



# Review of ancillary sources of information that could be used to inform recreational harvest estimates

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## EXECUTIVE SUMMARY

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This report provides a review of ancillary sources of information that could be used to improve the reliability of estimates provided by surveys specifically designed to quantify levels of recreational fishing effort and harvest. Some of the data reviewed here are derived from reporting regimes designed specifically to provide information on catch and effort by subcomponents of the non-commercial fishing sector, whereas other information sources provide data on a wider range of activities and circumstances that are indirectly related to recreational fishing. The data sources with the greatest potential are those designed to collect catch/effort data from specific sectors of the non-commercial fishing community.

A charter boat reporting regime was introduced on 1 October 2010 which could potentially provide useful information on harvests taken from charter boats – it is critical that this system is improved and made more comprehensive if recreational fisheries harvests are to be robustly estimated and monitored. This report provides the first external review of data initially provided by this regime, and several recommendations for its improvement are made. Further and ongoing effort is clearly required before these data can be readily used with confidence, but these data will make a useful contribution to recreational fisheries management if key recommendations are implemented.

Some commercial fishers fish recreationally from commercial fishing vessels and are required to report their recreational catches separately when filling out statutory catch/effort returns for that trip. Commercial catch/effort reporting systems are long established and recreational harvest data derived from this source are probably reasonably accurate. Some data grooming is still required however as recreational harvest weights reported for a small number of trips are implausibly high.

Fisheries officers and honorary fisheries officers routinely record data during compliance operations that are held on a common database. These data appear to be largely error free but little can be inferred about levels of recreational harvesting from the data available, because compliance operations occur in a targeted and non-random manner. Perhaps the best use of these data is that they give some indication of possible levels of non-compliance by non-commercial fishers, which is not usually detected by any other information source.

Data provided by four complementary customary reporting systems during the 2010–11 year have been reviewed, although these harvests are not considered to be recreational harvests. Although this data source is informative, harvests are reported in a range of metrics which are often semi-quantitative thus limiting the ultimate utility of any data provided.

The Ministry for Primary Industries commission creel surveys for a variety of reasons which do not necessarily include estimating recreational harvests. Most of these surveys are conducted over periods of 12 months or less, but two creel survey programmes have collected data over longer time frames, and give valuable insight into trends in the nature and extent of the recreational fisheries surveyed. It is recommended that standardised questions should be asked in all future MPI creel surveys irrespective of research provider to maximise the long term value of any data collected.

Harvest estimates are also provided for three commonly caught gamefish species: striped marlin, mako blue sharks and broadbill swordfish. These estimates are based on statistics provided by the New Zealand Sport Fishing Council. These are likely to be the most accurate harvest estimates available for these species (because catches of these species are rarely reported or observed during on-site or off-site survey programmes).

Web cameras have been installed overlooking several boat ramps in FMAs 1, 8 and 9. These systems provide a means of monitoring temporal trends in fishing effort over the long term, which can inform the comparison of survey based harvest estimates generated years apart.

Two large scale survey programmes have also been reviewed here: surveys conducted on behalf of Sport and Recreation New Zealand (SPARC) on the nature and extent of recreational physical activity; and annual Domestic Travel Surveys managed by MBIE that collect information on medium to long range domestic travel. Neither of these surveys are considered to be useful in this context, as they only collect information on aspects of fishing effort and catch, and there is no way of scaling any of the estimates that they provide to generate reliable absolute estimates of effort. The utility of weather data are also discussed.

This review concludes that although targeted surveys have provided the most reliable estimates of total recreational harvest available to date, some of the data sources examined here could provide more accurate estimates for some aspects of the recreational fishing community, such as that taken by commercial fishers and from some charter boat fisheries. This is because these information sources are targeted specifically towards those subcomponents of the recreational fishing community, which are poorly sampled by other survey methods.

## **1. INTRODUCTION**

Fisheries managers require reliable estimates of recreational harvest to set sustainable catch limits for inshore fish stocks, and to allocate these catch limits between sectors of the fishing community. Survey techniques are required to estimate recreational harvest levels because recreational fishers are not required to report their catch. In recent years considerable effort has gone into developing and improving a range of on-site and off-site survey based methods that can be used to estimate recreational harvests over differing spatial scales, culminating in an extensive multi-survey comparative study in 2011–12 (Wynne-Jones et al. 2014, Hartill et al. 2015). Comparisons of harvest estimates provided by these surveys suggest that they generate broadly comparable harvest estimates which are considered to be reasonably reliable (Lyle & Pollock 2013, Hartill & Edwards 2015).

This review explores other data sources that are not typically used when estimating recreational harvests, to determine the extent to which they could help improve the accuracy of survey based harvest estimates, or to shed light on specific aspects of the recreational fishery, especially in the context of the total non-commercial harvest. Each information source is described and reviewed in turn, followed by an overview of how potentially useful data sources could be used to augment and improve on-site and off-site survey based harvest estimates. An assessment of each data source is also made against the MPI standard for fisheries research science and information (Ministry of Fisheries 2011)

The overall objective of this research within the Ministry for Primary Industries recreational fisheries research portfolio was to contribute to the design and implementation of an integrated recreational fisheries harvest estimation system. The specific objectives of this research project were to provide a methodology for incorporating multiple data sets and/or partial harvest estimates into robust recreational harvest estimates, to apply the methodology to key fishstocks

for the 2011/12 fishing year (01 October start), and, to evaluate the methodology and its fit to a large-scale multi-species harvest estimation system.

## 2. AMATEUR CHARTER VESSEL – ACTIVITY CATCH RETURNS

The Amateur Charter Vessel–Activity Catch Return (ACV–ACR) system was first introduced on 1 October 2010. All charter fishing vessels are required to register annually with the Ministry for Primary Industries, although it is possible that a small number of operators are not currently registered. The number of registered vessels initially peaked at 360 but this total has since declined by about 15%.

All charter vessel operators are required to report on fishing activity: target species, fishing method, number of fishers, area fished (derived from reported latitude/longitude) and time spent fishing. They are required to fill out a return form for each fishing trip (see Appendix 1), and to provide information every time they change the fishing method, target species or fishing location (by more than 6 nautical miles). Each form provides space to record activity data for three of these “fishing events”, and operators only rarely require a second form to record information for any additional events that occur on that trip. Charter operators are still required to submit nil returns if they do not go fishing during the month.

Operators are also required to report catches of specific species in specific areas, and this requirement has changed over time (Table 1). Catches from these fisheries must be reported in terms of numbers caught and retained. Operators are also required to estimate the weight of any southern or bluefin tuna retained or released, but many also voluntarily report estimated catch weights for other species.

**Table 1: Fisheries Management Areas (FMAs) in which charter vessel operators were required to report catches of specific species, by fishing year.**

Species	Fishing year		
	2010–11	2011–12	2012–13
Bluenose	–	–	All
Blue cod	7	7	2,3,4,5,6,7,8
Hapuku/bass	–	1	All
Kingfish	–	1	All
Rock lobster	7*	7*	All
Southern bluefin tuna	7	1,7	All
Pacific bluefin tuna	7	1,7	All

\* Only covers rock lobster statistical reporting areas 916, 932, and 933 of CRA 5, but not 917 to 919.

Many operators also voluntarily provide catch information for other fisheries, but there is no reliable means of scaling up these reported harvests to take into account the harvest taken by other vessels that did not voluntarily report catches from the same fishery.

The following summary statistics are for the 2011–12 fishing year only. The data for this fishing year were provided by MPI in a raw ungroomed format, as this is the only form in which they were available, although the management of these data is currently being reviewed by MPI. Data have been punched as provided on the forms, without any attempt to enforce validation rules. This means that data were often entered into the wrong field, and incorrect or informal codes were entered without any errors being raised. Some grooming was therefore required

including: standardising informal species codes and method codes, correcting mistyped MSA vessel identification numbers, and assigning fishing events to FMAs based on reported latitudes and longitudes, points of departure and the fishing history of each vessel. This grooming process will have improved the accuracy of the data, but many errors will remain.

There were 339 charter boat vessels registered with MPI at the beginning of the 2011–12 fishing year, declining to 315 vessels by 30 September 2012 (G. McGregor, MPI, unpub. data). Returns were submitted for 310 vessels (15 172 forms) but only 272 of these vessels reported fishing activity during this fishing year (797 forms were nil effort returns).

About 55% of the vessels fished in FMA 1 in 2011–12, accounting for 60% of the days fished (Table 2). The second most commonly fished area was FMA 3: 19% of boats and 20% of days fished. Fishing activity returns suggest that 75% of vessels fished in just one FMA, 20% in two FMAs, 4% in three FMAs, with the remainder fishing in four FMAs.

**Table 2: Number of boats reporting fishing activity, number of days fished and reported retained catch (number of fish followed by total estimated weight in tonnes in brackets) in 2011–12, for those fisheries where catch reporting is mandatory (see Table 1). Weight estimates for BCO 7, HPB 1, KIN 1 and CRA in FMA 7 are based on reported numbers retained multiplied by mean fish weight estimates provided by a concurrent national boat ramp survey (Hartill 2015).**

FMA	Boats	Days fished	BCO	HPB	KIN	CRA	STN	TOR*
1	152	9 136	–	806 (6.2)	2 694 (28.1)	–	0 (0)	0 (0)
2	24	822	–	–	–	–	–	–
3	53	2 983	–	–	–	–	–	–
4	1	27	–	–	–	–	–	–
5	21	1 521	–	–	–	–	–	–
7	40	1 162	8 856 (3.9)	–	–	1 248 (1.4)	2 (0.2)	14 (7.4)
8	20	396	–	–	–	–	–	–
9	47	1 149	–	–	–	–	–	–

\* There were many instances where only numbers caught or total weight estimates were reported, but not both. Average reported weights for individual TOR were in the order of 200–250 kg.

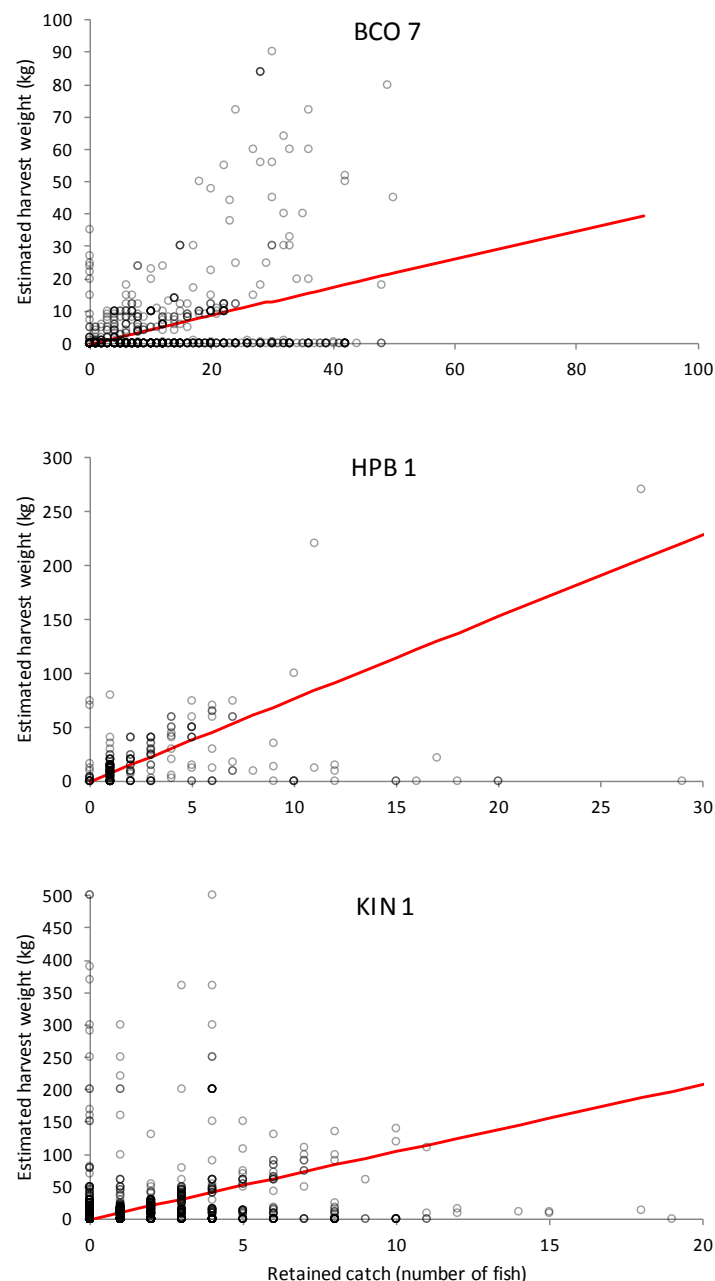
The estimated weight of hapuku and bass combined taken by charter boats from FMA 1 was 6.2 t, which only accounts for the east coast proportion of the HPB 1 stock which encompasses both FMAs 1 and 9. The kingfish harvest estimate for FMA 1/ KIN 1 of 28.1 t equates to only 5% of the 547 t estimate of the total recreational harvest provided by the national panel survey (Wynne-Jones et al. 2014). No charter boats recorded catches of southern or pacific bluefin tuna in FMA 1 in 2011–12 (Table 2).

In FMA 7 the weight of blue cod and rock lobster harvests reported by charter boats in 2011–12 is negligible compared to that estimated by the national panel survey (77.4 t and 7.4 t respectively), although the national panel survey estimate is for all of CRA 9 which encompasses a greater area than just FMA 7. The 0.2 t and 7.4 t estimates for southern and for pacific bluefin tuna respectively probably account for a sizeable proportion but not all of the recreational harvest from these fisheries.

The weight estimates for BCO 7, HPB 1, KIN 1 and for rock lobster landed in FMA 7 that are provided above are based on the reported number of fish retained per fishing event multiplied by mean weight estimates derived from a concurrent national boat ramp survey (Hartill 2015). Although charter boat operators are required to provide weight measurements only for southern and pacific bluefin tuna, they often report weight estimates for other species. These weight estimates will be potentially biased if they are based on subjective visual assessments rather than actual measurements.



The reliability of weight estimates reported on ACV-ACRs was assessed by comparing the relationship between numbers of retained fish and estimated catch weights reported for the same fishing event (Figure 1). Weight estimates for individual fishing events are often substantially higher than expected when catch numbers are multiplied by the independent survey based mean weight estimates. Some of the higher than expected estimated weights for BCO 7 and KIN 1 may be because operators recorded catch weights in terms of pounds rather than kilograms, but some of the KIN 1 weights are still implausibly high. These results suggest that any weight estimates reported voluntarily on ACV-ACRs should be regarded with some caution.



**Figure 1: Number of retained fish plotted against the estimated catch weight reported for the same fishing event, based on returns for BCO 7, HPB 1 and for KIN 1. Some extreme values fall outside the plotted ranges. Lines denote the relationship between reported catch numbers and associated weights based on mean weight estimates for these fisheries that were provided by a concurrent mean weight estimation survey.**

The review of ACV–ACR in this report should be regarded as provisional for two reasons. Firstly, because this system was only introduced in 2010 and reporting and databasing procedures are currently being reviewed and fine tuned given formative experiences. Secondly, because catch reporting for further species was intended to be phased in at the beginning of the 2012–13 fishing year (see Table 1).

The examination of the ungroomed data provided has, however, highlighted some issues that warrant further consideration:

- Data validation rules should be enforced when data are punched to ensure that obvious errors do not undermine the utility of the information provided by these systems. The current specification of method and species codes is not enforced at the data entry stage.
- Vessel registry data should inform validation rules for vessel identification fields, which should help to inform any feedback that vessel operators receive about problems associated with the information they provide.
- Operators currently report only one or two of ‘numbers caught’, ‘numbers retained’ or ‘estimated weight’ and as a result comparisons using existing data for reported numbers and weight for many trips are implausible;
- The activity part of the reporting form should include a field where the operator can write down the FMA in which they fished. Operators are currently required to enter latitude and longitude data and although these positions can be used to calculate the FMA fished, this assumes that positional data are always provided in an error free format of sufficient resolution. The reality is that latitude/longitude data are often incorrect, partially because of poor handwriting, and because many positions are reported to the nearest whole degree. The addition of a FMA field would make it far easier for fisheries managers to readily summarise charter boat harvest data by FMA.
- Experience in Australia suggests that when charter boat reporting systems are introduced, little if any effort goes into ensuring that the data collected are actually in a usable and verified format. This experience could be avoided in New Zealand if the development of this system and the scrutiny of the information it provides is ongoing.

In summary, until such time as appropriate modifications are made to the reporting forms, the database, and the grooming of data, this information would only generally rate as a two against the research science information standard (Ministry of Fisheries 2011).

### 3. RECREATIONAL HARVESTS TAKEN FROM COMMERCIAL VESSELS

Section 111 of the Fisheries Act 1996 provides two ways that commercial fishers can take recreational catches from recreational fishing vessels.

- 111 *Fish on registered vessel deemed to have been taken for purpose of sale***
- (1) *For the purposes of this act, all fish, aquatic life, or seaweed that is on board, or landed from, or transhipped from, any fishing vessel or fish carrier registered under this act is deemed to have been taken or possessed for the purpose of sale, unless—*
- (a) *the taking or possession of the fish, aquatic life, or seaweed was in accordance with a general or particular approval of the chief executive and with any conditions imposed on that approval; and*
  - (b) *the taking or possession occurred after that approval was given.*
- (2) *Subsection (1) does not apply if the fish, aquatic life, or seaweed were lawfully taken under regulations made under section 186 (Regulations relating to customary fishing).*

The general approval mentioned in S.111 (1a) applies when a condition on a fishing permit is specified for a period of up to one year, which entitles the crew of a vessel to take their daily recreational allowance with the proviso that this allowance is not taken during normal commercial fishing operations. Recreational catches taken in this manner should be recorded on the landed section of a commercial statutory fishing return, against destination code “F”.

The particular approval mentioned in S.111 (1a) applies when a fishing vessel operator contacts a fisheries officer and deregisters their vessel in advance so that they can that vessel for purely recreational purposes, for a pre-specified period of time. Although a fisheries officer may require the vessel operator to provide some form of catch reporting for that day or trip, any catches that are reported against a particular approval are not entered onto any formal database, and are therefore not available for collation.

The following summary of recreational harvests taken from commercial vessels during the 2011–12 fishing year is therefore based on general approval harvest data recorded on statutory catch effort returns against destination code “F”. A small number of records were assumed to be erroneous because the reported greenweights were far higher than expected given daily recreational allowances, e.g. 14 rock lobster landings with reported greenweights ranging from 40 to 360 kg.

Commercial fishers reported recreational catches of 71 finfish and 15 shellfish species, although the number of landings and total catch weight for most of these species was very low (Tables 3 and 4). There were only five finfish species where the total weight on national landings exceeded 1 tonne (snapper 13.2 t, blue cod 6.4 t, hapuku/bass 2.7 t, bluenose 1.7 t, and tarakihi 1.0 t) and one shellfish species (rock lobster 13.0 t). The reported harvest of these commonly caught species is further summarised by QMA in Table 5. Snapper, bluenose and tarakihi were mostly taken from northern QMAs, blue cod mostly from the south, and hapuku/bass and rock lobster were taken from a broad range of QMAs.

In summary, this information would generally rate as a one against the research science information standard (Ministry of Fisheries 2011).

**Table 3: Number of commercial fishing vessels reporting recreational landings of finfish species, the number of trips involved and the total greenweight reported for each species.**

Species code	Species	Number of vessels	Number of trips	Total greenweight (kg)
SNA	Snapper	155	1 169	13 195
BCO	Blue cod	139	661	6 354
HPB	Hapuku & bass	90	225	2 728
BNS	Bluenose	25	83	1 678
TAR	Tarakihi	75	219	1 051
KIN	Kingfish	35	86	915
GUR	Gurnard	65	185	674
FLA	Flats	42	141	618
SPO	Rig	22	53	423
SWO	Broadbill swordfish	5	12	391
KAH	Kahawai	43	96	380
TRE	Trevally	36	86	364
TRU	Trumpeter	27	45	346
MOK	Moki	34	86	344
JDO	John dory	43	89	295
ALB	Albacore tuna	13	21	261
SKI	Gemfish	16	27	256
WAR	Common warehou	11	29	227
MOO	Moonfish	4	7	170
RBM	Rays bream	12	19	170
SCH	School shark	11	18	148
POR	Porae	20	39	138
BUT	Butterfish	18	25	129
RSN	Red snapper	8	11	123
PIL	Pilchard	1	4	123
BYX	Alfonsino & long-finned beryx	9	19	109
SBO	Southern boarfish	5	10	100
BAR	Barracouta	10	14	94
BOA	Sowfish	5	12	81
LIN	Ling	9	14	79
SPE	Sea perch	9	20	76
CAR	Carpet shark	10	11	75
SKJ	Skipjack tuna	4	4	72
PAR	Parore	5	23	51
BIG	Bigeye tuna	1	1	50
CON	Conger eel	7	7	48
SSK	Smooth skate	2	7	43
EMA	Blue mackerel	5	7	42
MAK	Mako shark	1	1	40
SPZ	Spotted stargazer	3	11	40
RMO	Red moki	6	8	37
JMA	Jack mackerel	7	11	36
ELE	Elephant fish	9	10	34
SWA	Silver warehou	4	4	33
MDO	Mirror dory	1	1	30
HOK	Hoki	7	7	22
STU	Slender tuna	1	2	19
WWA	White warehou	1	1	14
RCO	Red cod	4	6	13
RRC	Red scorpion fish	4	5	12
LEA	Leatherjacket	5	9	11
YEM	Yellow-eyed mullet	2	10	11
CRC	Crocodile shark	1	1	10
STA	Giant stargazer	1	1	10
	Other finfish species			67

**Table 4: Number of commercial fishing vessels reporting recreational landings of shellfish species, the number of trips involved and the total greenweight reported for each species.**

Species code	Species	Number of vessels	Number of trips	Total greenweight (kg)
CRA	Rock lobster	195	2 065	13 032
PAU	Black paua & yellowfoot paua	31	105	742
SCA	Scallop	25	153	613
PHC	Packhorse rock lobster	14	69	435
PAD	Paddle crab	6	29	172
OCT	Octopus	15	42	162
OYS	Oysters dredge	5	11	105
SUR	Kina	11	12	104
PPI	Pipi	2	3	93
BSQ	Broad squid	8	14	55
MMI	Large trough shell	2	2	24
PZL	King clam	1	2	22
SFI	Starfish	2	3	10
PCH	<i>Penion chathamensis</i>	1	1	2
CRB	Crab	1	1	<1

**Table 5: Total greenweight (kg) reported by commercial fishers taking recreational catches under a general S.111 approval during the 2011–12 fishing year, for commonly caught species by Quota Management Area.**

	Quota Management Area									Total
	1	2	3	4	5	6	7	8	9	
Snapper	10 746	328	–	–	–	–	391	1 731	–	13 195
Blue cod	456	409	559	180	4 533	–	212	5	–	6 354
Hapuku/bass	891	614	455	153	275	–	289	51	–	2 728
Bluenose	1 057	326	218	–	–	–	56	21	–	1 678
Tarakihi	634	254	5	–	6	–	125	27	–	1 051
Rock lobster	1 372	732	410	2 784	2 553	568	59	3 869	686	13 032

#### 4. FISHERIES OFFICER ACTIVITY REPORT DATA

Fisheries officers and honorary fisheries officers usually record data describing routine compliance operations. Inspections of commercial and non-commercial fishers are reported on different systems and the following summary is for inspections of non-commercial (including customary) fishers during the 2011–12 fishing year. Compliance intercepting non-commercial fishers record information on:

- the type of compliance operation,
- the date of that operation,
- whether an inspection was undertaken by a fisheries officer or an honorary fisheries officer,
- the number of people in each intercepted party,
- the number of active fishers in each intercepted party,
- number of each species caught by that party (but not by individual fishers),
- the number of those fish deemed to be illegally harvested,
- whether the catch was taken under a customary permit,
- information that can be used to determine the Fisheries Management Area in which the operation took place (location description, compliance region and sub-region).

Although these data give some insight into potential levels of illegal harvesting by recreational fishers, the manner in which they are collected limits their utility beyond compliance purposes. This is because the timing and location of compliance operations is determined in a non-random and non-systematic fashion and there is therefore no means of scaling the information provided to estimate levels of effort or catch taking place within a wider area over a given period of time. The duration of each compliance operation is not recorded, but it is likely to vary considerably. Data are only recorded for intercepted parties, but no data are recorded on the incidence of other parties that were not intercepted during the operation because officers were already busy. Another problem with these data is that there is no record of the fishing method or fishing platform used by each party, which will influence both fisher success and the size of fish taken. There are also several types of compliance operation which will vary in terms of encounter intensity and access point type (Table 6).

**Table 6: Number of parties intercepted by fisheries officers and by honorary fisheries officers during the 2011–12 fishing year, by reported inspection type.**

Inspection type	Fisheries officer	Honorary fisheries officer	Total	% Fisheries officer
Educational contact	352	114	466	76%
Fisher inspection	3 444	5 823	9 267	37%
Gear inspection	44	9	53	83%
Vehicle inspection	477	727	1 204	40%
Vessel inspection	5 514	8 595	14 109	39%
Total	9 831	15 268	25 099	

Fisheries officers are more likely to conduct operations targeted towards persons or areas of interest than honorary fisheries officers, which means that they are more likely to detect non-compliant recreational harvests. This can be seen in Table 7, where fisheries officers encountered a far higher proportion of fishers in breach of recreational fishing regulations than honorary fisheries officers did.

**Table 7: Number of parties intercepted, fishers interviewed and number of fishers found in breach of daily recreational shellfish and finfish bag allowances and/or minimum legal size limits during the 2011–12 fishing year. Separate totals are given for inspections made by fisheries officers and by honorary fisheries officers as the former often conduct more targeted compliance operations.**

FMA	Fisheries officers				Honorary fisheries officers			
	Parties interviewed	Number of fishers	Fishers in breach	% in breach	Parties interviewed	Number of fishers	Fishers in breach	% in breach
1	3 503	9 090	1 377	15%	8 776	24 753	580	2%
2	1 345	3 118	401	13%	324	849	76	9%
3	1 254	3 053	104	3%	1 758	4 368	138	3%
4	441	931	1	0%	7	10	0	0%
5	723	1 951	114	6%	226	489	19	4%
7	1 674	4 684	181	4%	1 141	3 213	101	3%
8	215	467	48	10%	836	2 420	71	3%
9	676	1 718	67	4%	2 200	6 455	146	2%
Total	9 831	25 012	2 293	9%	15 268	42 557	1 131	3%

Although there are many limitations associated with the compliance data reviewed here, they can be used to inform other sources of information on recreational harvest in one unique way. These data provide some insight into relative levels of non-compliance with recreational harvesting regulations throughout New Zealand, for both finfish (Table 8) and for shellfish species (Table 9). Although compliance operations are likely to be biased towards detecting illegal activity, data recorded by officers in 2011–12 suggests that compliance with finfish regulations in most areas is very high, but less so for shellfish species. Lower levels of compliance associated with shellfish regulations may be partially a reflection of higher levels of availability of some species in some areas, which creates a greater opportunity for non-compliant harvesting for those so inclined.

In summary, this information in the context of providing harvest estimates would generally rate as a two or three against the research science information standard (Ministry of Fisheries 2011) as the data are not objective (due to profiling and associated targeting) and uncertainty cannot be appropriately described (due to the non-random data collection in particular).

**Table 8: Numbers of finfish observed by fisheries officers and honorary fisheries officers during the 2011–12 fishing year, by species by Fisheries Management Area. Totals are given for all fish observed and for those fish which were deemed to be either under the minimum legal size or in excess of the daily bag limit.**

Species code	Fisheries Management Area															
	1		2		3		4		5		7		8		9	
	All	Illegal	All	Illegal	All	Illegal	All	Illegal	All	Illegal	All	Illegal	All	Illegal	All	Illegal
SNA	77 788	619	259	1	—	—	—	—	—	—	557	—	2 687	1	12 516	163
BCO	196	14	557	7	16 174	22	5 875	—	4 947	45	10 362	226	1 200	18	59	—
KAH	12 906	27	621	63	16	—	2	—	—	—	308	—	1 734	1	4 615	8
GUR	3 011	3	106	—	32	—	1	—	2	—	418	—	2 304	—	3 644	30
TAR	2 617	29	442	2	268	—	7	—	97	—	653	7	366	4	14	—
SPE	3	—	60	—	2 536	—	2	—	17	—	1 262	—	14	—	—	—
TRE	1 997	7	16	1	—	—	—	—	—	—	11	—	129	1	246	4
GMU	527	17	4	4	10	—	—	—	—	—	15	—	14	—	1 591	52
YEM	692	25	116	30	—	—	—	—	—	—	177	—	185	15	495	1
JMA	1 216	1	3	—	—	—	—	—	—	—	1	—	31	—	230	—
KIN	1 145	17	54	—	—	—	—	—	100	—	28	2	17	—	109	1
FLA	572	59	86	—	34	—	—	—	613	1	229	20	67	—	634	73
BUT	79	1	147	4	476	—	67	—	44	—	205	2	56	—	—	—
SPR	184	—	—	—	—	—	—	—	—	—	—	—	—	—	610	—
HPB	64	—	36	—	136	—	415	—	44	—	54	—	126	—	6	1
KOH	580	—	3	—	—	—	—	—	—	—	—	—	—	—	8	—
SPO	205	12	99	—	12	—	—	—	—	—	37	—	41	—	55	—
GAR	382	—	—	—	—	—	—	—	—	—	2	—	—	—	69	—
STY	173	1	138	—	—	—	—	—	3	—	89	—	11	—	15	—
JDO	367	—	5	—	—	—	—	—	—	—	4	—	12	—	16	—
MOK	38	—	36	3	96	13	69	—	9	2	116	5	2	—	6	—
TRU	1	—	6	—	207	—	30	—	64	—	19	—	—	—	—	—
BAR	25	—	2	—	120	1	10	—	4	—	45	1	96	—	12	—
RCO	27	—	34	—	86	—	—	—	4	—	70	—	51	—	1	—
SCH	59	—	3	—	16	—	2	—	17	—	88	—	33	—	44	2
PAR	178	18	20	—	—	—	—	—	—	—	1	—	—	—	15	—
ALB	53	—	—	—	—	—	—	—	45	—	50	—	40	—	36	—
MAO	206	—	—	—	—	—	—	—	—	—	1	—	—	—	4	—
SKJ	73	—	3	—	—	—	—	—	—	—	—	—	—	—	85	—
POR	131	19	—	—	—	—	—	—	—	—	—	—	—	—	7	—
ANG	—	—	—	—	—	—	—	—	—	—	155	—	—	—	—	—
RBM	1	—	—	—	152	—	—	—	—	—	—	—	—	—	—	—
WSE	26	—	1	—	37	—	—	—	13	—	37	—	—	—	2	—
PIL	61	—	—	—	—	—	—	—	—	—	—	—	46	—	2	—
SKI	63	—	—	—	—	—	—	—	—	—	—	—	—	—	32	—
RSN	91	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
LEA	36	—	1	—	3	—	—	—	—	—	27	—	—	—	—	—
RMO	52	1	10	2	—	—	—	—	—	—	—	—	1	—	—	—
EMA	7	—	17	—	—	—	—	—	—	—	35	—	1	—	—	—
SAM	—	—	—	—	57	—	—	—	—	—	2	—	—	—	—	—
SPD	2	—	4	—	20	—	—	—	—	—	13	—	17	—	—	—
BNS	7	—	29	—	6	2	3	—	2	—	2	—	—	—	3	—
WRA	3	—	—	—	29	—	—	—	—	—	12	—	—	—	—	—
POT	32	—	—	—	6	—	—	—	—	—	1	—	—	—	2	—
SWA	40	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
STR	9	—	1	—	—	—	—	—	—	—	—	—	2	—	22	—
BMA	18	—	—	—	—	—	—	—	—	—	—	—	—	—	12	—
STA	—	—	—	—	—	—	—	—	—	—	28	—	—	—	—	—
ELE	—	—	—	—	9	—	—	—	—	—	16	—	—	—	—	—
MUU	10	—	—	—	10	—	—	—	—	—	4	—	1	—	—	—
EEL	9	—	—	—	—	—	—	—	—	—	2	—	—	—	11	—
PIG	19	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
SCO	18	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
RRC	17	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
MAR	6	—	—	—	—	—	—	—	—	—	—	—	—	—	9	—
KOI	2	—	—	—	—	—	—	—	—	—	—	—	—	—	10	—
HOK	—	—	10	—	1	—	—	—	—	—	—	—	—	—	—	—
ROC	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Other spp	56	1	10	—	10	—	5	—	1	—	5	—	2	—	17	—



**Table 9: Numbers of shellfish observed by fisheries officers and honorary fisheries officers during the 2011–12 fishing year, by species by Fisheries Management Area. Totals are given for all shellfish observed and for those shellfish which were deemed to be either under the minimum legal size or in excess of the daily bag limit.**

Species code	Fisheries Management Area															
	1		2		3		4		5		7		8		9	
	All	Illegal	All	Illegal	All	Illegal	All	Illegal	All	Illegal	All	Illegal	All	Illegal	All	Illegal
COC	64 021	18 872	680	–	17 902	405	–	–	8 622	120	1 266	–	360	–	6 059	50
SCA	43 154	1 315	383	27	–	–	10	–	84	1	54 335	1 834	149	–	4 581	40
PPI	65 303	3 799	–	–	80	–	–	–	1 150	–	105	–	3 502	–	8 570	–
PAU	1 940	1 393	13 581	5 851	15 271	1 073	6 772	85	6 855	563	5 611	435	3 357	1 831	3 093	197
MUS	26 718	1 296	6 009	636	5 043	86	–	–	7 022	508	7 573	258	338	–	6 807	69
SUR	34 265	736	13 529	658	1 349	–	1 907	–	870	–	640	–	1 236	71	5 824	24
TUA	9 026	41	–	–	313	–	2 655	–	–	–	356	–	–	–	24 552	–
TOH	–	–	–	–	–	–	–	–	1 426	62	–	–	–	–	32 031	1 153
CRA	1 652	63	2 299	387	6 641	197	1 374	–	1 061	16	5 672	188	595	2	310	5
OYS	11 505	353	–	–	289	276	68	–	5 735	16	409	151	–	–	1 202	22
LUN	519	209	1 919	200	1 504	501	–	–	815	149	383	100	15	–	–	–
MSG	4 135	1 540	–	–	–	–	–	–	–	–	198	–	56	6	72	–
OYU	–	–	–	–	–	–	–	–	3 752	163	–	–	–	–	–	–
PAD	262	–	602	411	131	–	–	–	–	–	238	38	578	239	162	4
SCI	20	–	–	–	–	–	–	–	–	–	20	–	–	–	722	472
PIP	950	5	–	–	–	–	–	–	–	–	–	–	21	–	45	–
WHE	841	112	–	–	–	–	–	–	–	–	–	–	–	–	–	–
CTU	–	–	–	–	804	4	–	–	92	–	–	–	–	–	–	–
POY	605	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PWI	504	62	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ROY	2	–	–	–	–	–	–	–	–	–	–	–	–	–	510	–
CRB	214	–	1	–	–	–	–	–	–	–	–	–	126	–	1	–
SCC	46	–	99	3	2	–	–	–	–	–	–	–	–	–	–	–
SLG	–	–	104	4	6	–	–	–	–	–	–	–	–	–	–	–
ACR	107	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
LIM	–	–	–	–	98	–	–	–	–	–	–	–	–	–	–	–
OSP	53	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
PAA	–	–	8	–	12	–	–	–	–	–	5	–	10	10	–	–
PHC	23	6	–	–	–	–	–	–	–	–	–	–	–	–	4	3
KOU	–	–	10	–	25	–	–	–	–	–	–	–	–	–	–	–
QSC	10	–	–	–	–	–	–	–	–	–	6	6	–	–	–	–
OCT	9	–	–	–	3	–	–	–	–	–	2	–	–	–	1	–
NMP	–	–	–	–	–	–	–	–	–	–	–	–	–	–	6	–
HOR	–	–	–	–	–	–	–	–	–	–	–	–	–	–	3	–
KBB	–	–	–	–	1	–	–	–	–	–	–	–	–	–	–	–
SQU	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
SQX	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

## 5. CUSTOMARY HARVEST REPORTING

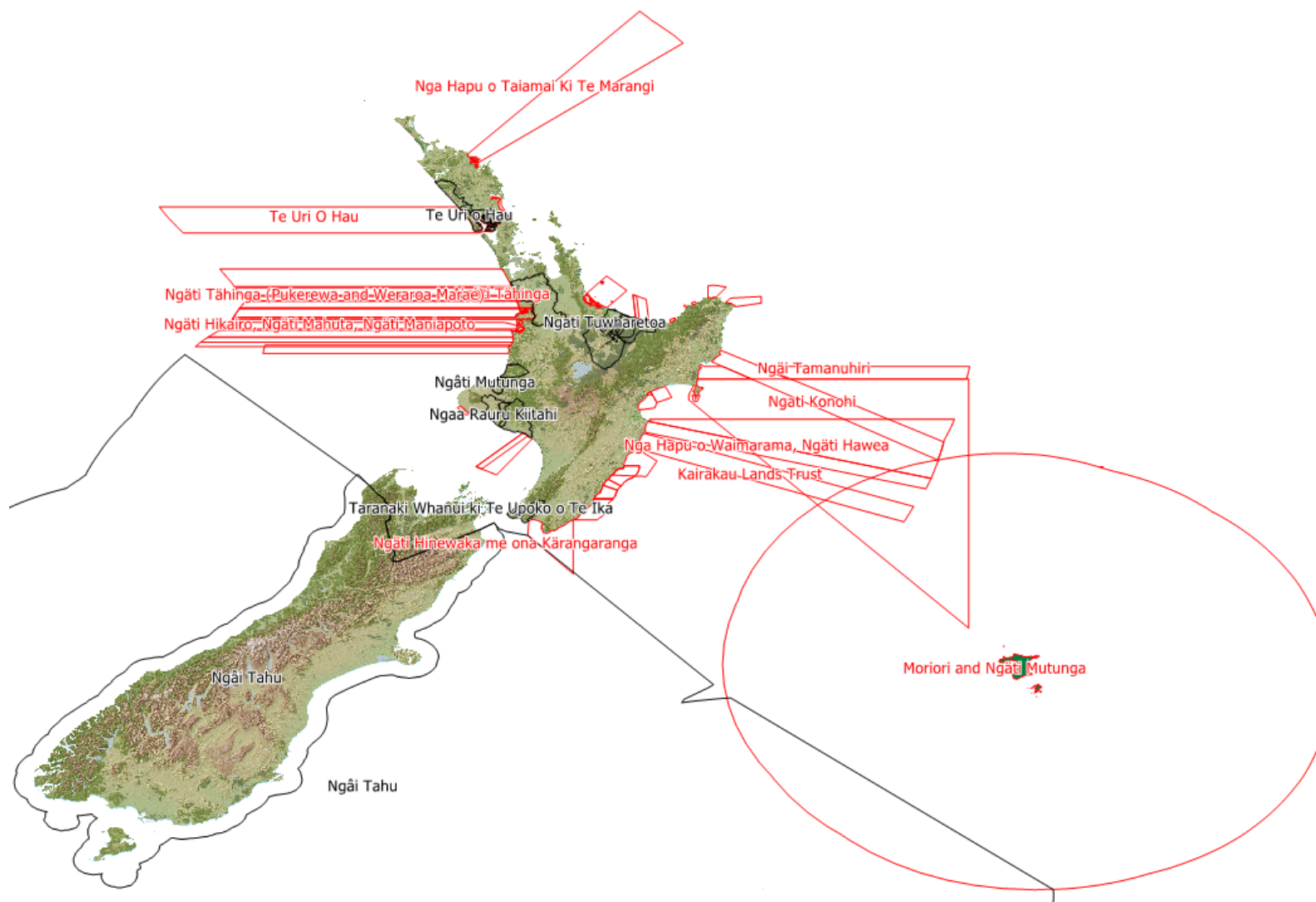
The Ministry for Primary Industries deems customary catches to be

*“... the taking of fish, aquatic life, or seaweed or managing of fisheries resources, for a purpose authorised by Tangata Kaitiaki/Tiaki, including koha, to the extent that such purpose is consistent with Tikanga Ma-ori and is neither commercial in any way nor for pecuniary gain or trade: those taken when authorised by Kaitiaki. (Fisheries (Kaimoana Customary Fishing) Regulations 1998)”*

which is often informally referred to as taking a catch under a customary permit (hereafter called an authorisation), not to be confused with recreational catches.

Tangata Kaitiaki/Tiaki (hereafter referred to as Kaitiaki) can issue an authorisation to take customary harvests of salt water species under one of four regulatory mechanisms:

- Section 27 of the Fisheries (Amateur Fishing) Regulations 1986, which allows for approved traditional non-commercial fishing harvesting of fish when prior permission has been given by Kaitiaki. There is no requirement for Kaitiaki to report on the level of harvesting that actually occurred against an authorisation, although some reporting does occur. The circumstances under which customary harvests can be taken under Regulation 27 are now limited, because of concerns about abuse of the regulation by some individuals for commercial gain. Further regulations have since been promulgated (as listed below) that have almost completely superseded the use of Regulation 27.
- Fisheries (Kaimoana Customary Fishing) Regulations 1998. These regulations apply in rohe moana that have been formally gazetted (see Figure 2), where they are the sole means of regulating customary harvests. These regulations define the circumstances under which non-commercial customary harvesting can occur within a rohe moana and the responsibilities of authorising Kaitiaki. Provision is also made of other forms of traditional fisheries management, such as the establishment of Mataitai reserves. Reporting of authorised and actual harvests is compulsory.
- Fisheries (South Island Customary) Regulations 1999. These regulations are broadly similar to those specified in the (Kaimoana Customary Fishing) Regulations 1998, but specifically define how customary harvesting is authorised and reported in the South Island. Reporting of authorised and actual harvests is compulsory.
- Customary harvests taken outside of rohe moana gazetted under the Kaimoana Customary Fishing (1998) and South Island Customary (1999) regulations are now mostly managed under section 27A of the Fisheries (Amateur Fishing) Regulations 1986, which was promulgated in 2006. Regulation 27A provides explicitly for fish taken for a hui or tangi. The level of customary harvesting covered under regulation 27A (and 27) should decline as more rohe moana are gazetted under the Kaimoana Customary Fishing Regulations (1998). There is no requirement for Kaitiaki to report on the level of harvesting that actually occurred against an authorisation, although some reporting does occur.



**Figure 2: Rohe moana gazetted under Fisheries (Kaimoana Customary Fishing) Regulations 1998 (red zones) and Fisheries (South Island Customary) Regulations 1999 (black zone) as of 1 May 2012. Customary harvests in all other areas are authorised in regulations 27 and 27A.**

All forms of customary harvest taken under these regulations are reported on a paper form which has a common universal format, on which Kaitiaki are required to record: the harvester's name and contact details, the purpose and venue of any hui/tangi, the species and quantity of kaimoana authorised for harvest, where the harvest is to be taken from, and in some cases, the nature and quantity of the harvest actually taken. Kaitiaki are required to submit copies of these authorisations, or in some cases quarterly summaries, to the Ministry for Primary Industries on a quarterly basis, but there are no penalties if the authorisations are not submitted.

The following tables summarise returns submitted for the 2010–11 fishing year, as extracted in early May 2012.

**Table 10: The number of reports (copies of authorisations actually issued or quarterly summaries) submitted by Kaitiaki who issued authorisations to take customary harvests of marine species, by area and regulatory mechanism, for the 2010–11 fishing year, as of 1 May 2012. Many of these returns were for multiple species.**

Customary area	North Island Regulations (1998)	South Island Regulations (1999)	Regulations 27 & 27A (1986)	Total
Kaiaio Hapu	4	–	–	4
Kairakau Lands Trust	1	–	–	1
Moriori and Ngati Mutunga	4	–	–	4
Nga Hapu o Aotea Moana	2	–	–	2
Nga Hapu o Taiaimai Ki Te Marangi	11	–	–	11
Nga Hapu o Waimarama and Ngati Hawea	11	–	–	11
Nga Toko Toru, Ngati Mahanga, Tamainupo & Tainui-Tahinga	14	–	–	14
Ngai Hapu o Waimarama	6	–	–	6
Ngai Tai Iwi	10	–	–	10
Ngai Tamanuhiri	4	–	–	4
Ngai Te Ruruku o Te Rangi	5	–	–	5
Ngai Tunapuhiarangi, Ngati Hamua	3	–	–	3
Ngaiterangi, Ngati Ranginui and Ngati Pukenga	44	–	–	44
Ngati Awa	4	–	–	4
Ngati Haumia	4	–	–	4
Ngati Hikairo, Ngati Mahuta, Ngati Maniapoto	8	–	–	8
Ngati Hinewaka me ona Karangaranga	6	–	–	6
Ngati Kere	5	–	–	5
Ngati Kinohaku	2	–	–	2
Ngati Kinohaku, Ngati Te Kanawa and Ngati Peehi	2	–	–	2
Ngati Konohi	8	–	–	8
Ngati Tahinga Weraroa Marae	4	–	–	4
Ngati Tamainupo	1	–	–	1
Patuharakeke	5	–	–	5
Rongomaiwahine	5	–	–	5
Tapaeururangi	38	–	–	38
Te Atihaunui a Paparangi and Nga Rauru	4	–	–	4
Te Hika o Papauma	13	–	–	13
Te Puaha	8	–	–	8
Te Uri O Hau	15	–	–	15
Te Whanau A Maruhaeremuri Hapu Trust	5	–	–	5
Te Whanau-a-Hunaara	7	–	–	7
Titahi-Ngaruahine	6	–	–	6
Kaihoka and Anatori Mataitai	–	2	–	2
Te Runanga o Ngai Tahu	–	4	–	4
Regulation 27 Gisborne	–	–	1	1
Regulation 27 Whangarei	–	–	3	3
Regulation 27A Nelson	–	–	172	172
Regulation 27A Opotiki	–	–	42	42
Regulation 27A Tauranga	–	–	263	263
Regulation 27A Whangarei	–	–	96	96
Total	269	6	577	852

A high proportion of the authorisations to gather customary harvest were issued under Regulation 27A, especially in Nelson and the Bay of Plenty (Table 10). Authorisations were also issued for a large number of rohe moana in the North Island, but there was very little customary harvesting reported in rohe covered under the South Island Customary regulations. There were only four reports of customary harvesting authorised under Regulation 27.

Most authorisations were issued for shellfish species, primarily: paua, kina, rock lobster, mussels, and scallops (Table 11). Authorisations to harvest finfish were far less common, and the preferred species were: snapper, butterfish, blue moki, blue cod, tarakihi, and kahawai.

**Table 11: The number of reports (copies of authorisations actually issued or quarterly summaries) submitted by Kaitiaki who issued authorisations to take customary harvests of marine species, by species. Some authorisations were given for multiple species.**

	Code	Common name	Scientific name	Reports submitted
Shellfish	PAU	Paua	<i>Haliotis iris &amp; H. australis</i>	297
	SUR	Kina	<i>Evechinus chloroticus</i>	294
	CRA	Rock lobster	<i>Jasus edwardsii</i>	249
	MUS	Mussels	<i>Perna spp</i>	235
	SCA	Scallops	<i>Pecten novaezelandiae</i>	163
	PPI	Pipi	<i>Paphies australis</i>	124
	OYS	Oysters	<i>Ostrea spp</i>	31
	TOH	Toheroa	<i>Paphies ventricosa</i>	23
	COC	Cockles	<i>Austrovenus stutchburyi</i>	14
	TUA	Tuatua	<i>Paphies subtriangulata</i>	9
	PHC	Pack horse crayfish	<i>Jasus verreauxi</i>	2
	PAD	Paddle crabs	<i>Ovalipes catharus</i>	2
	LUN	Cats eyes	<i>Turbo smaragdus</i>	2
	CRB	Crabs	<i>Brachyura</i>	1
	HOR	Horse mussels	<i>Atrina zelandica</i>	1
	SCC	Sea cucumbers	<i>Stichopus mollis</i>	1
	TUL	Sea tulips	<i>Pyura pachydermatina</i>	1
Finfish	SNA	Snapper	<i>Pagrus auratus</i>	51
	BUT	Butterfish	<i>Odax pullus</i>	43
	MOK	Blue moki	<i>Latridopsis ciliaris</i>	42
	BCO	Blue cod	<i>Parapercis colias</i>	26
	TAR	Tarakihi	<i>Nemadactylus macropterus</i>	25
	KAH	Kahawai	<i>Arripis trutta</i>	21
	SPO	Rig/dogfish	<i>Mustelus lenticulatus</i>	13
	GMU	Grey mullet	<i>Mugil cephalus</i>	12
	FLA	Flatfish	<i>Rhombosolea spp</i>	10
	TRE	Trevally	<i>Pseudocaranx dentex</i>	9
	EEL	Eel spp	<i>Anguillidae</i>	8
	KOU	Koura	<i>Paranephrops planifrons &amp; P. zealandicus</i>	7
	GUR	Red gurnard	<i>Chelidonichthys kumu</i>	4
	HPB	Hapuku/bass	<i>Polyprion oxygeneios &amp; P. americanus</i>	4
	KIN	Kingfish	<i>Seriola lalandi</i>	3
	PAR	Parore	<i>Girella tricuspidata</i>	3
	SCH	School shark	<i>Galeorhinus galeus</i>	3
	YEM	Yellow eyed mullet	<i>Aldrichetta forsteri</i>	3
	GCO	Common bully	<i>Gobiomorphus cotidianus</i>	1
	SFI	Starfish	<i>Asteroidea</i>	1
Unknown	WET	Wetfish	Unknown	28

In 2010–11, a variety of measurement units were used to quantify customary harvests (authorised and actually taken) of shellfish, and to a lesser extent, finfish (Tables 12 and 13). Harvests of kina, for example, were quantified in terms of “bags”, “bins”, ‘sacks”, numbers, and weights, and no measurement units were given for the majority of records, which were presumably expressed in terms of numbers harvested, but these could also have been reported in terms of weight. Converting this variety of measures into a universal quantity such as weight is very problematic because of the vagueness of some informal terms such as “bag”, and a lack of estimates of mean fish weight for most species in most areas.

The derivation of estimates of total customary harvest should be possible for rock lobster and the finfish species as informal measurement units such as “bags” and “bins” are rarely used to quantify customary harvests of these species. Mean fish weight estimates such as those provided by MAF2011/03 (Onsite collection of fish length data to inform National Panel Survey catch estimates) could be used to convert reported numbers into harvest weights. The use of these mean weight estimates would require the inherent assumption that customary and recreational fishers land similar sized fish, although customary fishers are not necessarily bound by recreational size limits.

Although Kaitiaki are required to provide information on the levels of harvesting that they authorise, there is no requirement under regulations 27 and 27A for them to report back on the harvest that was actually taken by the fisher, although this information is often provided. When both the authorised and actual harvests are reported, however, the actual harvest is often less than authorised. Summary statistics based on authorised catches will therefore overestimate the total customary harvest, whereas totals based on records of the actual catch taken will be underestimates, because this part of the report is often blank.

Note that customary fisheries in their true sense, although non-commercial, are not recreational. In summary, this information would generally rate as a two against the research science information standard (Ministry of Fisheries 2011), although this ranking could readily be improved with standardisation of reporting units, and, comprehensive implementation.

**Table 12: Quantities of shellfish species commonly harvested by customary fishers under all forms of customary fishing regulation in 2010–11. Totals are given for each fish stock, for each reported unit of measurement, both in terms of the authorised harvest and the quantity actually taken by the fisher (when reported). Numbers in brackets show the number of reports associated with each harvest quantity. Note that section 27 permit holders are not required to report on harvests taken under an approved authorisation.**

	FMA	Bags		Bins		Weight (kg)		Number		Sacks		Sugar sacks		Units not specified	
		Approved	Taken	Approved	Taken	Approved	Taken	Approved	Taken	Approved	Taken	Approved	Taken	Approved	Taken
Paua	PAU1	0.5 (1)	0.25 (1)	–	–	495 (13)	80 (3)	6255 (15)	3952 (13)	–	–	0.5 (1)	0.25 (1)	11960 (99)	3017 (44)
	PAU2	24 (16)	–	–	–	–	–	4130 (10)	1409 (9)	–	–	–	–	28270 (45)	23430 (39)
	PAU3	–	–	–	–	–	–	8380 (4)	7469 (4)	–	–	–	–	2097 (32)	899 (24)
	PAU4	–	–	–	–	–	–	–	–	–	–	–	–	1038 (4)	1025 (4)
	PAU5A	–	–	–	–	–	–	150 (1)	150 (1)	–	–	–	–	–	–
	PAU5B	–	–	–	–	–	–	2053 (3)	1978 (3)	–	–	–	–	–	–
	PAU5D	–	–	–	–	–	–	15806 (4)	15291 (4)	–	–	–	–	–	–
	PAU6	–	–	–	–	–	–	230 (1)	130 (1)	–	–	–	–	–	–
	PAU7	–	–	–	–	–	–	1040 (18)	31 (3)	–	–	–	–	2260 (30)	690 (11)
	All	24.5 (17)	0.25 (1)	–	–	495 (13)	80 (3)	38044 (56)	30410 (38)	–	–	0.5 (1)	0.25 (1)	45625 (210)	29061 (122)
Kina	SUR1A	–	–	10 (2)	–	2820 (13)	1920 (9)	–	–	–	–	–	–	11750 (22)	5643 (12)
	SUR1B	27 (7)	100 (1)	22 (2)	7 (1)	25088 (40)	18742 (29)	21890 (15)	19050 (15)	10 (3)	9 (2)	–	–	39397 (90)	3940 (16)
	SUR2A	38 (15)	–	–	–	–	–	1250 (3)	1050 (3)	–	–	–	–	31670 (17)	31621 (13)
	SUR2B	–	–	–	–	–	–	9200 (1)	–	–	–	–	–	14600 (15)	8347 (14)
	SUR3	–	–	–	–	–	–	17170 (3)	16092 (3)	–	–	–	–	–	–
	SUR4	–	–	–	–	–	–	–	–	–	–	–	–	570 (4)	550 (4)
	SUR5	–	–	–	–	–	–	300 (1)	300 (1)	–	–	–	–	–	–
	SUR7A	–	–	–	–	–	–	1400 (5)	–	–	–	–	–	3740 (15)	1320 (8)
	SUR8	–	–	–	–	–	–	–	–	–	–	–	–	1600 (4)	807 (4)
	SUR9	–	–	–	–	–	–	250 (1)	–	4 (2)	3 (2)	–	–	3450 (14)	1800 (10)
	All	65 (22)	100 (1)	32 (4)	7 (1)	27908 (53)	20662 (38)	51460 (29)	36492 (22)	14 (5)	12 (4)	–	–	106777 (181)	54028 (81)
Rock lobster	CRA1	–	–	4 (2)	20 (1)	100 (3)	–	–	–	–	–	–	–	340 (12)	142 (8)
	CRA2	2 (2)	–	1 (1)	–	20 (1)	–	2133 (18)	735 (15)	–	–	–	–	2255 (55)	529 (12)
	CRA3	–	–	–	–	–	–	270 (2)	8 (2)	–	–	–	–	5243 (7)	5237 (8)
	CRA4	–	–	–	–	–	–	1546 (6)	973 (5)	–	–	–	–	5710 (25)	2590 (24)
	CRA5	–	–	–	–	–	–	6752 (22)	5070 (7)	–	–	–	–	2102 (56)	991 (33)
	CRA6	–	–	–	–	–	–	–	–	–	–	–	–	117 (4)	117 (4)
	CRA7	–	–	–	–	–	–	2872 (3)	2814 (3)	–	–	–	–	–	–
	CRA8	–	–	–	–	260 (2)	129 (2)	13734 (4)	13668 (4)	–	–	–	–	–	–
	CRA9	–	–	–	–	–	–	20 (1)	–	–	–	–	–	775 (23)	170 (15)
	All	2 (2)	–	5 (3)	20 (1)	380 (6)	129 (2)	27327 (56)	23268 (37)	–	–	–	–	16542 (182)	9776 (104)
Mussels	MUS1	1 (1)	–	35 (8)	15 (2)	16353 (95)	11880 (71)	7165 (13)	5910 (12)	24 (3)	24 (3)	–	–	46500 (98)	2175 (10)
	MUS2	–	–	–	–	–	–	–	–	–	–	–	–	42900 (5)	34300 (5)
	MUS7	–	–	–	–	–	–	50 (1)	–	–	–	–	–	–	–
	MUS9	–	–	–	–	–	–	–	–	–	–	–	–	3000 (9)	880 (5)
	MUS3	–	–	–	–	–	–	1900 (2)	1900 (2)	–	–	–	–	–	–
	All	1 (1)	–	35 (8)	15 (2)	16353 (95)	11880 (71)	9115 (16)	7810 (14)	24 (3)	24 (3)	–	–	92400 (112)	37355 (20)
Scallops	SCA1	–	–	–	–	100 (1)	–	–	–	–	–	–	–	8950 (21)	5513 (12)
	SCA5	–	–	–	–	–	–	150 (1)	150 (1)	–	–	–	–	–	–
	SCA7	–	–	–	–	–	–	5350 (14)	–	–	–	–	–	34990 (66)	19107 (40)
	SCA7C	–	–	–	–	–	–	200 (1)	–	–	–	–	–	–	–
	SCA9A	–	–	–	–	–	–	–	–	–	–	–	–	250 (1)	100 (1)
	SCACS	–	–	–	–	105 (3)	65 (2)	1890 (7)	1400 (6)	–	–	–	–	17110 (48)	5250 (19)
	All	–	–	–	–	205 (4)	65 (2)	7590 (23)	1550 (7)	–	–	–	–	61300 (136)	29970 (72)

**Table 13: Quantities of finfish species commonly harvested by customary fishers under all forms of customary fishing regulation in 2010–11. Totals are given for each fish stock, for each reported unit of measurement, both in terms of the authorised harvest and the quantity actually taken by the fisher (when reported). Numbers in brackets show the number of authorisations associated with each harvest quantity. Note that section 27 permit holders are not required to report on harvests taken under an approved authorisation.**

	FMA	Bins		Weight (kg)		Number		Units not specified	
		Approved	Taken	Approved	Taken	Approved	Taken	Approved	Taken
Snapper	SNA 1	2 (1)	–	100 (3)	25 (3)	756 (7)	482 (7)	1560 (28)	280 (11)
	SNA 2	–	–	–	–	–	–	–	107 (1)
	SNA 7	–	–	–	–	–	–	30 (2)	–
	SNA 8	–	–	300 (2)	150 (2)	–	–	320 (8)	–
	All	2 (1)	–	400 (5)	175 (5)	756 (7)	482 (7)	1910 (38)	387 (17)
Butterfish	BUT 3	–	–	–	–	30 (1)	–	–	–
	BUT 7	–	–	–	–	192 (7)	–	1137 (35)	630 (22)
	All	–	–	–	–	222 (8)	–	1137 (35)	630 (22)
Blue moki	MOK 1	–	–	–	–	207 (8)	–	882 (33)	551 (22)
	MOK 3	–	–	–	–	160 (1)	–	–	–
	All	–	–	–	–	367 (9)	–	882 (33)	551 (22)
Blue cod	BCO 1	–	–	–	–	2 (1)	2 (1)	–	–
	BCO 3	–	–	–	–	260 (1)	260 (1)	–	–
	BCO 4	–	–	–	–	–	–	110 (2)	110 (2)
	BCO 5	–	–	170 (3)	170 (3)	1405 (3)	1345 (3)	–	–
	BCO 7	–	–	–	–	135 (5)	–	520 (11)	284 (7)
	All	–	–	170 (3)	170 (3)	1802 (10)	1607 (5)	630 (13)	394 (9)
Tarakihi	TAR 1	–	–	215 (2)	175 (2)	41 (2)	19 (2)	80 (2)	32 (2)
	TAR 7	–	–	–	–	62 (3)	–	442 (16)	266 (12)
	All	–	–	215 (2)	175 (2)	103 (5)	19 (2)	522 (18)	298 (14)
Kahawai	KAH 1	–	–	80 (2)	30 (2)	760 (4)	517 (4)	378 (9)	21 (4)
	KAH 2	–	–	–	–	–	–	–	309 (1)
	KAH 3	–	–	–	–	50 (1)	–	–	–
	KAH 8	–	–	–	–	–	–	60 (5)	12 (5)
	All	–	–	80 (2)	30 (2)	810 (5)	517 (4)	438 (14)	342 (10)



## 6. OTHER CONCURRENT CREEL SURVEYS

The Ministry for Primary Industries commissions creel surveys for a wide variety of purposes which do not necessarily include quantifying recreational harvest levels. Most creel surveys address short term objectives, such as: characterising a fishery (e.g. for Fiordland between 2006 and 2008 – Davey & Hartill 2011), quantifying localised harvests of one or two species (e.g. for blue cod and sea perch taken in North Canterbury in 2003 – Hart & Walker 2004), or to provide mean weight per species estimates for another programme (e.g. National mean weight survey conducted by NIWA in 2011–12, MAF201103). These surveys are mostly conducted on an intermittent basis, with very little if any temporal or spatial overlap with other programmes.

There are, however, two long running creel survey programmes which are often conducted alongside harvest estimation surveys, which provide some insight into long term trends for some recreational fisheries. The longest running and most extensive of these programmes has been a series of surveys in which recreational landings of kahawai in FMA 1, were sampled annually for length and age, between 2001 and 2008, and in 2011 and 2012. Creel surveys interviews were conducted on weekends between 1 January and 30 April in each year.

A second ongoing creel survey programme was introduced in late 2011, in which recreational fishers are interviewed when they return to a small number of ramps overlooked by web cameras, in FMAs 1, 8 and 9. The intention is to combine web camera based indices of effort with creel survey based indices of boat usage (i.e. the proportion of boats observed on camera that were used for fishing) and catch rate indices, to provide long term harvest indices for at least snapper and kahawai.

Interviews conducted during both these long-term programmes follow a standardised format developed in the early 1990s, and the potential uses of the information collected extend beyond the immediate objectives of each programme. Fishers are asked about all forms of fishing effort and interviewers attempt to count and measure catches of all species landed by intercepted parties. Catch and effort is recorded for each fisher, although these data can be aggregated to provide data on catch per boat. The data collected during the kahawai catch sampling creel surveys have since been used for a wide variety of purposes beyond those initially conceived at the time of collection, such as exploring alternative management regimes for the recreational fishery in SNA 1. This experience suggests that there is considerable merit in specifying standardised questions that should be asked in all surveys commissioned by MPI, to ensure greater comparability between surveys and a more extensive use of the information collected over the long term.

In summary, this information collected in a standard format over time, within random stratified survey sample designs, would generally rate as a one against the research science information standard (Ministry of Fisheries, 2011).

## 7. BILLFISH AND GAMEFISH TAGGING PROGRAMME DATA

The New Zealand Gamefish Tagging Programme (NZGTP) has run continuously since it was initiated by the Ministry of Agriculture and Fisheries in 1975. The NZGTP provides data on numbers of billfish and gamefish tagged and released annually by recreational fishers.

Information provided by this programme and the New Zealand Sport Fishing Council (NZSFC) can be used as a lower bound for recreational catch estimates for the following gamefish species: blue marlin, striped marlin, mako and blue sharks. A high proportion of these species are recorded in sport fishing club records, including some non-member landings (Table 14).

**Table 14: Numbers of blue marlin (BEM) striped marlin (STM), mako (MAK), blue sharks (BWS), and broadbill swordfish recorded as landed and tagged by the NZSFC in 2011–12 and the proportion landed by species.**

Species	NZSFC number landed	NZSFC number tagged	Proportion landed
BEM	78	43	0.65
STM	635	613	0.51
MAK	40	465	0.08
BWS	15	142	0.10
SWO	34	50	0.40

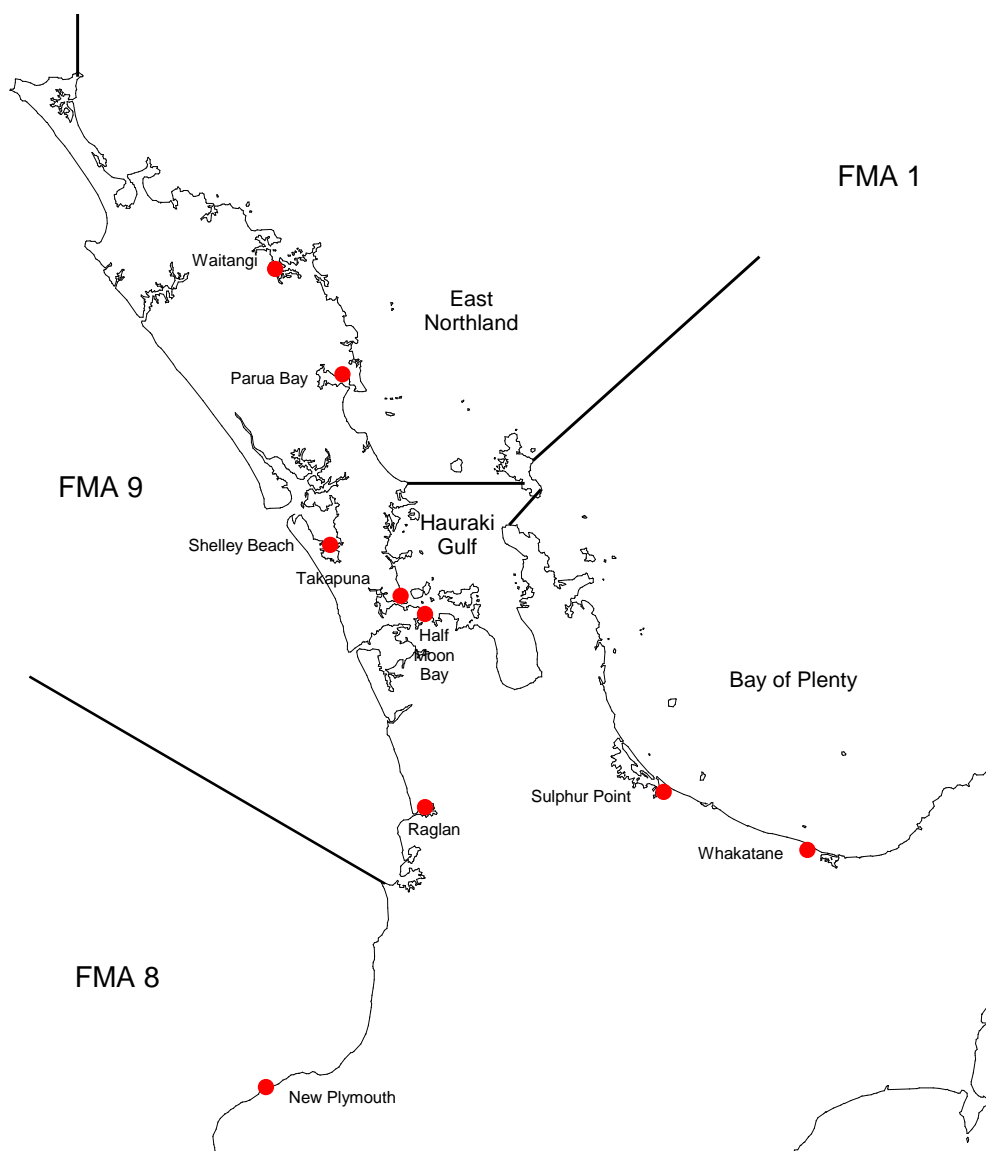
The harvest estimates given in Table 14 are likely to be underestimates because club members are encouraged to tag and release gamefish fish rather than land them (John Holdsworth, Blue Water Marine Research, pers. comm.) and an increasing (albeit minority) proportion of the gamefish catch is being taken by fishers not affiliated to clubs.

However the 2011–12 harvest estimates for blue marlin, striped marlin, mako, blue sharks, and swordfish given here are likely to be the most reliable available, because catches of these species are rarely encountered during general purpose creel surveys, and they are infrequently reported by diarists/panellists. Charter boat operators are not required to report catches of these species on ACV-ACRs (although a billfish logbook programme has collected catch and effort from gamefish charter boats for 37 years). (John Holdsworth, Blue Water Marine Research, pers comm.).

In summary, much of this information would generally rate as a one against the research science information standard, however data from clubs where records are inconsistent over time, or where focus in data provision/recording has changed over time are more likely to rate a two against the research and science information standard (Ministry of Fisheries 2011).

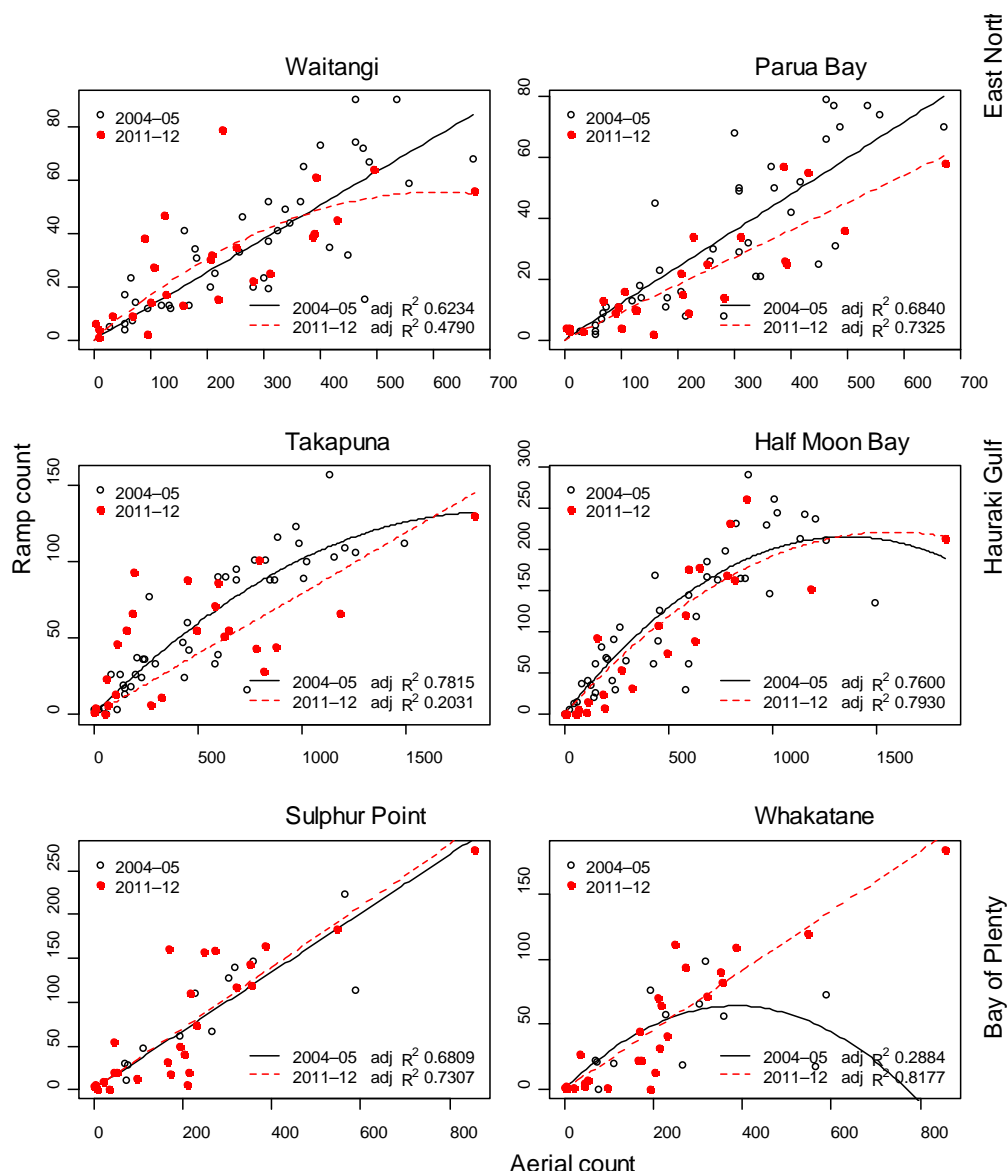
## 8. WEB CAMERA BASED RAMP TRAFFIC DATA

Web cameras have been used to monitor trends in recreational effort in FMA 1 since 2005 and in FMAs 8 and 9 since 2006 (Hartill et al. 2015). Web cameras located at key boat ramps in each region (Figure 3) capture an image of a ramp once every minute, for every minute of the day, and these images are viewed in series to determine the number of boats that returned to the ramp on each day. These data therefore provide a survey independent means of determining whether temporal trends observed in survey data are potentially biased.



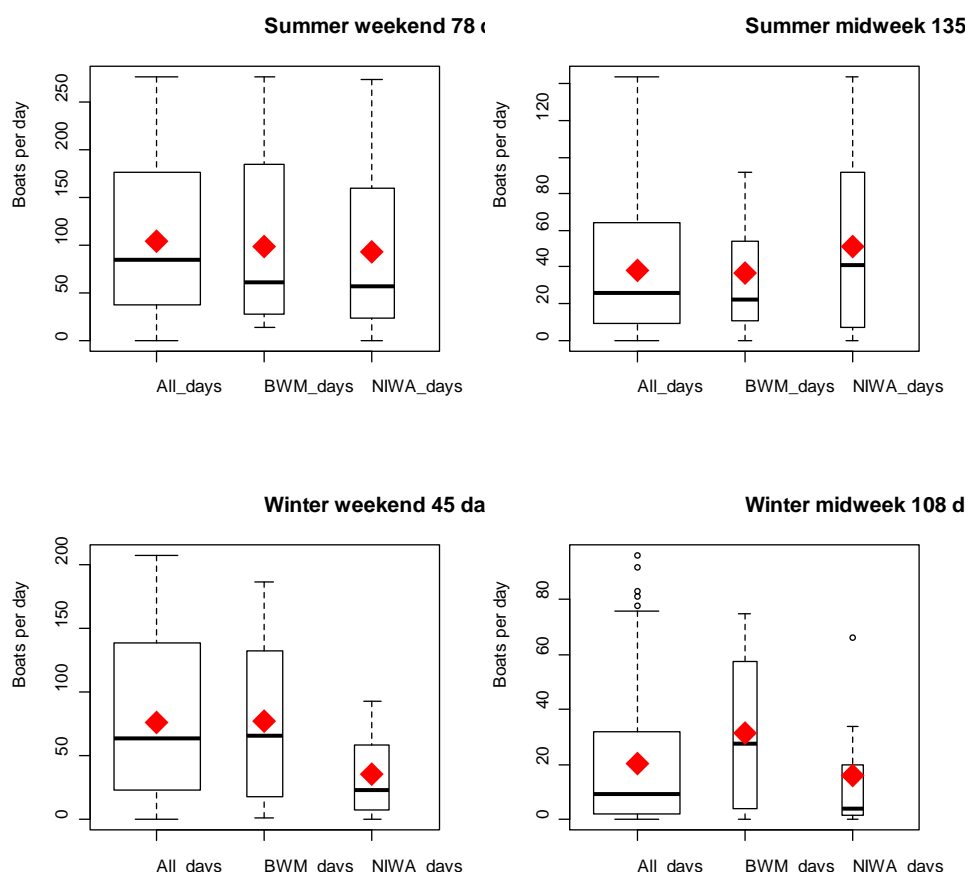
**Figure 3: Location of web cameras overlooking key boat ramps in FMAs 1, 8, and 9.**

Counts of recreational fishing boats made during aerial survey flights in 2011–12 have already been regressed against web camera based traffic counts made on the same survey days (Hartill 2015) (reproduced in Figure 4). These regressions suggest that the relationship between aerial and web camera counts is either linear, or in some cases, traffic can become saturated at some ramps when daily effort levels are high. None of these regressions suggest that aerial counts are negatively biased at increasing levels of fishing effort, although it is likely that aerial observers will overlook some vessels.



**Figure 4: Relationships between: aerial counts and web camera counts at the primary ramp in each region (left panels); aerial counts and web camera counts at the secondary ramp in each region (right panels). Open black symbols and solid lines denote data collected in 2004-05 and solid red symbols and dashed lines denote data collected in 2011-12. Linear relationships were replaced with non-linear fits when the addition of an extra second order polynomial parameter resulted in an AIC statistic significantly lower (less than 2.0) than that provided by the linear fit. Taken from figure 3 of Hartill (2015).**

There are two limitations associated with using web camera data to detect bias in temporal trends in other survey based data. Firstly that the traffic observed at ramps monitored by web cameras will only account for a fraction of the effort taking place within a wider region, and secondly, that many of the vessels observed on camera will have been used for purposes other than fishing. This second issue has been partially addressed following the recent introduction of a creel survey programme that collects data on the proportion of boats used for fishing activity during part of each web camera survey day (images are read on 60 days per survey year only).



**Figure 5: Comparison of the distribution of daily web camera based counts of boats returning to the Sulphur Point boat ramp on all days relative to that on NIWA and BWMR scheduled survey days, by seasonal/day type strata for the 2011–12 fishing year. Box plots show quantile ranges and solid diamonds denote averaged daily boat traffic counts for each plot. Panel titles give the number of days sampled relative to the number of days falling within each temporal stratum.**

Web camera data have been used to assess how representative survey days were in the Bay of Plenty in 2011–12 (Figure 5). These results suggested that survey days preselected by NIWA for an aerial-access survey were biased towards high effort days during the summer midweek stratum, but were biased towards low effort days during both of the winter strata. The days selected by Blue Water Marine Research (BWMR) were more representative in terms of overall effort, but the selection of survey days during the winter midweek stratum was biased towards higher effort days. This type of analysis should be used to assess the temporal representativeness of on-site survey designs in the future.

The best use of the web camera based ramp traffic data discussed here is that it will provide a survey independent long term measure of changes in fishing effort that can potentially be used to monitor trends in effort during years when no harvest estimation surveys are conducted.

In summary, this information would generally rate as a one against the research science information standard in that it has been collected in a scientifically rigorous manner (Ministry of Fisheries 2011). However, it is important to note that the utility of these data to fisheries management is still developing, especially with respect to deriving indices of fishing effort as opposed to trailer boat fishing effort.

## **9. SPORT AND RECREATION NEW ZEALAND SURVEYS**

Sport New Zealand (Sport NZ – formerly SPARC) conducts surveys on an irregular basis to determine relative levels of participation in recreational activities that require physical exertion. Two large scale surveys have been conducted to date: the 1997–2001 NZ Sport and Physical Activity Survey, and the 2007–08 Active New Zealand Survey. A third national survey was started in May 2013, which will run for 12 months. The 2013 survey is being conducted by the National Research Bureau, who also conducted MPI's Large Scale Multi Species survey in 2011–12.

These surveys follow a face-to-face survey approach where respondents are shown an A4 show card that lists a large number of physical activities including marine fishing, and separately, freshwater fishing. Respondents are asked to identify which of these activities they participated in over the last 12 months, 4 weeks, and 7 days. They are then asked to fill out a 7 day recall diary for top 4 types of physical activity. Regional statistics on participation rates by sex, age and ethnicity are available. The reported fishing participation rate decreased from 24.4% in 1997–98 to 19.3% in 2007–08, although issues such as recall bias over a 12 month period are likely to influence any participation rate estimates.

Although these surveys provide some information on recreational fishing activity, they are only broadly informative as they are focused on relative rather than absolute levels of effort. Any quantification of effort focuses on the four types of activity most commonly engaged in over the past seven days, which may or may not include marine recreational fishing. There is no attempt to distinguish between types of recreational fishing activity, such as surf casting compared to boat based fishing, and no data are available on catch or fishing location. Use of these data is unlikely to lead to more robust recreational harvest estimates.

In summary, this information would generally rate as a two to three against the research science information standard (Ministry of Fisheries 2011), except for the generic commentary about participation rates (which given the random stratified survey design and national scale should rank as science quality one).

## **10. DOMESTIC TRAVEL SURVEY**

The purpose of the Domestic Travel Survey (DTS) is to provide accurate quarterly information on numbers and types of trip and activities undertaken (including fishing), expenditure, and on respondent demography. The DTS is currently managed in-house by the Ministry of Business Innovation and Employment (MBIE) and was previously managed by the Ministry of Economic Development (MED). MBIE analyses and disseminates survey results, but the collection of these data is outsourced to private survey companies. The DTS has been conducted annually since 1983, apart from the period 1991 to 1998.

Approximately 15 000 people are surveyed each year, who are selected from households selected from a White Pages sample frame. Only one individual aged 15 years or older is selected from each cooperating household, given pre-specified sampling quotas for age, sex and region. Information is collected for domestic overnight trips undertaken in the last four weeks and domestic day trips undertaken in the last week. The short recall period minimises the potential for recall bias. A distinction is made between marine and freshwater fishing, but no information is collected on catch, effort or fishing method.

Data are only collected for trips greater than 40 km from home, yet many recreational fishing trips will occur within this distance, and there is no way of determining the proportion of trips travelled beyond 40 km. This means that there is no reliable means of scaling these data to determine the total number of

trips occurring within a given area within a given time. These data therefore appear to be of very limited use, other than to provide a minimum estimate of effort.

In summary, until there is substantial improvement in the rigour of collection and curation this information would generally rate as a three against the research science information standard (Ministry of Fisheries 2011).

## **11. WEATHER DATA**

NIWA has a national climate database that can provide daily/hourly data for a wide variety of weather variables. Previous modelling of boat ramp traffic data (Watson & Hartill 2005, Bian & Hartill 2015) suggests that the main environmental determinant of effort is wind speed, followed by wind direction. The weather over preceding days (and weekends) can also influence levels of recreational fishing on any given day, as prolonged periods of inclement weather can result in pent up latent fishing effort.

Although weather data can be used to infer trends in effort in the short term (days to weeks), longer term trends in effort and harvest will be strongly influenced by other factors such as population growth (also considered by Watson & Hartill 2005, Bian & Hartill 2015) and changes in catch rates and catch composition. In the Hauraki Gulf for example, there is good evidence to suggest that most of the increase in the snapper harvest detected by Aerial-Access surveys in 2004–05 and 2011–12 was due to increased catch rates and increased mean fish weights, rather than any substantive change in levels of effort. Seasonal and social calendars should also be considered as these also strongly influence levels of recreational catch and effort.

Weather patterns therefore only partially explain long and short term trends in effort, and to a lesser extent catch, because of other influential factors. Consequently survey and logbook based data on levels of catch and effort are more informative as they provide direct observations of the cumulative effect of several interacting influences, of which the weather is but one. Long term trends in weather are still informative however, as they can be used to assess whether or not a season was conducive to fishing, in at least a qualitative sense.

In summary, although the underlying weather data are undoubtedly of science quality one, in the context of recreational fisheries there is a substantive improvement in understanding the links between weather and recreational fishing effort required before weather information might rank highly against the research science information standard (Ministry of Fisheries 2011).

## **12. OTHER SOURCES OF INFORMATION CONSIDERED**

We have also considered, but rejected, the following sources of information which have been considered in previous studies:

- Catches landed at fishing competitions
- Consumer expenditure
- Disposable income indices
- Household economic survey statistics on boat expenditure
- Coastguard data on VHF traffic
- Parking ticket sales at ramps
- Water Safety NZ data on drownings
- Fresh water angling licence sales figures
- Trade and Industry import data on boats and fishing gear.

- A report by Shallard & Associates (2009) which assessed the utility of existing auxiliary data sources: trailer registrations, imports, TV viewership, boat safety, magazine sales, DVD sales, bait sales, VHF registrations, boat constructions, stock assessment information, Taupo licence data, catch records from fishing clubs, SPARC survey data, internet usage, overseas practices – which they concluded were not sufficiently informative.

These information sources mainly relate to long term measures of effort and not harvest. Regardless, they are very poor descriptors of relative and/or absolute change in effort or harvest.

In summary, these sources would generally rate as a three against the research science information standard (Ministry of Fisheries 2011).

### 13. SYNTHESIS OF AVAILABLE ANCILLARY DATA ON RECREATIONAL HARVESTS

Of the 10 sources of information on recreational fisheries that are reviewed here, most are of limited use and can only improve the accuracy of the 2011–12 survey based harvest estimates to a limited degree (Table 15).

**Table 15: Summary of how reviewed data sources could be used to improve recreational harvest estimates provided by the national NRB LSMS survey, the NIWA aerial-access survey of FMA 1 and the creel surveys conducted by BWMR in the western Bay of Plenty in 2011–12. Instances where these data sources are potentially useful are shaded.**

Data source	LSMS survey	Aerial-access survey	W Bay of Plenty creel survey	Long term use
Charter boat returns	Better for a few QMAs?	No overlap	No overlap	Strong potential <sup>1</sup>
Commercial S.111	Additional harvest	Additional harvest	Additional harvest	Additional harvest
Fishery office reporting	Undefined overlap	Undefined overlap	Undefined overlap	Insight into relative illegal
Customary reporting	Additional harvest	Additional harvest	Additional harvest	Lagged but useful
Other creel surveys	Already integral	Already integral	Already integral	Should standardise
Gamefish tagging	Better for some species	No overlap	No overlap	Better for some species
Web camera	Different sample frame	Were survey days typical?	Were survey days typical?	Long term index
SPARC surveys	No overlap	No overlap	No overlap	Not that informative <sup>2</sup>
Domestic travel survey	Not that informative	Not that informative	Not that informative	Not that informative <sup>3</sup>
Weather data	Too few diarists on day	Web camera better	Web camera better	Loose relation to effort

<sup>1</sup> Subject to required improvements in reporting of effort and catch, and, in databases and enforcement.

<sup>2</sup> Except in the context of changes in participation rates over time.

<sup>3</sup> Unless substantive changes made to data collected and comprehensiveness of collection and reporting.

#### 13.1 Implications for off-site survey estimates

Although the National Panel Survey (NPS) conducted by NRB in 2011–12 provided recreational harvest estimates for most of the fisheries commonly fished by recreational fishers, the accuracy of some of these estimates could be improved if information from other data sources are also considered. In particular:

- charter boat operators are currently required to report harvests taken from a small number of fish stocks, and the coverage of the ACV-ACR system should be far more comprehensive than that provided by the limited numbers of panellists – although the utility of charter boat data collected in 2011–12 is limited however, because further work is required before this system



can reach its potential (noting that if that work were complete it would substantially improve estimates from the NPS);

- the estimates provided by the NPS method do not include harvests taken from commercial fishing vessels, but comprehensive and reasonably accurate data on these harvests should be available from S.111 returns - a summary of S.111 harvests reported in 2011–12 suggests that commercial fishers could account for a significant proportion of the harvest from a few shellfish fisheries, but finfish harvests taken from commercial vessels are relatively inconsequential;
- the NPS survey is unlikely to provide reliable harvest estimates for billfish and large gamefish species because relatively few New Zealanders catch these species, and some of the harvest will be taken by anglers from overseas - reasonably accurate harvest estimates can be derived from data provided by the gamefish tagging programme and the NZSFC, although these estimates will be underestimates to some degree; and
- the remaining data sources are not considered informative when evaluating national fishstock harvest estimates.

### 13.2 Implications for on-site survey estimates

The aerial-access survey conducted by NIWA throughout FMA 1 and the creel surveys conducted by BWMR in the western Bay of Plenty during 2011–12 provide harvest estimates for the more prominent recreational fisheries in these areas, but the accuracy of these estimates could be improved if two ancillary data sources are also considered:

- the on-site methods used in 2011–12 do not provide any estimates of the harvest taken from commercial fishing vessels, but S.111 reports readily provide data on these;
- daily traffic count data have been used to assess whether the on-site method survey days randomly preselected in 2011–12 were representative in terms of relative levels of daily effort - this assessment, which was undertaken as part of another programme (MAF-2011/04), suggests that the NIWA survey favoured low effort days during the winter, and that the BWMR survey favoured higher effort midweek winter days (Hartill & Edwards 2015); and
- the remaining data sources are not considered informative when evaluating the on-site harvest estimates generated in 2011–12.

Potential future uses of the reviewed data sources beyond 2011–12 are summarised in the following conclusions.

## 14. CONCLUSIONS

As a result of this review of ancillary sources of information the following conclusions are drawn:

- This review has examined ancillary sources of information that could be used to improve the reliability of estimates provided by surveys specifically designed to quantify levels of recreational harvest and effort. Some of these data sources are potentially useful, but others are not.
- An amateur charter boat reporting system (ACV-ACR) was introduced on 1 October 2010, which is still in a developmental stage, as reporting requirements have been extended since its introduction. The review provided here is the first external review of the data provided by this system, and several recommendations are made to improve the utility these data in the future. Protocols for the grooming and storage of the information provided should be developed and implemented as soon as possible as there is currently no enforcement of data validation rules, and considerable effort is required to transform the available data into a usable format. Although many operators provide weight estimates for a wide variety of species, many of these estimates appear to be very inaccurate, and associated

counts of fish caught are probably more reliable. This system and the data that it provides should be actively managed to ensure that it meets its full potential, especially at this formative stage.

- Some commercial fishers fish recreationally from commercial fishing boats and report these catches on the commercial catch/effort return for that trip. Commercial catch/effort reporting systems are long established and recreational harvest data derived from this source are probably reasonably accurate. Some data grooming is still required however as recreational harvest weights reported for a small number of trips are implausibly high. The level of recreational harvesting reported by commercial fishers is appreciable for a small number of species only: snapper, blue cod, hapuku/bass, rock lobster and paua.
- Fisheries officers and honorary fisheries officers routinely record data during compliance operations that are held on a common database. Fisheries officers are far more likely to detect non-compliant activity than honorary officers as they are more likely to undertake operations that target areas where non-compliance is more likely. Non-compliant shellfish harvests are more likely than non-compliant finfish harvests. These data appear to be largely error free but little can be inferred about levels of recreational harvesting from the data available because compliance operations occur in a targeted and non-random manner. Perhaps the best use of these data is that they give some indication of possible levels of non-compliance by non-commercial fishers, which is not usually detected by any other information source. These data could also be used to inform survey designs, such as to identify relative levels of likely fishing effort.
- Although customary harvests taken under authorisations given by Tangata Kaitiaki/Tiaki are not formally considered to be recreational harvests, information reported on customary returns during the 2010–11 fishing year has been summarised to determine the potential utility of these data and the likely scale of this source of non-commercial harvesting. These data suggest that harvests of some shellfish species can be significant in some areas, but that the harvest of finfish species by this sector is insignificant relative to that taken by the commercial and recreational sectors. Although this data source is informative, harvests are reported in a range of metrics which are often semi quantitative, which limits the ultimate utility of any data provided.
- MPI commission creel surveys for a variety of reasons which do not necessarily include estimating recreational harvests. Most of these surveys are conducted over periods of 12 months or less, and although they provide background information that can be used to inform future survey designs, the long term utility of the information they provide is limited beyond their immediate purpose. There are two creel survey programmes that are conducted over a longer time frame which provide greater insight into trends and the nature and extent of the recreational fisheries surveyed. These programmes and the data they provide demonstrate the value of collecting comprehensive interview data in a consistent manner.
- Harvest estimates are also provided for three commonly caught gamefish species: blue marlin, striped marlin, mako blue sharks and broadbill swordfish. These estimates are based on statistics provided by the New Zealand Sport Fishing Council. These are likely to be the most accurate harvest estimates available for these species, because catches of these species are rarely reported and observed during on-site and off-site survey programmes.
- Web cameras have been installed overlooking several boat ramps in FMAs 1, 8 and 9. These systems provide a means of monitoring temporal trends in fishing effort over the long term, which can inform the comparison of survey based harvest estimates generated years apart.

- Sport and Recreation New Zealand (and formerly SPARC) have conducted two national surveys to determine relative levels of participation in types of physical recreational activity. Another similar survey is currently under way. Although these surveys provide recreational fishing participation rate estimates, no data are collected on numbers of trips undertaken or associated catches. It is unlikely that these surveys will provide any information that could result in more robust harvest estimates.
- A Domestic Travel Survey is conducted annually by MBIE (formerly MED) to provide estimates of numbers of domestic trips travelled at least 40 km from home. Although these surveys provide estimates of the number of long distance fishing trips undertaken annually, there is no reliable means of scaling these estimates to account for trips that also occur within 40 km of home, and no data are available on associated catches. Consideration of these data and estimates is unlikely to result in more robust harvest estimates.
- NIWA has a national climate data base containing fine scale long term data on a variety of weather variable. Although previous studies have shown that prevailing wind speeds and directions partially explain relative trends in fishing effort, there are many other factors that should also be considered, and the accuracy of short term predictions based on these data is limited.
- Several other sources of information were considered in this review but none of these are likely to inform the generation of more robust recreational harvest estimates.
- This review concludes that although targeted surveys have provided the most reliable estimates of total recreational harvest available to date, some of the data sources examined here could provide more accurate estimates for some aspects of the recreational fishing community, such as that taken by commercial fishers and from some charter boat fisheries. This is because these information sources are targeted specifically towards those subcomponents of the recreational fishing community, which are poorly sampled by large scale survey methods.

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## APPENDIX 1: Amateur Charter Vessel Activity Catch Return form.

<b>Ministry of Fisheries</b> <small>A Division of MAF</small>		<b>Amateur Charter Vessel Activity Catch Return</b>				<b>ACV 1032252</b>
1. Complete one return (using as many pages as required) for each fishing trip. For multi-day trips each day must start on a new page.						Page <input type="text"/> of <input type="text"/>
2. Date of fishing (dd/mm/yy)		MNZ/MSA number of vessel		Name of vessel		MFish operator number
<input type="text"/>		<input type="text"/>		<input type="text"/>		<input type="text"/>
3. Activity Reporting. Complete a new fishing event column each time the fishing location, fishing method or target species changes.						Nil return? Yes <input type="radio"/> No <input type="radio"/>
New fishing event		New fishing event		New fishing event		
Target species	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Fishing method	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
People actively fishing	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	
Latitude: (degrees minutes)	<input type="text"/> ° <input type="text"/> ' S	<input type="text"/> ° <input type="text"/> ' S	<input type="text"/> ° <input type="text"/> ' S	<input type="text"/> ° <input type="text"/> ' S	<input type="text"/> ° <input type="text"/> ' S	
Longitude: (degrees minutes E/W)	<input type="text"/> ° <input type="text"/> ' E/W	<input type="text"/> ° <input type="text"/> ' E/W	<input type="text"/> ° <input type="text"/> ' E/W	<input type="text"/> ° <input type="text"/> ' E/W	<input type="text"/> ° <input type="text"/> ' E/W	
Time spent fishing (hh:mm)	<input type="text"/> : <input type="text"/>	<input type="text"/> : <input type="text"/>	<input type="text"/> : <input type="text"/>	<input type="text"/> : <input type="text"/>	<input type="text"/> : <input type="text"/>	
4. Catch Reporting. Complete one line for each species taken for which reporting is required (see Explanatory Notes for the Catch Reporting Species list).						
Species caught	Number caught	Number retained	Estimated weight (kg)	Species caught	Number caught	Number retained
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/> .0kg	<input type="text"/>	<input type="text"/>	<input type="text"/>
5. Sign and date each page.						
I declare that the information I have given on this return is correct and complete, and that I have read and understood the explanatory notes supplied with this return.			Name of guide/skipper (e.g. J.SMITH)		Signature	
<input type="text"/>			<input type="text"/>		<input type="text"/>	
					Date signed	
					<input type="text"/>	