



Taihoru Nukurangi

A revised catch and effort form for the commercial freshwater eel fishery

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7. Executive summary

This document is a final report for work carried out under objective 4 of Ministry of Fisheries project EEL9701. The objective was to determine the most appropriate measures of fishing effort for the collection of commercial catch and effort data.

A trial catch and effort diary scheme, using prototype forms, was conducted in the lower South Island during 1996–97 and the central North Island during 1997–98. The intent of this diary scheme was to investigate an alternative scheme to the current multi-species multi-method catch effort landing return (CELR) for reporting catch-effort and landing data in the commercial eel fishery. In the South Island 10 fishers provided data from 419 fishing trips and 163 landings, and in the North Island 8 fishers provided data from 675 fishing trips and 133 landings. Catch Per Unit Effort (CPUE) data for all areas and methods was 2.72 and 3.06 kg/net-night for South and North Island respectively. CPUE varied markedly between Eel Return Areas (ERA), catchments and sub-catchments, indicating that, among other factors, CPUE is a function of location and demonstrates the value of recording location data at this level of detail. A new commercial freshwater eel fishery catch and effort form has been designed that is appropriate for both the North and South Islands. Key departures from the existing CELR form include: eel fishery specific, simplification, one form required per month, more detailed location data, changes to gear reporting, by-catch recording introduced, requirement to record landing data weights by species and fish stock, removal of non

relevant reporting fields. It is recommended that this form be adopted as the standard MFish commercial eel fishery catch effort landing form.

8. Objectives

Programme objective

1. To assess and monitor commercial eel fisheries

Objectives for 1997–98

1. To develop an optimal sampling design for the determination of size frequency of eels caught in commercial eel fisheries and the age of eels at the minimum legal size
2. To monitor the species composition, size structure, and age at the minimum legal size *and well above minimum legal size* of priority commercial eel fisheries by sampling 100 landings from the Waikato catchment in the fish processing sheds.
3. To monitor the species composition, size structure, and age at the minimum legal size *and well above minimum legal size* of priority commercial eel fisheries by sampling from 100 landings at the major eel processing shed in the South Island.
4. To determine the most appropriate measures of fishing effort for the collection of commercial catch and effort data.
5. To assess the feasibility of determining the current status of eel stocks in the priority commercial fisheries by analysis of size frequency data.

9. Introduction

The general consensus of the eel industry is that the fishery is showing signs of serial depletion in many areas, with fishers exploiting remote and previously unfished areas to meet the catch target of previous years. Additionally, despite the absence of detailed quantitative analyses of Catch Per Unit Effort (CPUE) data, which is generally considered to be flawed in the eel fishery, indications are that more effort is required to sustain current catch levels as fishers continue to exploit new and remote areas.

The lack of stock assessment data on the commercial eel fishery presents problems for fisheries managers in determining if the fishery is sustainable, and in making future decisions on TACCs, should eels move into the Quota Management System. Quality CPUE data is a valuable tool for monitoring trends in abundance in many fisheries. For the freshwater eel fishery CPUE is the only index of relative abundance that can be cost effectively measured. Indices of relative abundance based on CPUE could be used in Biomass Dynamic Models to estimate the optimal yield or maximum sustainable yield (MSY), information that would be very useful for managing the eel fishery.

Fishers are obliged to record catch and effort data as a part of their daily reporting requirements although the CPUE data are generally perceived by MFish and industry as being of a low standard. This may or may not be correct, but before CPUE can be used as a reliable index of relative abundance there must be confidence that gear and fishing methods have been standardised. This can be done during analysis of CPUE data but the way in which data is collected will have the greatest affect on the quality of the data. At present possible sources of error or noise in the data may result from some of the following:

- Inappropriate location data (some fishers record Eel Return Area (ERA) and others record Quota Management Area (QMA)).
- Variation in types of gear used (in the South Island different nets and baiting practices are used to target the two species. In the North Island fishers frequently use more than one codend but may record this as one fyke net.)
- Soak times vary between fishers and the affect that soak time has on catch has not been studied.
- Forms for recording catch and effort changed from Fisheries Statistics Unit (FSU) to Catch Effort Landing Returns (CELR) forms in 1989 resulting in a period of poor quality returns.
- Errors in recording have gone undetected and have been entered in the MFish catch effort database.
- The current CELR forms were designed more for marine species and associated fishing practices than for freshwater eels.

There is also a general lack of understanding on how to correctly fill out the CELR forms together with a degree of apathy on the part of commercial fishers. To some extent this can be ascribed to a lack of instruction by managers of the catch effort database. While some of these factors are database and educational/attitudinal problems, the objective of this research is to determine the most appropriate measures of fishing effort for the eel fishery.

Eel catches are currently reported by 23 Eel Return Areas (ERA), each comprising many catchments or river systems. Preliminary results of a mail survey to eel fishers in the South Island indicated that 60% of the catch was taken from only ten catchments (Beentjes and Chisnall 1997). Given that the eel fishery is made up of many independent non-spawning stocks, or populations linked only by spawning migration, and recruitment, it seems more appropriate to report catches in more detail such as by catchment or sub-catchment. This assumes particular importance since future management of the eel fisheries is likely to be catchment-based.

This is a Ministry of Fisheries Final Report for objective 4 of EEL9701 and includes results of 1996–97 (INEE01) objective 1 (*To develop an appropriate catch and effort data collection scheme for eels using a pilot survey*). The 1996–97 pilot survey was conducted in the South Island and the results were used to plan and implement objective 4 in 1997–98 which was carried out in the North Island. Based on the results, a new form and recommendations for future collection of catch and effort data throughout the country are provided

Although the objective was not necessarily to design a form that was administratively better or that was perceived as more user-friendly by commercial fishers, an attempt was made to address the latter issue as this would ultimately lead to improved quality of returns.

10. Methods

Based on discussions with the South Island Eel Industry Association (SIEIS) and individual eel fishers, a prototype catch and effort diary form was designed that was appropriate for the South Island commercial eel fishery (Appendix 1).

The key changes to this form compared to the current multi-fishery and multi-method CELR form are:

1. The form is dedicated and specific to the reporting requirements of the eel fishery.
2. Fishing location data are required by catchment and sub-catchment instead of the larger Eel Return Areas. (areas were determined in consultation with SIEIS).
3. Effort data are simplified and tailored to the eel fishery by requesting a) number of fyke nets lifted and b) number of nights fyke nets were in the water.
4. Gear type category was added with the option of specifying baited or unbaited. In the South Island, fyke nets are generally baited and have short leaders when targeting longfinned eels, and are unbaited with long leaders when targeting shortfinned eels.
5. A by-catch section was also trialed where fishers were asked to provide estimates of the numbers of by-catch species whether or not returned live.

Using this form, a trial catch and effort diary scheme was conducted in the lower South Island in 1996–97 with the cooperation of 13 volunteer fishers who agreed to fill out the new forms along-side their existing CELR form, for a season.

Based on discussions with the North Island commercial eel fishers and findings from the South Island pilot programme, a prototype catch and effort form was designed that was considered appropriate for the North Island commercial eel fishery (Appendix 2).

The North Island form was different from the South Island form in the following ways:

1. A section called 'Unchanging Data' was incorporated which allowed for one month's recording of catch and effort data on a single form providing that unchanging data remains constant.
2. Baiting practice was not recorded.
3. Numbers of codends were recorded as well as the number of fyke nets because some North Island fishers string multiple codends together attached to a single leader.
4. Estimates of quantities of by-catch species were requested by weight (kg) and not numbers.

Using this form, a trial catch and effort diary scheme was conducted in the central North Island in 1997–98 with the cooperation of 13 volunteer fishers who agreed to fill out the new forms along-side their existing CELR form, for a season.

Completed forms were posted to NIWA, data were checked for errors and transferred to a customised Excel database for analysis. Any comments on the forms were also noted. Based on the results an appropriate catch and effort form for the commercial eel fishery for both the North and South Island was designed.

11. Results

In the South Island, ten fishers completed the catch and effort diary (Appendix 1) between December and March 1997 providing data from 419 fishing trips and 163 landings (Table 1). In the North Island eight fishers completed the catch and effort diary (Appendix 2) between December 1997 and July 1998 providing data from 675 fishing trips and 133 landings (Table 2). The average number of fishing trips per landing was 2.6 in the South Island and 5.0 in the North Island.

CPUE relative to location

In the South Island (1996–97) the mean CPUE value (model A, kg/net-night; both species combined) for all areas and methods (baited and unbaited) was 2.72 kg/net-night (Table 1). CPUE calculated by ERA indicated that catches were substantially better in ERA20 than ERA19. A further breakdown by sub-catchment shows that CPUE also varied considerably between and within catchments. For example within ERA19, CPUE ranged from was 3.28 (19J, Waipori Lakes/Lake Mahinerangi) to only 0.91 (19L, Pomahaka River). Within ERA20 the greatest CPUE values were 5.55 (20H, lower Aparima River) and 4.99 (20D, upper Maitai River above Waikaiti branch), and the lowest was 2.06 (20G, upper Aparima River). Within catchments, CPUE ranged from 2.05–5.55 (Aparima River), 2.71–4.12 (Oreti River), 2.34–4.99 (Maitai River), 1.36–3.28 (Taieri River), and 0.91–1.78 (Clutha River).

In the North Island (1997–98) the mean CPUE value (model A, kg/net-night; both species combined) for all areas was 3.06 kg/net-night (Table 2). CPUE calculated by ERA indicated that catch rates were highest in ERA3 and ERA6, and poorest in ERA5. A further breakdown by sub-catchment indicates that, like the South Island, CPUE also varies considerably between and within catchments. For example within ERA4, CPUE ranged from 5.03 (4I, Lake Karapiro Dam to Huntly) to only 0.09 (4E, Lake Maratai). Only the Waikato River catchment yielded returns from more than one sub-catchment.

Baiting and gear type

In the South Island baited nets with short leaders are generally used to target longfinned eels and unbaited nets with long leaders are used to target shortfinned eels. There was little difference in CPUE for baited and unbaited nets in the South Island indicating that catch rates of the species are similar (Table 1). The estimated percentage species composition for baited and unbaited combined was 84% longfin and 16% shortfin, For fyke nets that were baited, it was 96% longfin and 4% shortfin, and unbaited 10% longfin and 90% shortfin. These percentage species composition figures are consistent with those obtained from the South Island Eel catch sampling programme (*see* Beentjes and Chisnall 1997, Beentjes and Chisnall 1998). Those fishers targeting shortfins tend to fish known shortfin habitat and therefore the swing

in percentage species composition between baited and unbaited is not entirely due to the preference for longfins to be attracted to bait as shortfins can also be caught using bait. The key variable to record is the target species rather than whether bait was used or the length of the leader.

Species composition is generally more even in the North Island and the reliance on baiting to target longfinned and long leaders to catch shortfinned is not as pronounced. The percentage species composition from the North Island was 39% longfin and 61 % shortfin. Indeed most fishers maintain that they target the species equally and this has little to do with baiting practice. Consequently baiting was not considered to be an important variable and was not recorded in the North Island.

In the North Island some fishers used more than one codend per fyke net (Table 2). This practice was largely confined to Lake Karapiro and Tauranga Harbour.

Soak time

In the South Island the mean soak time was 1.7 nights and the median was 1.0 although the maximum was 20 nights. In the North Island the mean soak time was 1.3, the median was 1.0 and the maximum was 5 nights. CPUE was calculated per net-night and per lift (Table 1 & 2). In the South Island kg/lift for all areas combined was 32% higher than kg/net-night, but only 8% higher in the North Island. The latter figure reflects the lower mean soak time used in the North Island. Therefore, the inclusion of nights fished, when nets have been left soaking for long periods, can have the effect of giving very low values of CPUE. Most frequently however, nets are only left overnight with a requirement in the regulations to check nets at least every 24 hours.

By-catch

Fishers filling out the diary had no problems recording by-catch species as requested. In the South Island eight by-catch species were recorded. Brown trout, perch and freshwater crayfish accounted for more than 80% of the total numbers of by-catch species caught. Only 0.2% were listed as unidentified or other (Table 3). In the North Island seventeen species were recorded and the total weight was 19.4 t with catfish and goldfish accounting for 90% of the total weight (Table 4).

How accurate are fishers estimates of catch weights

Fishers were asked to provide details of total estimated weight and species composition. Comparison of estimated versus actual weights (i.e., LFR weight) indicated that North fishers estimates were only 0.9% less than landed weights provided by LFRs and in the South Island this figure was 0.7%. There is currently no way of assessing the accuracy of fishers estimates of species composition since eels are landed into LFRs as mixed species and LFRs only provide fishers with a single weight which can include two species in the South Island and three species in the North Island. (LFRs were not requested to provide individual species weights during this trial). However, based on the high degree of accuracy that fishers are able to estimate catch weights, it seems reasonable to conclude that they could also provide acceptable estimates of species composition.

Compliance issues

It is important that any new catch and effort form meet compliance requirements, particularly if eels are managed under the QMS. Discussions were held with MFish Compliance staff in Dunedin on the proposed form. The requirement to record container type, number and weight has been removed as this is not relevant to the eel fishery. The landed state column was also removed since eels are always landed live and weights are always greenweight. Similarly destination has been removed as this is always LFR. Of most concern to compliance was the need to ensure that landings are reported accurately from the area they were caught. In some cases landed catches may come from more than one ERA (or equivalent quota management) and it is important that weights from LFRs be reported both by species and by management area. The proposed form provides for this option.

Consultation and feedback

Fishers provided positive feedback and details of anomalies in individual fishing practices that were taken into account when designing the catch and effort form. Most fishers are concerned with the complexity of the current form and the need to repetitively record unchanging data every time a landing is made, particularly since many fishers land fish daily.

Preliminary results of the South Island pilot were presented to Te Waka a Maui me ona Toka Mahi Tuna – Eel Management Committees (Christchurch, 21 March 1997) and the South Island Eel Industry Association conferences (Invercargill & Christchurch, 14 and 16 Oct 1997, respectively). Results to date were also presented to the Eel Stock Assessment Working Group meetings in Hamilton and Christchurch in February-March 1998.

The proposed eel fishery catch and effort form

Based on the results of the diary programmes in 1996–97 and 1997–98 a new catch and effort form has been designed specifically for the eel fishery (Appendix 3) and we recommend that this replace the current CELR. Explanatory notes are provided that describe the information required in each field. The main advantages of this form are that it is eel fishery specific (no template is required), it has been simplified, and only one form will be required per month as long as unchanging data remains constant. For example if a fisher lands into more than one LFR, or fishes from more than one vessel in a month, then more than one form will need to be completed. These situations are however uncommon.

The following points should be noted:

1. The incidence of *Anguilla rheinhardtii* in North Island commercial catches continues to increase and therefore we have made allowance for this in the new form using the code ALE which has been entered into the MFish species codes database. This allows for the option of having this species recorded at some time in the future.
2. The method is assumed to be fyke net in all cases but if other methods are used in the future there is the option of including a section in unchanging data that could include method.

3. A key feature of this form is the requirement for LFRs to provide weights by species and by ERA (or equivalent management area if this should change) at the time of landing.
4. The destination of all landings is assumed to be LFR. Unlike other fisheries, wharf sales or sales direct to retailers are not known to occur.
5. All eels are landed live and therefore landed state is always greenweight.
6. If by-catch are to be recorded, official MFish species codes will need to be determined for by-catch species where these do not already exist.
7. If the catchment area concept of recording catch and effort location data is adopted, the remainder of the South Island and North Islands will need to be sub-divided along the lines of catchment and sub-catchment based on appropriate consultation with commercial fishers and Iwi.

12. Discussion

A new catch and effort form, specific to the commercial freshwater eel fishery, has been designed that is user friendly, will satisfy MFish reporting and compliance requirements, and ensure that the catch and effort data will be meaningful for determining trends in CPUE.

Location

The data indicate that CPUE within catchments is likely to be a function of location and demonstrates the value of recording location data at this level of detail. It has the added advantage that it can be analysed by sub-catchment, catchment, multiple catchments or even by historical Eel Return Area. CPUE is also affected by such factors as fisher experience, lunar cycle, barometric pressure, rainfall and water temperature (Jellyman 1991), but these are outside the scope of any reporting scheme.

Gear type and baiting

Because fishers often make their own nets or have them customised to their particular needs, it would not be practical or meaningful to record gear specifications. There are always likely to be exceptions to fishing practices and this is highlighted by the difference between North and South Islands where the latter fishery is more targeted using leaders or baiting. The method of capture common to all areas is the fyke net and it seems reasonable to assume that they have similar catchability throughout the country. The number of codends however can vary per net and this variable should be recorded. Only the introduction of a new or markedly different type of fishing net would require this to be reviewed. In the South Island particularly, where shortfin and longfin fisheries are generally geographically separate, it is also important to record target species.

Soak time

CPUE is generally determined using the model kg/net-night, however the majority of eels are generally caught in the first night and any subsequent nights do not add significantly to the total catch (pers. comm. Victor Thompson, Mike Holmes, commercial eel fishers). As anecdotal evidence indicates that catch is not proportional

to the soak time, kg/lift may be a better indicator of CPUE than kg/net-night. The real CPUE is probably lies somewhere between these models but without research to determine the importance of soak time it may be prudent to retain this variable in the new catch and effort form.

Weight and species composition estimates

If eels are managed under the QMS as separate species there will need to be an accurate method of recording weights of each species including the third species, *Anguilla reinhardtii*, which is becoming more common in North Island landings. Although analysis of the return data indicate that fishers are capable of estimating catch weight with a high level of accuracy, fishers estimates of species composition are likely to be influenced by a fishers quota holdings and misreporting is inevitable. The sensible alternative is to have LFRs sort and weigh eels by species and although there is reluctance to do this at present, it is achievable and should be a legal requirement.

By-catch

Like most net-based fisheries, there is a component of by-catch associated with the use of fyke nets to catch eels, although much of this by-catch is returned alive. Currently, this by-catch information is not being recorded by fishers. The proposal to include by-catch as a requirement on the new forms has strong support from DoC and at the two South Island eel industry conferences a vote of members indicated majority support for the proposal. There was some opposition from Te Waihora eel fishers where by-catch of bullies and flounders can often exceed the catch of eels. By-catch information has value in that the spread of introduced species such as catfish, goldfish and koi carp can be monitored. In addition, it can provide information on the distribution and relative abundance of native species; data that can be added to NIWA's freshwater fish database.

13. Recommendations

1. That the form shown in Appendix 3 be adopted as the standard MFish catch effort form routinely filled out by commercial eel fishers in both the North and South Islands, replacing the existing CELR.
2. That this form be reviewed after one year to look for any problems or anomalies in its use.
3. That the managers of the eel catch and effort data recording system become more pro-active in educating fishers to fill out these forms correctly. This seems especially important in this fishery where the incidence of unintentional errors is particularly high, seriously compromising the value of existing CPUE data for eels.
4. That error checking and validation of data be improved to ensure that all data entered onto the catch effort database is of high quality. At minimum these need to be checked intensively for the first year that the new form is in place to identify problems which can be corrected the following year.
5. That until such time as new catch effort form is introduced, MFish request more detailed catch position data (catchment areas) from fishers. The data can be entered into the position field of the CELR form.

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Publications

None

14. Data Storage

All electronic data and raw data forms are archived in NIWA Greta Point to the standards and specifications of NIWA data fisheries managers.

Table 1: Eel effort and estimated catch data for the lower South Island in 1996–97 from 10 fishers filling out the trial catch and effort form. Data from Eel Return Areas and Catchment Areas were from all fykes whether baited or unbaited. Means were calculated by determining CPUE for each fishing trip and then by averaging for all trips. Model A, CPUE kg/net-nights; Model B, CPUE kg/lifts; s.e., standard error.

Area	Catchment description	Fishing trips	No. lifts	No. nights	Total catch (kg)	Model A CPUE		Model B CPUE	
						Mean	s.e.	Mean	s.e.
All ERAs combined									
Baited	Otago/Southland	363	13255	537	37280	2.74	0.11	3.21	0.11
Unbaited	Otago/Southland	54	982	196	5782	2.68	0.39	6.07	0.63
Baited or unbaited	Otago/Southland	419	14292	737	43163	2.72	0.10	3.59	0.14
Eel Return Areas									
ERA 19	Otago	211	7671	368	16551	1.89	0.11	2.67	0.18
ERA20	Southland	205	6560	358	26482	3.61	0.16	4.54	0.19
Catchment Areas									
20F	lower Waiau River	2	62	2	180	2.53	1.03	2.54	1.04
20G	upper Aparima River	8	129	21	595	2.06	0.72	4.85	0.65
20H	lower Aparima River	6	220	7	1282	5.55	1.49	5.73	1.40
20I	lower Oreti River	17	454	18	1980	4.12	0.41	4.22	0.39
20C	upper Oreti River	9	232	22	1120	2.71	0.67	4.67	0.58
20K	lower Mataura River	134	4818	198	18445	3.58	0.19	4.49	0.27
20J	middle Mataura River	22	522	74	2110	3.31	0.5	4.04	0.37
20D	upper Mataura River	6	96	13	580	4.99	1.74	6.90	1.17
20E	Wakaia River	1	27	3	190	2.34	–	7.04	–
19M	Catlins	23	737	41	1355	1.40	0.23	2.08	0.26
19I	lower Taieri River (Plains)	5	139	22	660	1.36	0.61	4.40	1.40
19J	Waipori lakes/L. Mahinerangi	34	691	116	4118	3.28	0.52	6.12	0.75
19K	lower Clutha River	95	3988	117	5992	1.57	0.11	1.72	0.11
19L	Pomahaka River	35	1416	45	2906	0.91	0.15	2.35	0.24
19B	Lake Wakatipu	19	700	27	1520	1.78	0.22	2.14	0.19
18E	lower Waitaki River	2	55	4	100	0.90	0.14	1.80	0.20

Table 2: Eel effort and estimated catch data for the North Island in 1997–98 from 8 fishers filling out the trial catch and effort form. Means were calculated by determining CPUE for each fishing trip and then by averaging for all trips. Model A, CPUE kg/net-nights; Model B, CPUE kg/lifts; s.e., standard error.

Area	Catchment Description	Fishing trips	No. lifts	No. codends	No. nights	Total catch (kg)	Model A CPUE		Model B CPUE	
							Mean	s.e.	Mean	s.e.
Eel Return Areas										
ERA2	Auckland	9	240	240	9	385	1.65	0.38	1.65	0.38
ERA3	Hauraki	63	812	812	65	4422	5.96	0.42	6.04	0.42
ERA4	Waikato	543	14168	14390	713	33487	2.81	0.13	3.11	0.13
ERA5	Bay of Plenty	35	317	572	47	1025	1.49	0.21	1.82	0.22
ERA6	Poverty Bay	10	107	107	10	620	5.79	0.60	5.79	0.60
ERA8	Rangitikei-Wanganui	4	43	43	4	170	3.64	0.85	3.64	0.85
All ERAs combined		675	15907	16384	861	40949	3.06	0.12	3.32	0.12
Catchment Areas										
3A	Piako River	33	420	420	34	2252	6.16	0.69	6.18	0.68
3B	Waihou River	30	392	392	31	2170	5.75	0.45	5.89	0.45
4E	Waikato River (Lake Maraetai)	2	40	90	2	7	0.09	0.01	0.09	0.01
4F	Waikato River (Lake Waipapa)	4	187	187	4	150	0.82	0.38	0.82	0.38
4G	Waikato River (Lake Arapuni)	28	1633	1633	28	1860	1.20	0.10	1.20	0.10
4H	Waikato River (Lake Karapiro)	31	944	1114	32	1447	1.50	0.16	1.51	0.16
4I	Waikato River (Karapiro Dam to Huntly)	63	1091	1091	108	4349	5.03	0.79	5.73	0.75
4J	Waikato River (Waipa River)	174	4555	4557	188	12759	3.56	0.20	3.66	0.19
4K	Waikato River (Huntly to Meremere)	109	2347	2347	123	4375	2.15	0.25	2.27	0.25
4L	Waikato River (below Meremere)	75	2212	2212	162	4190	1.05	0.09	2.09	0.15
4N	Kawhia Harbour	5	108	108	5	315	2.83	0.20	2.83	0.20

Table 2 – *continued*

Area	Catchment Description	Fishing trips	No. lifts	No. codends	No. nights	Total catch (kg)	Model A CPUE		Model B CPUE	
							Mean	s.e.	Mean	s.e.
Catchment Areas										
4P	Awakino River	21	424	424	24	2305	2.65	0.26	2.81	0.23
4Q	Mokau River	31	627	627	37	1730	3.33	0.32	3.58	0.30
5A	Tauranga Harbour	32	272	526	44	895	1.39	0.21	1.75	0.23
5B	Kaituna River and Tarawera River	3	45	46	3	130	2.56	0.84	2.56	0.84
6A	Waioeka River and Nukuhou River	10	107	107	10	620	5.79	0.60	5.79	0.60
8B	Wanganui River (Taumaranui to Pipiriki)	4	43	43	4	170	3.64	0.85	3.64	0.85

Table 3: Total numbers and percent of by-catch species caught in fyke nets recorded by South Island eel fishers filling out the catch and effort diary in 1996–97

By-catch species	Total number	Percent total number
Brown trout	2179	42.5
Perch	1217	23.8
Freshwater crayfish	1004	19.6
Kokopu	334	6.5
Bully	224	4.4
Flounder	135	2.6
Rainbow trout	17	0.3
mullet	4	0.1
Other	8	0.2

Table 4: Total weight and percent of by-catch species caught in fyke nets recorded by North Island eel fishers filling out the catch and effort diary in 1997–98

By-catch species	Weight (kg)	Percent weight
Catfish	15568.9	80.16
Gold fish	1854.8	9.55
Koi carp	961.8	4.95
Rudd	562.3	2.89
Brown trout	167.5	0.86
Freshwater crayfish	93.3	0.48
Bully	61.4	0.32
Flounder	45.0	0.23
Mullet	27.0	0.14
Carp	26.8	0.14
Yellow eye mullet *	24.0	0.12
Kokopu	9.6	0.05
Rainbow trout	9.0	0.05
Perch	4.0	0.02
Yellow belly flounder *	3.8	0.02
Tench	2.3	0.01
Sand flounder *	2.0	0.01
Total	19423.3	

* Identification not certain

Appendix 1: Catch effort diary form trialed in the South Island in 1996–97.

SOUTH ISLAND EEL FISHERY CATCH EFFORT DIARY

Date

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Day Month Year

Name of permit holder:

Name of fisher (if different): _____

Permit Number							
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Vessel Name: _____ Vessel Reg. No.

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Catch Effort Data

[illegible]

Landing Data

Landing date	Fishstock Species/area	Landed state	Containers			LFR Destination	LFR Number	Green weight (kg) (from LFR)
			Number	Type	Wt (kg)			
/ /								
/ /								

Signature of fisher: _____

Appendix 2: Catch effort diary form trialed in the North Island in 1997-98.

NORTH ISLAND EEL FISHERY CATCH EFFORT DIARY

Daily catch and effort data

Landing data

Page 1 of 2

Fishing Position			Gear		No. of nights set	Target Specie	Total eel catch (kg)	% LFE	% SFE	Estimate of by-catch species (kg)					Fishstock	Processe state	No. of containers	Container content weight (kg)	Green - weight (from LFR) (kg)	Purchase tax invoice number (from LFR)	Masters initials
Date Nets Lifted dd/mm/yy	Eel return area (ERA)	Map ref. number (see map)	No. of fyke nets lifted	No. of codends used						Species weight	Species weight	Species weight	Species weight	Species weight							
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Unchanging data

LFR number fish landed to	Vessel registration number	Name of vessel	Permit number	Name of permit holder	Name of master (if different)	Signature of master	Date signed Day Month Year
							/ /

Appendix 3: Explanatory notes, the proposed eel fishery catch and effort form, and South and North Island maps showing catchment reporting areas used in the trial catch effort diary programme.

Freshwater eel Catch and Effort Landing Return (Eel CELR)

Explanatory notes

The freshwater eel catch and effort landing return shall be completed in accordance with the requirements of the Fisheries (reporting regulations) 1990. These explanatory notes are to assist you in completing the return. If after studying the regulations and these notes you are unsure of how to complete the return please consult a registrar of fisheries.

Completing the Freshwater eel Catch and Effort Landing Return

Begin a new form at the start of each calendar month and only one form is required per month unless unchanging data alters. This form is appropriate for fishers fishing from either a vessel or from land.

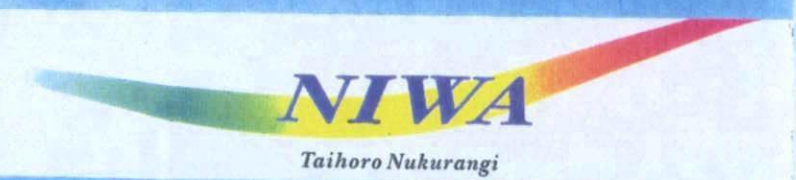
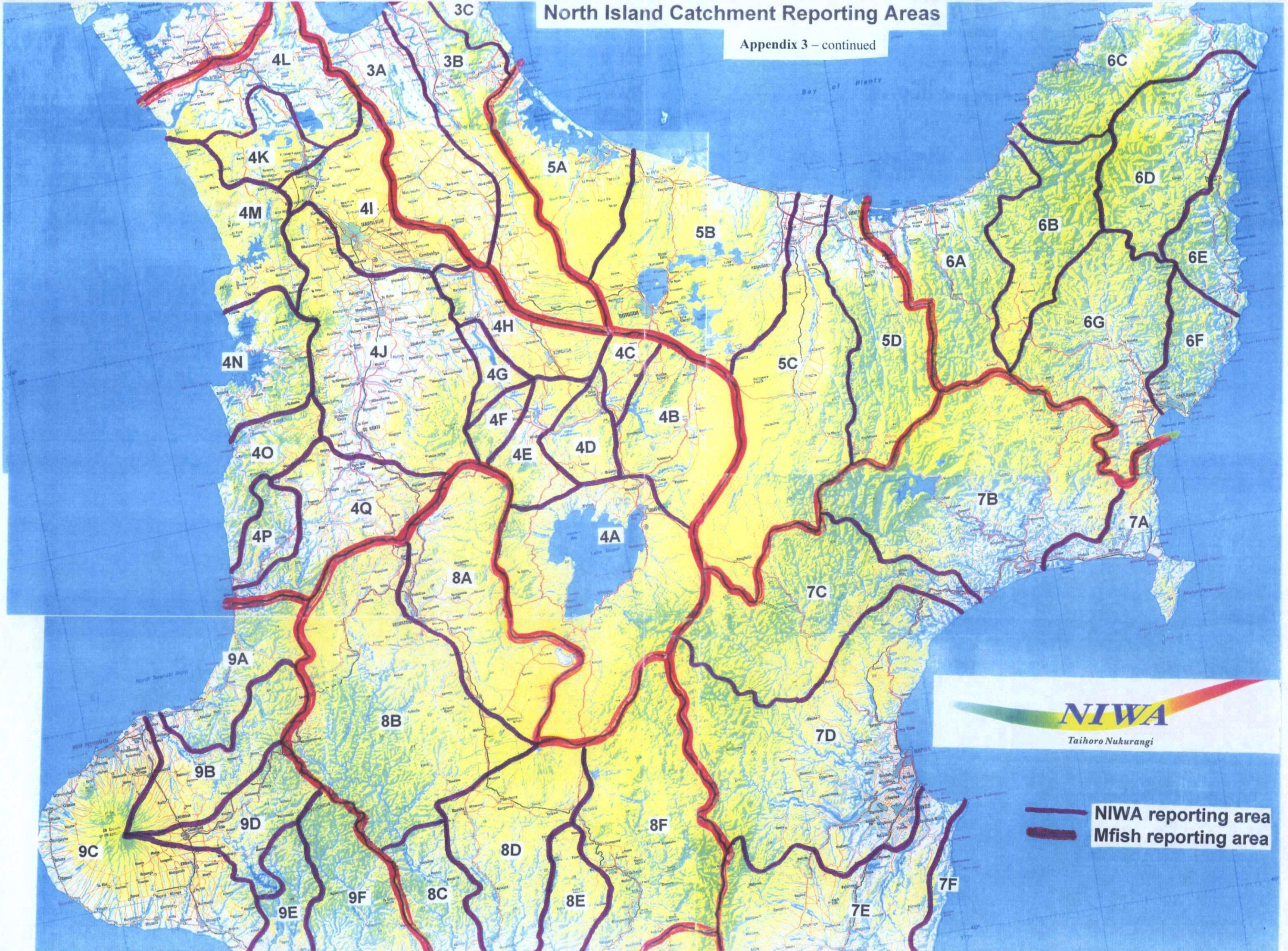
- 1. Unchanging Data** – fill out this section first. If any details given in this section change during the month then you need to begin a second form. For example, if you land into more than one LFR or fish from more than one vessel.
 - 1.1 LFR number fish landed to:** enter the FIN number assigned by MFish of the licensed fish receiver to whom the fish were landed.
 - 1.2 Vessel registration number:** Enter the registration on your vessels MFish Certificate of Registry.
 - 1.3 Name of vessel:** Enter your vessels name, i.e. the name of the vessel as entered on its certificate of Registry or Licence.
 - 1.4 Permit number:** Enter the FIN number, assigned by MFish, of the holder of the permit under whose authority the vessel or fisher is fishing.
 - 1.5 Name of permit holder:** Enter the name (initials and surname, or company) of the holder of the permit under whose authority the vessel or fisher is fishing.
 - 1.6 Name of fisher (if different):** Enter the name of the person who had authority to fish under the permit if this is not the permit holder.
 - 1.7 Signature of permit holder:** The permit holder must sign the return.
 - 1.8 Date signed:** Enter the date on which the return was signed by the fisher.
- 2. Daily Catch Effort Data** – this section must be filled out after each days fishing and a new line for each day should be used.
 - 2.1 Date nets lifted:** enter the date that nets were lifted.

Appendix 3—continued

- 2.2 **Catchment code (see map):** Enter the code given on the map provided that corresponds to the catchment area where the eels were caught. Note that the number corresponds to eel return area (ERA) and the letter to catchment or sub-catchment.
 - 2.3 **No. of fyke nets lifted:** Enter the number of fyke nets lifted during that day.
 - 2.4 **No. of codends used (if different):** Enter the number of codends used if this is different from the number of fyke nets.
 - 2.5 **No. nights set:** Enter the number of nights that nets were in the water. This assumes that all nets were in the water for the same number of nights. If not then use a new line so that number of fyke nets lifted and the number of nights set are the same. For example if 40 nets are set and 30 lifted the next day, and 10 the following day then you would use two lines, one with 30 nets lifted and 1 night, the next line with 10 nets lifted and two nights.
 - 2.6 **Target species code:** Enter the species code of the eel species that you were primarily attempting to take, i.e. LFE, SFE, ALE. Otherwise enter EEU.
 - 2.7 **Estimated catch weight:** Enter an estimate of weight (kg) of each of the three species LFE, SFE or RHE. An entry is only required where the eel species was present in the catch.
 - 2.8 **Estimate of non eel by-catch species (kg):** Enter the species codes (top) and estimated weight of non-eel by-catch species (bottom) whether returned dead or alive to the water or whether taken during that day.
3. **Landing Data** – this section should be completed on the day eels are landed into the Licensed Fish Receiver (LFR). Enter landing data along side the last entry into Daily Catch and Effort Data prior to the landing.
- 3.1 **Fish stock Eel Return Area (ERA):** Enter the Eel Return Area (ERA) where these eels were caught. Use more than one line when fish are landed from more than one ERA.
 - 3.2 **Landing date:** Enter the date that eels were landed into the LFR.
 - 3.3 **Green weight (from LFR):** Enter the greenweight (kg) for LFE, SFE and ALE when advised by the LFR.
 - 3.4 **Purchase tax invoice number (from LFR):** Enter purchase tax invoice number when advised by LFR.

North Island Catchment Reporting Areas

Appendix 3 – continued



NIWA reporting area
Mfish reporting area

Lower South Island Catchment Reporting Areas

NIWA

Taihoro Nukurangi

Appendix 3 – continued

