



# Fishery Basics — Fishing Gear

## Gear Types

All types of fishing gear, regardless of how it might be used, are designed to lure and capture fish. Fishing gears are defined as tools used to capture marine/aquatic resources, whereas how the gear is used is the **fishing method**. Additionally, a single type of gear may also be used in multiple ways. Different target **species** require different fishing gear to effectively catch the target species.

Fishing gears fall under two general categories, active gear and passive gear. Active gears are designed to chase and capture target species, while passive gears generally sit in one place allowing the target species to approach the capture device. The [United Nations Food and Agriculture Organization \(FAO\)](#) further classifies fishing gear into 11 categories primarily based on how the gear are fished, we have provided detailed information about each category [See Fishing Gear](#). To browse a partial list of fishing methods and marine zones where they might be used [click here](#).

## Trawl Nets

**Trawl nets** are funnel shaped nets with extended wings at the opening that are towed by a vessel. Trawl nets are responsible for the greatest portion of the nation's fish and shrimp catches. There are hundreds of trawl styles and sizes used around the world to target schooling species or groups of species. These nets often target **demersal** species along the seafloor or **pelagic** species in the water column.

To operate trawl nets successfully, there are four basic requirements a vessel needs to have: sufficient power to tow the net, a mechanism to hold the mouth of the net open, a system of wires to connect the net and the gear to the towing mechanism, and a mechanism for casting and **hauling** the net. Depending on the size of the trawl net, it may be towed by a small vessel powered by an outboard engine or a large **freezer (factory) trawler** (See Fishing Vessels – Trawlers). Also depending on size, trawl nets may be deployed and retrieved by hand or by using winches or other mechanized gear.

The mesh size of trawl nets varies depending on the targeted species. Larger mesh sizes allow for the **escapement** of **juveniles** and other non-target species. Nets are commonly made from two combined panels, a top and bottom, but can be made from four or more panels by incorporating side panels. The netting narrows, like a funnel, towards the back of the net where the targeted species are forced into a bag or collection area known as the **cod-end**. Trawl nets have wide openings that can be held open by a variety of methods. To maintain the horizontal shape, **beams** or heavy boards/doors, known as **otter boards**, may be used. To maintain the vertical shape of

# Fishery Basics — Fishing Gear

the net mouth opening, floats may be used along the top of the netting, called the **headrope**, and weights along the bottom (**footrope**).

To reduce the amount of **bycatch** occurring in some **fisheries**, the design of trawl nets have been changed over the past few decades. Many trawl nets now include **bycatch reduction devices (BRDs)**, such as **turtle exclusion devices (TEDs) (video)** in shrimp trawl fisheries. Additionally, the configurations of the nets are being redesigned. In recent years two designs have proven to be effective in reducing bycatch:

1. A **topless shrimp trawl** has been designed to allow pelagic **finfish** to escape nets in the Gulf of Maine shrimp fishery. The net does not have a top panel and the headrope has been pulled back, thus finfish can escape prior to entering the cod-end of the net. Field tests resulted in a 13.6% increase in catch of the targeted shrimp over the traditional trawl net used in the fishery, as well as an 87% decrease in bycatch of **Herring**.
2. Another experimental trawl net, named **the Eliminator**, was tested for use in the **Haddock** fishery in New England. This design won the 2007 **World Wildlife Fund's International Smart Gear Competition**. The net design is primarily based on fish behavior, Haddock swim upward when they encounter trawl nets and **Cod**, one of the primary bycatch species in the fishery, swim downward when they encounter trawl nets. The Eliminator is designed with larger mesh on the bottom panel of the net and smaller mesh size along the sides and top of the net. Field tests resulted in an 81% decrease in bycatch of Cod and a 95% reduction in Flounder bycatch.

**Trawling (animation)** primarily occurs along **continental shelves** throughout the world, but also along the **continental slope** to depths of 2,000 m (6,562 ft). Trawling operations vary by target species, geographic location, and how the trawl is towed (e.g., whether one or two vessels tow the net or if it is deployed from the side or rear of the vessel). However two general trawl types exist: bottom trawls and midwater trawls.

1. **Bottom trawls** are designed to catch species living on or near the seafloor, thus the gear must remain in contact with the seafloor for successful operations. Bottom trawls are outfitted with weighted **rollers** along the footrope to allow the trawl net to move across the seafloor without getting snagged. The sizes of these rollers vary depending on what type of habitat the trawl is being fished in. Small rollers, also known as cookies, are designed for relatively flat environments, while large rollers, known as **rockhoppers**, allow the trawl to move over structurally complex habitats like boulder fields and coral reefs. **Federal regulations (pdf)** of bottom trawling and the use of rockhopper gear varies by region. The **Regional Fishery Management Councils (RFMCs)** sets the regulations of the size of cookies and rockhoppers used in specific fisheries. Additionally, the otter boards or doors maintain the horizontal opening of the net when the trawl is being used by one vessel, known as **midwater otter trawls**.

# Fishery Basics — Fishing Gear

Additionally, the RFMCs may close areas to bottom trawling and/or limit mesh sizes of the nets. The mesh size in a trawl net is critical, since large mesh will help decrease water resistance and, therefore, fuel use. Mesh that is too large will allow the target species to escape, and mesh that is too small may result in heavy bycatch that requires labor-intensive sorting. Therefore, it is a balance of successful fishing and reduced bycatch that both the fishermen and fisheries managers seek to reach when regulating the mesh size.

Similar to federal regulations, [state regulations \(pdf\)](#) of bottom trawls can vary. The [California Fish and Game Code](#) limits rollers to a maximum size of 20 cm (8 in) in diameter and requires a minimum mesh size of 11.4 cm (4.5 in).

**Tickler chains** may also be added to the footrope. These chains hang vertically from the bottom of the trawl and are designed to come into contact with **flatfish**, startling them from the seafloor and into the opening of the trawl net. Bottom trawls are towed at speeds ranging between 1 and 7 **knots** (1.15-8.05 mph), with an average between 3-5 knots (3.45-5.75 mph). They may be fished up to 12 hours at a time, with an average of 3-5 hours per tow. The [United Nations Food and Agriculture Organization's International Standard Statistical Classification of Fishing Gear](#) further classifies bottom trawl into three separate categories:

1. [Beam Trawls](#)
2. [Bottom Otter Trawls](#)
3. [Bottom Pair Trawls](#)

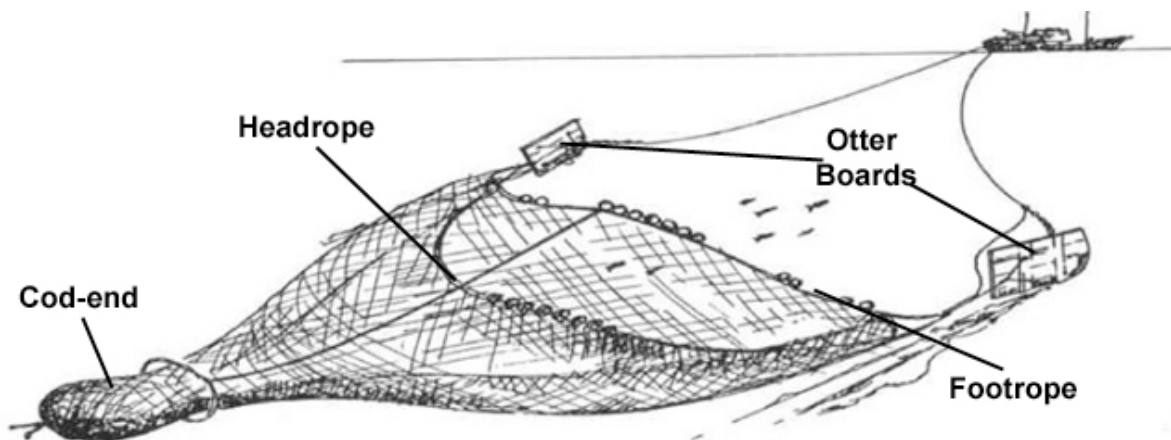


Illustration of a bottom trawl fishing along the seafloor. (Credit: NOAA Northeast Fisheries Science Center)

2. [Midwater trawls](#) are designed to catch species living anywhere in the water column above the seafloor, including at the surface. This type of net is used in the Alaska Pollock fishery. They are typically larger than bottom trawls and are comprised of four or more net panels. Older midwater trawls were designed with floats along the headrope and weights along the footrope to maintain

# Fishery Basics — Fishing Gear

the vertical opening of the net. However, modern midwater trawls are designed in such a way that floats are not needed because the downward forces created by the weights maintain the vertical opening of the net mouth.

**Midwater pair trawls** use two vessels to tow the trawl to maintain the horizontal opening of the net. Midwater trawls may be outfitted with netsounders, a type of **echosounder** that is placed on the net to provide data on the distance of the net from the seafloor or surface. This allows fishermen to maintain the intended position of the net, which reduces bycatch and more efficiently captures the target species.

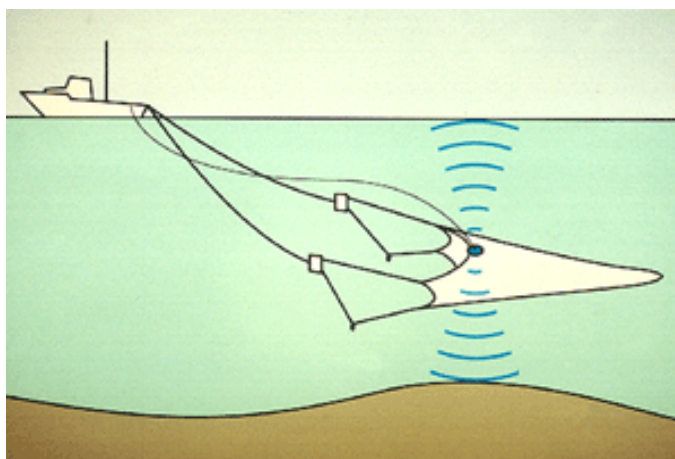


Illustration of a midwater trawl with a netsounder. (Credit: Food and Agriculture Organization of the United Nations)

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# Fishery Basics — Fishing Gear

[http://wwf.panda.org/what\\_we\\_do/footprint/smart\\_fishing/sustainable\\_fisheries/bycatch/fishing\\_gear/](http://wwf.panda.org/what_we_do/footprint/smart_fishing/sustainable_fisheries/bycatch/fishing_gear/)

## Additional Resources

[Bycatch Reduction Database](#)

FAO – [The Use of Technical Measures in Responsible Fisheries: Regulation Of Fishing Gear](#)

International Council for the Exploration of the Sea – [Trawl Survey Details](#)

Marine Conservation Society – [Fishing Methods](#)

Rhode Island Sea Grant – [Bycatch Fact Sheet](#)