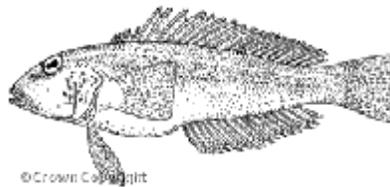




# Blue Cod in Kaikoura

## Summary of the Information

26 November 2009



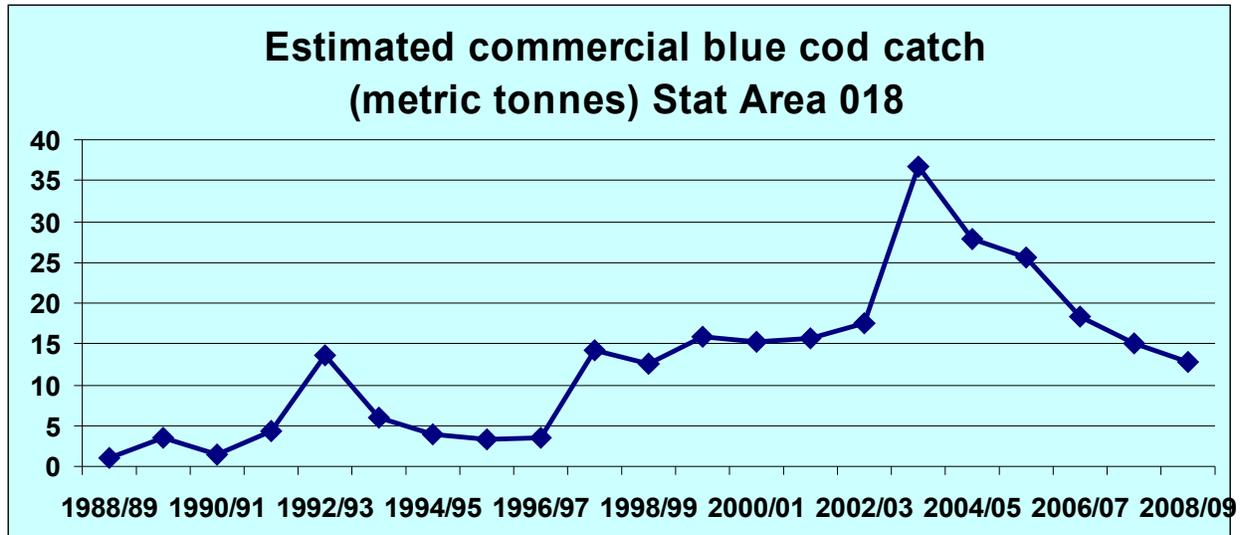
### ***Purpose***

The purpose of this paper is to support decision making by Te Korowai about blue cod management around Kaikoura. It is designed to accompany our public discussion paper on blue cod that can be found at <http://teamkorowai.org.nz/>. This is a living document that will be updated as new information comes to hand so keep watching our website for new versions.

### ***Current Knowledge***

#### ***Summary***

Blue cod has been reported to Te Korowai, largely through evidence gathered locally, as a species under pressure both commercially and recreationally. Those with a knowledge of fish abundance and past catch levels have indicated their concerns about the future of the stock, particularly given the sharp rise in popularity of Kaikoura as a recreational fishing destination and the introduction of commercial fish quota from outside the area. A recent study by Dr Glen Carbines suggested that blue cod depletion around Kaikoura is limited to inshore areas with healthy population numbers at greater depths. He also concluded that blue cod is currently sustaining itself in the face of fishing pressure around Kaikoura.



Commercial catch from the Kaikoura region has varied significantly and is currently around 15 tonnes per year. Estimates for recreational catch are highly variable, but it seems that recreational catch is, on average, about the same as the commercial catch. In some years of good fishing conditions the recreational catch can be many times as large as the commercial take. Both science and anecdotal evidence show:

- The inshore fishery to be in a severely depleted state.
- The mid-water fishery is depleted past the point that will produce maximum sustainable yield.
- Productivity of blue cod fisheries may be reduced by damage to firm grounds that can support horse mussel, coral, sponge and bryozoan beds
- Decreased abundance of other stocks has forced a lot more recreational and subsistence effort onto blue cod and perch.
- There was a noticeable improvement, particularly in the inshore in 2007.

### **Background:**

There is a great deal of scientific study on Blue Cod, mostly from Foveaux Strait and Marlborough Sounds, with two abundance studies having been done in the Kaikoura region. There is very strong agreement between scientific study and anecdotal evidence, when one looks at the information in detail.

### **Life history:**

- Blue cod are a relatively long lived fish, living up to 30 years.
- Adults tend to live at reef margins, and can be found at depths down to 350m.
- They have an unusual life history in several aspects.

### **Sex & abundance:**

Blue cod are born male or female, as a result of their genetics, yet can change sex as a result of behaviour. The largest fish in a group tends to be the most dominant, and the most dominant fish tends to become male, whatever its original genetic sex was. A male tends to defend a loose territory that includes 3 to 5 females. Being picked on by a more dominant

animal creates stress hormones that tend to change the sex of a fish to female. The lack of stress hormones tends to turn the fish male.

This is consistent with the sex ratios observed in the recent (2007) survey, in which the sex ratio in the inshore areas, with low densities was biased towards males (1.4:1), while in water deeper than 100m the sex ratio was 1 male to 3 females. There are most likely two factors at work:

1. When the large fish in a group are caught and removed, many of the remaining fish experience less stress, and thus turn into males.
2. A reduction in overall density of fish, as a result of fishing pressure, leads to the same outcome, reduction of stress on individuals, and therefore more fish becoming male.

These characteristics result in a very odd situation. The fishery is most productive of eggs and larvae when there are high densities of large fish. In this situation the largest fish tend to become aggressive males, and the less aggressive fish become females. Reducing the density of fish, or removing the largest most aggressive fish, tends to result in many more of the remaining large fish turning into males, and thus further reducing the productivity of the fishery. Fisheries with patches of large concentration of large fish, or fishing practices that leave significant numbers of large fish in all places, are likely to be far more productive than fishing down areas to a uniform low density.

### **Growth and distribution:**

Studies (including carbines 2003 PhD) have shown clearly that blue cod tend to remain in one area, with very few individuals moving any significant distance from their home range (in a Foveaux Strait study more than half of fish tagged and returned had travelled less than 1km from their release point). For those fish that do travel the tendency is to travel up current.

Blue cod eggs have a relatively short planktonic stage (free drifting), of about 10 days. Those eggs that find their way into the prevailing current can be carried significant distances in that time, while those eggs that find their ways into caves, cracks, on crannies in rocks or amongst seaweed may not travel very far at all.

Once larvae hatch, they require habitat that provides them shelter from predators if they are to survive in large numbers. Blue cod are non specific predators, and will eat anything they can catch, including small blue cod. Having habitat that provides both lumpy bits that small blue cod can hide behind, and sufficient food for those small cod to grow, is an essential part of having a productive blue cod fishery. Having fishing methods that scrape off all the “bumpy bits” can significantly reduce the productivity of a system (from the perspective of growing lots of blue cod).

It takes 5 to 8 years for a blue cod to reach the minimum legal size (MLS) of 30cm - some females may take up to 12 years to reach MLS.

The recent surveys of the Kaikoura region show that catch rates in the inshore are one fifth of those in midwater, and one 15<sup>th</sup> of those in the deeper water (greater than 100m).

These figures are entirely consistent with anecdotal evidence that blue cod densities in the inshore have declined significantly (in this case to about 6% of the densities found in the deep water), and that the density in the intermediate depths has also declined significantly (in this case to about 20% of the density in deep water). (And it is entirely probable that the density

in deep water is well below the density that would occur without human fishing, and should not be thought of as any sort of “virgin” state - it is simply the best we can find now.)

There is sign of an increase in legal sized catch rates that had just appeared in 2007, but no data yet as to whether these are just a blip caused by a strong years class (para 2 page 14 Carbines 2007), or are indicative of a sustained change due to changes in management practices (reduction in recreational bag limits in 2000).

These figures are entirely consistent with localised depletion caused by a combination of commercial and recreational economic and behavioural factors:

- Most people will fish closer to home if they can.
- If someone only has a short time to fish, they will fish close to shore.
- If someone only has a small engine in their boat then many will often not go far from home.
- Many people are not experienced on the ocean, and feel uncomfortable going long distances, and so tend to fish close to shore, irrespective of the catch rates. This can lead to a situation arising where a local fishery gets depleted by commercial activity, and then is driven to even lower levels by concentrations of recreational activity that take very few fish (compared to the previous commercial take) but those few fish are the ones that need to be left there if the fishery is ever to recover to levels of high abundance.

Economic factors will balance the cost of capture against the return, this will lead to a balance between the catch rates that are acceptable, and the distance travelled. The effects of this are similar in some aspects and different in other between recreational and commercial fisheries.

In commercial fisheries, there is a cost, in terms of both the fuel used, and the crew wages, in travelling to fishing grounds further from home. This will lead to more fishing close to home until the catch rates drop to a point that it is more economic to travel further away to higher catch rates. The exact economics depend on many factors, including the practices of the fishery and the type of vessel. To give two contrasting examples:

1. If a fishery is of a type that it requires several hours work each day to get the gear ready to deploy, and several hours to finish up afterwards, and the vessel is of a displacement type with very low running cost, then the cost of travelling the distance that it takes to get the gear ready may be very low - so that catch rates within a range of a couple of hours travel from port may be very similar.
2. In contrast to that, if the fishery is a type that requires little or no preparation or cleanup, and the vessel is a type that has a high cost per distance travelled, then the combination of vessel and crew costs can lead to it being economic to fish local fishing grounds to very much lower levels than more distant areas.

In recreational fisheries, the economics are similar but different.

Recreation fishers tend to count the direct costs of fishing (like fuel) but discount the labour cost (as it is recreation). Thus they will tend to spend up to what they consider a reasonable amount for the value of the catch they take (on average, over time). This can lead to some very paradoxical situations.

If one simply reduces bag limits, across the board, this can make it “uneconomic” in the minds of recreation fishers to go far from home. Thus the effect of reducing bag limits may

be to concentrate even more effort in the already depleted local fisheries. This can be the opposite of the intended outcome.

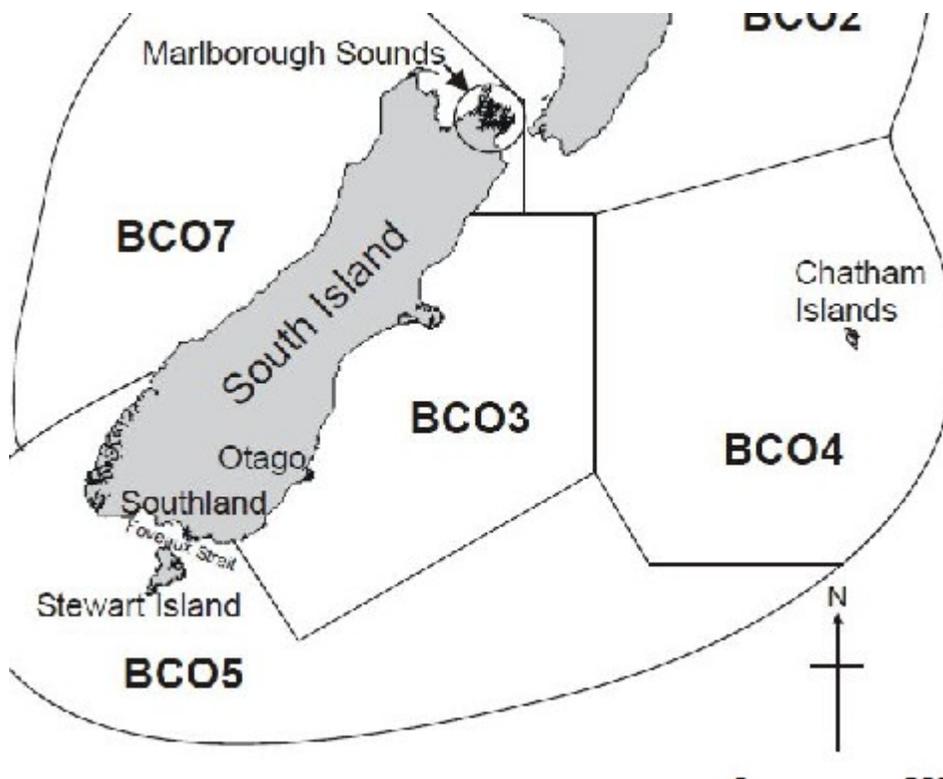
As we move into thinking about strategies to address the issues, we need to keep clearly in mind the diversity of the problems. In the case of blue cod the problems may be different for each reef in an area, and according to both anecdotal and scientific evidence, the inshore area is severely depleted, and the mid-water area is significantly depleted.

### Current Catch

Commercial catch from the Kaikoura region has varied significantly.

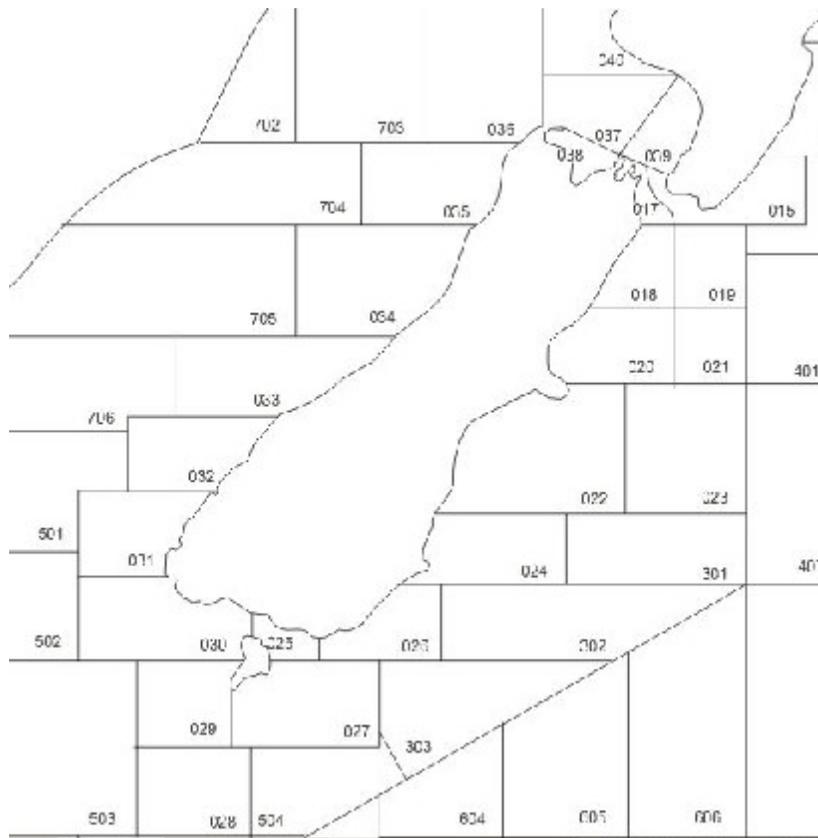
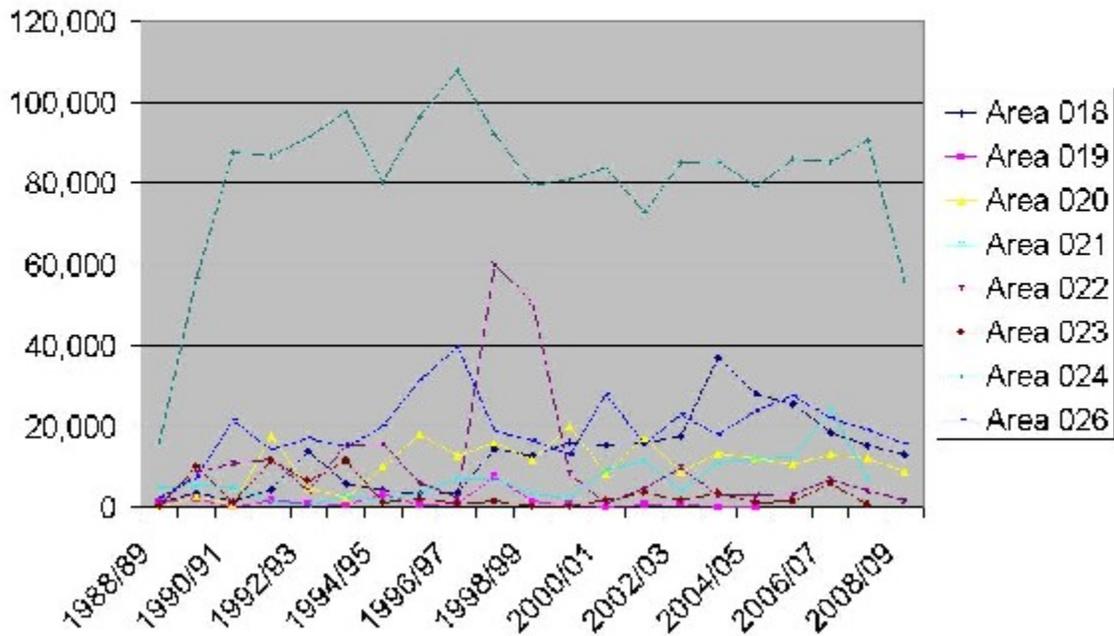
Around the introduction of the Quota Management system in the early 80s it was between 5 & 10 tonnes per year, with a peak of around 14 tonnes in 1993. In 1997 the catch rose to 15 tonnes per year where it remained stable until 2003 when it jumped to over 35 tonnes then slowly reduced to around 15 tonnes again in 2009 (the average for the 9 years from 1988 - 1997 was 4.5T/year, and in the 12 years since was 19T / year - or an additional 10,000 fish per year).

The commercial catch for the entire BCO3 region (as shown on the map below) is about 162T per year.

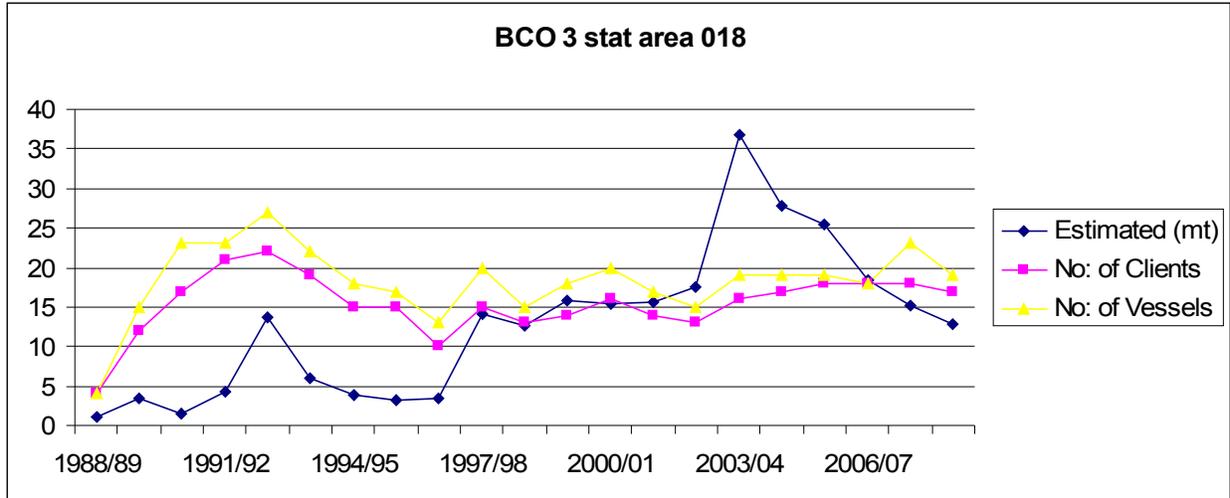


Below is a graph of commercial catch by Statistical Area, and a map of the statistical areas showing total commercial catch for the east coast of the South Island. Kaikoura is in reporting area 018 as shown on the map below.

## Commercial catch of Blue Cod - East Coast Sth Island



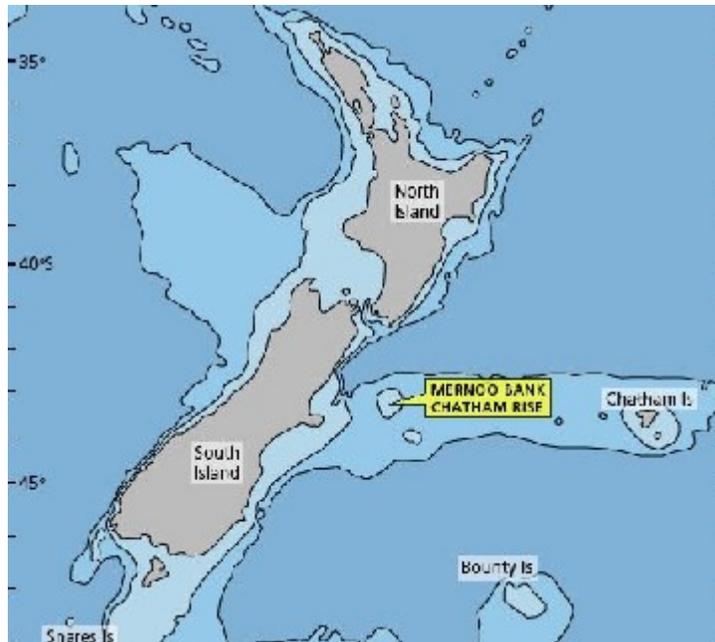
**Commercial Statistical Reporting Areas**



Estimates for recreational catch are highly variable, and it seems that recreational catch is about the same as the commercial catch, and may be highly variable from year to year.

Note that the commercial catch limit (Total Allowable Commercial Catch - TACC) has not been altered since 2001 and thus does not have a fully defined distribution between commercial and recreational fisheries. There is no Total Allowable Catch (TAC) set, and no explicit allowance has been made for recreational or traditional take. Any change in the TACC would require these assessments to be made. Current catch level decisions, such as they are, have been made on the basis of commercial catch history information alone.

Note also that many scientists have noted that the localised nature of blue cod populations makes it inappropriate to try and manage at the level of Quota Management Area (QMA), and that smaller scale management is required to prevent serial and localised depletion of stocks. This view is not compatible with the current legislative framework of the Fisheries Act - which focuses management at the scale of QMA.



## *Issues*

Both science and anecdotal evidence show the inshore fishery to be in a severely depleted state.

Both science and anecdotal evidence suggest that the mid-water fishery is depleted past the point that will produce maximum sustainable yield.

Scientific data suggests that damage to firm grounds that can support horse mussel, coral, sponge and bryozoan beds may significantly reduce the productivity of blue cod fisheries.

Decreased local abundance of other stocks, including hoki, ling, gurnard, red cod, trumpeter, tarakihi, kahawai and hapuka have forced a lot more recreational and subsistence effort onto the only fish left in reasonable abundance (blue cod and perch - those living predominantly on “foul” ground {too rough to trawl without damaging the gear}).

Both science and anecdotal evidence indicates that there was a noticeable improvement, particularly in the inshore in 2007. The science does not tell us at this stage if this improvement is as a result of the reduction to the recreational bag limit from 30 to 10 fish in November 2000 (regulation 2000/241), in which case the increase in recruitment ought to be steady over subsequent years, and we should see steady improvement, or if it is simply the result of an exceptional recruitment event, and is not something we can plan on seeing consistently in the future. Further monitoring is urgently required to answer this question.

(It would be nice if raw results of these surveys were available within a few days of the survey work, rather than waiting two years.)

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