BOX 9 | Effects of Trawling on Seamounts

By Malcolm R. Clark

Trawling involves the towing of nets through the water or along the seafloor to sieve out fish and marine invertebrates. It is the most widely used method to catch fish throughout the world, and there are many variations in gear design and towing methods. The main type of trawl used on seamounts is termed a bottom trawl (Figure 1a). This equipment is towed off two wires from the stern of the fishing vessel, with the net spread in between and held apart by steel trawl doors. These doors drag along the seafloor, throwing up two sediment plumes, which helps herd fish into the net, where they are swept back into the closed cod-end of the trawl. The bottom part of the net may have large rollers (Figure 1b) to avoid snagging on rocks, which can cause serious damage to the net. Bottom trawls used on flat ground (e.g., ocean floor covered by pelagic sediment) can be large, but on seamounts they are often smaller and more heavily built because they are being towed over rocky and rough seabed. Although seamount trawls are smaller, the intensity of trawling can be extremely high, with hundreds, or even thousands, of trawls carried out on individual seamounts (Clark and Koslow, 2007). Trawling occurs from the summit down the flanks, often repeatedly along the same tow lines. The distance between the trawl doors is usually about 100 m, and between the ends of the net about 25 m. Trawl doors may weigh up to 2 t each, and the net and ground gear between 3 and 4 t.

Because of the weight of the doors and the ground gear, bottom trawls can have a major impact on the seafloor and its fauna (Figure 1c–d). There are direct impacts on benthic communities caused by physical disturbance or destruction by bottom trawls, but also indirect effects through selective removal of particular seamount species (e.g., Clark and Koslow, 2007). Sediment resuspension and mixing can change habitat structure and alter community composition at longer time scales. Sessile fauna, such as sponges and cold-water corals, which provide important cover for juvenile and small fish, are particularly vulnerable to damage because many are large, fragile, and long-lived (see Box 7 on page 128 of this issue [Etnoyer, 2010]). Catches of coral taken when trawling on seamounts for deep-sea species such as orange roughy can be large, with tons, sometimes tens of tons, caught in a single trawl. In a new fishery on three seamounts off southern Australia, it was estimated that in the first year of fishing, over 1700 t of coral comprised the bycatch of 4000 t of orange roughy—that is, almost one-third of the total catch was coral (Anderson and Clark, 2003). The area covered by trawling on these small seamounts was probably less than 40 km^2 (half the size of Manhattan Island), but the number of trawls carried out over and over again on these types of seamounts means the dense coral can be reduced to rubble over much of the area. Trawling generally breaks up the coral, so the amount damaged but not retained by the net is larger still. Recovery of seamount habitat is likely to take decades, if it can occur at all (see review by Clark et al., 2010b).

Trawls generally don't discriminate, catching small fish and sharks as unintended bycatch in addition to the targeted commercial fish. Some species can be caught by midwater trawls, which are designed to fish above the sea bottom without touching it, and in some situations bycatch can be reduced by incorporating special grids in the trawl that allow some animals to escape. However, for many of the main seamount fisheries, there is no alternative to bottom trawling. Seamount management is consequently beginning to focus on closing some seamounts to prevent damage by trawling, and an increasing number of countries and Regional Fisheries Management Organizations are protecting seamounts (Probert et al., 2007). The future lies in a balance, with some seamounts protected from fishing to conserve the biodiversity of seamount habitat, while others remain "open" to maintain a fishery (see Spotlight 7 on page 146 of this issue [Clark et al., 2010a] and Spotlight 4 on page 104 of this issue [Shank, 2010]).

Malcolm R. Clark *(m.clark@niwa.co.nz) is Principal Scientist, National Institute of Water & Atmospheric Research, Wellington, New Zealand.*

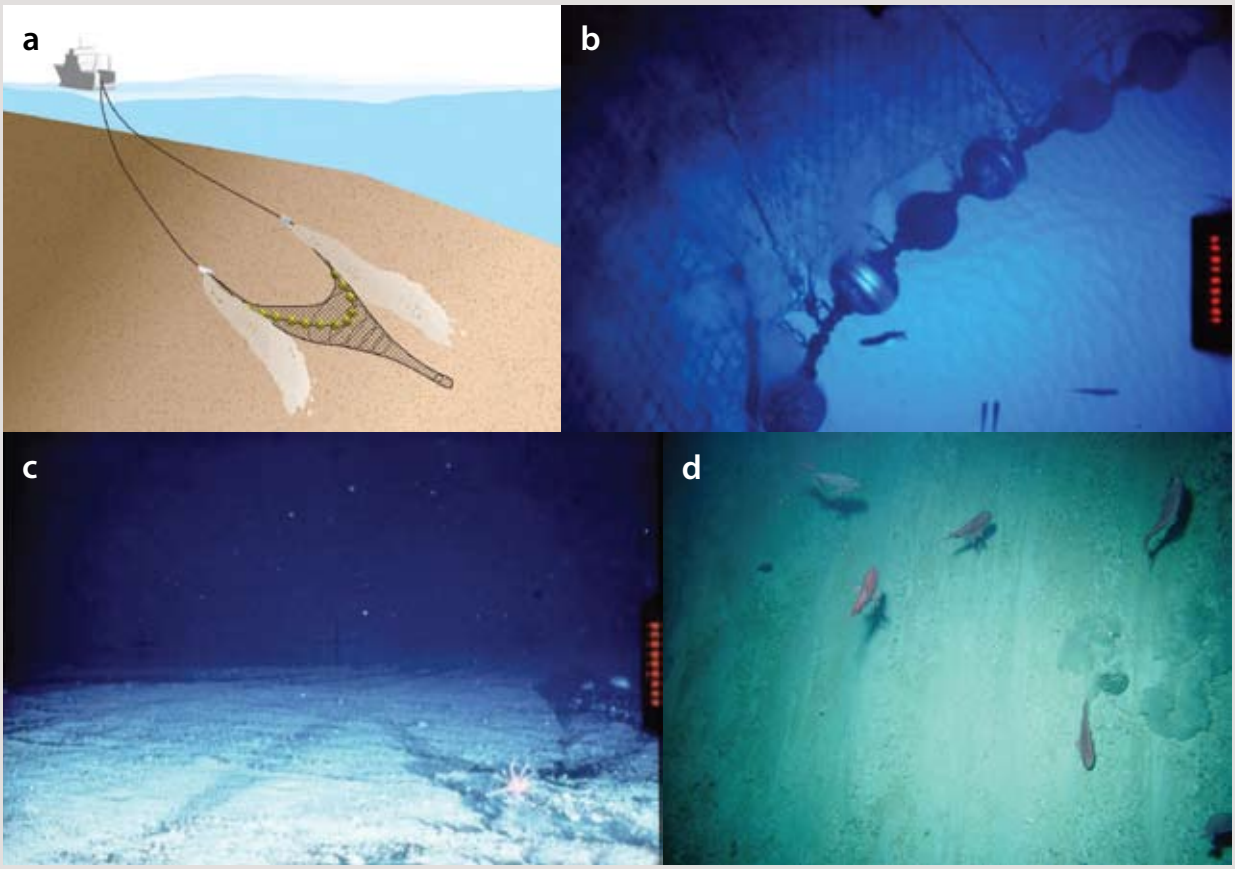

Figure 1. (a) Cartoon of a bottom trawl being towed by a fishing vessel. (b) View of a bobbin rig on a bottom trawl. Note the large size of the bobbins (60-cm diameter) to help the net roll over rough seafloor. (c) Trawl marks on the summit of a small seamount off Tasmania that had been heavily trawled in the 1990s. The trawl has removed sessile sponges and corals. Image view is about 3 m x 2 m. (d) Scours from the bobbin rig on a small seamount off New Zealand. Although orange roughy are still present, heavy trawling has removed sponges and corals that are common on unfished seamounts in the region. Image view is about 3 m x 2 m. *(a) and (d) courtesy of NIWA, (b) courtesy of NIWA-CSIRO, (c) courtesy of CSIRO*

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