Short-jawed Kokopu (*Galaxias postvectis*)

Conservation Status in Nelson/Marlborough - Year Two Interim Report 2000

Department of Conservation
Te Papa Atawhai

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C O N T E N T S

Abstract

A total of 176 short-jawed kokopu were either caught or observed in surveyed streams, with 108 (18 sites) within conservation estate. Short-jawed kokopu were found in 27 of the 48 streams surveyed, with 20 of these streams containing previously undocumented populations. Clusters of populations occurred in four main areas, notably Croisilles Harbour, Tennyson Inlet, Endeavor Inlet and Nydia Bay streams. Seven new populations of giant kokopu were discovered during short-jawed kokopu survey, and banded kokopu occurred in nearly all streams surveyed.

Short-jawed kokopu are able to inhabit streams with a certain amount of land modification, provided the stream originates from mature or regenerating native forest and remains relatively healthy. Populations disappeared as landuse impacts increased down catchments.

Low numbers of juvenile and sub adult short-jawed kokopu were widely represented throughout the Marlborough Sounds. Preferred microhabitat of juvenile and sub adults included eddies and small holding areas within riffles and rapids, back waters, and runs/ pools associated with adults.

Castor Stream (Croiselles Harbour) shows the importance of intact lowland coastal forest for freshwater fauna. Integrating this area and other core short-jawed kokopu streams into the Department of Conservation RAP process is discussed along with other management recommendations.

1. Introduction

1.1 SHORT-JAWED KOKOPU

Short-jawed Kokopu, Galaxias postvectis is currently ranked a Category 'A' threatened species by the Department of Conservation (Molloy & Davis 1994). This ranking is partially based on the low numbers of records nationally, on the New Zealand Freshwater Fish Database. Recent surveys show that short-jawed kokopu are in higher numbers than these records indicate, at least in the top of the South Island.

This diadromous, largely nocturnal species, is restricted to small, lower order rivers and streams generally associated with podocarp forest. Although New Zealand wide, distribution is localised, with the highest numbers of records so far from the West Coast of the South Island. Short-jawed kokopu contribute a minor component to the whitebait fishery and have an ability to climb substantial waterfalls when young.

There are still many unresolved research questions relating to short-jawed kokopu. Life history, particularly juvenile habitat and recruitment are areas where better understanding may help its long-term protection.

1.2 SURVEY METHODS

To date, the use of electric fishing machines has generally been the most preferred survey technique for assessing presence/absence of short jawed kokopu in New Zealand. An alternative survey technique, spotlighting at night, is proving to be a more accurate method for targeting the cryptic short-jawed kokopu. Comparison of spotlighting and electric fishing in year one of the survey (Studholm *et al*., 1999) showed spotlighting to be a far superior technique for surveying this species. Spotlighting was the only technique used to locate short-jawed kokopu during this year two survey. Not only does this method give the opportunity to observe short-jawed kokopu in their foraging area, it is a less invasive survey technique on fish communities.

1.3 AIMS AND OBJECTIVES

The primary aim of this year two survey was to provide further up to date information on distribution, population abundance and juvenile habitat requirements of short-jawed kokopu in the Nelson/Marlborough region. Results of all three years survey work will assist any national review of the conservation status of the species, and provide greater guidance for resource management advocacy.

The objectives were as follows:

1. To assess the conservation status of short-jawed kokopu in the Nelson/ Marlborough region, the results of which may provide for a change in the conservation ranking status of the species nationally.

2. To assess whether differing land uses were influencing short-jawed kokopu populations in the Marlborough Sounds and Abel Tasman areas.

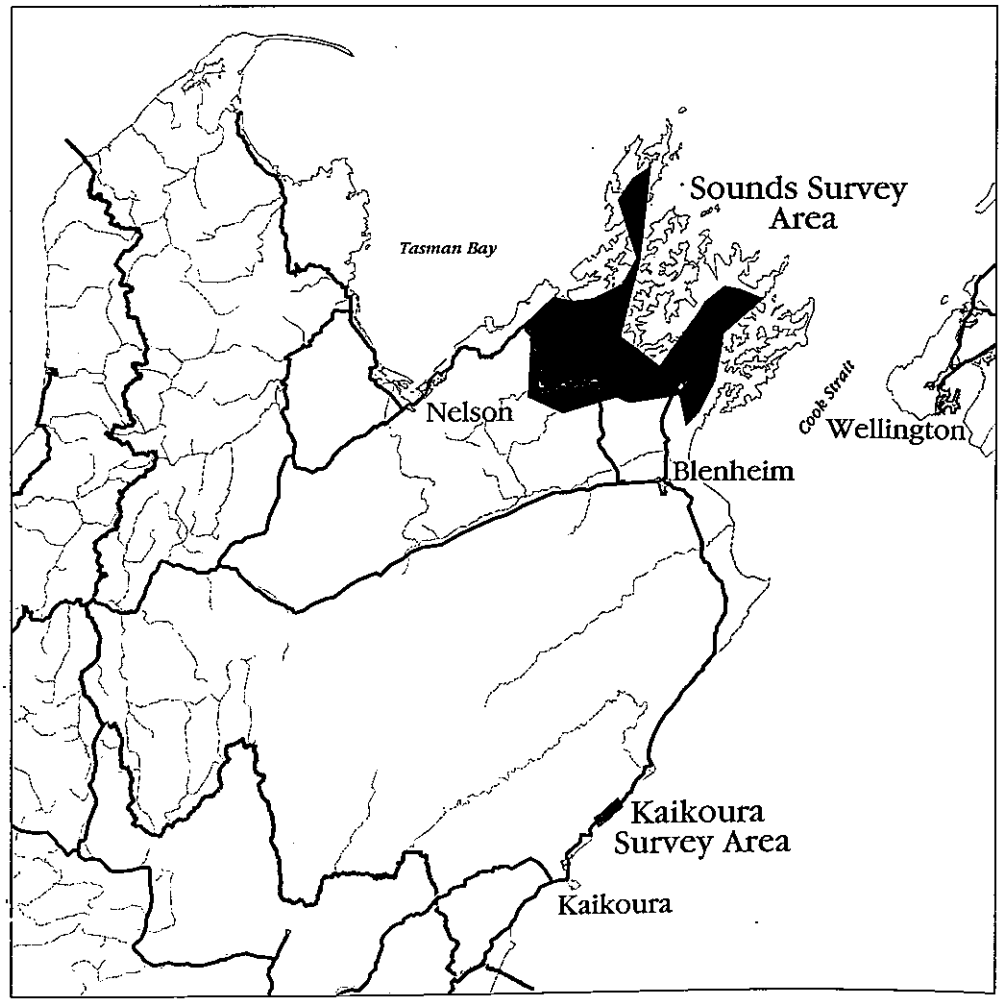
3. To locate and document juvenile short-jawed kokopu and their habitat.

4. To provide up to date information for management of protected lands and resource management advocacy.

2. Survey Area

The area of Marlborough Sounds was surveyed between 7 February and 5 May 2000. A variety of streams were covered from Croisilles Harbour, D'Urville Island, Pelorus and Queen Charlotte Sound to Port Underwood. Tributaries of Whangamoa, Pelorus and Wairau were sampled, but not extensively due to prolific trout populations. Four streams north of Kaikoura were also surveyed.

LOCALITY MAP



The topography of the Marlborough Sounds rises steeply from the 1400 km of coastline. While the majority of lowlands adjacent to streams are privately owned and utilised for agriculture, silviculture (pinus radiata) and holiday accommodation, upper stream catchments generally drain Conservation land and remain pristine. This land is predominately covered in mixed beech/podocarp and coastal hardwood forest. Geology with-in the Marlborough Sounds consists mainly of greywacke, to a lesser degree schist and out crops of ultra-maffic zones.

3. Methods

3.1 DISTRIBUTION AND ABUNDANCE

All accessible coastal streams within the Marlborough Sounds larger than 2 metres wide were targeted, from Cape Soucis (Croiselles Harbour) to Rarangi (Cloudy Bay). Only three sites were sampled in the Pelorus River, the largest river system within the Marlborough Sounds area. Landowner permission was required at 50% of all streams surveyed to access streams via private property.

3.1.1 Spotlighting

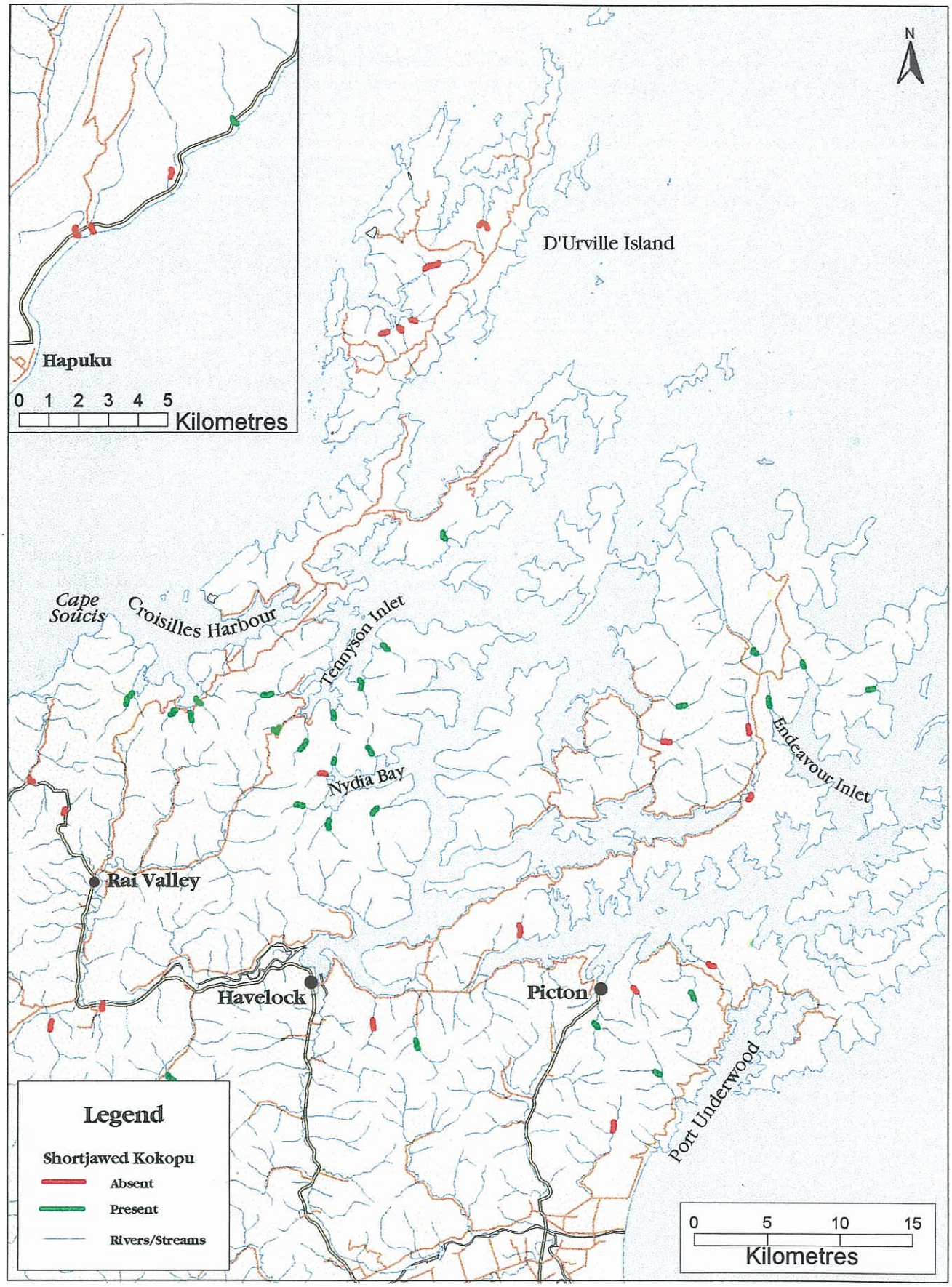
After a suitable stream reach for surveying had been located, 400 metres was paced out during the day and marked for ease of re-location. Surveyors returned to the stream two hours after sunset (11.00 pm summer and 9.00 pm autumn). On-site camping avoided access difficulties and public disturbance after dark. A 35-watt and 50-watt spotlight powered by 12 volt dry cell batteries, accompanied with a Petzl duo head torch were used for illumination. Each surveyor (2) covered a side of the marked stream reach and methodically searched the water slowly moving upstream. Fish were caught when positive identification could not be made, if the fish remained uncaptured it would be recorded as an unidentified Galaxiid. All short-jawed kokopu were captured at some sights to give length frequency information. Usually largest and smallest fish were also caught to give an indication of size range in all other streams. All fish species identified were recorded on NIWA freshwater fish database forms.

The use of spotlights in remote and difficult terrain proved to be a very practical survey technique with large sections of each stream able to be covered in a short space of time. Following recommendations from year one, the 75-watt spotlight was exchanged for a 50-watt spotlight, which increased the spotlighting time marginally. The red filter was trialled again and although there was minimal fish disturbance, the operator's ability to move around was restricted in the dim light. Conditions for spotlighting were at their optimum during low summer flows.

3.1.2 Habitat and Land Use

The 400 metre stream section, where practical, targeted a change of catchment vegetation and stream gradient, thus providing a cross-section of vegetation and substrate varieties. The average width of the stream (taken from pool/run/rapid) multiplied by distance walked (400) gave approximate area (m^2) fished. Using McDowall's description of characteristic habitats of short-jawed kokopu, and year one

Figure 1


N
Hapuku
0 1 2 3 4 5
Kilometres
D'Urville Island
Cape Soucis
Croisilles Harbour
Tennyson Inlet
Nydia Bay
Endeavour Inlet
Rai Valley
Havelock
Picton
Port Underwood
Legend
Shortjawed Kokopu
Absent
Present
Rivers/Streams
0 5 10 15
Kilometres

results as a guide, the survey targeted streams including some or all of these specific habitat parameters:

- Forests associated with podocarp/hardwood.
- Sea level – 100 metres.
- Intact native headwater catchment.
- Native riparian vegetation (regeneration/pristine).
- Stream size two metres or greater.
- Unimpeded migratory access.
- No known trout populations.
- Substrate/canopy/riparian cover present.

Stream health information was collected in the form of substrate, invertebrates, and algal cover. Substrate type was measured using a modified Wentworth scale (Bain *et al.*, 1985). A 2 metre-lead rope, calibrated into 10cm sections, was laid across the stream substrate. Dominant and sub-dominant substrate categories (bedrock/boulder/cobble/gravel/sand) were recorded from where the rope lay. Invertebrate samples were taken from all sites using a $1m^2$ kick-net in pool/run/rapid and then preserved in alcohol. These are later identified and categorised to give an idea of stream health. A visual estimation of the percentage of Algal cover was recorded. The report 'Periphyton of New Zealand streams: a field guide (NIWA, 1995)' was used to identify the algal communities present.

3.1.3 Juvenile Short-jawed Habitat

Greater effort was expended this year to try and find juvenile short-jawed kokopu while spotlighting, as recommended in the year survey report.

4. Results

4.1 DISTRIBUTION AND ABUNDANCE

Short-jawed kokopu were found in 27 of the 48 streams surveyed. Of these, 20 were new populations, previously undocumented. Seven of these were re-confirmed from existing records.

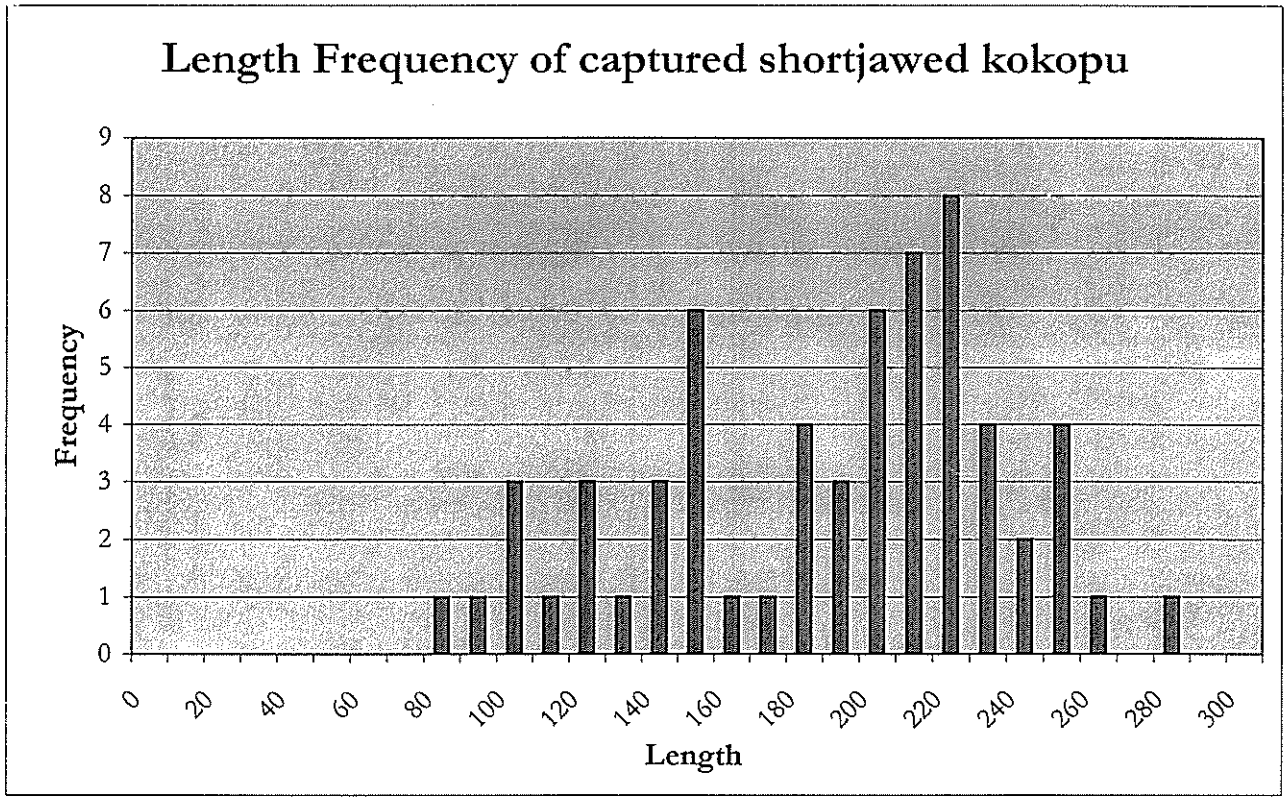
Clusters of populations occurred in four main areas (Fig. 1.), notably Croisilles Harbour, Tennyson Inlet, Endeavour Inlet and Nydia Bay. A total of 176 short-jawed kokopu were either caught or observed in surveyed streams, with 108 (18 sites) within conservation estate. Only four streams were sampled outside the Marlborough Sounds area, all north of Kaikoura. Of these, Ohau Stream had two short-jawed kokopu present.

Table 1 documents number, density (per/m^2), and stream area fished (m^2) of streams containing short-jawed kokopu, located using a spotlight. Three of the six highest population densities (Harvey Bay, Matai Bay and Duncan Bay) occur around Tennyson Inlet. In many of these streams groups of up to four individuals were occupying the

same pool. Two or less short-jawed kokopu per site were recorded from only seven of the 27 streams containing short-jawed kokopu.

Table 2 displays all other fish species captured or observed that were recorded during the survey. No trout were observed in any streams associated with short-jawed kokopu, and a complete absence of short-jawed kokopu was documented in D'Urville Island streams. Seven new populations of giant kokopu were discovered during short-jawed kokopu survey, four of these in co-habitation with short-jawed kokopu in streams with dense riparian vegetation at low elevations. Banded kokopu occurred at all but two of the sites (Cullen, Mt Camp) containing short-jawed kokopu, and were occupying the shallower margins of pools, runs and riffles. This species was also very abundant at many of the sites without short-jawed kokopu. Good distributions of Giant bullies and Dwarf galaxias were also noted. Short-jawed kokopu ranged in size from 80-280 mm TL (Fig. 2), with reasonable representation across all size ranges.

Figure 2



4.2 HABITAT AND LAND USE

Short-jawed kokopu were located in predominately coastal streams from 2 metres to 11 metres. Relatively few of these streams were unmodified in any way. Of the 46 streams surveyed, 27 ran through, at some stage, agriculture and/or silvaculture. Of these streams, over 50% (15) contained a population of short-jawed kokopu (Table 1).

Stream substrate was comprised mainly of a mixture of cobbles and boulders. Table 3 concentrates on the dominant cover types associated with streams in which short-jawed kokopu were recorded from during this survey. Substrate (large cobbles, boulders), canopy (overhead shade) and riparian (streambank vegetation) cover were generally preferred with substrate being the dominant form of cover utilised within the survey area. All streams surveyed were associated with podocarp/hardwood and beech/podocarp/hardwood as the dominant forest types.

4.3 JUVENILE AND SUB-ADULT HABITAT

Low numbers of juvenile and sub adult short-jawed kokopu (80-120mm) were widely represented throughout the Marlborough Sounds (Port Underwood, Pelorus Sound, Tennyson Inlet, Croisilles Harbour, and Endeavour Inlet). Big Bay and Endeavor Inlet were the only streams to have both juvenile and sub adults recorded from them. Preferred microhabitat of juvenile and sub adults included runs/pools associated with adults, eddies and smallholding areas within riffles, rapids and backwaters.

5. Discussion

5.1 DISTRIBUTION AND ABUNDANCE

The Marlborough Sounds has proven to be another strong hold for the short-jawed kokopu. The combined totals of Year 1 (96) and Year 2 (176) have surpassed that of the National 1996 Total (220) of short-jawed kokopu. The top of the South Island appears to be a national stronghold for this species, casting some doubt on its current category 'A' ranking.

Spotlighting at night continues to be an effective method of locating short-jawed kokopu. The results from the trial of electric fishing versus spotlighting during year-one of this project confirmed spotlighting to be the most appropriate method for this type of survey. The current low numbers of short-jawed kokopu records on the National Freshwater Fish Database may well be linked to survey technique, given the greater success rate of spotlighting over electric fishing for this fish species.

The size of short-jawed kokopu populations centered in Croiselles Harbour, Nydia Bay, Endeavour Inlet and particularly Tennyson Inlet indicate possible self-sustaining or core populations. As found in year one survey results, only a small percentage (26%) of survey sites had two or fewer fish present, which is contrary to the trend on the national freshwater fish database of 74%. A good representation of size ranges for short-jawed

kokopu, particularly juvenile and sub-adult across the survey area indicates ongoing recruitment is taking place within the populations. Juveniles less than 80 mm were not captured, however this is likely to be due to capture difficulty rather than an actual absence of this size range.

Unlike year one results, no streams with short-jawed kokopu present were found to have trout present. Three streams were sampled in the Pelorus river system, Mountain Camp Stream, a catchment of the Wakamarina River, Bryants and Bowns Creeks, tributaries of the Pelorus River. Bryants Creek, although having a pristine environment, held an abundant population of Brown trout. Bowns Creek ran through a dairy farm and had low numbers of Brown trout. No galaxias were recorded in these streams with only occasional red-finned bullies and long-finned eels being observed. Mountain Camp Stream is well known for its short-jawed population residing above a formidable series of waterfalls and torrents (McDowall *et al.*, 1996). Good numbers of a variety of native fish were observed in this stream including Dwarf Galaxias and Upland Bullies. This inland stream has an unusual fish fauna, possibly due to the natural migration barrier to brown trout in the form of a steep gorge. Promising habitat in streams on D'Urville Island, particularly Greville Harbour, were surveyed and revealed no short-jawed kokopu. One possible explanation for this could be the high level of ultra-maffic geology present on D'Urville Island, however further research is needed to answer this.

Discovery of seven new populations of the Category 'B' giant kokopu within the Marlborough Sounds, and the presence of Category 'C' banded kokopu at nearly all sites is a heartening result for the conservation status of these species also.

5.2 HABITAT AND LAND USE

The presence of short-jawed kokopu in 15 streams within the survey area draining agriculture and/or silvaculture indicates that short-jawed kokopu are able to inhabit streams with a certain amount of land modification, provided the stream originates from mature or regenerating native forest and remains relatively healthy. Future analysis of stream substrate, periphyton, and invertebrate samples may further quantify this.

At Tennyson Inlet and Nydia Bay the majority of lowland has been cleared for farming and while short-jawed kokopu were located upstream of these areas, they disappeared within the farmed areas below native forest. Some of these streams (e.g. Tuna Bay Stream) showed signs of degradation within the farmed area. Decreased riparian canopy, streambank instability and increased light levels in the lower sections resulted in avoidance of these areas by short-jawed kokopu, supporting findings by Caskey (1999). Generally, high periphyton levels were associated with these areas. Future analysis of the invertebrate samples and substrate data collected may give further evidence of stream health. These observations give weight to the need for streambank protection and/or enhancement in streams containing core populations of short-jawed kokopu presently located on private farmland. Fencing and/or planting assistance could be offered to landowners to sustain or enhance these populations.

Castor Stream (Croisilles Harbour) shows the importance of intact lowland forest for freshwater fauna. This stream has an incredibly high level of riparian vegetation sustaining short-jawed kokopu and a large population of giant kokopu. Other intact streams at Chance Bay, Matai Bay, Tawa Bay and Ngawhakawhiti Bay enforce the necessity of coastal valley floor reserves for the protection of freshwater fauna.

The use of stream substrate as the most preferred form of cover for short-jawed kokopu confirms earlier work done in this area (McDowall *et al.*, 1996). This preference may indicate why short-jawed kokopu are absent or rare from streams with a high bedload of sand and other material. As interstices fill, available cover for the species will become limited. However streams with high bedloads are also likely to have poor invertebrate composition, so the relative importance of this factor to short-jawed kokopu is not known. If other forms of cover exist such as canopy or riparian, the species appears able to use these as an alternative.

5.3 JUVENILE AND SUB-ADULT HABITAT

The capture of most juvenile short-jawed kokopu in eddies or small holding areas of rapids usually in higher gradient stretches of streams gives an insight into the apparent absence of this size range from most streams. It appeared that when approached these fish used broken (white) water for cover. This could be one reason why limited numbers of juveniles are being observed during surveys. This type of habitat preference makes finding these juveniles very difficult with a spotlight. It may be that these juveniles are occupying these areas to avoid predation or aggression by larger short-jawed kokopu or other fish species.

Although reasonably difficult to distinguish from juvenile banded kokopu at a glance, when approached cautiously, juvenile short-jawed kokopu evasive behaviour to the spotlight is not as rapid as that of a juvenile banded kokopu.

6. Recommendations

The long-term protection of Caster Stream should be discussed with landowners not only for short-jawed kokopu but the largest population of giant kokopu recorded so far within the Marlborough Sounds. Integrating this and other key streams into the Department of Conservation Recommended Areas for Protection (R.A.P.) process would be worthwhile, particularly those from Year 1 survey in Golden Bay, as land use there is very intensive. Funding for fencing/planting assistance could be sought so improved management of core short-jawed kokopu populations within or upstream of farmed areas can be undertaken in conjunction with willing landowners.

Continued effort to discover more data on juvenile and sub-adult habitat should be undertaken during final year.

Survey of upland streams in the backcountry of Mt Richmond Forest Park and Kahurangi National Park similar to Mountain Camp Stream should be undertaken to get a better idea of inland penetration of short-jawed kokopu. Investigation of Buller River tributaries using spotlighting would also be useful, particularly those where short-jawed kokopu records already exist, as this would give further insight into relative effects of brown trout on short-jawed kokopu populations.

7. Acknowledgements

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- Pip Aplin and Sam Leary for assistance in the field and sacrificing their social lives.
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- Jan Clayton-Green (Department of Conservation, Renwick).
- Faith Barber and staff (Department of Conservation, Kaikoura).
- Alan Price and Charmayne Devine (Department of Conservation, Nelson).
- And Residents and Landowners of the Marlborough Sounds for access onto their properties.

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TABLE 1: LOCATION AND DENSITY OF SHORTJAWED KOKOPU FOUND BY SPOTLIGHTING SURVEY TECHNIQUE. *INDICATES STREAMS WITHIN PRIVATE PROPERTY

STREAM	GRID REF.	SJK	AREA FISHED/ M^2	SJK/M^2	DIST. INLAND (KM)	ALTITUDE (M)
Waitohi	P27 940 882	1	1840	0.0005	2	40
Graham	P27 008 904	1	3200	0.0003	3.2	50
Stace	P27 984 847	6	1760	0.003	2	70
*Totaranui	P26 999 105	3	1360	0.002	3	80
*Anakoha	P26 053 145	5	2240	0.002	3	60
*Cullen	P27 816 865	2	1760	0.001	5.5	100
Duncan B	P27 748 078	12	1360	0.009	1.8	40
Tuna B	P26 714 114	9	4400	0.002	2	25
*Maori B	P27 787 033	17	2040	0.008	1	25
Chance B	P26 785 072	18	3320	0.005	0.5	20
Nydia (Q) B	P27 737 035	3	1080	0.003	1.5	30
*Nydia (M)	P27 755 019	7	1840	0.004	1.6	25
Nydia (R)	P27 749 057	1	1240	0.0008	0.5	15
Tawa B	P26 795 145	8	1224	0.007	0.5	20
Matai B	P26 776 117	13	1240	0.01	0.7	25
Waiona B	P26 834 224	1	1200	0.0008	0.3	20
Harvey B	P27 718 088	8	860	0.009	2.5	45
Ngawhakawhiti	P27 758 100	8	1160	0.007	0.2	20
*Kaimiko	O27 647 102	4	1840	0.002	0.5	10
*Ruataniwha	O27 658 098	13	1732	0.008	0.5	25
Pouawhariki	O27 664 108	3	1600	0.002	0.4	15
*Castor	O27 613 106	3	1600	0.002	1	10
Ship Cove	Q26 136 117	1	1760	0.0006	0.2	5
*Mt Camp	O27 644 845	4	2520	0.002	13	40
Endeavour In	P26 087 132	10	1960	0.005	0.7	20
Big Bay	P26 063 106	13	1240	0.01	0.5	5
Ohau	P31 785 844	2	1480	0.001	0.3	10

TABLE 2: SOME FISH SPECIES RECORDED DURING SURVEYS. *INDICATES POPULATION ON PRIVATE LAND

	GALAXIAS						GORBIOMORPHUS					OTHER SPECIES			
	Short-jawed kokopu	Banded kokopu	Giant kokopu	Koaro	Inanga	Dwarf galaxiid	Redfin bully	Blue-gilled bully	Giant bully	Common bully	Upland bully	Longfin eel	Comon smelt	Brown Trout	Torrent fish
Waitohi	✓	✓					✓					✓			
*Waikawa					✓		✓					✓			
Graham	✓	✓			✓	✓	✓					✓			
Stace	✓	✓		✓	✓	✓	✓					✓			
*Ahuriri		✓			✓	✓	✓								
Umungata		✓			✓	✓	✓								
Wheadows				✓			✓					✓			
*Kenepuru						✓	✓					✓	✓		
*Manaroa		✓		✓			✓					✓			
*Totaranui	✓	✓		✓			✓					✓			
*Anakoha	✓	✓	✓	✓		✓	✓					✓			
*Cullen	✓			✓			✓					✓			
Duncan	✓	✓		✓			✓	✓				✓			
Tuna	✓	✓					✓		✓			✓			
*Maori	✓	✓		✓	✓		✓		✓			✓			
Chance	✓	✓		✓	✓		✓		✓			✓			

TABLE 2 (CONTINUED)

	Short-jawed kokopu	Banded kokopu	Giant kokopu	Koaro	Inanga	Dwarf galaxiid	Redfin bully	Blue-gilled bully	Giant bully	Common bully	Upland bully	Longfin eel	Comon smelt	Brown Trout	Torrent fish
Nydia-Quins	✓	✓		✓	✓		✓			✓		✓			
*Nydia - Meads	✓	✓			✓		✓		✓	✓		✓	✓		
*Nydia - Pattons		✓	✓		✓		✓		✓			✓			
Nydia - Reserve	✓	✓	✓		✓		✓		✓			✓			
Tawa	✓	✓		✓			✓					✓			
Matai	✓	✓	✓		✓		✓		✓			✓			
*Wells Arm		✓			✓	✓	✓	✓							
Mill Arm		✓			✓	✓	✓		✓			✓			
*Whararíki		✓	✓		✓	✓	✓		✓			✓			
*Punt		✓			✓	✓	✓		✓			✓			
*Smylies		✓			✓	✓	✓		✓			✓			
Waiona	✓	✓		✓	✓	✓	✓		✓			✓			
Harvey	✓	✓		✓	✓		✓					✓			
Ngawhakawhiti	✓	✓		✓	✓		✓					✓			
Bryants							✓					✓		✓	
*Kaimiko	✓	✓	✓		✓		✓		✓			✓			
*Ruataniwha	✓	✓					✓					✓			

TABLE 2 (CONTINUED)

	Short-jawed kokopu	Banded kokopu	Giant kokopu	Koaro	Inanga	Dwarf galaxiid	Redfin bully	Blue-gilled bully	Giant bully	Common bully	Upland bully	Longfin eel	Comon smelt	Brown Trout	Torrent fish
Poutawhariki	✓	✓			✓		✓		✓			✓			
*Castor	✓	✓	✓		✓		✓		✓			✓			
Ship Cove	✓	✓		✓	✓	✓	✓					✓			
Colins R.		✓					✓					✓		✓	
*Bowns							✓					✓		✓	
*Mt Camp	✓					✓					✓	✓			
Pukaka						✓					✓	✓		✓	
Endeavor	✓	✓		✓			✓					✓			
Big Bay	✓	✓		✓	✓		✓	✓				✓			
Ohau	✓	✓		✓		✓									
*Rakautara				✓	✓		✓			✓		✓			
Irongate					✓			✓				✓			✓
Blue Duck		✓			✓							✓			

TABLE 3. STREAM COVER ASSOCIATED WITH SHORT-JAWED KOKOPU

DOMINANT		SUB DOMINANT 1		SUBDOMINANT 2	
	NO. STREAMS		NO. STREAMS		NO. STREAMS
Substrate	14	Riparian	10	Riparian	8
Canopy	8	Canopy	10	Canopy	6
Riparian	4	Substrate	6	Instream debris	5
Instream debris	1	Instream debris	1	Substrate	4
				Undercut banks	3
				Algae	1
Total	27		27		27