



## FISHING ACTIVITY: SEABED TRAWLING

Environmental Snapshot  
March 2010

### Key points

- In 2008, 68 large (>28 m) fishing vessels conducted 38,648 seabed trawls covering 85,222 km<sup>2</sup>.
- Since 2005, the number of trawls and area trawled by large fishing vessels has decreased.
- The Chatham Rise 1 demersal fish community<sup>1</sup> had the highest total area trawled over the 19-year period 1990–2008; however, this community is relatively small in area in comparison to other communities. Fish caught in high volumes in the Chatham Rise 1 community include spiny dogfish, silver warehou, and occasionally hoki. In contrast, the demersal fish community with the largest area, deep midslope, was relatively untrawled over the 19-year period 1990–2008.
- In recent years, the average area trawled for the majority of fish communities decreased compared with earlier years, with the average area trawled in Campbell Plateau 3 decreasing by over 60 per cent.

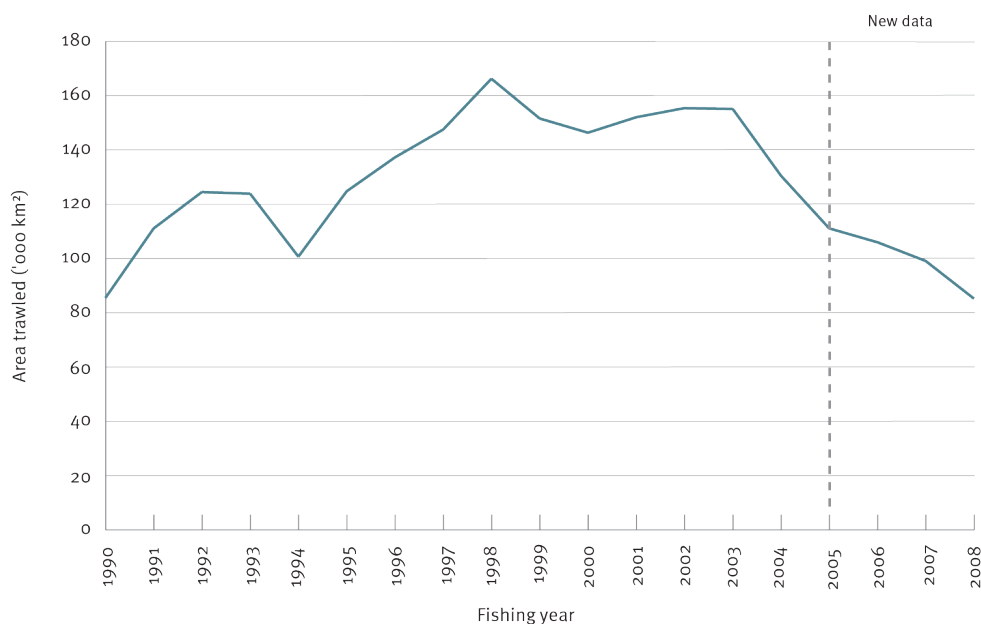
Fishing is the most widespread human activity in the marine environment. New Zealand's marine environment and fisheries resources are highly valued economically, recreationally, culturally and environmentally. This snapshot report is one of a series that provides information on New Zealand's fishing activity from an environmental perspective. To report on seabed trawling, the area trawled by commercial trawlers and the types of fish found in different trawled areas are estimated.

### Area trawled by commercial trawlers

#### Current situation

Figure 1 shows that 85,222 km<sup>2</sup> were trawled by commercial vessels in the 2008 fishing year. (Note that this is the total area of all trawls added together, and is not a measure of actual seabed area covered by these trawls because many trawls overlap.) The *Fish Stocks Environmental Snapshot* (Ministry for the Environment, 2009) showed that middle-depth fish (ie, hoki, hake and ling) made up almost a quarter of total commercial catch in 2008. Eighty-two per cent of the middle-depth fish catch was hoki. Some of these fish would have been caught during seabed trawling.

**+ FIGURE 1**  
**TOTAL AREA TRAWLED BY TRAWL CATCH EFFORT PROCESSING RETURN (TCEPR) VESSELS (SUM OF ALL OVERLAPPING TRAWLS), 1990–2008**



Note: Effort data is reported by 'fishing year', which for most species runs from 1 October to 30 September. A fishing year takes its name from the second of the two calendar years because this is the year in which most of the fishing year lies.  
Data source: Ministry of Fisheries (data groomed by NIWA).

Figure 2 shows the geographic distribution of commercial trawling effort by TCEPR (see side bar on page 3) vessels in New Zealand waters from 1990 to 2008, expressed as the total area trawled in each 25 km<sup>2</sup> (5 km by 5 km) 'cell'. Around 67,000 of these cells are in fishable depths (less than 1600 m deep). These cells are represented by the coloured areas in figure 2. Many areas in the Exclusive Economic Zone (EEZ) are not fished by trawling (shaded in the key as 'Not trawled'), usually because they are too deep, or the sea floor is too rough, or because they do not support commercially viable fish catches. Overall, about 20 per cent of fishable cells (between 200 m and 1600 m deep) were trawled at least once<sup>2</sup> by these large commercial vessels in the 2008 fishing year. Figure 2 shows that trawl effort is highest in the eastern (on the Chatham Rise) and southern (on the north west edge of the Campbell Plateau) areas of the EEZ and is also high off the west coast of the South Island at the edge of the Challenger Plateau. Other trawling hotspots include areas off the Wairarapa coast and east of the Coromandel Peninsula. These are areas where the main target species of hoki, squid, orange roughy, southern blue whiting, barracouta, scampi and hake can be found.

<sup>1</sup> See explanation of demersal fish communities on page 6.

<sup>2</sup> For the purpose of this snapshot report, a trawled cell is defined as a cell that has undergone at least one trawl.

**+ FIGURE 2**  
**CUMULATIVE AREA TRAWLED BY TCEPR VESSELS, 1990–2008**

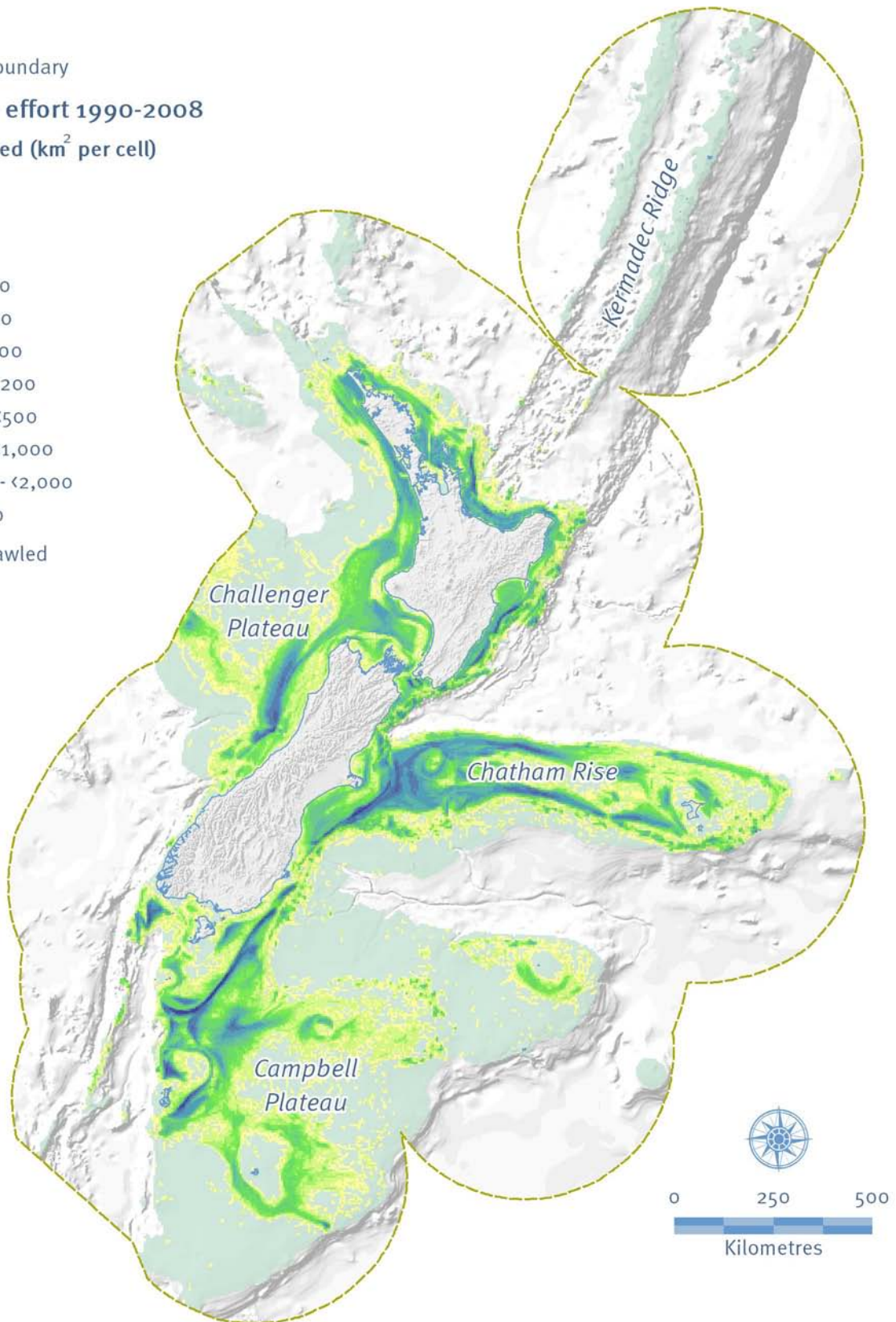
**Legend**

— EEZ boundary

**Trawling effort 1990-2008**

Area trawled (km<sup>2</sup> per cell)

- <1
- 1 - <5
- 5 - <10
- 10 - <20
- 20 - <50
- 50 - <100
- 100 - <200
- 200 - <500
- 500 - <1,000
- 1,000 - <2,000
- >2,000
- Not trawled



Note: In some cells, the total area trawled can exceed the actual seabed area of the cell (which is 25 km<sup>2</sup>), as trawls may have occurred multiple times in the same location over the past 19 years.

Data source: Ministry of Fisheries (data groomed by NIWA).

## Reporting on trawl effort

Between 1990 and 2008, three different data return forms were used to collect trawl effort data from commercial fishing vessels operating in New Zealand waters. The Trawl Catch Effort Processing Return (TCEPR) was used primarily by vessels longer than 28 m operating in waters deeper than 200m. TCEPR forms report individual trawl positions, and data reported here include bottom trawls and mid-water trawls close to the seabed (referred to here as 'seabed trawling'). The Catch Effort Landing Return (CELR), which does not report individual trawl positions, was used by vessels smaller than 28 m fishing in shallow inshore waters up until 2008. In 2008, a new form, the Trawl Catch Effort Return (TCER) was introduced for small trawl vessels (6–28 m long), to allow individual trawl reporting, and the use of CELR is being discontinued.

The amount of seabed trawling has therefore been determined from the TCEPR forms, and is reported here for 1990 to 2008. The seabed area of each TCEPR trawl was calculated using the reported start and end positions of the trawl and estimates of the 'doorspread' (effective width) of the trawl gear. Although individual trawl positions for smaller vessels are not known, the number of CELR/TCER trawls is also reported to provide some estimate of effort by these vessels (see the number of trawls by commercial fishing vessels text box opposite).

To summarise the geographic distribution of trawl effort, the area inside the EEZ has been divided into a grid of 25 km<sup>2</sup> cells. For each cell, the cumulative area trawled by TCEPR vessels was calculated. To report on recent changes in total trawl effort over time, we have compared the average area trawled for the three new years of data (2006–2008) against the average area trawled since we last reported (1990–2005). (Note that this comparison only shows recent changes and not long-term trends). For the purpose of this snapshot report, a trawled cell is defined as a cell that has undergone at least one trawl.

## Long term trend

Figure 1 shows that the estimated total area trawled by TCEPR vessels increased from 85,448 km<sup>2</sup> in 1990 to a peak of 166,233 km<sup>2</sup> in 1998. Since 1998, the total trawled area has almost halved to 85,222 km<sup>2</sup> in 2008. The percentage of fishable cells trawled at least once<sup>2</sup> per year rose from around 18 per cent in 1990 to a peak of about 28 per cent in 2002, and decreased to around 20 per cent in 2008. Overall, 54 per cent of cells at fishable depths were trawled at least once<sup>2</sup> in the 19 years for which there is data.

## Recent trend

Figure 1 shows that the trawled area by TCEPR vessels steadily decreased from 111,104 km<sup>2</sup> in 2005 to 85,222 km<sup>2</sup> in 2008 (see 'new data' line). The percentage of fishable cells trawled at least once<sup>2</sup> also decreased, from 23 per cent in 2005 to 20 per cent in 2008.

Figure 4 shows the percentage change in the average annual area trawled over the period 1990–2005, compared to the period 2006–2008. On average, over the past three years (2006–2008), 41 per cent of fishable cells had decreasing trawling effort, with the majority of these cells decreasing by more than 50 per cent. Twelve per cent of fishable cells had increasing trawling effort compared with earlier years and 46 per cent of cells in less than 1600 m remained untrawled over the entire 1990–2008 period.

Figure 4 shows that, on average in the past three years (2006–2008) trawling effort in most of the areas in the main trawling hotspots decreased by more than 50 per cent compared with earlier years (1990–2005). In contrast, trawling effort increased around other trawling hotspots including areas around the Coromandel, East Cape and Wairarapa. Trawling effort has also increased off the coast of Taranaki. As previously mentioned, the main target species found in the areas listed above include hoki, squid, orange roughy, southern blue whiting, barracouta, scampi and hake.

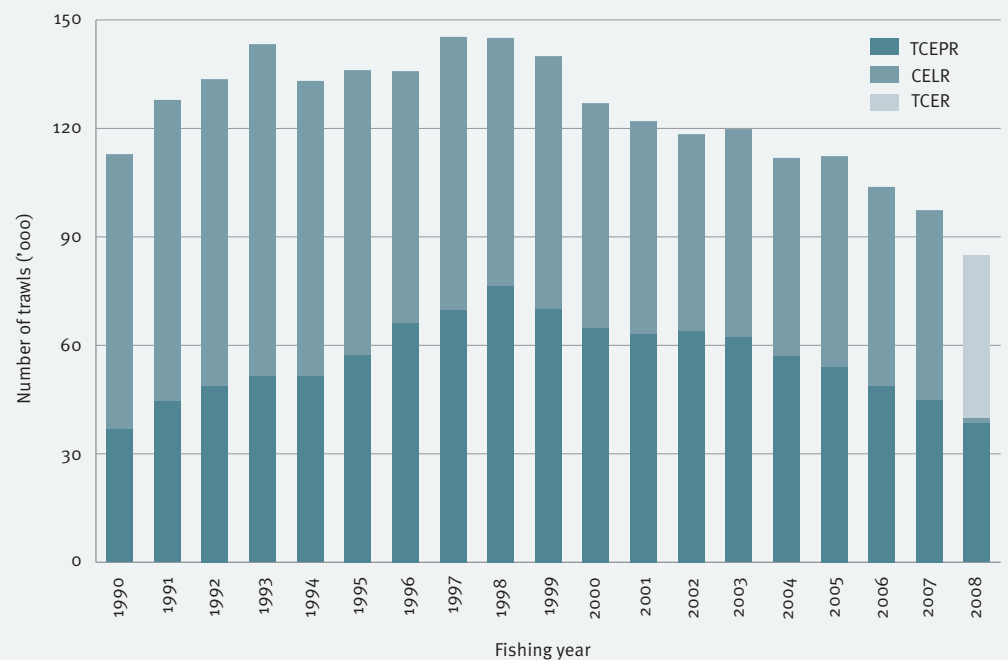
Trawling effort over these two time periods is dominated by the catch of middle-depth fish (ie, hoki, hake and ling) (Ministry for the Environment, 2009). Eighty-two per cent of the middle-depth fish catch was hoki. Middle-depth fish catches have declined from 203,140 tonnes in 1990 to 112,513 tonnes in 2008. Total allowable catches have been reduced for target species such as hoki from 200,010 tonnes in 2003 to 90,010 tonnes in 2008. This combination of fish catch declines and active management to reduce catch of target species has contributed to changes in the distribution of fishing effort over these time periods.

## Number of trawls by commercial fishing vessels

Trawl effort by commercial fishing vessels increased from 112,822 trawls by 495 vessels in 1990 to a peak of 145,306 trawls by 481 vessels in 1997, followed by a steady decline to 84,800 trawls by 251 vessels in 2008 (figure 3). The increase in the number of trawls reported up to 1997 reflects increasing effort in a number of target fisheries, particularly hoki for the TCEPR vessels and inshore species such as flatfish and red cod for the CELR vessels. The drop in the number of CELR trawls after the mid-1990s reflects the change in form use to TCEPRs by some vessels. In 2008, the number of trawls by CELR vessels was almost nil as these forms were replaced by the new TCER forms.

### + FIGURE 3

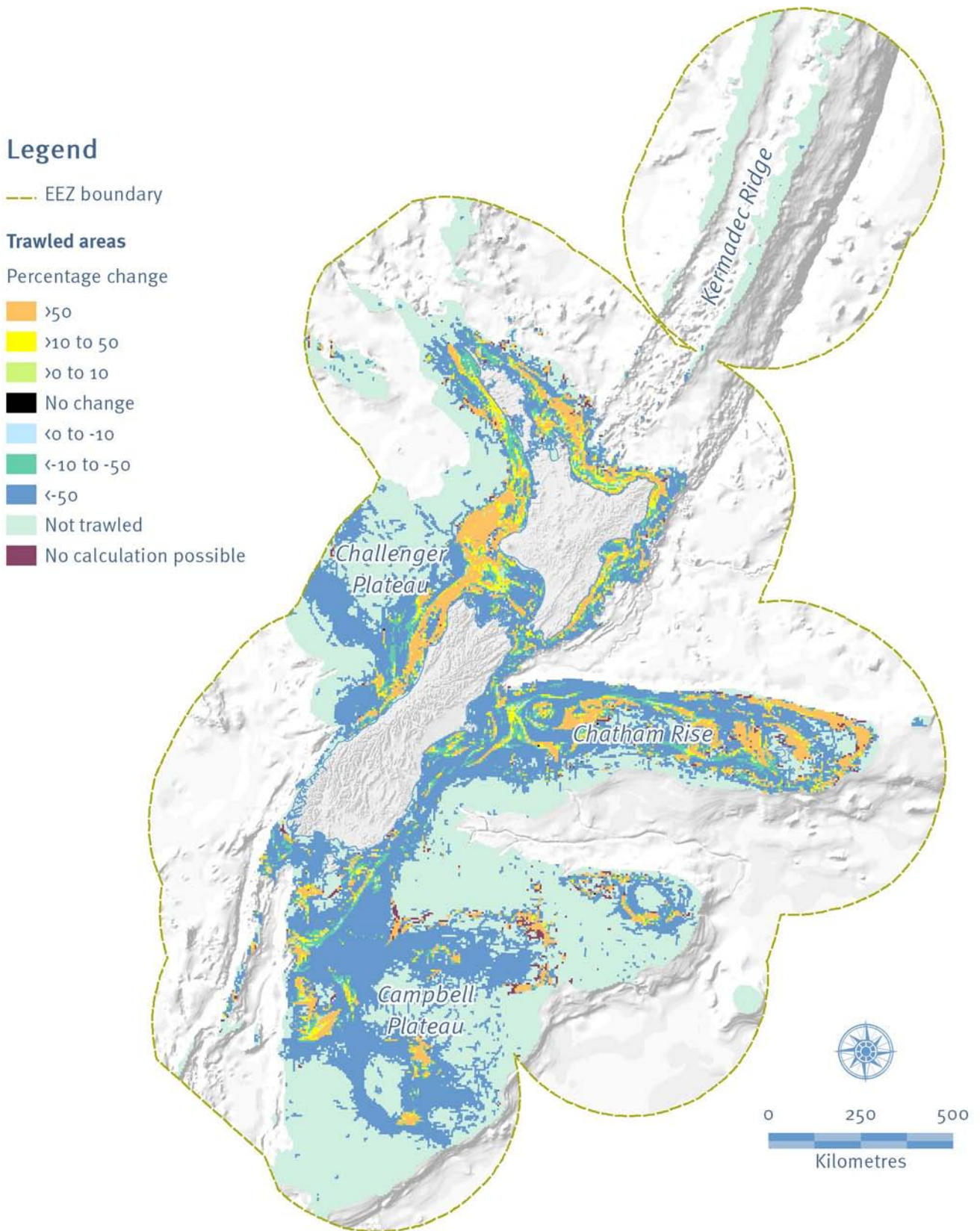
#### TOTAL NUMBER OF TRAWLS BY TCEPR AND CELR/TCER FISHING VESSELS, 1990–2008



Data source: Ministry of Fisheries (data groomed by NIWA).

+ FIGURE 4

PERCENTAGE CHANGE IN AVERAGE ANNUAL AREA TRAWLED PER CELL BY TCEPR VESSELS BETWEEN THE PERIODS 1990–2005 AND 2006–2008



Notes:

(1) Cells trawled for the first time in 2006–2008 are displayed in burgundy. These cells have undergone an increase in trawled area but it is not possible to quantify the percentage change as the original area trawled is nil.

(2) Cells with decreasing trawling effort may include cells that have been intermittently trawled over the 16-year period, but that have not undergone any fishing in the past three years.

Data source: Ministry of Fisheries (data groomed by NIWA).

+ FIGURE 5

CUMULATIVE TRAWLED AND UNTRAWLED AREAS BY TCEPR VESSELS AND DEMERSAL FISH COMMUNITY CLASSIFICATION, 1990–2008

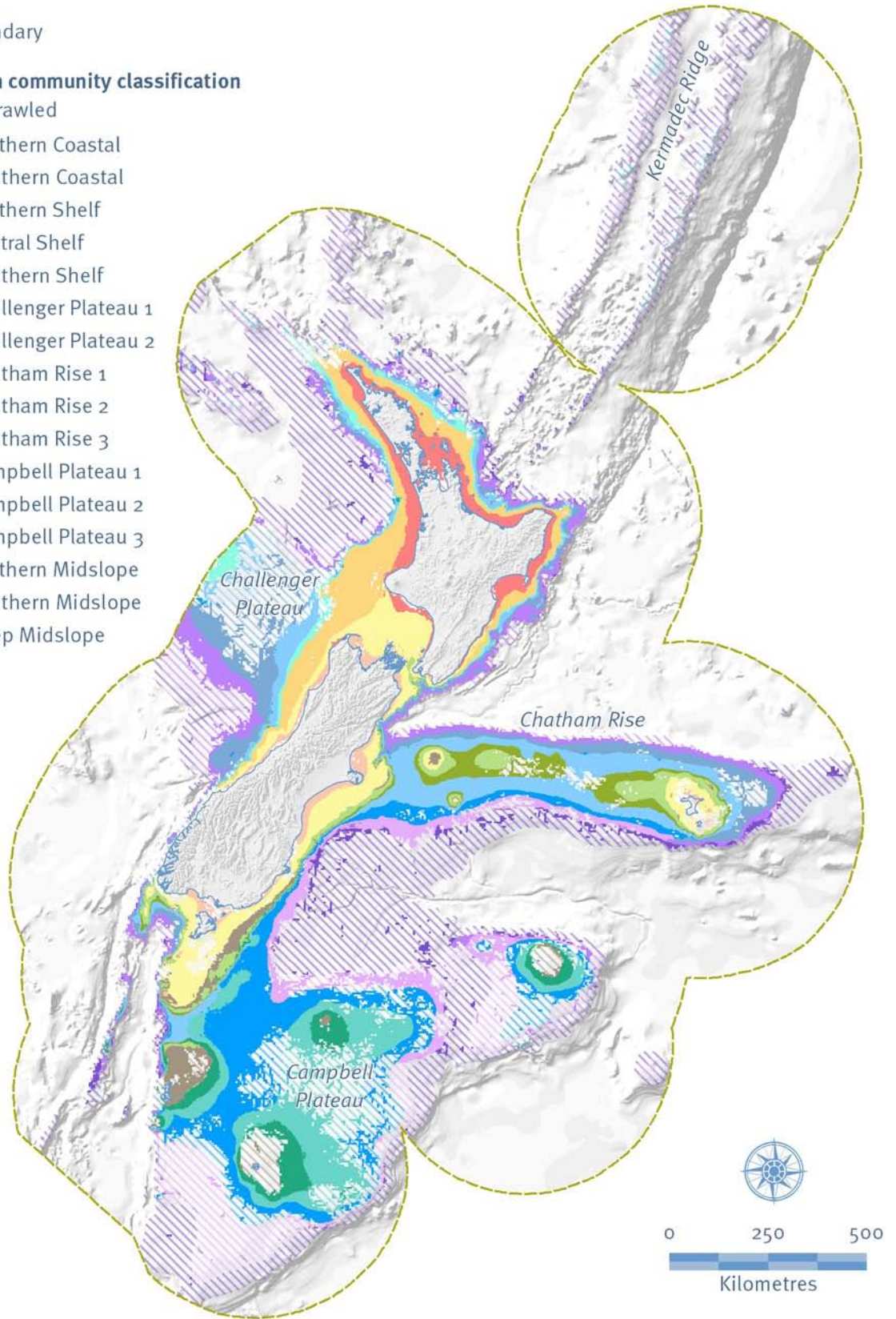
### Legend

— EEZ boundary

#### Demersal fish community classification

Trawled / untrawled

- Northern Coastal
- Southern Coastal
- Northern Shelf
- Central Shelf
- Southern Shelf
- Challenger Plateau 1
- Challenger Plateau 2
- Chatham Rise 1
- Chatham Rise 2
- Chatham Rise 3
- Campbell Plateau 1
- Campbell Plateau 2
- Campbell Plateau 3
- Northern Midslope
- Southern Midslope
- Deep Midslope



Data source: Ministry of Fisheries and Leathwick et al, 2006.

## The types of fish found in different trawled areas

### Demersal Fish Community Classification

The Demersal Fish Community Classification was developed to identify particular seabed areas that typically support certain characteristic fish groupings, and uses an extensive set of fisheries research trawl data to model the distribution of 122 fish species that live near the seabed (demersal fish species) (Leathwick et al, 2006). The species listed in the following section do not necessarily reflect the commercial catch in those areas, as this information is based on research trawls aimed at specific species.

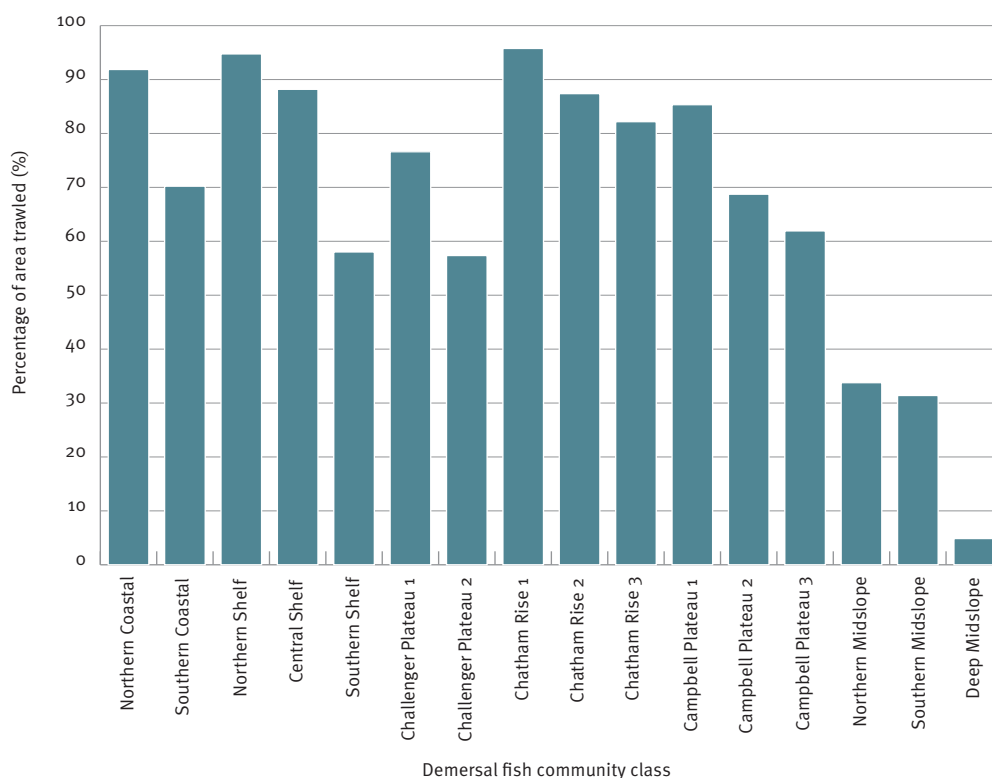
The classification provides a geographic distribution of areas that typically support particular demersal fish communities, based on the types of fish living in the communities and the environmental conditions in which the communities occur in each area (Leathwick et al, 2006). This provides a useful way of evaluating whether geographic shifts in fishing effort are related to changes in the extent to which particular fish groupings are being targeted.

### Current situation

Figure 5 shows the 16 fish community classes in the Demersal Fish Community Classification. Each class represents a different demersal fish community characterising each area and is shown by a different colour. The dashed shades show where the various classes (and their fish communities) have not been trawled. Note that the area trawled represented in figure 5 simply shows areas that have and have not been trawled, and does not show the intensity of trawling. For example, if a trawled cell had been trawled only once in the past 19 years, it would still appear as a trawled cell in figure 5.<sup>2</sup>

Figure 6 shows the cumulative area trawled (the sum of the area of all trawls) as a percentage of the total area per demersal fish community between 1990 and 2008. In the main trawling hotspots trawls may have occurred multiple times in the same location over the past 19 years and so, while the total trawled area may be high this does not mean that the entire area of the fish community has been fished. For example, the cumulative trawled area may total 95 per cent of a demersal fish community class area, but all of this trawling can occur in one-third of the area, leaving the other two-thirds unfished.

**+ FIGURE 6**  
**CUMULATIVE AREA TRAWLED BY TCEPR VESSELS AS A PERCENTAGE OF TOTAL AREA OF EACH DEMERSAL FISH COMMUNITY CLASS, 1990–2008**



Data source: Ministry of Fisheries and Leathwick et al, 2006.

Note that inshore fishing areas (coastal areas) are comparatively under-represented because smaller vessels that do not use TCEPRs are more likely to fish inshore and are not included in these analyses.

The Chatham Rise 1 fish community had the highest (96 per cent) percentage area trawled in the 19-year period 1990–2008. However, this is a fairly small demersal fish community class area. Fish caught in high volumes in this area are spiny dogfish, silver warehou, and occasionally hoki (Leathwick et al, 2006)<sup>3</sup>.

Northern Shelf and Northern Coastal fish communities also had a high percentage area trawled from 1990 to 2008 (95 and 92 per cent respectively). Fish species caught in high volumes in these areas include snapper, spiny dogfish, barracouta and tarakihi (Leathwick et al, 2006)<sup>3</sup>. The Chatham Rise 1, Northern Shelf and Northern Coastal fish communities all have relatively small areas compared to some of the larger demersal fish communities (eg, Campbell Plateau 3, Northern Midslope and Deep Midslope) and as a result small changes in fishing patterns in the vicinity can generate large local changes (B. Wood, NIWA, pers. comm., 21 December 2009).

The Deep Midslope fish community had the lowest percentage of its area trawled (5 per cent) in the 19-year period 1990–2008. However, the Deep Midslope fish community is the largest demersal fish community with a total area of 517,165 km<sup>2</sup>. Fish most commonly caught in small volumes in this area include lighthouse fish, spineback and Baxter’s dogfish, and occasionally smooth oreo are caught in large volumes (Leathwick et al, 2006)<sup>3</sup>. Despite the large size of this fish community, it is likely to be lightly fished as it is outside trawlable depths and the species that are listed are not target or Quota Management System or commercially viable species.

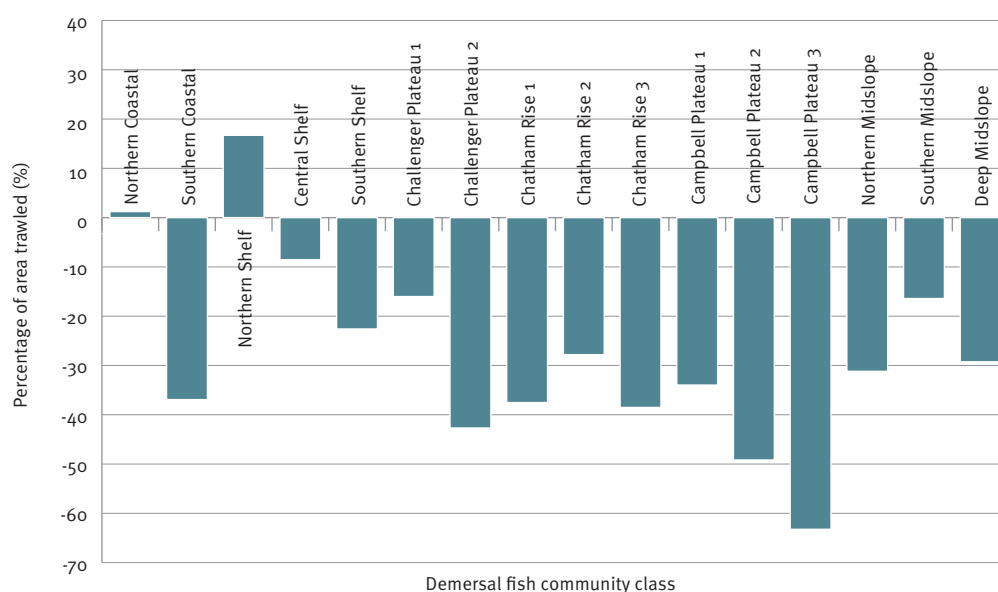
## Trend

Figure 7 shows a summary of percentage change in the average annual area trawled over the period 1990–2005 compared with the period 2006–2008 by demersal fish community. The average annual area trawled from 2006–2008 decreased in the majority of the demersal fish communities compared to 1990–2005.

The Campbell Plateau 3 fish community had the greatest decrease, with a 63 per cent drop in the average annual area trawled in 2006–2008 compared to 1990–2005. Campbell Plateau 2 and Challenger Plateau 2 also had large decreases (49 and 43 per cent respectively). Fish commonly caught in high volumes in these areas include hoki, javelin fish, ling, southern blue whiting, and occasionally orange roughy (Leathwick et al, 2006)<sup>3</sup>. As mentioned above, these trends reflect decreases in the total allowable catch of some target species such as hoki.

### + FIGURE 7

**PERCENTAGE CHANGE IN AVERAGE AREA TRAWLED BY TCEPR VESSELS BETWEEN 1990–2005 AND 2006–2008 BY DEMERSAL FISH COMMUNITY CLASS**



Data source: Ministry of Fisheries and Leathwick et al, 2006.

<sup>3</sup> The species listed here do not necessarily reflect the commercial catch in those areas, as this information is based on research trawls aimed at specific species.

The establishment of protected areas also influence seabed trawling activity as some areas within a demersal fish community class may not be able to be fished or may have restrictions in place that have been brought in during the sampling period of 1990–2008. For example, 31 of New Zealand’s marine reserves were established after 1990 (Ministry for the Environment, 2008) and the Southern Shelf class has the second largest marine reserve in its area. This in turn has influenced fishing patterns since 1990. Northern Shelf and Northern Coastal fish communities were the only two communities to have an increase in their average area trawled (17 and 1 per cent respectively) in 2006–2008 compared with earlier reporting. Fish species commonly caught in high volumes in these areas include snapper, barracouta, spiny dogfish, and tarakihi (Leathwick et al, 2006)<sup>3</sup>.

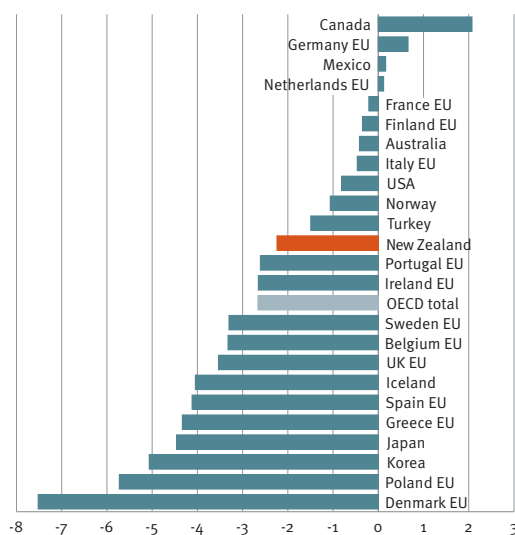
These trends are consistent with figure 4, which shows that trawling decreased to the east, south and west of the EEZ and increased in coastal waters around the North Island.

## International comparison



Between 1995 and 2006, New Zealand had the 12<sup>th</sup> highest average annual percentage change in fish landings<sup>4</sup> out of 24 OECD countries (figure 8), with a 2.2 per cent decrease in total catch.

**+ FIGURE 8**  
**FISH LANDINGS IN DOMESTIC AND FOREIGN PORTS, 1995–2006**



Notes:

- (1) EU = Member state of the European Union.
- (2) Changes in fish catch may be due to a number of environmental and non-environmental factors.

Source: OECD Factbook 2009.

## References

- Leathwick J, Francis M, Julian K. 2006. *Development of a Demersal Fish Community Classification for New Zealand’s Exclusive Economic Zone*. Prepared for Department of Conservation. NIWA Client Report HAM2006-062. Hamilton: National Institute of Water and Atmospheric Research.
- Ministry for the Environment. 2007. *Environment New Zealand 2007*. Wellington: Ministry for the Environment.
- Ministry for the Environment. 2008. *Marine Areas with Legal Protection*. Wellington: Ministry for the Environment.
- Ministry for the Environment. 2009. *Fishing Activity: Fish Stocks Environmental Snapshot*. Wellington: Ministry for the Environment.

<sup>4</sup> Change in fish landings is a proxy for the pressure seabed trawling puts on the environment.



### FOR MORE INFORMATION:

- about the state of New Zealand’s environment see [www.mfe.govt.nz/environmental-reporting](http://www.mfe.govt.nz/environmental-reporting)
- about the Ministry for the Environment’s reporting on New Zealand’s oceans contact Janine Smith at [janine.smith@mfe.govt.nz](mailto:janine.smith@mfe.govt.nz)

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