellfish that live on the seafloor, such as scallops.

Gill-netting

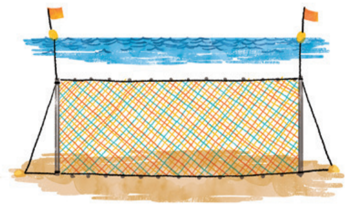


Gill nets are rectangular curtains that hang in the sea at different depths. Floats are tied to the top and weights to the bottom. Since the nets are almost invisible to fish, they swim into them and get trapped in holes that are big enough for their heads, but not their bodies, to pass through. When they try to swim backwards, their gills become entangled. Gill-netting is commonly used to catch fish such as horsehead.

ASSESSMENT OF SEAFOOD SPECIES FROM WILD-CAPTURE FISHERIES

Trammel gill-netting

Instead of one layer of nets, trammel gill nets have three, with holes ranging from large to very small that can catch fish of a range of different sizes. This method is used to catch cuttlefish.



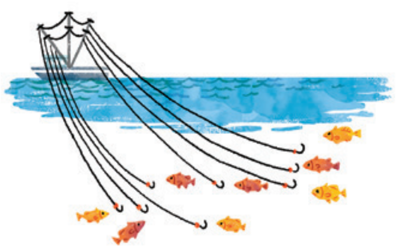
Hook and lining

Hooks with bait are tied to fishing lines and rods. Bait is used to attract fish; sometimes bait is thrown into the water to create a feeding frenzy and attract more fish. Hooked fish are gathered by hand or using machines. Hook and lining is commonly used to catch leopard coral trout, squaretail coral trout and camouflage grouper.

Hand-lining

A type of hook and lining that does not use rods: fishermen simply hold the lines in their hands. Hand-lining is used to catch fish like yellowfin tuna.

Trolling

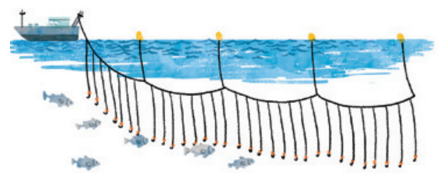


Another type of hook and lining, this time with fishing lines set behind or alongside while the fishing boat is on the move. This method is commonly used to catch Pacific salmon.

Long-lining

Long-lining, as the name suggests, involves long fishing lines which can be as long as 100 kilometres. Attached to them are shorter lines with baited hook tied at fixed intervals. Long lines can be set at different depths to catch different species. Long-lining is commonly used to catch golden threadfin bream and bigeye.

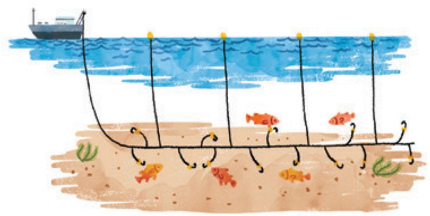
Pelagic long-lining



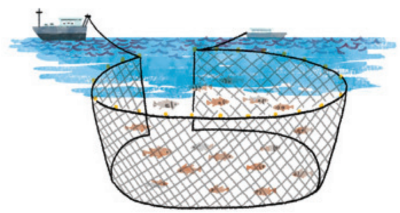
A specific type of long-lining, where the long lines are set near the surface of the water to catch open water fish such as bluefin tuna, yellowfin tuna and swordfish.

Bottom long-lining

A type of long-lining where the long lines are set near the seabed to catch fish such as black cod and Chilean sea bass.



Purse seining

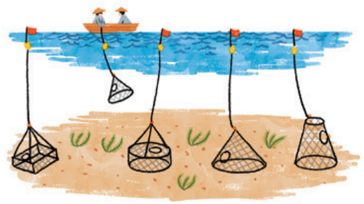


Purse seine nets are used as walls to encircle fish. After the fish are surrounded, the bottom end of the purse seine net is pulled up and closed to form a bag that traps the fish. Schooling fish such as sardine, salmon and yellowfin tuna are caught by this method.

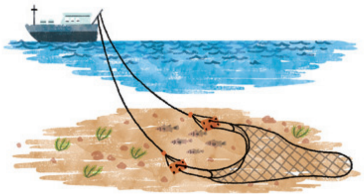
ASSESSMENT OF SEAFOOD SPECIES FROM WILD-CAPTURE FISHERIES

Traps and pots

Traps and pots made of wood, metal wire or plastic are placed on the seafloor to catch fish, sometimes by using bait. The captured animals are usually still alive in the traps and pots when they are harvested. Traps and post are commonly used to catch lobsters and white-spotted rabbitfish.



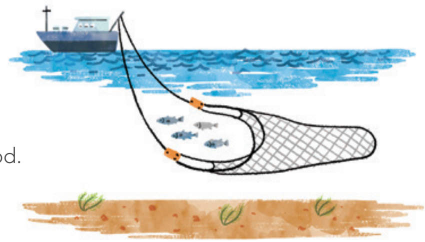
Bottom trawling



A type of trawling that sets the nets on the seafloor. Heavy weights are attached to the nets to stir up the sand or mud so that fish and shrimp living there can be caught. Sometimes heavy rockhoppers are used, chains with roller wheels that allow the net to roll over rough, rocky seabeds without damaging the nets or being stopped by the rock. Shrimp, red crab and squid are commonly caught by this method.

Mid-water trawling

A type of trawling where the nets are set at the surface or within the water column of the sea. Silver pomfret are commonly caught by this method.



Handpicking

Fishermen harvest seafood by hand because the animals in question are slow-moving. Diving equipment and nooses are used to help collect the animals when they live more than an arm's length from the surface of the water. Handpicking is commonly used to catch abalone and sea urchins.

Fishing methods and associated bycatch

Since the species we like to eat usually live alongside other marine organisms, they are also caught by fishermen and are called bycatch. They can be unwanted animals like sponges, starfish or sea urchins but can also be the young of commercially important seafood species such as grouper, snapper or sea bream. Sometimes, even endangered species like marine turtles, albatrosses, sharks and dolphins are caught.

Unsustainable fishing practices generate large amounts of bycatch and can endanger marine animals, and some fishing methods are prone to produce more bycatch than others, such as indiscriminate bottom trawling as opposed to highly selective handpicking. Unwanted organisms may be thrown back into the sea, but many may not survive because they have drowned, have been crushed in the fishing nets or are too stressed to survive. Sometimes when animals are caught but are not allowed to be sold, they are also thrown back. It is all a huge waste. The weight of unwanted organisms in tropical shrimp fisheries, for example, can contribute as much as 70% of the total catch. Fishing methods like mid-water and bottom trawling usually generate a large amount of unwanted bycatch as these techniques are non-selective.

The young of commercially important species and other small and relatively low-value fish species are sometimes sold as fish feeds to fish farms. Many farmed seafood species, particularly carnivorous fish such as groupers and bluefin tuna, still require essential nutrients from other fish. This can compromise the regeneration rates of these wild-caught species, and if these species are already overfished, such a farming practice will further worsen their wild population status.

Each year many individuals of endangered species, such as marine turtles, dolphins, albatrosses and sharks, are accidentally killed by unsustainable fishing. Turtles are caught by fishing methods like long-lining and bottom trawling. Bycatch can include dolphins, which are entangled in fishing nets and drown. Albatrosses are attracted by long-line bait and drown when they take it and get hooked.

Fortunately, good fishing practices can minimize the amount of bycatch and avoid catching endangered species. Improved technology can help fishermen focus on the species they are after and avoid bycatch, particularly of endangered species. Equipment such as Turtle Excluder Devices (TED) and Bycatch Reduction Devices (BRD) can be installed on bottom trawlers to allow trapped marine turtles and other unwanted organisms to escape from fishing nets. Innovative fishing gear such as circle hooks for long-lining can help release hooked marine turtles quickly and safely, and bird streamer liners which scare away birds are deployed on long-lining vessels to reduce the chances of sea birds like albatrosses being accidentally killed. Nets with big holes allow smaller fish and other animals to escape from the nets, while still catching the seafood species that fishermen want.

ASSESSMENT OF SEAFOOD SPECIES FROM WILD-CAPTURE FISHERIES

Fishing methods and associated impacts on the environment

The seabed is an important environment for marine organisms, including seafood species, to live in. When the seabed is altered by fishing, the habitats that species rely on for food and shelter will be damaged.

Different fishing methods will have different kinds of impact on the seabed. Fishing gear such as hook and line, purse seines, trolls and mid-water trawls do not touch the seabed and do not affect it. Traps and cages, bottom long lines, gill nets and handpicking will involve limited contact with the seabed and the impact will be relatively mild, unless they are at sensitive marine habitats like coral reefs and seagrass beds. The most destructive forms of fishing gear are bottom trawls and dredges because they use heavy weights to push the net onto the seabed and catch all the seafood species and other marine organisms along the way. These techniques are like running a steamroller through a forest: they destroy everything in their path. The use of electricity, explosive or chemical such as cyanide to catch fish, which is often illegal, is also very detrimental to the environment such as coral reefs where many fish stay.

Some marine habitats like tropical coral reefs, seagrass beds, deep-water seamounts and deep-sea coral reefs are extremely sensitive to fishing activities. These habitats boast a high diversity of marine life, and they are important feeding, spawning and nursery grounds for many marine organisms. For example, bottom trawling at seamounts - mountains on the seafloor - destroys deep-sea coral reefs that take centuries to recover. These poor fishing practices directly threaten the survival of many endangered species. Sandy, rocky or muddy seabeds are less sensitive to fishing activities, but uncontrolled fishing can still damage these ecosystems.

7. Fisheries management

In the past, people thought marine resources were inexhaustible and there was no limit to what could be caught. The collapse of a major traditional fishery, the Atlantic cod fishery at Grand Bank in Canada, in 1992, made people realise that fisheries management is the key to sustainable fishing.

According to the FAO's definition, fisheries management is an integrated process to ensure that seafood species can continue to be harvested. The process begins with gathering and analysing information about the species in question. That information is then used to plan how much can be caught and how to catch it, measures that are enshrined in regulations. Fisheries management organizations, such as government departments, will then regulate the activities of fishermen. That can happen at the local, national and regional levels. For example, the Agriculture, Fisheries and Conservation Department (AFCD) manages fishing activities in Hong Kong, while the mainland Chinese government is responsible for fisheries in mainland waters.

When seafood species are caught in international waters not owned by any particular country (also known as the high seas), regional fisheries management organizations (RFMOs) are responsible for regulating the activities of fishermen. These organizations are formed by countries that have an interest in species that are caught in the relevant international seas, whether or not fishermen from those countries actually fish there. Some of these RFMOs include Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), International Commission for the Conservation of Atlantic Tuna (ICCAT) and The Western Central Pacific Fisheries Commission (WCPFC).

Different countries or regions have different ways of managing the activities of fishermen, but here are some of the basic components:

1 Licensing of fishermen

This controls the number of fishermen who are permitted to catch specific kinds of seafood. Licensing is the fundamental element of any fisheries management system.

2 Stock assessment

This involves estimating the quantity and status of seafood species in the sea so that fishing quotas can be set accurately.

3 Fishing quota

Based on the results of stock assessments, fishing quotas determine what quantity of a particular species can be caught while ensuring that enough are left for the species to regenerate.

4 Fishing method restrictions

These are restrictions on some of the more destructive fishing methods. For example, the use of explosives and chemicals like cyanide is prohibited. Bottom trawling could be banned in sensitive marine habitats like coral reefs, seagrass beds, and marine protected areas.

5 Bycatch controls

There are several ways of limiting the effects of bycatch:

1. Fishermen install special devices on their boats, such as TED, BRD and bird-streamer lines, to avoid catching endangered species. Minimum mesh sizes allow young animals to escape from fishing nets.
2. Controls are set on the amount of unwanted marine organisms that can be caught or thrown back into the sea.
3. Animals smaller than the minimum permitted size have to be released back into the sea.

6 Scientific research

Although we consume many seafood species, we still do not understand the biology of many of them. Scientific research can help us learn more about them and provide guidance when it comes to setting fishing quotas.

7 Marine protected areas

These include areas designated as no-take zones where no fishing is permitted. Closing fishing areas during mating periods can also help to protect species from overfishing.

Having credible information on the status of wild stocks is necessary for effective fisheries management to be put in place.
In fact, because many of the commercial fisheries which Hong Kong imports from and which are targeted by the assessments of this book are in Southeast Asia, long-term species-specific data are often not available. Assessment outcomes were therefore generally not positive, with most capture fishery assessments in this region being graded as "Avoid". This is likely a fair reflection of: i) the generally depleted state of many of the target species in this region; ii) the degradation of the marine habitats through coastal pollution, habitat loss and destructive fishing practices; iii) the lack of effective management and scarcity of species-specific data held by management authorities.

ASSESSMENT OF SEAFOOD SPECIES FROM AQUACULTURE

In order to determine the sustainability of seafood species from aquaculture, WWF checked each species against a set of necessary information listed below. For detailed information on individual seafood species, please consult the summary pages in relation to each of the seafood species included in this guidebook.

1. Common name

The common name of a seafood species can change from place to place. The common names used in this guidebook are those mainly used in Hong Kong or listed by FishBase, the global fish database.

2. Scientific species name

Scientific species names are given to plant and animal species by taxonomists. Each species has only one scientific name in Latin. This is the most consistent way to refer to a seafood species.

3. Origin

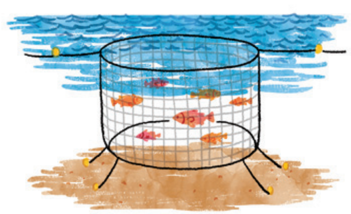
Fish farms can be found in many countries and the same seafood species can be cultured in more than one place, region or country. As countries may have different regulations on aquaculture, it is vital to know where the seafood species comes from in order to assess whether it is sustainably produced.

4. Regional production system and culture method

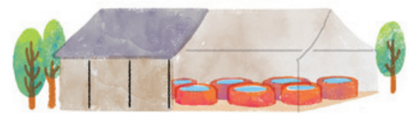
People have been culturing fish for food for centuries and have developed numerous ways of doing so. In the past, only freshwater fish were raised in ponds but with the development of new technologies in recent decades, many seafood species are now produced in farms. The regional production system and culture method for seafood species amount to important information to consider when assessing the sustainability of aquaculture, because different culture methods come with different types of impact on the environment. There are many ways to undertake aquaculture. The following are some of the most common methods:

Floating open net cages or pens

Cages or pens are used to keep fish in sheltered areas. The size of the cages or pens depends on the size of the farm. They are stabilized by heavy weights on the seafloor. Salmon, tiger grouper and mangrove snapper are commonly raised this way.



Indoor ponds



Ponds are built indoors to raise saltwater fish and other animals; water is extracted from the sea or freshwater is mixed with salt. They usually come with heaters or coolers to control water temperature, and lighting system to maintain the day-night cycle. Wastewater can be contained and treated by the farm, but it is sometimes discharged into the main drainage system without any treatment. Turbot and some giant grouper are farmed in these ponds.

Outdoor ponds

Ponds are built outdoors in coastal or intertidal areas to keep fish and other animals. Again, water is extracted from the sea or freshwater is mixed with salt, or from nearby freshwater sources in case of freshwater species farming. Wastewater can be contained and treated by the farm. But again, it is sometimes discharged into the main drainage system without any treatment. Shrimps and mud crabs are commonly raised in these ponds.

Outdoor mudflats or muddy shores

Natural outdoor mudflats or muddy shores can be used to raise shellfish without changing the landscape. Shellfish like geoduck clams and clams are farmed there, while other non-farmed animals are sometimes actively removed to prevent them from competing with farmed species for space and food.

Floating rafts shellfish culture

Filter feeders – creatures that can obtain food from seawater – are kept on ropes, plastic trays or mesh bags suspended from floating rafts. Oysters and scallops are commonly raised this way.

ASSESSMENT OF SEAFOOD SPECIES FROM AQUACULTURE

Originally, farmed fish were raised in small numbers in ponds where all their food could be generated naturally. For example, fish farmers in southern China would raise ducks and different types of fish together in the same ponds. The ducks produced waste that provided nutrients to the plants in the ponds. These in turn provided food to the fish. Several types of fish could be raised together because they ate different types of food. Common carp would feed on animals and plants that lived in mud, for instance, while big head carp would eat plankton in the water column of the pond. This type of fish culture system is known as extensive farming and it is environmentally friendly because all the materials needed to raise the fish are produced naturally and are consumed. However, since it could only produce small quantities of fish, new types of intensive aquaculture have evolved to cope with the increasing demand for seafood.

In recent decades, advanced technologies have allowed intensive farming systems to raise large quantities of seafood species in relatively small areas. The result has been significant increase in production. However, it has also led to a problem: overcrowding. Some seafood species, such as juvenile pompano, naturally live in big groups and are therefore not sensitive to crowded conditions. However, many other species such as grouper, bream and snapper do not naturally live in groups. They are easily stressed when too many of them are put together and this makes them more susceptible to diseases and parasites, and also increase the chances of those diseases and parasites spreading. In addition, some regional production systems are more prone to viral or bacterial disease outbreak. For example, Atlantic salmon farms in Norway are much more spread out along the coastline, which has been a factor in avoiding massive disease outbreaks that have decimated the Chilean salmon industry in recent years, where the density of fish is higher.

Since seafood species require clean and fresh seawater to live in, many fish farms are close to the coast, or have pens floating in the sea. When the farms are on land, seawater can be flushed directly into the farms by tides, or can be pumped into them from the sea. However, many coastal areas contain sensitive ecosystems like coral reefs, mangroves and seagrass beds. They are often important spawning and nursery grounds for commercially important seafood species and are home to many other marine organisms. Putting fish farms in or near these areas can impact them negatively. For example, coastal shrimp farming in Asia can involve large-scale removal of coastal habitats, such as mangroves, which are very important nursery grounds for many other commercially important fisheries species, whereas in China, vertical hanging mesh bags used to suspend scallop in the water column in farms do not touch the seabed, meaning that impact on the seabed is minimal. Good farming practices make use of natural marine environments without altering them. Bad practices destroy these important marine habitats and convert them into farms.

5. Feed

Wild seafood species can obtain food from their natural environment but most farmed seafood species need an external supply of food for them to grow. Different seafood species need different types of food. For example, abalone are herbivores – plant-eaters – while carnivorous species like grouper, salmon and snapper need protein from meat, usually fish, to grow. Farmed shellfish such as geoduck clams, clams and oysters are the exception – they do not require an external food supply because they are filter feeders and can obtain the food they need from seawater.

Some fishermen catch wild fish to provide protein for carnivorous seafood species like grouper, salmon and snapper. Although plants like soy can also provide protein to farmed seafood species, they lack some essential nutrients that are only found in marine species. For good farming practices, these wild fish are harvested in ways that will not lead to overfishing; bad practices involve collecting the fish unsustainably. Although wild fish caught for fish meal are usually low-value species, a lot of them are the young of commercially important species. They are either deliberately caught by fishermen or obtained from the bycatch of wild-caught fisheries. These poor practices will lead to further depletion of seafood species that are already overfished. Currently relatively few wild species are sustainably caught, which means they are unable to meet the huge demand from fish farms.

Another reason for the need of a large amount of wild fish taken for fish feed is that carnivorous farmed seafood species need large quantities of feed to grow to marketable size. For example, it takes as much as four kilograms of protein - usually fish - to produce one kilogram of tiger grouper farmed in Southeast Asia. Good fish farming practices will develop ways to minimize the amount of animal protein used in fish feed. In addition, in a world with an ever increasing human population, which is projected to reach nine billion by 2050, and amid depleting wild capture fisheries resources, the time may soon come for us to rethink if we should consume more of these low-value species rather than feeding these edible species into the farm as fish feed.

6. Ecological effects

Different aquaculture systems have different ecological effects, which are closely linked to the source of fry for the farmed species and the farming practices.

ASSESSMENT OF SEAFOOD SPECIES FROM AQUACULTURE

Source of fry

Intensive farming of seafood species requires a large number of fry, or juvenile individuals. There are two ways to obtain fry for aquaculture: producing them in hatcheries or collecting them in the wild. The best way is to use fry from well-developed full-cycle hatcheries, meaning that all production from the farms are sourced from hatcheries, so there is no need to collect any fish from the wild. Unfortunately, when hatchery technology has not been developed and, thus, cannot provide an adequate number of juveniles to meet the huge demand, or the cost of buying fry from hatcheries is too high, farmers will collect fry from the wild.

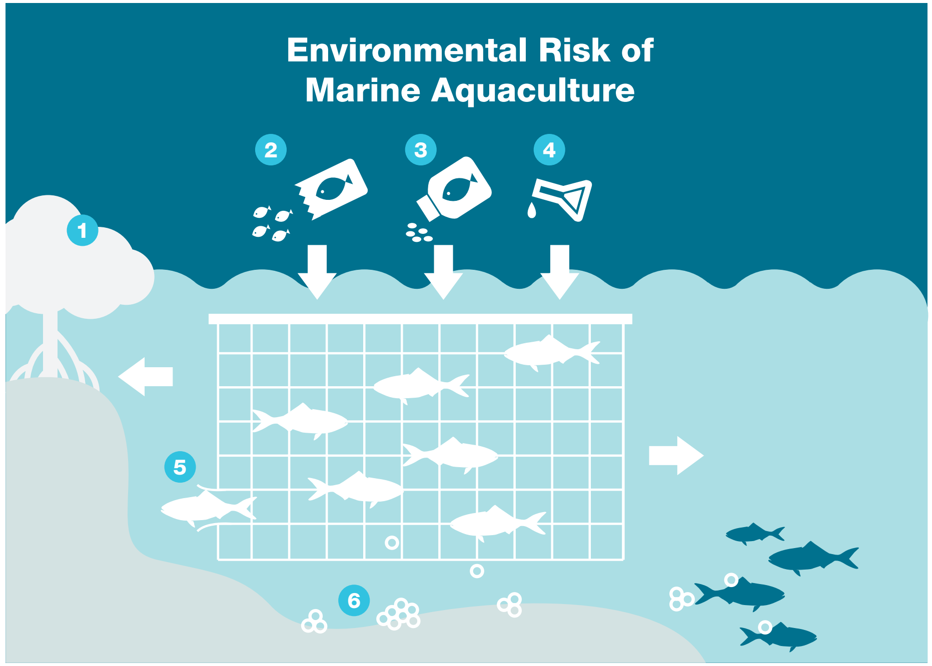
The practice of collecting small juveniles from the wild and raising them to market sizes is called "grow-out" and it is often unsustainable. The problem is that individuals caught in this way will never have the chance to reproduce in the wild, through which the wild population could be replenished. In the worst cases, fry are collected from wild populations that are already overfished, or even from endangered species. This could only worsen the species wild population status. Bluefin tuna from the Mediterranean Sea and many groupers from Southeast Asia come from grow-out farms, and this practice is seriously affecting the already depleted stock of these fisheries.

Farming practices

Seafood species are farmed in many countries but not all of them are native to those areas, including some popular species. White shrimps, for example, come from Latin America but are now farmed in Asia, including mainland China. Bad farming practices can mean that large numbers of these non-native species escape. When they start to live in the local marine environment they can compete with native species for food and space, and if they can better adapt to that environment than local species, they may threaten the survival of native species.

Even species that are native to the area where they are being farmed can threaten local wild populations. For example, in Norway, from 2001 to 2009 nearly four million Atlantic salmons were reported to have escaped from sea cages. Since Atlantic salmon held in sea cages in Norway outnumber the returning wild salmon entering fjords and rivers – roughly 325 million versus one million – even a small proportion of escapes has considerable potential to swamp wild population both genetically and competitively. Worse still, escaped Atlantic salmon are also a leading vector for disease transmission to wild populations.

Notably, there has been recent development in Southeast Asia in producing hybrid grouper by artificially crossing two pure-bred species, such as tiger grouper and giant grouper. The end product is a non-naturally occurring species, variously named but commonly referred to as Sabah grouper in Hong Kong. Escape from farm to the wild has been observed in producing places such as Sabah, Malaysia. On the other hand, in consumer places such as Hong Kong where these hybrid groupers are readily available in markets as live fish, some Sabah groupers are purchased and released intentionally to local waters for various reasons such as religious release. Very little information is available to assess the long-term impact of this hybrid species on the marine ecosystem in Hong Kong.



1. Sensitive natural habitats such as mangroves are often destroyed to convert into farms
2. Juvenile fish may be from unsustainable sources
3. Fish meal and fish oil are necessary for growing carnivorous species and these may come from unsustainable sources
4. Chemicals and antibiotics are often added to treat diseases or parasites
5. Escaped individuals may compete with native species for food and habitat
6. Pollution: intensive farming of seafood species uses large quantities of food and produces much waste. Diseases and parasites may spread to wild population

ASSESSMENT OF SEAFOOD SPECIES FROM AQUACULTURE

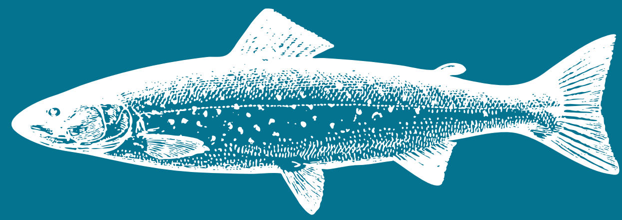
Notably, the case of the lionfish in the Bahamas reef can be a good reminder to us of the potentially deleterious effect of introducing species into the marine ecosystem. Lionfish, which is an Indo-Pacific species, was noted in the 1980s and 1990s in Florida. The fish was subsequently observed by divers in the Bahamas in 2004. The lionfish population in the area has since then exploded, and its population density in some places are nearly five times higher than estimates for the Indo-Pacific, its native range. Further study in the Bahamas by Albins and Hixon in 2008 estimated that this species caused significant reduction in the recruitment of native fishes by an average of 79% over the five-week duration of the experiment. The lionfish is having very strong effect on the key life stage of coral-reef fishes, directly affecting the coral reef ecosystem.

Apart from the issue of escape, bad farming practices can pollute the natural environment. Intensive farming of seafood species uses large quantities of food and produces much waste. Good farming practices treat wastewater and reuse treated water, or transfer wastewater to local sewage treatment facilities. However, some farms release waste into the surrounding environment or discharge it directly into the sea. It is important that diseases or parasites, if there is any, are removed before wastewater gets discharged. When chemicals are used to treat disease or parasites, for example, it is important to ensure that such use is effectively regulated so as to minimize the impact on the environment. In addition, good farming practice should mean that there is minimal disturbance or threat to other local wildlife. Bad farming practices can adversely affect local wildlife, such as by lethal control through the shooting of birds which prey on fish within open sea cages.

7. Aquaculture management

Different countries and regions have different aquaculture regulations. Some countries have areas designated for the farming of seafood species and require farms to conduct enviromental impact assessments (EIA) to make sure the impact on the surrounding natural environment is minimal. Well-run farms work to prevent farmed animals from escaping, in order to avoid introducing non-native species which can help prevent the spread of diseases and parasites and to avoid discharging polluted wastewater into the natural environment.

In Hong Kong, locally operated fish farms can sign up to the Accredited Fish Farm Scheme (AFFS), which focuses mainly on controlling the use of heavy metals and drugs, monitoring the water quality in farm and testing for certain bacteria. The scheme has improved local farming practices, although its limited scope means that it has not fully addressed all of the issues mentioned above.



ECO-LABELLING

ECO-LABELLING

Well-managed, sustainable fisheries control their fishing activities by incorporating all or most of the components described previously into their management systems, but not all fisheries do so. Even if the regulations are strict, in badly managed fisheries they may not be enforced effectively. Good fisheries can prove their sustainability with certification on fisheries and eco-labelling on their products, for instance, from the Marine Stewardship Council (MSC) and the Aquaculture Stewardship Council (ASC), to allow consumers to choose seafood harvested and produced in an environmentally friendly way. WWF supports both MSC and ASC and consumers are always recommended to ask for and choose these certified seafood.

Marine Stewardship Council

The Marine Stewardship Council (MSC) is an independent, global, non-profit organization. MSC was first established in 1997 by WWF and Unilever, one of the world's largest buyers of seafood, and became independent in 1999. MSC works with many partners such as the fisheries industry, seafood processing and trade industry and consumers to transform the world's seafood markets and promote sustainable fishing practices. MSC has developed an environmental standard for sustainable and well-managed fisheries. Fisheries are independently assessed to prove they meet the standards set by MSC, and are then able to use MSC-certified eco-label.

CERTIFIED SUSTAINABLE SEAFOOD MSC www.msc.org

MSC's three principles of sustainable fishing are:
1. Sustainable fish stocks
2. Minimizing environmental impact
3. Effective management

Details about these principles and fisheries that have been certified by MSC are available from www.msc.org

Aquaculture Stewardship Council

Similar to the MSC, the Aquaculture Stewardship Council (ASC) is an independent, international non-profit organization that has developed a certification programme for responsible aquaculture. ASC was co-founded by WWF and IDH (Dutch Sustainable Trade Initiative) in 2010. ASC works with many partners such as aquaculture producers, seafood processing and trade industry and consumers to transform world's seafood markets and promote the best environmental and social aquaculture performance.

FARMED RESPONSIBLY asc CERTIFIED ASC-AQUA.ORG

ASC's seven principles of responsible aquaculture are:

1. Comprehensive legal compliance
2. Conservation of natural habitat and biodiversity
3. Conservation of water resources
4. Conservation of species diversity and wild population (e.g. through prevention of escapes)
5. Use of feed and other inputs that are sourced responsibly
6. Good animal health (e.g. no unnecessary use of antibiotics and chemicals)
7. Social responsibility for workers and communities impacted by farming (e.g. no child labour, health and safety of workers, freedom of association, and community relations)

Details about these principles and fisheries that have been certified by ASC are available from wwf.asc-aqua.org

Chain of Custody (CoC)

Traceability for certified seafood is crucial for ensuring seafood species that end up off the shelf or on the dining table are the same sustainable seafood species from certified fisheries. In order to achieve this, a chain of custody system is in place for both MSC and ASC standards where companies along the supply chains, such as processors, suppliers, restaurants and supermarkets, are subject to certification against the MSC and ASC CoC standard for seafood traceability.

Only companies with the chain of custody certification are allowed to use the MSC and ASC logo on their promotional materials and product packaging. In addition to ensuring traceability, by restricting the use of the logo, companies that support the certification system are also rewarded by being entitled to use it on their products. Having the logo on products enables customers to easily identify which items are certified sustainable and responsible, and allows the company to demonstrate to consumers their support for seafood sustainability.

WHAT CAN YOU DO?

Everyone has a part to play in supporting sustainable seafood. Whatever your role is, always ask for sustainable seafood. When we begin to ask for sustainable seafood, it will send a strong signal about the fact that we care about seafood sustainability and can gradually encourage positive changes along the supply chain.

Individual Consumers

1. Always ask the retailers and caterers if they provide sustainable seafood.

2. Check against the WWF Seafood Guide before buying or ordering any seafood.

3. Support retailers and caterers that offer sustainable seafood choices to their customers. A list of these sustainable seafood providers are available from wwf.org.hk/seafood/ofm/en

4. Tell your friends about sustainable seafood consumption.

Corporate Consumers

1. In all corporate dining activities, do not consume seafood species in the "Avoid" category or, better still, only eat those from the "Recommended" category.

2. Make it a company policy to stop consuming, trading and promoting shark fin and pledge to WWF.

3. Tell your staff about what you are doing as a company to protect the marine environment, and why it is important to do so.

4. Work with WWF to establish a sustainable seafood dining policy to help your corporation more effectively stay away from consuming unsustainable seafood.

Seafood Suppliers

1. Make it a policy to increase the proportion of seafood you sell that is sustainable, or, better still, switch to sourcing only sustainable seafood.

2. Source and sell more seafood species in the "Recommended" category of the WWF Seafood Guide, particularly MSC and ASC certified products, and apply for respective CoC certification.

3. Phase out seafood species in the "Avoid" category and explain to your clients why you are doing so.

4. Work with WWF so we can provide you with more sourcing advice, jointly develop Ocean Friendly Catalogue or its equivalent, and suggest to our retail and catering partners and facilitate them to source your sustainable seafood.

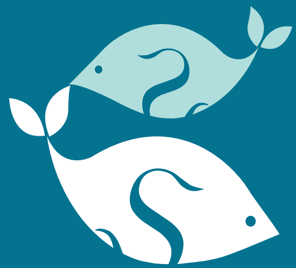
Retail & Catering Sectors

1. Establish a policy to increase the proportion of seafood you sell that is sustainable, or better still, switch to sourcing only sustainable seafood.

2. Offer more seafood species in the "Recommended" category of the WWF Seafood Guide, particularly MSC and ASC certified products, and apply for respective CoC certification.

3. Phase out seafood species in the "Avoid" category and explain to your clients why you are doing so.

4. Work with WWF so we can provide you with more sourcing advice, jointly develop Ocean Friendly Menu or its equivalent, inform customers of the good initiative your businesses have taken.



After assessing each seafood species against the criteria stated in the previous section, they were classified into three categories: Green - “Recommended”, Yellow - “Think Twice” and Red - “Avoid”.

Recommended

The types of seafood in this category are the best to order - they are caught or farmed from well-managed fisheries or responsible aquaculture operations.

Think Twice

This type of seafood comes from fisheries at risk of becoming unsustainable. Increasing demand for this type of seafood may affect both their sustainability and the marine environment. There are still some issues with the species wild population status, fishing or farming methods, or with fisheries management. Only consume this type of seafood occasionally. Green – “Recommended” seafood should be your first choice.

Avoid

This type of seafood comes from unsustainable fisheries. Consumers should abstain from eating species listed in this category as they are overfished, caught or farmed in an ecologically unfriendly way, or the fisheries are not well managed. Consumption of these seafood species is harmful to the marine environment.

Icon Descriptions

Scientific Uncertainty

Insufficient data available to evaluate the status of the target species, impact of fishing and farming activities on the target fish stock and the environment respectively, or the effectiveness of management.

Destructive Method

Fishing method adopted can cause huge damage to habitats such as sea-bed, or the establishment of aquaculture causes significant damage to habitats.

Overfished

Species is overfished, or subject to overfishing, such that species is being caught faster than it can regenerate.

Vulnerable Biology

The biology of the species makes it more vulnerable to fishing pressure such as slow growth rates, late maturation, predictable migration routes, aggregation for feeding and reproduction.

Pollution

Aquaculture which has discharge to surrounding water, such as antibiotics, other chemicals, refuse from the farmed species, causing significant impact on the environment.

Bycatch

Fisheries generate large amounts of bycatch – non-targeted species which can contain overfished or even “Threatened” species. Such bycatch are likely dead, and are either retained or discarded, causing considerable impact on these non-target species.

Fish Feed

Species cultured require feed that is derived from other fish, fishmeal or fish oil, resulting in high fish-in-fish-out ratio, and source of these fish components is not traceable or proven sustainable.

Fishery Management

Fishery, wild capture or aquaculture, is not comprehensively and effectively managed, not monitored regularly, with limited effort to minimize damage to the environment or ensure sustainability in the long term.

Threatened Species

Target species is threatened – listed as “Vulnerable”, “Endangered” or “Critically Endangered” by the IUCN.

Source of Fry

Juvenile sourced unsustainably. For example, juveniles are caught in the wild and its species wild population is already overfished or even “Threatened”, as opposed to being sourced from a hatchery.

Escape from Farm

Escape of species from farm to the wild may bring diseases or parasites to the wild population, or cause introduction of non-native or hybrid species to the wild, which may impact native species and the local ecosystem.

Method:

Wild Caught

Method:

Farmed

GIANT GROUPER

Scientific Name:
Epinephelus lanceolatus

Location:
Hong Kong

Fishing Gear:
Indoor tanks (AFFS certified)

Assessment Summary

Regional production systems:

The indoor recirculating system needs minimal alteration of natural land area. Major regional disease outbreak is not an issue and these indoor ponds operate independently from each other to further reduce this risk.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed. The fish-in-fish-out ratio is relatively high, meaning that quite a large volume of fish are input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed is traceable but certification on sustainability is lacking.

Ecological effects:

The use of chemicals is regulated. Ecological impact such as discharges and impact on other wildlife are all significantly reduced by enclosed indoor systems. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

The regulatory framework in Hong Kong covers site location planning, EIA, protection of valuable habitats, use of chemicals, disease management and monitoring. However, these are only considered partially effective.

Method:
Farmed

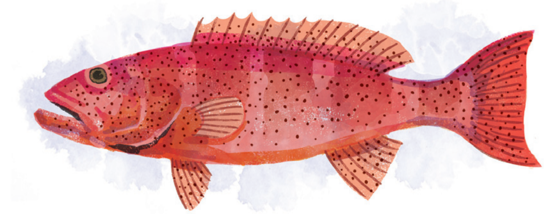
More information on the source of this seafood: wwf.org.hk/seafood/species/en

LEOPARD CORAL TROUT

Scientific Name:
Plectropomus leopardus

Location:
Queensland, Australia

Fishing Gear:
Hook and lining



Assessment Summary

Biology:

Leopard coral trout change sex from female to male they grow up. Females mature in two to three years and adult fish aggregate at predictable locations to reproduce, meaning that fishermen can target the species easily. This makes leopard coral trout vulnerable to targeted fishing.

Stock status:

The stock is generally considered to be healthy throughout the region although it is considered fully fished.

Ecological effects:

The capture of vulnerable or non-target species is not an issue with the hook and line fishing method. Any accidental catch of protected species needs to be reported and this number has been low. This fishing method does not generally touch the seabed and therefore there is no impact on the seabed.

Management:

Management measures include stock monitoring and assessment, annual quota, fish size restriction, gear restriction, licensing, and closed season during spawning aggregation and the management is considered largely effective. The regulatory framework ensures the stock is well-monitored and at a sustainable level.

Method:
Wild Caught

BOSTON LOBSTER

Scientific Name:
Homarus americanus

Location:
Canada

Fishing Gear:
Traps

Assessment Summary

Biology:

This species may take five to eight years to reach sexual maturity and it can live for at least 50 years. This makes the species vulnerable to fishing pressure.

Stock status:

Most stocks are considered to be in good or fair condition.

Ecological effects:

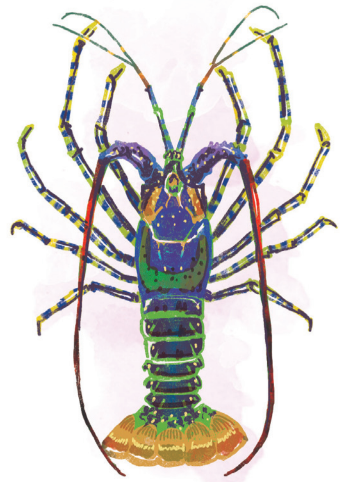
"Threatened" species such as whale may become entangled in the lines that connect traps but measures are in place to try to reduce the impact. Traps may also pose threats to declining populations of Jonah crab through bycatch. Traps are deployed on seabed, but the impact is limited as they are used in rocky habitats where the lobster inhabits.

Management:

Management measures include stock monitoring and assessment, licensing, gear restriction, minimum size of lobster, closed area and closed season. Management is considered largely effective.

Method:
Wild Caught

ROCK LOBSTER



Scientific Name:
Panulirus ornatus

Location:
Queensland, Australia

Fishing Gear:
Handpicking

Assessment Summary

Biology:

The rock lobster reaches sexual maturity at about two to three years of age, which makes them less vulnerable to fishing pressure.

Stock status:

The stock is considered to be at a healthy status. The fishery is operating at lower levels than its allowed catch.

Ecological effects:

Handpicking is highly selective, it does not involve the capture of vulnerable or non-target species. This fishing method does not touch the seabed, and therefore there is no impact on the seabed.

Management:

Management measures including licensing, gear restriction, stock monitoring and assessment and annual quota. Management is considered effective. The regulatory framework ensures the stock is well-monitored and at a sustainable level.

Method:
Wild Caught

ABALONE

Scientific Name:
Haliotis laevigata, H. rubra, H. roei

Location:
Australia

Fishing Gear:
Handpicking

Assessment Summary

Biology:

Abalone takes about three years to become sexually mature. Adult abalone will aggregate to reproduce, which makes them vulnerable to fishing pressure.

Stock status:

All stocks are considered to be fully exploited but within sustainable limits.

Ecological effects:

The handpicking method is highly selective, and the capture of vulnerable or non-target species is not an issue with hand collection. This fishing method does not touch the seabed and therefore there is no impact on the seabed.

Management:

Management measures include stock monitoring and assessment, catch quota and size limit. Management is considered largely effective. The regulatory framework ensures a sustainable fishery is maintained despite issues concerning disease and poaching.

Method:
Wild Caught

ABALONE

Scientific Name:
Haliotis discus, H. gigantea, H. asinina, H. diversicolor

Location:
China

Fishing Gear:
Indoor ponds

Assessment Summary

Regional production systems:

The indoor pond is filled with seawater. The system may require some alterations to intertidal habitats such as clearing of coastal vegetation. Indoor systems reduce the risk of major regional disease outbreak.

Feed:

The species is herbivorous and seaweed is used as feed, so no fish is required for feed production.

Ecological effects:

Chemicals may be used but this is not regarded as a major issue. Discharges may cause eutrophication from the release of nutrients and this is a cause for concern. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. Regulatory framework covers issues concerning site location planning, protection of valuable habitats, EIA, chemical use and discharge, but these are only considered partially effective.

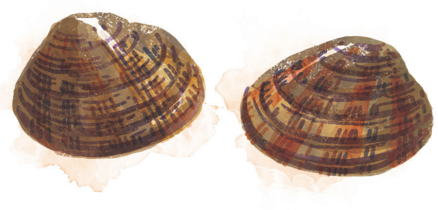
Method:
Farmed

CLAM

Scientific Name:
Ruditapes philippinarum, Cyclina sinensis, Tegillarca granosa, Meretrix meretrix, Paphia euglypta

Location:
China

Fishing Gear:
Outdoor mud flats



Assessment Summary

Regional production systems:

This intertidal system is naturally flushed. Some site alteration is required in this ecologically sensitive habitat. Spread of disease is reported and may threaten the production of this species.

Feed:

Cultured adults filter feed on natural supplies of phytoplankton, so no additional feed is required.

Ecological effects:

Chemicals may be used in some cases but this is not regarded as a major problem. Discharges are bio-deposits and the environmental impact is minor. Juveniles are sourced predominantly from the wild and their collection from the wild has little impact on the ecosystem. This system may have some impact on birds and crabs but further research in this area is needed.

Management:

Regulatory framework in China covers issues relevant to site location planning, habitat protection, EIA and chemical use, but these measures are only considered partially effective.

Method:
Farmed

WHITE SEA CUCUMBER

Scientific Name:
Parastichopus californicus

Location:
Western Canada

Fishing Gear:
Hand-picked

Assessment Summary

Biology:

The life history characteristics of this species are not well-known. More research is needed to further improve the fishery management.

Stock status:

Stock densities are higher than the initial conservative assumption of sea cucumber density in natural shoreline. Stock status is considered to be in good condition.

Ecological effects:

Handpicking is a highly selective fishing method and therefore there is no capture of vulnerable or non-target species in this fishery. This fishing method also does not touch the seabed and therefore there is no impact on the seabed.

Management:

Due to the lack of biological information on this species, the management takes a more precautionary approach to ensure long-term productivity. Management measures include stock monitoring and assessment, annual quota, gear restriction and closed areas. Management is considered largely effective.

Method:
Wild Caught

GEODUCK CLAM

Scientific Name:
Panopea generosa, P. abrupta

Location:
North America (Washington, USA, and British Columbia, Canada)

Fishing Gear:
Outdoor muddy shores

Assessment Summary

Regional production systems:

Outdoor muddy shores system leads to some negative impact on the ecologically sensitive muddy shores. This intertidal zone is fed by natural tides. Pressurized water harvesting may have some impact on the physical structure of the sediment. Major regional disease outbreak is not an issue.

Feed:

Cultured adults filter feed on natural supplies of phytoplankton; no additional feed is required.

Method:
Farmed

Ecological effects:

Chemicals are not required. Discharges are bio-deposits and the environmental impact is minor. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

Both Washington (USA) and British Columbia (Canada) provide rigorous strategic environment planning and regulatory framework covering site location planning, habitat protection and EIA. Some farms have third party certification (i.e. trusted and independent companies such as the Food Alliance certify socially and environmentally responsible management practices in shellfish farming operations and handling facilities) that improves the guarantee of sustainability. Management measures are considered effective.

OYSTER

Scientific Name:
Crassostrea gigas, C. rivularis

Location:
China

Fishing Gear:
Vertical hanging nets; short vertical concrete stones

Assessment Summary

Regional production system:

The system is fed by natural water exchange in bays and estuarine inlets. The suspended culture system of hanging nets requires no alteration to the seabed, hence the minimal impact, while that of vertical concrete stones may have some impact on the seabed. Major regional disease outbreaks are not reported for the farming of this species.

Feed:

Cultured adults filter feed on natural supplies of phytoplankton, so no additional feed is required.

Method:
Farmed

Ecological effects:

Chemicals are not required. Discharges are bio-deposits and the environmental impact is minor. Juveniles are either hatchery-based, or are collected from the wild using settlement materials, but their collection from the wild has minimal impact on the ecosystem.

Management:

There is a lack of comprehensive strategic environmental planning. Regulatory framework in China covers issues relevant to site location planning, habitat protection and EIA, but these measures are only considered partially effective.

OYSTER

Scientific Name:
Crassostrea gigas, C. virginica, Ostrea conchaphila, O. edulis

Location:
USA

Fishing Gear:
Vertical hanging nets or lines; on-bottom culture

Assessment Summary

Regional production systems:

The system is fed by natural tides in shallow sub-tidal zones of saltwater lagoons and estuaries. On-bottom culture requires substrate addition which will have some impact on the seabed, while the culture using vertical hanging nets and lines will have minimal impact. Disease prevalence is high in all assessed species with mass mortalities reported.

Feed:

Cultured adults filter feed on natural supplies of phytoplankton, so no additional feed is required.

Ecological effects:

Chemicals are not generally required, except for occasional applications of anti-fouling compounds. Discharges are bio-deposits and the environmental impact is minor. Juveniles are either hatchery-based, or are collected from the wild using settlement materials, but their collection from the wild has minimal impact on the ecosystem.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework in the USA covers site location planning, EIA, disease management, environmental monitoring, chemical use and discharge control, but there is insufficient data to assess the effectiveness of these measures. Some farms have third party certification (i.e. trusted and independent companies such as the Food Alliance certify socially and environmentally responsible management practices in shellfish farming operations and handling facilities) that improves the guarantee of sustainability.

Method:
Farmed

SCALLOP

Scientific Name:
Patinopecten yessoensis

Location:
Japan

Fishing Gear:
Vertical hanging nets or lines

Assessment Summary

Regional production systems:

This system is naturally flushed with open seawater. The suspended culture system requires no alteration to the seabed, hence the minimal impact. Major regional disease outbreak is not a significant problem.

Feed:

Cultured adults filter feed on natural supplies of phytoplankton, so no additional feed is required.

Ecological effects:

Anti-fouling chemicals are used, but their application is governed by an effective regulatory framework. Discharges are bio-deposits, so the environmental impact is minor. Juveniles are sourced almost exclusively from the wild through natural settlement on spat collectors and their collection has minimal impact on the ecosystem.

Management:

There is insufficient information to assess the management system and its effectiveness. There is a lack of strategic environmental planning, which leads to concerns that the environmental carrying capacity may be exceeded.

Method:
Farmed

SCALLOP

Scientific Name:
Amusium balloti

Location:
Queensland, Western Australia

Fishing Gear:
Bottom trawling

Assessment Summary

Biology:

Scallops grow quickly and become mature in a year. However, scallop populations can be affected by external conditions such as changes of seawater currents and temperature, making them more sensitive to fishing pressure in some years than others.

Stock status:

The stock is considered healthy, and fishing pressure is considered sustainable.

Ecological effects:

Bottom trawling is a non-selective fishing method, but the capture of vulnerable species such as turtles is greatly reduced through the use of Turtle Exclusion Devices and By-catch Reduction Devices on all trawls. The fishery operates over a predominantly sandy habitat, which can reduce the negative impact on the seabed.

Management:

Management measures include licensing, minimum size limit on scallop, minimum mesh size, annual quota and closed season. Management is considered largely effective.

Method:
Wild Caught

GREEN WHELK

Scientific Name:
Buccinum undatum

Location:
Canada

Fishing Gear:
Traps

Assessment Summary

Biology:

Whelks in the wild grow fairly rapidly in the first two to three years of age. Then growth tends to slow down gradually. Males reach maturity at around six years while females mature at about seven. This relatively late maturity makes the species vulnerable to fishing pressure.

Stock status:

The stock is considered to be stable and the fishery is operating at a sustainable level.

Ecological effects:

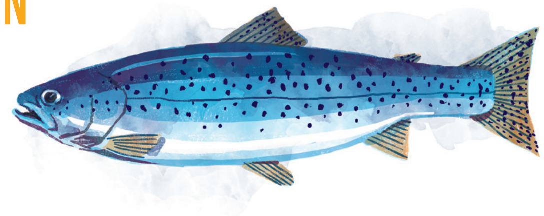
Bycatch on overfished or even "Threatened" species is minimal in general. However, leatherback turtles may become entangled in the lines that connect traps, which might be an issue but its scale is not well-known at the moment. The use of traps in seabed may have some impact on the benthic habitat, but this issue is not considered significant because traps are deployed in muddy and sandy substrate where the whelk inhabits.

Management:

Management measures include licensing, control on size and the number of traps, control the minimum size of whelks, limited fishing season and annual quota. Management is considered largely effective.

Method:
Wild Caught

ATLANTIC SALMON



Scientific Name:
Salmo salar

Location:
Ireland

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

The anchor-point floating net cage culture system in open seawater ensures there is little impact on the seabed. Major regional viral and bacterial disease outbreak is a cause for concern but is prevented as far as possible.

Feed:

The species is carnivorous. Wild fish are used for the production of fish feed. The fish-in-fish-out ratio is relatively high, meaning that quite a large volume of fish are input into this farming system as feed. Traceability policies are strong and verifiable with most sources of feed ingredients being certified environmentally responsible by reliable standards.

Ecological effects:

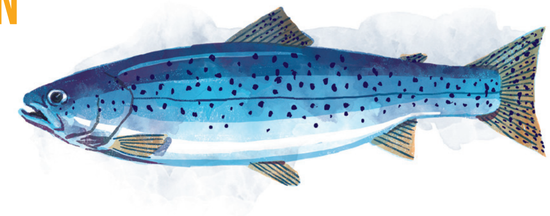
The use of chemicals is in decline due to better husbandry in controlling disease in Irish farms. Juveniles are hatchery-based so it is not necessary to capture juveniles from the wild. Escape of cultured salmon is an issue and can transfer diseases and parasites to the wild population.

Management:

In general, Ireland conducts strategic planning for aquaculture at a local level and has a regulatory framework covering issues such as site location planning, EIA, protection of valuable habitats, use of chemical, discharge, disease management, prevention of escape and monitoring, but these are only considered partially effective.

Method:
Farmed

ATLANTIC SALMON



Scientific Name:
Salmo salar

Location:
Scotland

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

The anchor-point floating net cage culture system is in open seawater and thus there is little impact on the seabed. Major regional viral and bacterial disease is an issue but is prevented as far as possible.

Feed:

The species is carnivorous. Wild fish are used for the production of fish feed. The fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into this farming system as feed. There are some levels of feed traceability and sources of feed components are being certified environmentally responsible by reliable standards.

Ecological effects:

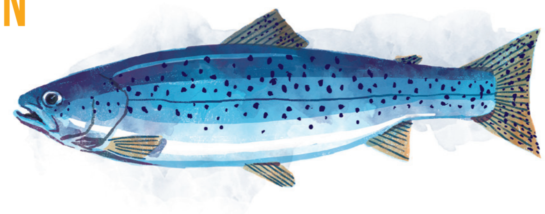
The use of chemicals is in decline due to better husbandry in controlling disease in Scottish farms. Juveniles are hatchery-based so it is not necessary to capture juveniles from the wild. Escape of cultured salmon is an issue and can transfer diseases and parasites to the wild population. Some farms deploy lethal control on salmon predators such as seals.

Management:

In general, Scotland provides strategic planning for aquaculture at a local level and has a regulatory framework that covers issues such as site location planning, EIA, protection of valuable habitats, use of chemicals, discharge, disease management, prevention of escapes and monitoring. These are considered largely effective.

Method:
Farmed

ATLANTIC SALMON



Scientific Name:
Salmo salar

Location:
Norway

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and subsequently have little impact on the seabed. Major regional bacterial and viral disease is an issue.

Feed:

The species is carnivorous. Wild fish is used for the production of fish feed and subsequently the fish-in-fish-out ratio is relatively high, meaning that quite a large volume of fish are input into this farming system as feed. Traceability systems are in place for feed components and a policy is in place to ensure sustainability of some of the sources of feed components.

Ecological effects:

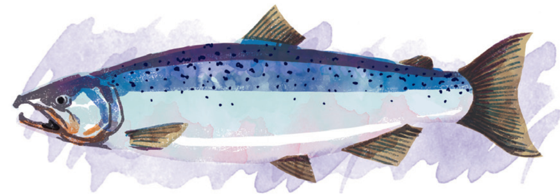
Chemicals such as delousing agents and antibiotics are applied but have not been shown to be a major problem. Juveniles are hatchery-based so it is not necessary to capture juveniles from the wild. Escape of cultured salmon, despite showing a decrease due to better regulation, is still an issue and can transfer diseases and parasites such as sea lice to wild salmon, sea trout and Arctic char.

Management:

In Norway, there is strategic coastal planning. The regulatory framework covers issues concerning site location planning, protection of valuable habitats, use of chemicals, prevention of escapes, disease management, and monitoring, but these are only considered partially effective.

Method:
Farmed

PACIFIC SALMON



Scientific Name:
Oncorhynchus keta,
O. tshawytscha, O. kisutch,
O. gorbuscha, O. nerka

Location:
USA

Fishing Gear:
Gill-netting, trolling, purse seining

Assessment Summary

Biology:

Pacific salmon are born in rivers and migrate to the sea to grow until they mature at about four or five years of age. When mature, they swim back in groups to the river where they were born to reproduce. Since Pacific salmon gather to reproduce at predictable times and places, fishermen can catch almost every fish, making them vulnerable to fishing pressure.

Stock status:

Stocks are well-monitored and scientific indicators of stock health show that there are healthy populations of fish able to spawn, ensuring the long-term productivity of the stock.

Ecological effects:

Seabirds and seals are accidentally caught by gill-netting although this does not pose any significant impact on their wild population. All these three kinds of gears may involve catching wild salmon from some of the depleted stocks within this region, which may cause damage in terms of the wild salmon population. There is no impact on the seabed, as these fishing gears rarely touch the seabed.

Management:

Management measures include gear restriction, licensing, monitoring and assessment, annual quota and seasonal closure. Management is considered largely effective.

Method:
Wild Caught

BLACK COD

Scientific Name:
Anoplopoma fimbria

Location:
USA (Washington, Oregon, California)

Fishing Gear:
Traps and bottom long-lining

Assessment Summary

Biology:

Black cod can live up to 94 years. It takes a relatively long time, around five years, for them to become sexually mature. This makes them vulnerable to fishing pressure.

Stock status:

Fishing pressure has been recently increasing and the size of the population capable of reproducing may be declining.

Ecological effects:

Some overfished species may also be caught by traps and bottom long-lining, such as sharks and rays, and occasionally seabirds, but measures are in place to reduce such bycatch and mortality of these species during discard. Deployment of traps has a slightly larger impact on the seabed than bottom long-lining but is not considered significant. Negative habitat impact is reduced through the designation of marine protected areas in some locations of the fishery.

Management:

Management measures include stock monitoring and assessment, annual quota, fish size limit, licensing, minimum mesh size for trap, bio-degradable escape panel in traps, long line length, the number of hooks and traps, and closed season. Management is considered partially effective.

Method:
Wild Caught

SARDINE

Scientific Name:
Sardina pilchardus

Location:
Spain

Fishing Gear:
Purse seine

Assessment Summary

Biology:

Sardines are schooling fish and they feed and reproduce in big groups. Sardine populations can fluctuate greatly, as they are affected by factors including seawater temperature, climate and water currents. These characteristics make them more sensitive to fishing pressure in some years than others.

Stock status:

The number of fish that are mature enough to become part of the fishery has increased. However, the size of the stock is still at a low level and is at risk of decline due to high fishing pressure.

Ecological effects:

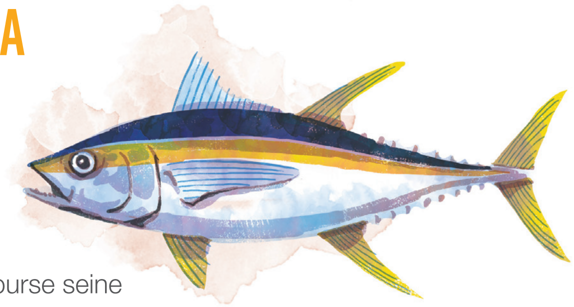
Purse seine may capture non-target species such as dolphins and other pelagic fish but mortality and discarding rates of these species are low. Purse seine does not touch the seabed therefore there is no impact on seabed.

Management:

Management measures include monitoring and assessment and minimum mesh size in the purse seine. Management is only considered partially effective.

Method:
Wild Caught

YELLOWFIN TUNA



Scientific Name:
Thunnus albacares

Location:
Indonesia and Philippines

Fishing Gear:
Hand lining, pole and line, purse seine

Assessment Summary

Biology:

Yellowfin tuna grow relatively quickly and become sexually mature in about one to two years, and they live for at least eight years in the wild. They are less sensitive to fishing pressure than bluefin tuna.

Stock status:

The stock is considered to be fully exploited. Yellowfin tuna is considered to be a "Near Threatened" species by the IUCN.

Ecological effects:

The pole and line and handline fishery is a labour intensive, low-impact method where fish are captured one-by-one. Subsequently, negligible numbers of vulnerable species are caught in this fishery. Juvenile tuna may be caught, however. For the purse seine fishery, it may catch a number of vulnerable non-target species, including dolphin and whale shark. The long-term ecological impact of removing such mobile top predators such as yellowfin tuna and shark from oceans are not currently fully understood. There is no impact on the seabed, as handline, pole and line and purse seine fishery do not touch the seabed.

Management:

The management framework is regional and measures include monitoring and assessment, licensing, catch limit, closed areas and closed season. Some information on effectiveness and implementation is lacking, and the management is only considered marginally effective.

Method:
Wild Caught

GIANT GROUPER

Scientific Name:
Epinephelus lanceolatus

Location:
Hong Kong

Fishing Gear:
Outdoor ponds (AFFS-certified)

Assessment Summary

Regional production systems:

The outdoor pond system requires minimal alternation to the natural land area. There has been occasional outbreak of disease, causing considerable fish mortality within the system.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed and subsequently fish-in-fish-out ratios are relatively high, meaning that quite a large volume of fish are input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally traceable but their sources are not proven to be sustainable.

Ecological effects:

Chemicals are used but this is regulated. Discharge is not well-regulated and may have a negative impact on the nearby waters. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, EIA, protection of valuable habitats, use of chemicals, discharge, disease management and monitoring, but these are only considered partially effective.

Method:
Farmed

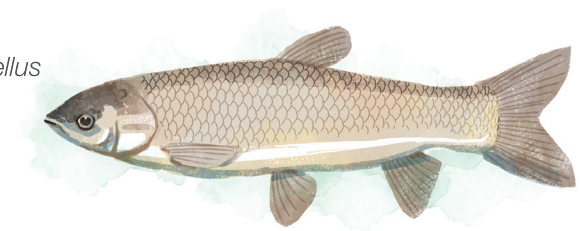
More information on the source of this seafood: wwf.org.hk/seafood/species/en

GRASS CARP

Scientific Name:
Ctenopharyngodon idellus

Location:
China

Fishing Gear:
Outdoor ponds



Assessment Summary

Regional Production Systems:

The outdoor pond system generally has little impact on natural land areas. Major regional disease outbreak is not a significant issue, and the lack of water exchange between ponds further reduces the risk of disease outbreak.

Feed:

The species is herbivorous. Weeds, grasses and commercially produced soybean and rapeseed cake are used as feed but components are generally not traceable and sources have not been proven sustaianble.

Ecological effects:

Chemicals may be used for pond preparation and to treat fish disease, but this is regulated. Unutilized feed accumulates in ponds and these discharges pose a negative impact on the environment. Juveniles are mainly hatchery-based, reducing the necessity to capture from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework in China covers site location planning, EIA, land and water use, use of chemical and discharge, but these are only considered partially effective.

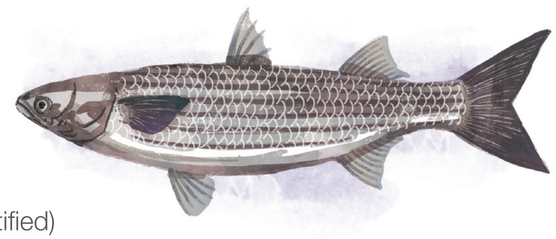
Method:
Farmed

GREY MULLET

Scientific Name:
Mugil cephalus

Location:
Hong Kong

Fishing Gear:
Outdoor ponds (AFFS-certified)



Assessment Summary

Regional production systems:

The outdoor pond system requires minimal alternation to the natural land area. Major regional disease outbreak is not an issue and there is no water exchange between ponds to further reduce this risk.

Feed:

The species is omnivorous and thus fish feed contains minimal fish components. The fish-in-fish-out ratio is relatively low, meaning that very few fish are input into this farming system as feed, and this reduces the need to source wild fish as feed. But feed components are generally not traceable and sources have not been proven sustainable.

Ecological effects:

Use of chemicals is not commonplace but this is regulated. Discharge is not well-regulated and may have an impact on the nearby waters. Juveniles are caught from the wild and the wild population may have already been fully or even over-exploited.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, EIA, protection of valuable habitats, use of chemicals, discharge, disease management and monitoring, but these are only considered partially effective.

Method:
Farmed

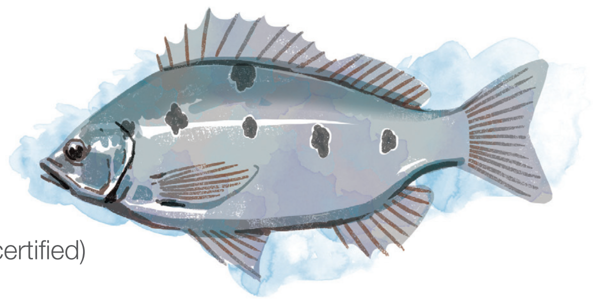
More information on the source of this seafood: wwf.org.hk/seafood/species/en

JADE PERCH

Scientific Name:
Scortum barcoo

Location:
Hong Kong

Fishing Gear:
Outdoor ponds (AFFS certified)



Assessment Summary

Regional Production Systems:

The outdoor pond system has relatively minimal alteration to natural land areas. Major regional disease outbreak is not an issue, and as these ponds operate independently from each other, this risk is further reduced.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed. The fish-in-fish-out ratio is relatively high, meaning that quite a large volume of fish are input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are not traceable and sources have not been proven sustainable.

Ecological effects:

The use of chemicals is not commonplace but this is regulated. Discharge is not well-regulated and may have impact on nearby waters. Juveniles are hatchery-based, so it is not necessary to source them from the wild. This species is not native to Hong Kong. However, its risk of escaping from the system is minimal.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, EIA, protection of valuable habitats, use of chemicals, discharge, disease management and monitoring, but these are only considered partially effective.

Method:
Farmed

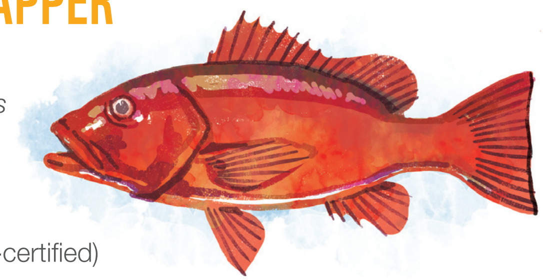
More information on the source of this seafood: wwf.org.hk/seafood/ofm/en

MANGROVE SNAPPER

Scientific Name:
Lutjanus argentimaculatus

Location:
Hong Kong

Fishing Gear:
Floating net cages (AFFS-certified)



Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. No major regional viral and bacterial disease has been reported.

Feed:

This species is carnivorous. Wild fish are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and not proven to be sustainable.

Ecological effects:

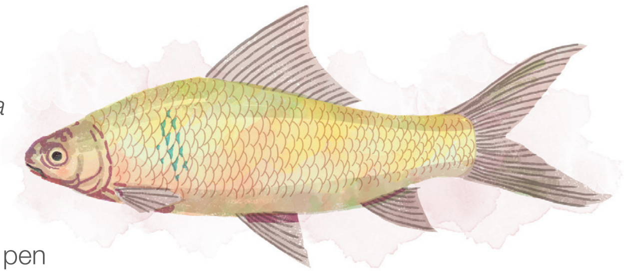
Chemicals may be used but this is regulated. Discharge is not well-regulated and may have a negative impact on the nearby waters as the system is in an open system. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, use of land and water resources, EIA, protection of valuable habitats, chemical use, discharge, disease management and monitoring, but these are only considered partially effective.

Method:
Farmed

MUD CARP



Scientific Name:
Cirrhinus molitorella

Location:
China

Fishing Gear:
Outdoor pond and pen

Assessment Summary

Regional Production Systems:

The outdoor pond and pen system requires little alteration of natural land areas. Major regional disease outbreak has not been reported.

Feed:

The species is omnivorous species and the feed contains minimal fish components. The fish-in-fish-out ratio is relatively low, meaning that very few fish are input into the farming system as feed and this reduces the need to source wild fish as feed. However, feed components are generally not traceable and sources have not been proven sustainable.

Ecological effects:

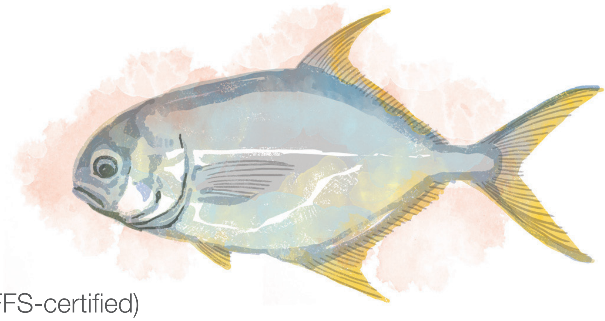
Chemicals are used for disease control but this is regulated. Discharge from the farm leads to negative impact on the environment. Juveniles are mainly hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework in China covers site location planning, EIA, land and water use, use of chemicals and discharge, but these are only considered to be partially effective.

Method:
Farmed

POMPANO



Scientific Name:
Trachinotus blochii

Location:
Hong Kong

Fishing Gear:
Floating net cages (AFFS-certified)

Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. No major regional viral and bacterial disease has been reported.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and have not been proven to be sustainable.

Ecological effects:

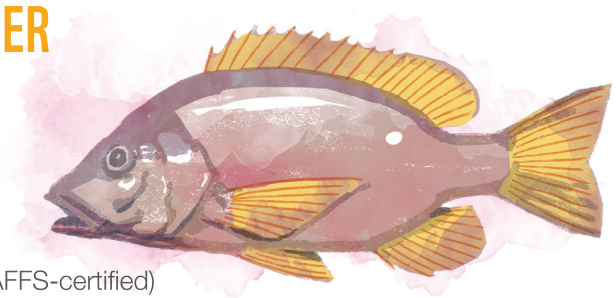
Chemicals may be used but this is regulated. Discharge is not well-regulated and may have a negative impact on the nearby waters as the systems are open systems. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, use of land and water resources, EIA, protection of valuable habitats, chemical use, discharge, disease management and monitoring, but these are only considered partially effective.

Method:
Farmed

STAR SNAPPER



Scientific Name:
Lutjanus stellatus

Location:
Hong Kong

Fishing Gear:
Floating net cages (AFFS-certified)

Assessment Summary

Regional production systems:

The anchor-point floating net cage culture system is in open seawater and so there is little impact on the seabed. No major regional viral and bacterial disease has been reported.

Feed:

The species is carnivorous. Wild fish are used to produce the fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and sources not proven to be sustainable.

Ecological effects:

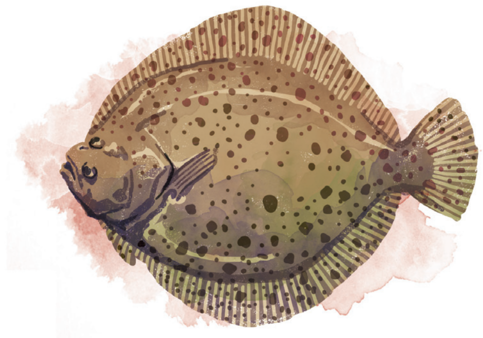
Chemicals may be used but this is regulated. Discharge is not well-regulated and may have a negative impact on the nearby waters as the system is an open system. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, use of land and water resources, EIA, protection of valuable habitats, chemical use, discharge, disease management and monitoring, but these are only considered partially effective.

Method:
Farmed

TURBOT



Scientific Name:
Psetta maxima

Location:
China

Fishing Gear:
Indoor ponds

Assessment Summary

Regional production systems:

This is an indoor closed circulation system and generally requires little alteration to natural land areas. The closed system reduces the disease impact and thus large-scale disease outbreak is not an issue.

Feed:

The species is carnivorous; fish are used to produce fish feed. The fish-in-fish-out ratio is relatively high, meaning that a large volume fish could be input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable or certified sustainable.

Ecological effects:

Chemicals such as antibiotics and other pharmaceuticals may be used but this is regulated. Discharge from farms has a negative impact on the environment. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild. The species is not native to China but there is minimal risk of escape because of the indoor closed circulation system.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework in China covers site location planning, protection of valuable habitats, EIA, land and water use, use of chemicals and discharge, but these are only considered partially effective.

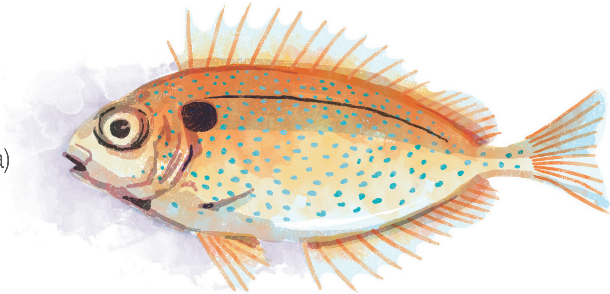
Method:
Farmed

WHITE-SPOTTED RABBITFISH

Scientific Name:
Siganus canaliculatus

Location:
South China Sea
(Hong Kong and China)

Fishing Gear:
Traps



Assessment Summary

Biology:

White-spotted rabbitfish are fast-growing and can reach maturity in about a year, meaning that they are naturally less vulnerable to fishing pressure.

Stock status:

The stock is not well-monitored and its current state is largely unknown. Although it is not considered to be a species particularly vulnerable to fishing, it may be overfished in some areas.

Ecological effects:

Traps are not a selective fishing method and several non-target species may be caught, including undersized individuals, overfished or even "Threatened" species such as grouper. Although non-target species can be released alive, most are likely to be retained for trading. Traps are used in close proximity to reef structures and therefore traps may have some impact on the habitats.

Management:

Management measures in Hong Kong and China include irregular stock monitoring, limit on catching undersized fish, and licensing. However, the level of enforcement in China is unknown and overall speaking, the management is only considered marginally effective.

Method:
Wild Caught

BANANA PRAWN, KING PRAWN, TIGER PRAWN

Scientific Name:
Penaeus merguiensis, Penaeus plebejus, Metapenaeus endeavouri

Location:
Queensland, Australia

Fishing Gear:
Bottom trawling

Assessment Summary

Biology:

Prawns are generally fast-growing and some species in the fishery may only live up to three years. They are naturally resistant to fishing pressure.

Stock status:

Fishing is currently considered to be at a sustainable level for the majority of these species.

Ecological effects:

Trawling is a highly unselective fishing method, and this may catch turtles, but this is effectively reduced through the use of Turtle Excluder Devises. The fishery is associated with the catching and discarding of large numbers of non-target species, and Bycatch Reduction Device is used to reduce this impact. Bottom trawling causes considerable damage to benthic habitats, which include sandy areas and sponge areas.

Management:

Management measures include monitoring and assessment, licensing, restrictions on number of trawlers, closed areas, closed season and size of trawlers. Management is considered largely effective.

Method:
Wild Caught

MUD CRAB

Scientific Name:
Scylla serrata

Location:
China

Fishing Gear:
Outdoor ponds and intertidal ponds

Assessment Summary

Regional production systems:

Netted pond culture systems require minimal alteration to the seabed. Regional disease outbreaks are not an issue.

Feed:

The fish-in-fish-out ratio is high due to the use of wild fish in the feed, meaning that quite a large volume of fish are input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable or certified sustainable.

Ecological effects:

Chemicals are used but this is regulated with Discharge from ponds can impact surrounding environment. Juveniles are mainly hatchery-based so it is not necessary to capture them from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework in China covers site location planning, protection of valuable habitats, EIA, land and water use, use of chemicals and discharge, but these are only considered partially effective.

Method:
Farmed

ABALONE

Scientific Name:
Haliotis midae

Location:
South Africa

Fishing Gear:
Handpicking

Assessment Summary

Biology:

This species of abalone only occurs in South Africa and may take up to eight year to become sexually mature, and in the wild they can live for at least 30 years, making it vulnerable to fishing pressure.

Stock status:

Fishery data indicate that the target stock is overfished. Significant pressure from illegal fishing leaves the future stock status uncertain.

Ecological effects:

Handpicking is a highly selective fishing method and it does not touch the seabed so there is no impact on the seabed. Bycatch can be totally avoided by this fishing method.

Management:

There is a monitoring and quota system in the legal fishery. However, illegal fishery accounts for the majority of harvesting and overrides any impact that management of the legal fishery may have. The management is only considered marginally effective.

Method:
Wild Caught

RED SEA CUCUMBER

Scientific Name:
Cucumaria frondosa

Location:
Eastern Canada

Fishing Gear:
Dredging

Assessment Summary

Biology:

Study indicates that this species take about five years to reach sexual maturity and can live for at least 25 years in the wild.

Stock status:

The stock is probably in good condition and current fishing should not cause overfishing at the moment.

Ecological effects:

Dredging is highly unselective fishing methods and can generate a considerable amount of bycatch. All forms of bycatch, however, are released although the survival rate is unknown. Dredging has a great impact on the seabed, especially in rocky reefs where this species inhabits.

Management:

Management measures include annual quota, monitoring and assessments, licensing, limited fishing days and fishery observers on all licensed vessels. Management is considered partly effective.

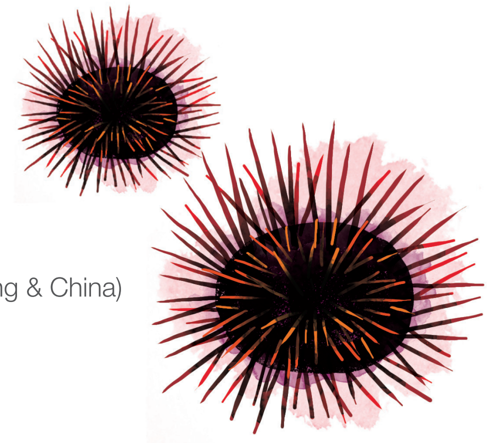
Method:
Wild Caught

SEA URCHIN

Scientific Name:
Anthocidaris crassispina

Location:
South China Sea (Hong Kong & China)

Fishing Gear:
Handpicking



Assessment Summary

Biology:

This species can live for at least nine years. Relatively little is known on the life history on this species.

Stock status:

The stock is not well-monitored and there is a lack of fishery specific data relating to catches. The population status of this species is largely unknown.

Ecological effects:

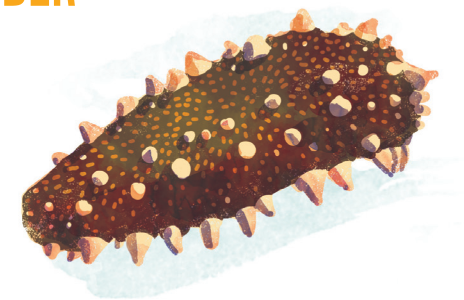
Handpicking is a highly selective fishing method and does not involve the capture of "Threatened" or overfished species. This fishing method does not touch the seabed so the impact on the habitat is minimal. Notably, sea urchins are keystone species in the ecosystem and have been documented outside this area to cause cascade effects when overexploited.

Management:

Management measures in Hong Kong and China include irregular stock monitoring, limit on catching undersized fish, and licensing. However, the level of enforcement in China is unknown and overall speaking, the management is only considered marginally effective.

Method:
Wild Caught

SPIKY SEA CUCUMBER



Scientific Name:
Apostichopus japonicus

Location:
China

Fishing Gear:
Pond culture, pen farming, sea ranching

Assessment Summary

Regional production systems:

The outdoor culture system includes ponds, pens and sea ranching. Alteration to land areas and the seabed varies among systems but the pond system could lead to large-scale alteration of ecologically sensitive coastal wetlands. The rapid expansion and intensification of sea cucumber farming is associated with widespread disease outbreak.

Feed:

Cultured adults feed on natural organic debris and generally no additional feed is required but in pond systems, cultivated microalgae may be used to feed juveniles.

Ecological effects:

The use of chemicals in pond systems and the discharges from systems have a negative impact on the environment. Hatcheries are the primary source of seed.

Management:

There is a lack of comprehensive strategic environmental planning for aquaculture. The regulatory framework covers site location planning, protection of valuable habitats, EIA, land and water use, use of chemicals and discharge. However, these are only considered to be partially effective.

Method:
Wild Caught

BLUEFIN TUNA
(ATLANTIC, PACIFIC, SOUTHERN)

Scientific Name:
Thunnus thynnus T. orientalis, T. maccoyii

Location:
Mediterranean, Mexico and Indian Ocean

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. No major regional viral and bacterial disease has been reported.

Feed:

The species is carnivorous. Wild sardines and anchovy are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into the system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components may be traceable but it has not been proven to be sustainable.

Ecological effects:

Chemicals are not used, but discharge is not well-regulated and may have a negative impact on the nearby waters as the systems are open systems. Juveniles are sourced from the wild. Depending on the species, such capture of juveniles puts huge pressure on the already fully or over-exploited bluefin tuna wild population. Atlantic bluefin tuna and Southern bluefin tuna are listed as "Endangered" and "Critically Endangered" species by the IUCN respectively.

Management:

Strategic environmental planning exists in some locations but is absent in others. Management measures vary among places, covering issues concerning site location, EIA, discharge, disease management and monitoring. Their effectiveness also varies a lot. Notably, illegal fishing is still a cause for concern.

Method:
Farmed

BLUEFIN TUNA
(ATLANTIC, PACIFIC, SOUTHERN)

Scientific Name:
Thunnus thynnus T. orientalis, T. maccoyii

Location:
Northeast Atlantic, Northwest Atlantic, Indian and Western & Central Pacific Ocean

Fishing Gear:
Pelagic long-lining, pole and line

Assessment Summary

Biology:

Atlantic and Southern bluefin tuna grow slowly, taking eight to 12 years to become sexually mature, while Pacific bluefin tuna take three to five years. They reproduce and feed in big groups. This makes bluefin tuna particularly vulnerable to fishing pressure.

Stock status:

The stock of Atlantic and Southern bluefin tuna is depleted. Southern bluefin tuna is considered "Critically Endangered", while Atlantic bluefin tuna is considered "Endangered" by the IUCN. Although Pacific bluefin tuna is not considered threatened, study reported that the existing stock biomass is only about 3.6% of the unfished biomass and current fishing pressure is at a high level.

Ecological effects:

Pelagic long-lining is not a selective fishing method and it catches non-target and vulnerable species such as sea birds, sharks and turtles. The pole and line fishery is a labour intensive, low-impact method whereby fish are captured one-by-one. Subsequently, negligible numbers of vulnerable species are caught in this fishery. However, this fishery on Pacific bluefin tuna is reported to catch a lot of juvenile Pacific bluefin tuna, which is a cause for concern. Both Pelagic long-lining and pole and line do not touch the seabed, so there is no impact on seabed.

Management:

Management of the fishery is run by various Regional Fisheries Management Organizations. Measures vary among these bodies but can include annual quota, stock monitoring and assessment, licensing and catch documentation scheme for Atlantic and Southern bluefin tuna. Notably illegal fishing activities on the Atlantic bluefin tuna are still a cause for concern. For Pacific bluefin tuna, relevant Regional Fisheries Management Organizations and major fishing nations such as Japan have recently put measures in place to control fishing effort on the stock. Overall speaking, for all three species of bluefin tuna, their management is only considered partly or marginally effective.

Method:
Wild Caught

YELLOWFIN TUNA

Scientific Name:
Thunnus albacares

Location:
Indonesia, Philippines

Fishing Gear:
Pelagic long-lining

Assessment Summary

Biology:

Yellowfin tuna grow relatively quickly and become sexually mature in about one to two years, and they live for at least eight years in the wild. They are less sensitive to fishing pressure than bluefin tuna.

Stock status:

The stock is considered to be fully exploited. Yellowfin tuna is considered to be a "Near Threatened" species by the IUCN.

Ecological effects:

The long-line fishery primarily targets adult fish and, therefore, the rate of capturing juveniles is low. However, it can catch non-target species and can constitute up to half of the total catch. Bycatch of shark species are likely to be high and impact on these species can be significant. A considerable proportion of these are discarded but the survival rate is very low. The long-term ecological impact of removing mobile top predators such as yellowfin tuna and sharks from the oceans is not currently fully understood. There is no impact on the seabed as this method does not touch the seabed.

Management:

The management framework is regional and measures include monitoring and assessment, licensing, catch limit, closed areas and closed season. Some information on effectiveness and implementation is lacking, and the management is only considered marginally effective.

Method:
Wild Caught

CAVIAR
(STURGEON)

Scientific Name:
Huso huso, Acipenser gueldenstaedtii, A. persicus, A. nudiventris, A. stellatus

Location:
Global (Russia, Georgia, Romania, Iran, Azerbaijan and Kazakhstan)

Fishing Gear:
Seining netting

Assessment Summary

Biology:

Sturgeon takes a long time to become sexually mature, depending on the species and sex; this can vary from six to 22 years. They migrate from the sea to rivers to reproduce. Fishermen catch sturgeon for their eggs to produce caviar. Sturgeons can live beyond 50 years in the wild and was suspected to exceed 100 years. The biology and the predictable migration pattern make sturgeon vulnerable to fishing pressure.

Stock status:

The stock is not well-monitored. Studies reported that almost all of these species have suffered significant population decline, by as much as 80 to 90% in the past 30 to 40 years. Sturgeons are listed on CITES Appendix II, meaning that the import of this species into Hong Kong requires permits. All of these species of sturgeons are listed as "Critically Endangered" by the IUCN, meaning that they are only one step away from extinction in the wild.

Ecological effects:

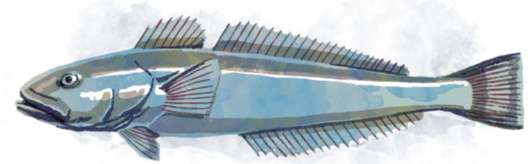
Seine netting is not a selective fishing method and can catch non-target species. In some places, non-target species can comprise as much as 60% of the catch and it contains large number of juveniles of other commercially important species. This non-target species catch may be discarded but the survival rate is unknown. Seine netting does touch the seabed, so there is some impact on habitats.

Management:

Management measures vary among countries, and some countries have imposed a moratorium on export. Cross-border trade in this species is regulated and monitored by CITES. However, illegal fishing is an issue and study estimated that illegal catch of sturgeons in the Caspian Sea and Volga River can be six to 10 times greater than the legal catch. Overall speaking, management on these species is considered not effective.

Method:
Wild Caught

CHILEAN SEA BASS



Scientific Name:
Dissostichus eleginoides, D. mawsoni

Location:
Global (southern part of Atlantic, Indian and Pacific Oceans)

Fishing Gear:
Bottom long-lining

Assessment Summary

Biology:

Chilean sea bass grows slowly and takes from nine to 17 years to mature, depending on the species and sex. They have a long lifespan, one species can live for 35 years and the other can live for at least 50 years. These biological characteristics make them vulnerable to fishing pressure.

Stock status:

The stock is generally not well-monitored and as a result its recent status is not well-known. However, the level of both legal and illegal fishing effort is a cause for concern as they may be excessive for these species.

Ecological effects:

Bottom long-lining does touch the seabed but impact on the seabed is relatively small. The fishery accidentally catches seabirds and other non-target species such as sharks, and the catches are considerable in some of the fishing areas. The fishery has the potential to expand into deeper water and could have an even larger negative impact on this sensitive ecosystem.

Management:

Management of the fishery is run by various fishing countries and the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). Measures vary among areas of fishing but can include stocking monitoring and assessment, catch limit, observers on fishing vessels, vessel monitoring system and catch documentation scheme. Overall speaking, the management is considered largely effective.

Method:
Wild Caught

BLACK COD

Scientific Name:
Anoplopoma fimbria

Location:
USA (Washington, Oregon and California)

Fishing Gear:
Bottom trawling

Assessment Summary

Biology:

Black cod can live up to 94 years. It takes a relatively long time, around five years, for them to become sexually mature. This makes them vulnerable to fishing pressure.

Stock status:

Fishing pressure has been recently increasing and the size of the population capable of reproducing may be declining.

Ecological effects:

Bottom trawling is a highly unselective fishing method, and it catches marine mammals such as California sea lions, many non-target fish species and vulnerable species of sharks, rays and other fishes, and they have a very low survival rate even when released. Bottom trawling has significant negative impact on the seabed, although conservation effort is in place, such as established areas protected from bottom trawling.

Management:

Management measures include stock monitoring and assessment, licensing, annual quota, daily catch limit and on-board observer, but management is only considered partly effective.

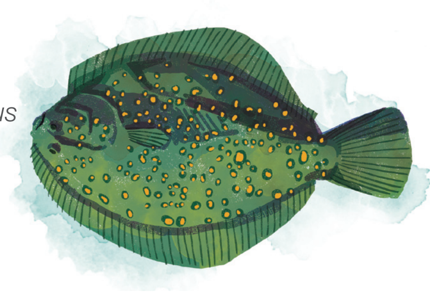
Method:
Wild Caught

SOLE

Scientific Name:
Rhombosolea leporina, R. plebeia, R. retiaria, R. tapirina, Colistium guntheri, C. nudipinnis, Peltorhamphus novaezeelandiae, Pelotretis flavilatus

Location:
New Zealand

Fishing Gear:
Bottom trawling



Assessment Summary

Biology:

Soles in general are fast-growing, short-lived and relatively fecund. Most species just live for three to four years, but a few can be much more long-lived and one of them can live for at least 21 years. Therefore, except for certain species, soles are generally not particularly vulnerable to fishing pressure.

Stock status:

Comprehensive regular stock assessment is lacking and a considerable proportion of landing data is not recorded by species, impeding any proper analysis. The stock status is largely unknown.

Ecological effects:

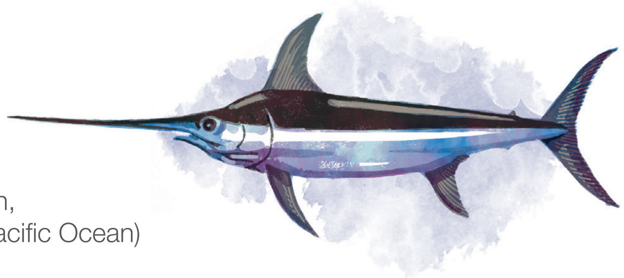
Bottom trawling is a highly unselective fishing method. This fishery can catch non-target species and is reported to have considerable impact on seabirds. Bottom trawling causes significant negative impact on the seabed.

Management:

Management measures include licensing, annual quota and minimum fish size. However, the management is only considered marginally effective.

Method:
Wild Caught

SWORDFISH



Scientific Name:
Xiphias gladius

Location:
Global (Atlantic, Indian, Mediterranean and Pacific Ocean)

Fishing Gear:
Pelagic long-lining

Assessment Summary

Biology:

Swordfish grow slowly, and can take five years to become sexually mature. They are highly migratory and can reach more than 4.5m in length. All of these characteristics make them vulnerable to fishing pressure.

Stock status:

Current stock status varies among regions. For example, it is overfished in the Mediterranean while in some areas, such as the Pacific, the stock is reported to be in better shape.

Ecological effects:

The fishery will catch a diversity of non-target species, some of which may be vulnerable species of seabirds, sharks and turtles. In some areas, it is estimated that 30 to 70% of swordfish catches consist of swordfish juveniles. Pelagic long-lining does not touch the seabed, so there is no impact on the seabed.

Management:

The fishery is managed by several Regional Fisheries Management Organizations (RFMOs) including the IATTC, ICCAT, IOTC and WCPFC. The availability of management measures varies among these RFMOs and can include stock monitoring and assessment, use of circle hook to reduce mortality of hooked turtles, and closed season. Overall speaking, the management is considered marginally effective in most RFMOs except IOTC, whose management is considered ineffective.

Method:
Wild Caught

AREOLATE GROUPER, DUSKYTAIL GROUPER

Scientific Name:
Epinephelus areolatus, Epinephelus bleekeri

Location:
Hong Kong

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. No major regional viral and bacterial disease has been reported.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into the system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and have not been proven to be sustainable.

Ecological effects:

Chemicals may be used and may not be well-regulated. Discharge is not well-regulated and may have a negative impact on nearby waters as the systems are open systems. Juveniles are sourced from the wild where population is very likely to be in decline.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, use of land and water resources, EIA, protection of valuable habitats, chemical use, discharge, disease management and monitoring, but these are only considered partially effective.

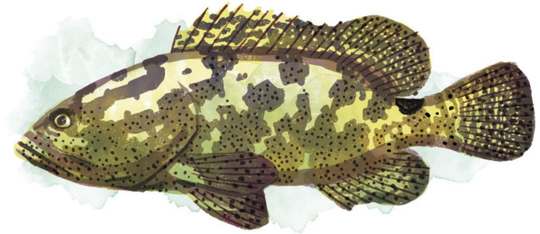
Method:
Farmed

CAMOUFLAGE GROUPER

Scientific Name:
Epinephelus polyphekadion

Location:
Southeast Asia (Indonesia, Malaysia and the Philippines)

Fishing Gear:
Hook and Lining



Assessment Summary

Biology:

Camouflage grouper only mature when attaining about 30cm in length. When they reproduce, they travel over a long distance and gather to form spawning aggregation of hundreds to thousands of individuals. The biology and the predictable nature of the aggregation by fishermen make this species vulnerable to fishing pressure.

Stock status:

The stock is not well-monitored. A survey in the species spawning aggregation revealed reducing numbers of fish in these aggregations in many places. This strongly indicates a decline in stock. This species is listed as "Near Threatened" by the IUCN.

Ecological effects:

Hook and lining is a relatively selective fishing method but it can still catch non-target species, including overfished and even "Threatened" species. This non-target catch would also be retained. However, the level of this non-target catch is unknown. This fishing method has no impact on the seabed. Cyanide fishing is noted for catching this species and this fishing method has significant negative impact on habitats, particularly coral reefs.

Management:

Management measures vary among countries but are limited to licensing and establishing marine reserves. These measures are inadequate and management is considered not effective.

Method:
Wild Caught

GIANT GROUPER

Scientific Name:
Epinephelus lanceolatus

Location:
Hong Kong

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. No major regional viral and bacterial disease has been reported.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into the system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and have not been proven to be sustainable.

Ecological effects:

Chemicals may be used and may not be well-regulated. Discharge is not well-regulated and may have a negative impact on the nearby waters as the systems are open systems.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, use of land and water resources, EIA, protection of valuable habitats, chemical use, discharge, disease management and monitoring, but these are only considered partially effective.

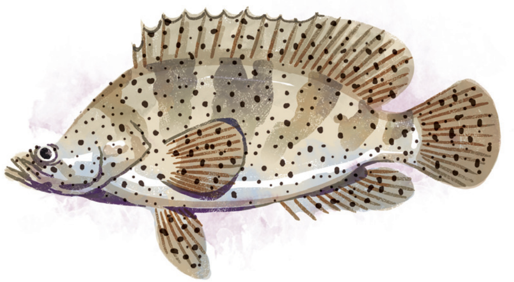
Method:
Farmed

HIGH-FINNED GROUPER

Scientific Name:
Cromileptes altivelis

Location:
Southeast Asia (Indonesia, Malaysia and the Philippines)

Fishing Gear:
Hook and Lining



Assessment Summary

Biology:

High-finned grouper undergo sex change from female to male as they grow. As they grow slowly, they need a relatively long time to become sexually mature, which happens when they reach around 30 to 40cm in length. They can live for at least 19 years in the wild. The species is therefore sensitive to fishing pressure.

Stock status:

The stock is not well-monitored. However, based on high fishing pressure related to harvesting this species and the declining numbers observed through an underwater survey, its stock should be declining. This species is listed as "Vulnerable" by the IUCN.

Ecological effects:

Hook and lining is a relatively selective fishing method but it can still catch non-target species, including overfished and even "Threatened" species. Such non-target catch would also be retained. However, the level of this non-target catch is unknown. This fishing method has no impact on the seabed. Cyanide fishing is noted for catching this species and this fishing method has significant negative impact on habitats, particularly coral reefs.

Management:

Management measures vary among countries but are limited to licensing and establishing marine reserves. These measures are inadequate and management is considered not effective.

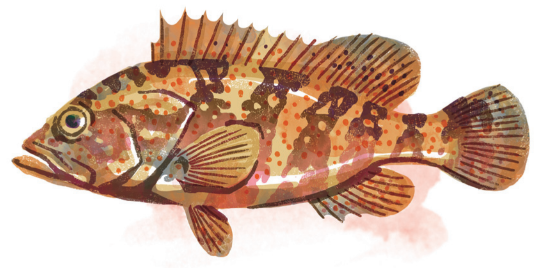
Method:
Wild Caught

HONG KONG GROUPER

Scientific Name:
Epinephelus akaara

Location:
China

Fishing Gear:
Floating net cages



Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. No major regional viral and bacterial disease has been reported.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into the system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and have not been proven to be sustainable.

Ecological effects:

Chemicals may be used but this is regulated. Discharge is not well-regulated and may have a negative impact on the nearby waters as the systems are open systems. Juveniles are mainly sourced from wild stocks. Its wild population has been overfished and is now listed as "Endangered" by the IUCN.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework in China covers site location planning, protection of valuable habitats, EIA, land and water use, use of chemicals and discharge, but these are only considered partially effective.

Method:
Farmed

HUMPHEAD WRASSE

Scientific Name:
Cheilinus undulatus

Location:
Southeast Asia (Papua New Guinea, Indonesia, Malaysia and the Philippines)

Fishing Gear:
Hook and lining

Assessment Summary

Biology:

Humphead wrasses grow slowly, attaining sexual maturity when reaching at least 40cm in length, taking as much as nine years when some animals change sex from female to male. Mature humphead wrasses travel over a long distance and aggregate to reproduce. They can live for at least 30 years in the wild. The biology and the predictable nature of their aggregation make them easy targets by fishermen, and this species is therefore vulnerable to fishing pressure.

Stock status:

The stock is severely under-monitored and illegal fishing is an issue. Naturally this species is rare, even in unfished areas. The density of humphead wrasses is only about 10 fish per 10,000m square metre in suitable habitats. In major source countries of this species, the fishery and trade data suggested a decline of 10-fold or more over 10 to 15 years. In some coastal provinces in the Philippines, this species catch is in some cases less than 5% of the levels of only a few decades ago. All these strongly indicate a serious decline in stock. The humphead wrasse is listed on CITES Appendix II, meaning that trading of this species in Hong Kong requires permits. This species is also listed as "Endangered" by the IUCN.

Ecological effects:

Hook and lining is a relatively selective fishing method but it can still catch non-target species, including overfished and even "Threatened" species and this non-target catch would also be retained. However, the level of such non-target catch is unknown. In many places, catches of humphead wrasses mainly or almost exclusively comprise juveniles of this species. This fishing method has no impact on the seabed. Cyanide fishing is noted for catching this species and this fishing method has significant negative impact on habitats, particularly coral reefs.

Management:

Management measures vary among countries, and can include minimum size and annual quota. Cross-border trade in this species is regulated and monitored by CITES. Overall speaking, management of this species is considered not effective and the illegal trade of this species is a serious issue.

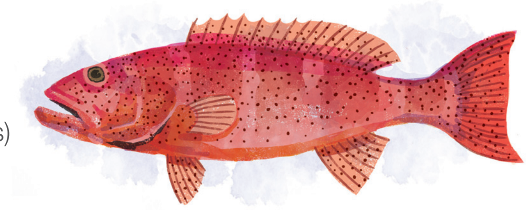
Method:
Wild Caught

LEOPARD CORAL TROUT

Scientific Name:
Plectropomus leopardus

Location:
Southeast Asia (Indonesia, Malaysia and the Philippines)

Fishing Gear:
Hook and lining



Assessment Summary

Biology:

Leopard coral trout undergo sex change from female to male as they grow, which may take up to seven years. The fish may only mature when attaining at least 20cm in length but in some places, they may only mature when growing to as large as 36cm in length. Individuals of this species aggregate to spawn and the aggregation can have tens to several hundreds of fish. It can live for at least 19 years in the wild. The biology and the predictable nature of the aggregation make this species vulnerable to fishing pressure.

Stock status:

The stock is not well-monitored. Catch and export figures revealed a fishery that was once large but has dropped rapidly by 43% in four years, in the Philippines. Its population is in decline. This species is now listed as "Near Threatened" by the IUCN.

Ecological effects:

Hook and lining is a relatively selective fishing method but it can still catch non-target species, including overfished and even "Threatened" species and this non-target catch would also be retained. However, the level of this non-target catch is unknown. In some areas in Palawan, Philippines, more than 70% of all catch of this species is juvenile. This fishing method has no impact on the seabed. Cyanide fishing is noted for catching this species and this fishing method has significant negative impact on habitats, particularly coral reefs.

Management:

Management measures vary among countries but are limited to licensing and establishing marine reserves. These measures are inadequate and management is considered not effective.

Method:
Wild Caught

ORANGE-SPOTTED GROUPER

Scientific Name:
Epinephelus coioides

Location:
Thailand

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. Major regional viral and bacterial disease has not been reported.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into the system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and have not been proven to be sustainable.

Ecological effects:

Chemicals may be used but this is regulated. Discharge is not well-regulated and may have a negative impact on the nearby waters as the systems are open systems. Juveniles are both hatchery-based and sourced from wild stocks, which may have some impact on its wild population as it is listed as "Near Threatened" by the IUCN.

Management:

Management measures include licensing, use of land and water resources, use of chemicals and discharge. However the effectiveness is unknown.

Method:
Farmed

SABAH GROUPER

Scientific Name:
Epinephelus lanceolatus X Epinephelus fuscoguttatus, Epinephelus lanceolatus X Epinephelus corallicola (hybrid species)

Location:
Malaysia

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. No major regional viral and bacterial disease has been reported.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into the system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and have not been proven to be sustainable.

Ecological effects:

Chemicals may be used but this is regulated. Discharge is not well-regulated and may have a negative impact on the nearby waters as the systems are open systems. Juveniles are hatchery-based as this is not a naturally occurring species. There have been reports of damaged cages and this hybrid species escaping to the wild. The impact of this on the ecosystem is not well-known.

Management:

The regulatory framework covers issues concerning site location planning, use of land and water resources, EIA, protection of valuable habitats, chemical use, discharge, disease management and monitoring, but these are only considered partially effective.

Method:
Farmed

SQUARETAIL CORAL TROUT

Scientific Name:
Plectropomus areolatus

Location:
Southeast Asia (Indonesia, Malaysia and the Philippines)

Fishing Gear:
Hook and lining

Assessment Summary

Biology:

Squaretail coral trout only mature when attaining at least 35cm in length. When they reproduce, they travel over a long distance and gather to form spawning aggregation of a few hundreds to several thousands of individuals. The biology and the predictable nature of the aggregation by fishermen make this species vulnerable to fishing pressure.

Stock status:

The stock is not well-monitored. An underwater survey revealed decreasing size of fish for this species in some places and low numbers of fish even at spawning aggregation site, indicating a decline in stock. It is considered a "Vulnerable" species by the IUCN.

Ecological effects:

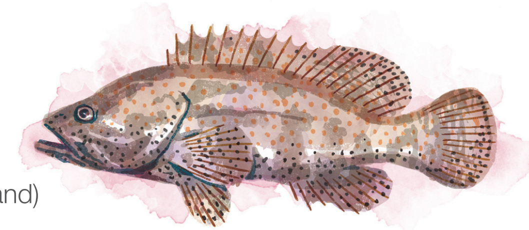
Hook and lining is a relatively selective fishing method but it can still catch non-target species, including overfished and even "Threatened" species and this non-target catch would also be retained. However, the level of this non-target catch is unknown. This fishing method has no impact on the seabed. Cyanide fishing is noted for catching this species and this fishing method has significant negative impact on habitats, particularly coral reefs.

Management:

Management measures vary among countries but are limited to licensing and establishing marine reserves. These measures are inadequate and management is considered not effective.

Method:
Wild Caught

TIGER GROUPER



Scientific Name:
Epinephelus fuscoguttatus

Location:
Southeast Asia (Indonesia, Malaysia, the Philippines, Thailand)

Fishing Gear:
Floating net cages

Assessment Summary

Regional production systems:

Anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. There has a report of regional viral and bacterial disease outbreak.

Feed:

The species is carnivorous. Wild fish are used to produce fish feed and subsequently the fish-in-fish-out ratio is high, meaning that quite a large volume of fish are input into the system as feed. This can put additional pressure on the already overfished populations of other marine species. Feed components are generally not traceable and have not been proven to be sustainable.

Ecological effects:

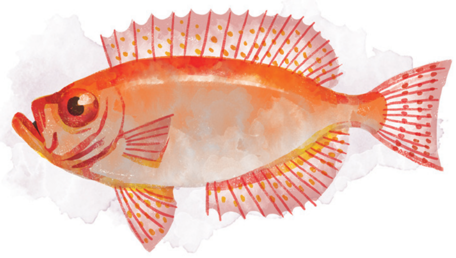
Chemicals may be used and the regulation on its use is not effective. Discharge is not well-regulated and may have a negative impact on the nearby waters as the systems are open systems. Juveniles are sourced from wild stocks and its wild population is under high fishing pressure, and this species is listed as "Near Threatened" by the IUCN.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework varies among countries in this region, and it covers issues concerning site location planning, EIA, protection of valuable habitats, use of land and water resources, chemical use, discharge, disease management and monitoring, but there is insufficient information to assess effectiveness.

Method:
Farmed

BIGEYE



Scientific Name:
Priacanthus macracanthus

Location:
South China Sea (Hong Kong and China)

Fishing Gear:
Bottom long-lining, gill-netting

Assessment Summary

Biology:

Study suggested that bigeye take about three years to become sexually mature and can live for at least nine years in the wild.

Stock status:

The stock is not well-monitored and there is only limited information available on the species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure may be already excessive for this species.

Ecological effects:

The bottom long-lining and gill-netting fishery can catch several non-target species, some of which are overfished or are even "Threatened" species. Bottom long-lining and gill-netting operated in sandy, muddy areas and reefs, where this species inhabits, can have some impact on the seabed.

Management:

Management measures in Hong Kong and China include irregular stock monitoring, limit on catching undersized fish, and licensing. However, the level of enforcement in China is unknown and overall, speaking, the management is only considered marginally effective.

Method:
Wild Caught

GOLDEN THREADFIN BREAM

Scientific Name:
Nemipterus virgatus

Location:
South China Sea (Hong Kong and China)

Fishing Gear:
Bottom long-lining

Assessment Summary

Biology:

Golden threadfin bream grow fast and become sexually mature in about a year, meaning that they are not particularly sensitive to fishing pressure.

Stock status:

The stock is not well-monitored and there is only limited information available on the species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure is excessive for this species. Catches of this species are declining in the South China Sea, and it has been estimated that the rate of decrease has reached about 30% over the last decade. This species is considered "Vulnerable" by the IUCN.

Ecological effects:

The fishery also catches several non-target species, some of which are overfished or are even "Threatened" species. Bottom long-lining operated in sandy and muddy areas, where this species inhabits, has minimal impact on the seabed.

Management:

Management measures in Hong Kong and China include irregular stock monitoring, limit on catching undersized fish, and licensing. However, the level of enforcement in China is unknown and overall speaking, the management is only considered marginally effective.

Method:
Wild Caught

HORSEHEAD

Scientific Name:
Branchiostegus auratus, B. argentatus, B. japonicus

Location:
South China Sea (Hong Kong and China)

Fishing Gear:
Gill-netting

Assessment Summary

Biology:
Relatively few are known about the biology of these horsehead species. Study suggested that some horsehead species can live for at least nine years in the wild.

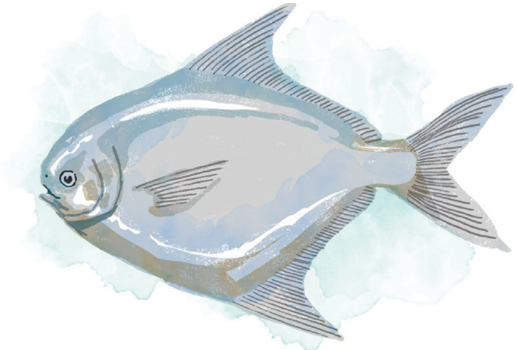
Stock status:
The stock is not well-monitored and there is only limited information on the species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure may be already excessive for these species.

Ecological effects:
The fishery can catch several non-target species, some of which are overfished or are even "Threatened" species. Gill-netting operated in sandy, muddy areas and reefs, where this species inhabits, has some impact on the seabed.

Management:
Management measures in Hong Kong and China include irregular stock monitoring, limit on catching undersized fish, and licensing. However, the level of enforcement in China is unknown and overall speaking, the management is only considered marginally effective.

Method:
Wild Caught

SILVER POMFRET



Scientific Name:
Pampus argenteus

Location:
South China Sea (China)

Fishing Gear:
Mid-water trawling

Assessment Summary

Biology:
Silver pomfret matures at around 15 to 20cm in length. They inhabit inshore waters and usually form schools, and such aggregation makes them vulnerable to overfishing.

Stock status:
The stock is not well-monitored and there is only limited information available on the species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure may be already excessive for this species.

Ecological effects:
The mid-water trawling is an unselective fishing method and will catch a diversity of non-target species, some of which are likely to be overfished. The trawl fishery is operated in mid-water and does not have impact on the seabed.

Management:
Management measures include limit on catching undersized fish, closed season and licensing, but the level of enforcement is unknown and the management is only considered marginally effective. The ban on trawling in Hong Kong can help ease the pressure on this stock.

Method:
Wild Caught

TILAPIA

Scientific Name:
Oreochromis niloticus, Oreochromis mossambicus

Location:
Hong Kong

Fishing Gear:
Outdoor ponds

Assessment Summary

Regional production systems:

The outdoor pond system may in some cases cause damage to the mangrove environment in close proximity to farms. Major regional disease outbreak is not an issue and there is reduced water exchange between ponds to further reduce this risk.

Feed:

The species is omnivorous and thus fish feed contains minimal fish components. Fish-in-fish-out ratio is relatively low, meaning that very few fish are input into this farming system as feed. This reduces the need to source wild fish as feed. Feed components are generally not traceable or certified sustainable.

Ecological effects:

Chemical use is not commonplace and is regulated. Discharge from the farm may cause negative environmental impact. Juveniles are hatchery-based. This species is not native to Hong Kong and has been found in natural habitats outside these farm areas. Escape is possible but its impact on the ecosystem is not well-known.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework covers issues concerning site location planning, EIA, protection of valuable habitats, use of chemicals, discharge, disease management and monitoring, but these are only considered partially effective.

Method:
Farmed

YELLOW CROAKER

Scientific Name:
Larimichthys crocea

Location:
China

Fishing Gear:
Floating net cages, outdoor ponds

Assessment Summary

Regional production systems:

The outdoor pond system requires moderate alteration to the natural land area, while anchor-point floating net cage culture systems are in open seawater and so there is little impact on the seabed. Regional viral and bacterial disease has been reported.

Feed:

The species is carnivorous; fish are used to produce fish feed. The fish-in-fish-out ratio is relatively high, meaning that quite a large volume of fish are input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species, and feed components are generally not traceable or certified sustainable.

Ecological effects:

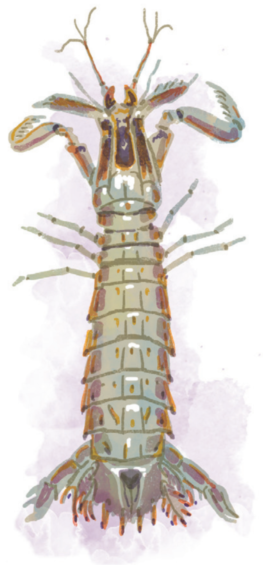
Chemicals are used but this is regulated. Discharge is not well-regulated and may have a negative impact on nearby waters. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework in China covers site location planning, protection of valuable habitat, EIA, land and water use, use of chemicals and discharge, but these are only considered partially effective.

Method:
Farmed

MANTIS SHRIMP



Scientific Name:
Oratosquilla oratoria, O. interrupta,O. anomala, Miyakea nepa, Harpiosquilla harpax

Location:
South China Sea (China)

Fishing Gear:
Bottom trawling

Assessment Summary

Biology:

Mantis shrimp is a generally short-lived species and can start to reproduce within a few months. It is not naturally sensitive to fishing pressure.

Stock status:

The stock is not well-monitored, and there is only limited information available on this species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure may be already excessive for these species.

Ecological effects:

Bottom trawling is a highly unselective fishing method and this fishery can catch many non-target species, some of which are overfished or even "Threatened" species. Non-target species can constitute as much as 70% of the total catch. Bottom trawling causes significant negative impact on the seabed.

Management:

Management measures include limit on catching undersized fish, closed season and licensing, but the level of enforcement is unknown and the management is only considered marginally effective. The ban on trawling in Hong Kong can help ease the pressure on this stock.

Method:
Wild Caught

SHRIMP

Scientific Name:
Atypopenaeus stenodactylus, Metapenaeopsis barbata, M. palmensis, Parapenaeopsis tenella, Trachypenaeus curvirostris

Location:
South China Sea (China)

Fishing Gear:
Bottom trawling

Assessment Summary

Biology:

Shrimps are generally fast-growing and can start to reproduce within 12 months. They are naturally resistant to fishing pressure.

Stock status:

The stock is not well-monitored and there is only limited information available on these species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure may be already excessive for these species.

Ecological effects:

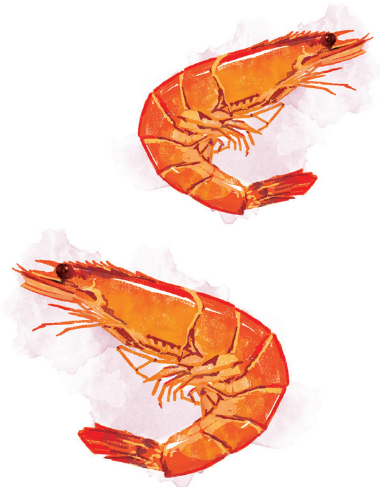
Bottom trawling is a highly unselective fishing method and this fishery can catch many non-target species, some of which are overfished or even "Threatened" species. Non-target species can constitute as much as 70% of the total catch. Bottom trawling causes significant negative impact on the seabed.

Management:

Management measures include limit on catching undersized fish, closed season and licensing, but the level of enforcement is unknown and the management is only considered marginally effective. The ban on trawling in Hong Kong can help ease the pressure on this stock.

Method:
Wild Caught

SHRIMP



Scientific Name:
Penaeus orientalis, P. vannamei, P. monodon

Location:
Asia

Fishing Gear:
Outdoor ponds

Assessment Summary

Regional production systems:

The outdoor pond system may involve clearance of mangrove habitats and heavy use of freshwater, which may negatively impact the environment. Disease outbreak is also a cause for concern.

Feed:

The fish-in-fish-out ratio can be high, meaning that a large volume of fish could be input into this farming system as feed. This can put additional pressure on the already overfished populations of other marine species. But feed components are generally not traceable or certified sustainable.

Ecological effects:

Chemicals are used and despite regulation, illegal usage is reported. Discharge into surrounding area happens to varying degrees and this negatively impacts the environment. Juveniles are hatchery-based, so it is not necessary to capture juveniles from the wild.

Management:

There is a lack of comprehensive strategic environmental planning. The regulatory framework within Asia varies and it may cover site location planning, protection of valuable habitats, EIA, land and water use, use of chemicals and discharge, but these are only considered partially effective.

Method:
Farmed

RED CRAB

Scientific Name:
Charybdis feriatus

Location:
South China Sea (China)

Fishing Gear:
Bottom trawling

Assessment Summary

Biology:

Red crabs grow quickly and become sexually mature in about seven months and therefore they are naturally not very susceptible to fishing pressure.

Stock status:

The stock is not well-monitored and there is only limited information available on this species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure may be already excessive for this species.

Ecological effects:

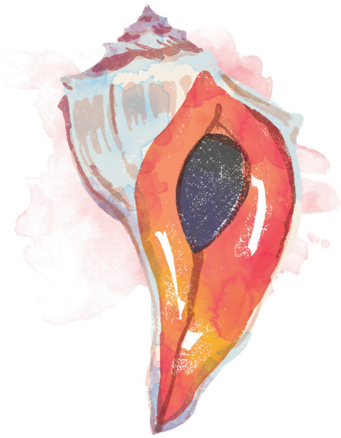
Bottom trawling is a highly unselective fishing method and this fishery can catch many non-target species, some of which are overfished or even "Threatened" species. Bottom trawling causes significant negative impact on the seabed.

Management:

Management measures include limit on catching undersized fish, closed season and licensing, but the level of enforcement is unknown and the management is only considered marginally effective. The ban on trawling in Hong Kong can help ease the pressure on this stock.

Method:
Wild Caught

CONCH



Scientific Name:
Busycotypus canaliculatus, Busycon carica

Location:
USA

Fishing Gear:
Bottom trawling

Assessment Summary

Biology:

These species generally grow slowly, mature late and have a low reproductive rate. Depending on the species and sexes, it can take about four to nine year for them to become sexually mature. One of the species can live for at least 11 years. This biology makes these species vulnerable to fishing pressure.

Stock status:

The stock is not well-monitored. However, the recent decline in landing may be an indication of overfishing of these species.

Ecological effects:

Bottom trawling is a highly unselective fishing method. This fishery catches a variety of non-target species. The discarding rate and subsequent survival rate of these non-target species are unknown. Sea turtles are also caught in this fishery but Turtle Excluder Device (TED) is not required in some fishing grounds. Bottom trawling has significant negative impact on the seabed.

Management:

Management measures vary among states, and this can include TEDs and closed areas. Management is only considered marginally effective.

Method:
Wild Caught

CUTTLEFISH

Scientific Name:
Sepia pharaonis

Location:
South China Sea (Hong Kong and China)

Fishing Gear:
Trammel gill-netting

Assessment Summary

Biology:

Cuttlefish grow fast, but their lifespan is only about a year. They only reproduce once in their lifetime and will gather together in big groups during the mating season, making them sensitive to fishing activities.

Stock status:

The stock is not well-monitored and there is only limited information on the species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure may be already excessive for this species.

Ecological effects:

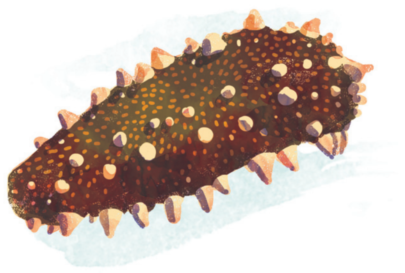
The trammel gill-netting fishery is highly unselective, and can catch a variety of non-target species, which include overfished or even “Threatened” species. The trammel gill netting is operated over sandy, muddy areas and reefs, where this species inhabit, may have some impact on the seabed.

Management:

Management measures in Hong Kong and China include irregular stock monitoring, limit on catching undersized fish, and licensing. However the level of enforcement in China is unknown and overall speaking the management is only considered as marginally effective.

Method:
Wild Caught

SPIKY SEA CUCUMBER



Scientific Name:
Apostichopus japonicus

Location:
Japan

Fishing Gear:
Dredging

Assessment Summary

Biology:

This species takes about two years to mature, which is considerably earlier than other temperate species. It forms aggregations and inhabits the coastal seabed.

Stock status:

The stock in Japan is considered fully exploited, and landing of this species has been stable in recent years. But over a longer timeframe, its landing in Japan was reported to have declined by at least 30% from the late 1970s to the late 1980s. Wild population of this species elsewhere has shown more significant decline in places such as China, South Korea and Russia. Globally this species is considered "Endangered" by the IUCN.

Ecological effects:

Dredging is a highly unselective fishing method. Although there is no report to suggest that the method leads to the capture of vulnerable species, it does result in the capture of a considerable number of non-target species. Dredging may damage delicate reef structures and alter the sediment, and therefore causes significant damage to the seabed.

Management:

Management is considered only partly effective and management measures include quota, minimum size limit, gear restrictions and closed season.

Method:
Wild Caught

SQUID

Scientific Name:
Loliolus beka, L. uyii, Uroteuthis duvauceli, U. chinensis, U. edulis, Sepioteuthis lessoniana

Location:
South China Sea (China)

Fishing Gear:
Bottom trawling

Assessment Summary

Biology:

Squids grow to adulthood quickly and have a short lifespan of about a year. As they gather together in big groups to reproduce, squids can be easily targeted by fishermen.

Stock status:

The stock is not well-monitored and there is only limited information available on these species. In this region, fishing pressure is high in general, and over-exploitation has happened in a lot of fisheries. Current fishing pressure may be already excessive for these species.

Ecological effects:

Bottom trawling is a highly unselective fishing method and this fishery can catch many non-target species, including overfished and even "Threatened" species. Bottom trawling causes significant negative impact on the seabed.

Management:

Management measures include limit on catching undersized fish, closed season and licensing, but the level of enforcement is unknown and the management is only considered marginally effective. The ban on trawling in Hong Kong can help ease the pressure on this stock.

Method:
Wild Caught

WWF