

FINAL RESEARCH REPORT

Date: 29 September 2006

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Project Title: Relative abundance of blue cod (*Parapercis colias*) in Milford and Doubtful sounds in 2006.

Project Code: SAP2005-08

Principal Investigator: Alan Key

Project Duration: 15 January 2006 – 30 September 2006

Overall Objectives:

1. To monitor blue cod stocks (*Parapercis colias*) in Doubtful and Milford Sounds.

Specific Objectives:

1. To monitor changes in recreational catch rates of blue cod in Doubtful and Milford Sounds using experimental linefishing in summer 2006.
2. To assess the movement of blue cod within and into Doubtful and Milford Sounds from tagging.

Background

Fishing for blue cod in Milford and Doubtful Sounds has been prohibited under the Fiordland Management Act since mid 2005. These two sounds were closed to blue cod fishing primarily to allow stocks to recover but also to assess the impact of recreational fishing on blue cod abundance in these two areas. The intention is to reopen non-reserve portions of Milford and Doubtful Sounds to recreational fishing once stocks have recovered to acceptable levels.

SAP2005-08 was a pilot study to investigate the feasibility of using linefishing surveys to provide a cost effective monitoring tool with which to monitor blue cod abundance during the closed period. It is anticipated that the data series generated will be compatible with data collected from diary surveys once the fiords are reopened to recreational fishing.

Methods

Research fishing was conducted using Southern Sam, an aluminium 6.7m monohull vessel with a 200hp outboard engine. Owing to the depth of both Milford and Doubtful sounds blue cod are distributed in a narrow band close to the shore. Most recreational fishing takes place at waterfalls between ten and a hundred meters from the shore and within a depth range of 10 to 50m. Fourteen and Sixteen sites were identified within Milford and Doubtful Sounds, respectively. Sites were based on knowledge of recreational fishers who had operated in each

sound for 10 to 30 years. The sampling team consisted of a scribe, a boat operator and three fishers. Each site was fished for 15 minutes using two 6/0 hooks and sea perch as bait. The fork length (nearest mm for blue cod and nearest 10 mm for other species) of each fish caught during the 15-minute period was recorded. Owing to the effect of the wind and swell, it was necessary for the skipper to maintain approximate position (within about 15 m of the starting point) using engine power. Given the steepness of the bottom, depth typically varied by up to 20 m during a fishing session. Milford Sound was surveyed on 20 January and 18 March 2006 and Doubtful Sound on 21 January and 19 March 2006.

Results

A total of ten species were caught during the two linefishing surveys (Table 1). The dominant species was sea perch, comprising 56.6% and 74.8% by number of catches in Milford and Doubtful sounds, respectively. Blue cod comprised 15.8% and 11.9% of the survey catch in the two sounds. Apart from tarakihi, most of the other species are either discarded or used as bait by recreational fishers, with the result that boat ramp surveys are unlikely to provide an accurate picture of recreational catch composition in Fiordland. In addition to providing an index of blue cod relative abundance, the linefishing survey will also provide information on catch and size composition of other species caught by recreational anglers. One interesting observation was the dramatic decline in the catch of scarlet wrasse between surveys. In January scarlet wrasse comprised 20% and 11% of the catch in Milford and Dusky Sounds, but in March these figures had declined to 1% and 0%.

Totals of 47 and 27 blue cod were caught in Milford and Dusky Sounds, respectively. Fork length ranged from 20 to 56 cm. Lack of strong modes in smaller size classes indicates that younger fish are not more abundant than the older ones, as is anticipated for natural populations. This suggests that fish within the inner sounds do not represent self-sustaining populations, and that individuals recruit from the open coast at all sizes. Sample sizes were however small and this hypothesis needs further testing with additional data. Thirty percent of the Milford and 42% of the Doubtful catch were under the minimum legal size. Four fish of between 34 and 53 cm died as a result of hook damage to gills - equating to a mortality rate of 5.4%. All remaining blue cod were tagged and released. Two (7.7%) of the 26 blue cod tagged in Milford Sound in January were recaptured during the March 2006 survey. Neither had moved from the original tagging site.

Average catch rates for blue cod were 2.2 fish/fisher/hour ($s = 1.67$) for Milford and 1.19 fish/fisher/hour ($s = 1.53$) for Doubtful Sound (Tables 2 & 3). Catch rates were not normally distributed and coefficients of variation were particularly large (i.e. 74 and 129%). Data transformation will therefore be required to both normalize data distributions and stabilize variance if parametric statistics are to be used to compare relative abundance between years. Methods for data transformation should be investigated once sufficient data is available to reliably estimate data distribution. It is however very likely that the CPUE data are Poisson distributed and that square root transformation is consequently most appropriate. Square root transformation, after adding 0.5 to each observation to account for zeros, of combined data sets reduced the cvs to 33% and 45% in Milford and Doubtful Sounds, respectively.

Conclusions

- The results of this pilot study suggest that experimental linefishing could be used as a cost effective tool to monitor blue cod relative abundance in Milford and Doubtful

Sounds. Experimental linefishing surveys also provide information on recreational catches that would be difficult to obtain via other means.

- Owing to high variances at least three surveys should be conducted in each Sound over summer. Disappearance of wrasses from the March survey catches suggests that environmental factors may begin to influence fish distribution and behaviour at this time of year and that December to February would probably be the ideal window for sampling.
- The marine reserve along the northern shore of the Milford Sound has been in existence for just over 10 years. It is therefore recommended that future surveys include a similar number of sites within the reserve in order to gauge the impact that recreational fishing has had on the previously open area and the value of marine reserves in protecting blue cod populations, particularly in Fiordland. This would require an additional day. The following specific objective should therefore be added to the project: *To determine the impact of recreational fishing on blue cod populations in Milford Sound by comparing catch rates and size composition of fish from within the longstanding Marine Reserve with those from the previously open area.*

Table 1: Species composition of the survey catches in Milford and Doubtful Sounds.

Common Name	Scientific name	Jan 06		Mar 06		Both Trips	
		<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
<i>Doubtful Sound</i>							
Blue Cod	<i>Parapercis colias</i>	18	14.4	9	8.9	27	11.9
Yellow weever	<i>Parapercis gilliesi</i>	1	0.8				
Red cod				2	2.0	2	0.9
Scarlet Wrasse	<i>Pseudolabrus miles</i>	14	11.2	0	0.0	14	6.2
Sea Perch	<i>Heliconlenus percoides</i>	82	65.6	87	86.1	169	74.8
	<i>Nemadactylus</i>						
Terakihi	<i>macropterus</i>	4	3.2	0	0.0	4	1.8
Witch	<i>Arnoglossus scapha</i>	2	1.6				
Wrasse (Spotty + Girdled wrasse)	<i>Notolabrus celidotus, N. cinctus</i>	4	3.2	3	3.0	7	3.1
Total		125		101		226	
<i>Milford Sound</i>							
Banded wrasse	<i>Notolabrus fuciola</i>	1	0.8				
Blue Cod	<i>Parapercis colias</i>	28	22.2	19	11.1	47	15.8
Scarlet Wrasse	<i>Pseudolabrus miles</i>	25	19.8	2	1.2	27	9.1
Sea Perch	<i>Heliconlenus percoides</i>	54	42.9	114	66.7	168	56.6
Spiny Dogfish	<i>Squalus acanthias</i>	7	5.6	11	6.4	18	6.1
	<i>Nemadactylus</i>						
Terakihi	<i>macropterus</i>	3	2.4	1	0.6	4	1.3
Wrasse (Spotty + Girdled wrasse)	<i>Notolabrus celidotus, N. cinctus</i>	8	6.4	24	14.0	33	11.1
Total		126		171		297	

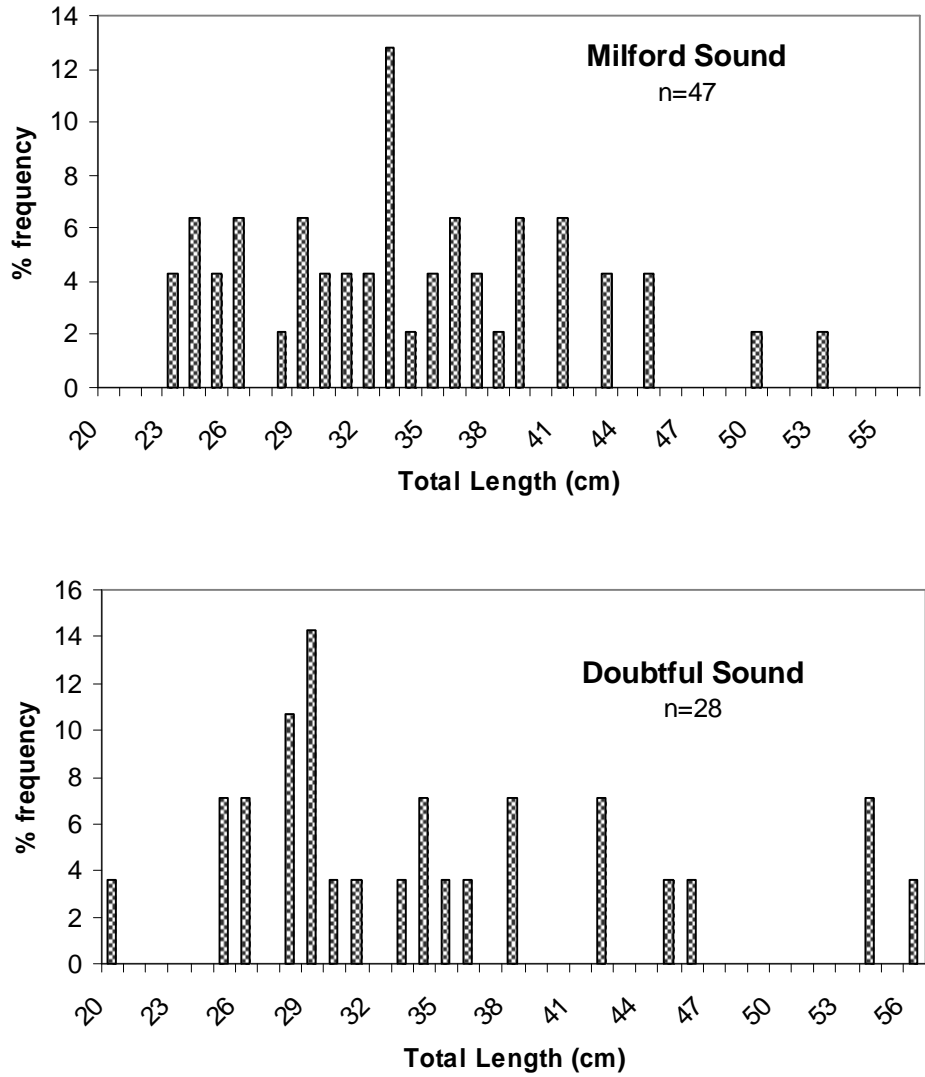


Figure 1: Size composition of blue cod caught during the 2006 linefishing surveys of Milford and Doubtful Sounds.

Table 2: Blue cod catch rates (numbers/fisher/hour) obtained during two 2006 line fishing surveys of Milford Sound

Site	Jan 06		Mar 06		All data
	<i>n</i>	<i>CPUE</i>	<i>n</i>	<i>CPUE</i>	
1	1	1.333333	2	2.666667	
2	0	0	1	1.333333	
3	3	4	2	2.666667	
4	2	2.666667	2	2.666667	
5	1	1.333333	0	0	
6	2	2.666667	1	1.333333	
7	1	1.333333	2	2.666667	
8	5	6.666667	1	1.333333	
9	3	4	0	0	
10	1	1.333333	3	4	
11	1	1.333333	0	0	
12	3	4	1	1.333333	
13	1	1.333333	1	1.333333	
14	4	5.333333	3	4	
Mean		2.666667		1.809524	2.238095
StDev		1.885618		1.344277	1.665079
c.v.		71%		74%	74%

Table 3: Blue cod catch rates (numbers/fisher/hour) obtained during the two 2006 linefishing surveys of Doubtful Sound

Site	Jan 06		Mar 06		All data
	<i>n</i>	<i>CPUE</i>	<i>n</i>	<i>CPUE</i>	
1	2	2.666667	0	0	
2	0	0	0	0	
3	5	6.666667	2	2.666667	
4	1	1.333333	0	0	
5	1	1.333333	3	4	
6	0	0	0	0	
7	2	2.666667	1	1.333333	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	1	1.333333	
11	1	1.333333	1	1.333333	
12	1	1.333333	0	0	
13	2	2.666667	0	0	
14	2	2.666667	0	0	
15	0	0	1	0.761905	
16	2	2.666667	0	1.250153	
Mean		1.583333		0.79242	1.187877
StDev		1.770122		1.170212	1.529762
c.v.		112%		148%	129%