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Identification and reporting of commercial skate landings

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EXECUTIVE SUMMARY

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Rough and smooth skate (*Dipturus nasutus* and *D. innominatus*) were introduced into the Quota Management System on 1 October 2003, and correct identification of species assumes more importance both for compliance and sustainable management of each species as separate stocks. The aim of this project (Ministry of Fisheries project SKA200301) was to determine the extent to which skates are being correctly identified.

Methods to achieve this involved three steps. Firstly, catch data from the Ministry of Fisheries catch-effort database were extracted to determine the relative quantities of skate reported historically under the species codes RSK (rough skate) and SSK (smooth skate), and the generic code SKA. Secondly, the routine procedures used by fishers and processors for landing, weighing, and reporting skate were examined. And lastly, skate landings were sampled from processor factories throughout the South Island to determine the extent to which landed skates are correctly weighed and reported by their species codes (RSK and SSK).

The overall proportions of skate reported between 1989–90 and 2003–04 were RSK 22.5%, SSK 33.1%, and SKA 44.5 %. The species code SKA was not permitted after skate was introduced into the QMS in 2003, although a small amount of catch (0.7%) was still coded as SKA in 2003–04. There were no clear trends in the relative proportions of SSK or SKA reported over time, but for RSK the proportion has steadily increased, particularly in 2003–04 when RSK landed catch was three times that of SSK.

Between 1 March and 11 October 2004, 6250 kg of skate were sampled from 47 landings at six South Island factories (four companies). These landings were from 26 inshore trawlers ranging in length from 10 to 37 m. In 49% of landings processors over-reported RSK (and under-reported SSK) and in 11% they over-reported SSK (and under-reported RSK). In 40% of landings the proportions of RSK and SSK were the same for processor and sampler; however these landings were 100% RSK and RSK was used to report catch by default. Both RSK and SSK were reported by processors in 13% of landings compared to an actual sampled 57%. The sampled catch from the 47 landings overall by weight was 77% RSK and 23% SSK. Processors reported 87% of the catch as RSK and 13% as SSK, so identification by processors was often incorrect. Sampled catch indicates that RSK is the dominant species in QMA 3 and to a lesser extent in QMA 1, but in QMAs 7 and 8, SSK is caught in similar quantities to RSK. The equivalent processor species proportions are similar to those sampled in QMA 3, but for other QMAs they differ markedly, reflecting poor identification.

The findings highlight a serious identification problem resulting in over-reporting of rough skate and, correspondingly, under-reporting of smooth skate. Neither fishers nor processors are distinguishing between the two skate species and reporting catches of each species correctly. Skate data in the Ministry of Fisheries Catch Effort Database, and from Monthly Harvest Returns (MHR) and Licensed Fisher Receiver Returns (LFRR), should therefore be regarded as inaccurate. Rough and smooth skates are easily distinguished, even in the 'wings' state. However, training of fishers and processors is required before accurate catch statistics can be expected.

1. INTRODUCTION

Commercial landings of skate in New Zealand comprise two species, rough skate (*Dipturus nasutus*, RSK) and smooth skate (*D. innominatus*, SSK). Both species were previously classified in the genus *Raja*. Two other species of deepwater skate (*Bathyraja shuntovi* and *Amblyraja hyperborea*) are relatively uncommon and probably comprise a negligible proportion of the landings. Rough and smooth skates are distributed throughout New Zealand waters over the continental shelf and upper slope to a depth of about 500 m (Francis 1997). Smooth skate is generally found deeper than rough skate, but the two species are often caught together. These are the only skate species found on the continental shelf in depths less than 200 m, which is where most of the commercial catch is taken. Rough and smooth skates usually occur on open mud bottom and are therefore associated with numerous other demersal fishes. The bulk of the skate commercial catch is taken from the South Island, particularly Fisheries Management Area 3 where it is mainly a bycatch of trawl fisheries that target species such as red cod, barracouta, and flatfish. Skates are also caught as bycatch of the ling longline fishery, although it is likely that the deepwater skates are often incorrectly recorded as rough or smooth skate. Skate landings are more related to the timing of fisheries for target species than an inherent seasonal pattern of availability. For example, very little skate is processed in Dunedin between November and February when many inshore vessels change from targeting finfish to rock lobster. Similarly, in the Canterbury Bight many inshore vessels set net for elephantfish, school shark, and rig between November and February, and during this time skate landings decline.

Most landings of skate are from smaller inshore vessels (under 28 m) that are required to complete Catch, Effort and Landing Returns (CELR) (Francis 1997). These vessels undertake trips of one to several days and land skates to the processor as wings with skin on, kept on ice. However, a number of inshore vessels (under 28 m) on the east coast South Island complete Trawl, Catch, Effort and Processing Returns (TCEPR) and landed catch is recorded on Catch Landing Returns (CLR). This gives the false impression that there are considerable quantities of skate landed by vessels fishing in deepwater. Skates caught on deepwater processing vessels are seldom processed and are usually discarded.

The commercial fishing industry has found it difficult to distinguish between rough and smooth skate and the code SKA has often been used as a generic term for either species. About one-half to one-third of landings in recent years have been reported as SKA (Francis 2002a). Further, where RSK or SSK have been used, there is doubt as to whether identification has been correct. The two species are similar in morphology and it is not surprising that identification poses problems for the fishing industry. Indeed, processors seldom question the identification of skate wings landed by fishers. The degree of misidentification is unknown, but discussions with processors and fishers suggest that there is often confusion. Recent work has shown that the two species can be easily distinguished (Francis 2002a, 2002b).

Skates were introduced into the Quota Management System on 1 October 2003 and correct identification of species assumes more importance both for compliance and sustainable management of each species as separate stocks. The aim of this project was to determine the extent to which skates are being correctly identified

2. METHODS

2.1 Skate landings

Catch data from the Ministry of Fisheries catch-effort database were extracted to determine the relative quantities of skates reported historically under the species codes RSK and SSK, and the generic code SKA. Specifically, landed greenweights of species codes SKA, SSK, and RSK from

Catch Landing Returns (CLR) and Catch Effort Landing Returns (CELR, landing), by fishing year (1989–90 to 2003–04), and Fisheries Management Area (FMA) were extracted.

2.2 Weighing and reporting procedures

The routine procedures for landing, weighing, and reporting skates were documented based on discussions with a number of fishers and processors.

2.3 Skate sampling at processors

Skate landings were sampled in processors' coolstores to determine the extent to which landed skates are correctly weighed and reported by their species codes (RSK and SSK). Only landings from South Island processors were sampled because the bulk of skate is caught in Quota Management Areas (QMAs) 3 and 7 (Annala et al. 2004). Similarly, sampling was restricted to landings from inshore vessels that fish the continental shelf and upper slope where skates are most commonly caught. These vessels undertake trips of one to several days and skates are landed as wings with skin on, on ice.

Skate landings were sampled from the Ngai Tahu Seafood Products Ltd (Bluff and Dunedin factories), Otakou Fisheries Ltd (Dunedin), Sanford South Island (Timaru), and Talley's Fisheries Ltd (Motueka and Nelson factories).

Skate wings are landed to the dock in fish boxes (about 50 kg capacity) where they are immediately weighed by the processor and held in a coolstore until processing. After weighing and before processing, we examined all skate wings from the landing, sorted them into rough and smooth skate, and weighed each species. Identification was based on morphological features described by Francis (2002a) and supplemented by observations and photos of skates by the author during the 2003 trawl survey of the Southland and sub-Antarctic region (TAN0317). Details were also recorded of the vessel that landed the skates, and the proportion of each species per fish box, to determine if fishers had attempted to sort and land skates as separate species. The equivalent weights of each skate species for the sampled landing were then requested from the processor. Actual landed catch (as determined from sampling) was then compared directly with the processors' reported catch.

Because fishers and processors vary in their ability to correctly identify skates, landings were sampled from a number of vessels in each port to ensure the results are representative of the fishery as a whole. Based on discussions with the four processors, a target of 25 landings from four to six 6 vessels per port was set.

Sampling was planned for between March and November 2004 when many inshore vessels trawl in the multispecies demersal fishery, and when skate are commonly caught. Outside this time, many vessels target rock lobster or set net for rig and school shark.

3. RESULTS

3.1 Skate landings

The total catch of all skates in 1989–90 was about 1500 t and it increased markedly in 1991–92 and 1992–93, thereafter fluctuating between about 2500 t and 3300 t per year (Figure 1). The catch for 2003–04 was about 2500 t, the smallest since 1991–92, and was probably constrained by the combined RSK and SSK TACC of 2835 t (Annala et al. 2004). The species code SKA was not permitted after skates were introduced into the QMS in 2003, although a small amount of catch

(0.7%) was still coded as SKA in 2003–04. There were no clear trends in the relative proportions of SSK or SKA reported over time, but for RSK the proportion has steadily increased, particularly in 2003–04 where RSK landed catch was three times that of SSK. The overall proportions of skates reported between 1989–90 and 2003–04 were RSK 22.5%, SSK 33.1 %, and SKA 44.5 %.

Between 1989–90 and 2003–04 the overall proportion of skate catch reported on CELRs (catch landing data) was 72%, with the remainder reported on CLRs. There was a slight trend of increasing catch of skates reported by CLRs in recent years (Figure 2). Over the same period, 60% of skates were caught in FMA 3, 15% in FMA 7, and 10% in FMA 5. In FMAs 5 and 6 (Southland and sub-Antarctic) SSK catch was greater than that of SKA. In all other FMAs, catch reported as SKA was greater than that of either RSK or SSK (Figure 3).

3.2 Landing, weighing and reporting procedures

3.2.1 General procedures

The general procedures used by fishers and processors for handling and reporting skate catch are described in chronological order.

1. Skates caught at sea *may or may not* be sorted into RSK and SSK and binned separately by the fisher.
2. Fishers estimate greenweight of RSK and/or SSK catch at sea; if in the top five species by weight vessels under 28 m length complete CELRs, and over 28 m complete TCEPRs.
3. Fishers land skates to the Licensed Fish Receiver (LFR) who *may or may not* sort skates into species before weighing
4. The LFR provides a landing docket to the fisher with the total weight of each species, either immediately before the vessel leaves the wharf or within days, and subsequently a greenweight docket which includes information on fishstock, landed state, number of tubs, landed weight (wings), and greenweight.
5. Fisher completes Catch Landing Data section of the CELR, or a CLR form if a TCEPR is used, with information taken from the greenweight docket, i.e., fishstock and greenweight.
6. The LFR completes a monthly Licensed Fish Receiver Return (LFRR) providing total monthly landed weights of each species and the source of the catch, i.e., quota holder/fisher.
7. The Fisher completes a Monthly Harvest Return (MHR) with total monthly catch weights for each fishstock.

3.2.2 Comments on the procedures

1. Only one of the 27 landings that included both rough and smooth skate, was correctly sorted by species into separate bins.
2. None of the four LFRs sorted the catch into RSK and SSK before weighing, and usually weighed catch according to what the fisher stated was landed (e.g., two boxes of RSK and one box of SSK, but not necessarily the correct bins).
3. The recorded catch from LFRRs should be the same as that from MHRs for each fisher. Also, the sum of LFRRs (or MHRs) should be equal to the sum of catch recorded in CLRs and the Catch Landing Data of the CELR.
4. If the LFR provides species weights that differ from fisher's records of what was landed the fisher must get LFR to amend greenweight docket, otherwise the MHR and LFRR monthly summaries will not tally.

3.3 Skate sampling at processors

Between 1 March and 11 October 2004, 6250 kg of skate were sampled from 47 landings at six South Island factories (Table 1), exceeding the target of 25 landings. These landings were from 26 trawlers sampled usually once or twice, with a maximum of four (Table 2). Vessels ranged in length from 10 to 37 m with a mean length of 17 m. Of the 26 vessels, 3 completed CLRs, 22 CELRs, and 1 both CLRs and CELRs. Only two vessels were over 28 m long and therefore required to complete deepwater TCEPR and CLR returns; the two other vessels may have done so at the request of the Ministry of Fisheries.

For each of the 47 landings the degree to which processors correctly weighed and reported skates by species is shown in Figure 4. The results show that:

1. 49% of landings processors over-reported RSK (and under-reported SSK), and 11% they over-reported SSK (and under-reported RSK);
2. 40% of landings the proportions of RSK and SSK were the same for processor and sampler. In all cases, however, landings were 100% RSK, and RSK was used to report catch by default;
3. RSK and SSK were reported by processors in 13% of landings compared to an actual sampled 57%.

Most of the sampled skate catch came from QMAs 3 and 7 (63% RSK 3/SSK 3, 26% from RSK 7/SSK 7) with the remainder from QMAs 1 and 8 (Table 3, Figure 5). The sampled catch from the 47 landings overall by weight was 77% RSK and 23% SSK, whereas processors reported 87% of the catch as RSK and 13% as SSK (Table 3). The total sampled weights of skates are not exactly the same as processor reported catch (6250 compared to 6557 kg), probably because processors make allowance for ice in the fish boxes and we weighed skates without ice. Processors over-reported rough skate in RSK 1, 3, and 7 and, correspondingly, under-reported smooth skate in SSK 1, 3, and 7 (Table 3, Figure 6). RSK was most markedly over-reported in QMAs 1 and 7 where SSK comprised a larger proportion of the skate catch. Only in QMA 8 was RSK under-reported by the processor; in this case the catch from one of the two landings was reported as 100% SSK, whereas sampling showed that only RSK was present.

Sampled catch indicates that RSK is the dominant species in QMA 3 and to a lesser extent in QMA 1, but in QMAs 7 and 8, SSK is caught in similar quantities to RSK (Table 4). The equivalent processor species proportions are similar to those sampled in QMA 3, but for other QMAs they differ markedly.

4. DISCUSSION

4.1 Reporting accuracy

The aim of this project was to determine the extent to which skates are correctly identified and reported by fishers and processors. If identification of skates by fishers/and processors was accurate, the proportions of each species in each landing reported by the processor and as determined by independent sampling would be roughly the same. The results of this programme show clearly that this was not the case and highlights a serious identification problem that is resulting in over-reporting of rough skate and, correspondingly, under-reporting of smooth skate. In nearly half the landings RSK was over-reported by processors. Smooth skate was present in nearly two-thirds of the landings, but reported in only 13%. Although the results show that 40% of landings were correctly identified, this is misleading since these landings were 100% RSK. By using RSK as the default code, processors get a large proportion of the catch identification correct simply because many landings comprise only RSK. In other words, if processors report all catch of skates as RSK, then for 40% of the landings identification and reporting

would be correct. Further, although sampling showed that overall 23% of the catch was SSK compared with 13% reported by processors, identification by processors was often incorrect.

None of the six factories sampled, sorted the catch into rough or smooth skate before weighing. There are two reasons for this. Firstly, the catch is weighed by fish box as it is landed on the wharf and factories assume fishers have sorted their catch correctly. Secondly, factory staff indicated that they cannot distinguish between the two species. Identification of live skates is easier than in the factory where only the wings are landed and the distinguishing black blotches of smooth skate are less distinct. Thus, fishers should be better able to identify skates at sea and land these in separate boxes. There was only one landing sampled where smooth skate and rough skate were boxed separately, a clear indication that fishers have been either unable or unwilling to separate and box the two species at sea.

Although the code SKA was not used to any extent in 2003–04, the first year for RSK and SSK as quota species, this has not improved the reporting accuracy. Catch previously reported as SKA now appears to be reported as RSK (see Figure 1). The tendency to use RSK as the default code may be because RSK are more common than SSK, particularly further inshore. It is also possible that to some degree reporting may actually reflect TACCs and quota holding more than actual catch because the TACC for RSK is 1986 t compared to 849 t for SSK (Annala et al. 2004).

As noted, not all inshore vessels (under 28 m) complete CELRs and thus the catch by form type is not necessarily an indication of deepwater versus inshore catch.

4.2 Identification

NIWA recently carried out research into identification of skates and provided a report to the Ministry of Fisheries (Francis 2002a), an article to *Seafood New Zealand*, (Francis 2002b), and an identification guide in the form of a poster and description of each skate species (Ministry of Fisheries contract MOF2001/03N). The distinguishing features of rough and smooth skate were described as follows.

Smooth skate

- Grey above with many large charcoal blotches (no white dots).
- Tail narrower than in similar-sized rough skates.
- Can grow very large (max. length excluding tail at least 158 cm, max. weight at least 60 kg).

Rough skate

- Brown, grey, or olive green above.
- Margins of fins and snout reddish (possibly an artifact of trawl capture).
- Usually sprinkled with many small white dots and often with fewer larger dark spots.
- May have a marbled network of white lines.
- Large dark 'eye-spot' present near centre of each wing.
- Tail broader than in similar-sized smooth skates.
- Smaller than smooth skate (max. length excluding tail at least 79 cm, max weight at least 13 kg).

Observations from sampling skates on the R.V. *Tangaroa* trawl survey of Southland and the sub-Antarctic region (TAN0317), and in processing factories, suggest that ventral colour is an important diagnostic feature to distinguish between the two species. Smooth skate are mottled grey/black, ventrally, particularly near the anterior-posterior midline, whereas rough skate are white with well-defined small black spots (Figures 7–12). This characteristic was particularly helpful in identifying skates from wings when the dorsal charcoal blotches of smooth skate were often less distinct. Size was also found to be a useful indicator because most rough skate sampled were smaller than smooth skate.

4.3 Recommendations

For skates to be correctly reported by species on CELRs, CLRs, LFRRs, and MHRs, the fishing industry will need to distinguish between rough and smooth skate. There are two options for addressing this.

1. Identification and sorting of skates could be carried out at sea by fishers, and the landed catch of each species clearly identified to wharf staff at unloading.

2. Factory staff could sort through the entire landed catch to ensure that rough and smooth skate are weighed separately and reported accurately.

Option 1 offers the most practical solution as fishers are required to record the correct skate species on the catch/effort landing section of their CELRs and TCEPRs (if in the top five). The ability to distinguish between the species is therefore mandatory.

Option 2 is probably less desirable as skates are difficult to sort at the factory because wings are flat, slime-covered, and tend to adhere together in the fish box, and identification of wings is more difficult than for whole live specimens. Landings can also contain large quantities of skates presenting logistical problems.

Regardless of which option is preferred, a campaign of education and training of fishers/processors on skate identification is required. The identification guides produced earlier by NIWA (Francis 2002a, 2002b) appear to have had little effect on improving species identification and it is not clear whether they were distributed to industry by the Ministry of Fisheries. A first step in the education campaign is therefore to ensure that all commercial fishers receive a copy of the guide and be informed of the QMS requirement to identify species accurately. The guide should also be updated incorporating those characteristics used in this programme to distinguish between the species. Following this, a similar sampling programme should be carried out to gauge whether identification and reporting of skate catch has improved.

5. ACKNOWLEDGMENTS

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Table 1: Skate sampling details from six processing factories at five ports.

Processor	No. landings	Sampled weight (kg)	Percent weight
Ngai Tahu (Bluff)	12	1 409	22.5
Ngai Tahu (Dunedin)	11	988	15.8
Otakou (Dunedin)	1	621	9.9
Sanfords (Timaru)	10	945	15.1
Talleys (Motueka)	2	333	5.3
Talleys (Nelson)	11	1 955	31.3
Totals	47	6 250	100

Table 2: Details of 26 vessels from which landings of skates were sampled.

Vessel	Length (m)	Port landed	Reporting form	No. landings	Landed weight (kg)	Percent weight
Amatal Mariner	37.0	Motueka	CLR	1	263	4.2
Apollo	11.9	Timaru	CELR	2	95	1.5
Aquarius	13.3	Timaru	CELR	1	145	2.3
Argo	16.7	Bluff	CELR	2	336	5.4
Ariel	21.9	Dunedin	CELR	1	621	9.9
Capricorn	12.3	Bluff	CELR	2	116	1.9
Corsair	20.9	Nelson	CELR/CLR	3	469	7.5
Endurance	19.8	Nelson	CELR	2	185	3.0
Frey	15.8	Nelson	CELR	1	187	3.0
Galatea	26.0	Dunedin and Bluff	CELR	2	41	0.6
Gannet	12.5	Timaru	CELR	1	177	2.8
Ikawai	26.0	Timaru	CLR	1	53	0.8
IVA	10.9	Dunedin	CELR	3	271	4.3
Jane Marie	12.5	Timaru	CELR	1	49	0.8
Jay Elaine	20.6	Nelson	CELR	2	353	5.6
Katrina	10.0	Dunedin	CELR	2	182	2.9
Latham Bay	11.9	Dunedin and Bluff	CELR	4	650	10.4
Mako	23.2	Motueka	CELR	1	70	1.1
Nidaro	19.2	Dunedin	CELR	3	439	7.0
Pursuit II	14.6	Dunedin	CELR	1	160	2.6
Sanspeur	12.5	Dunedin	CELR	2	195	3.1
Surpris	13.3	Bluff	CELR	2	154	2.5
Susan	13.1	Timaru	CELR	2	373	6.0
Trident	11.7	Bluff	CELR	1	15	0.2
Trojan	11.6	Timaru	CELR	2	53	0.8
West Bay	28.3	Nelson	CLR	2	602	9.6
Totals				47	6 250	100

Table 3: Relative weights and overall percentage of each skate species sampled and reported by Quota Management Area (QMA).

	Sampled		Processor	
QMA	Weight (kg)	Percent	Weight (kg)	Percent
RSK 1	163	2.6	260	4.0
RSK 3	3 668	58.7	4 087	62.3
RSK 7	775	12.4	1 214	18.5
RSK 8	212	3.4	172	2.6
SSK 1	100	1.6	0	0.0
SSK 3	294	4.7	214	3.3
SSK 7	840	13.4	356	5.4
SSK 8	199	3.2	254	3.9
Total	6 250	100	6 557	100

Table 4: Relative percentage of each skate species sampled and reported by Quota Management Area (QMA).

		Sampled %			Reported %		
QMA	No. landings	RSK	SSK	Total	RSK	SSK	Total
QMA 1	1	62.0	38.0	100	100.0	0.0	100
QMA 3	34	92.6	7.4	100	95.0	5.0	100
QMA 7	10	48.0	52.0	100	77.3	22.7	100
QMA 8	2	51.6	48.4	100	40.4	60	100

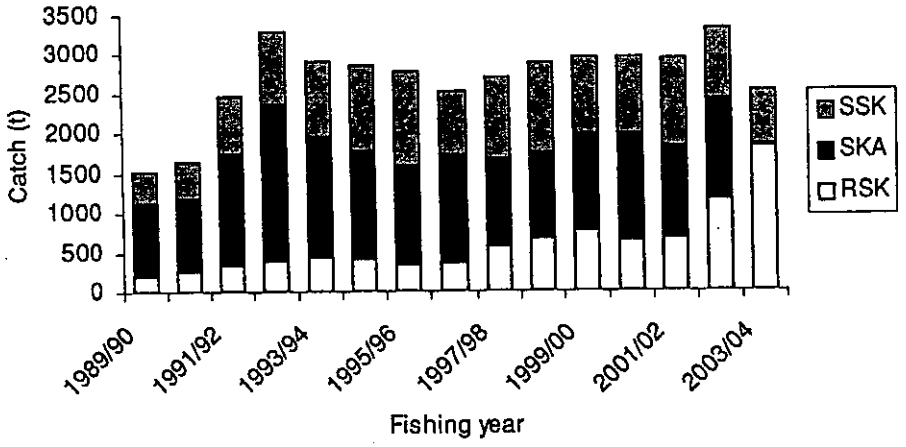

Figure 1: Total skate catch by species code and year, reported by CELR (catch landing data) and CLR. SSK, smooth skate; RSK, rough skate; SKA, skate unspecified.

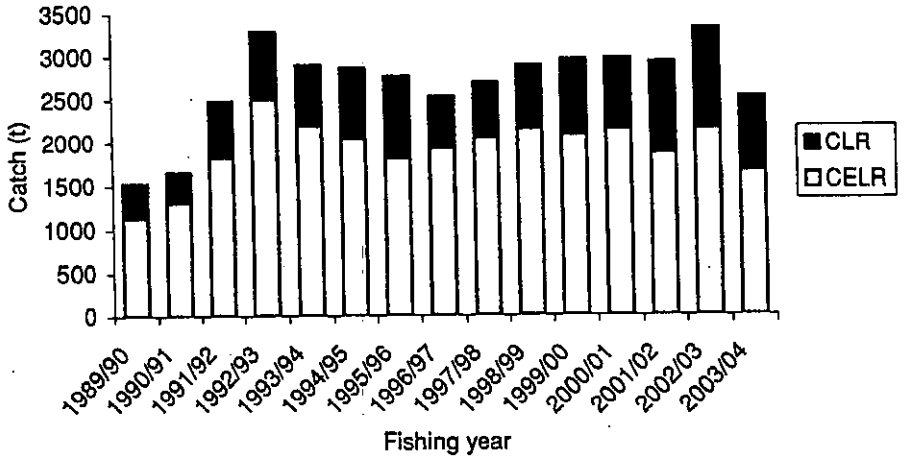

Figure 2: Total skate catch reported by CLR or CELR by year.

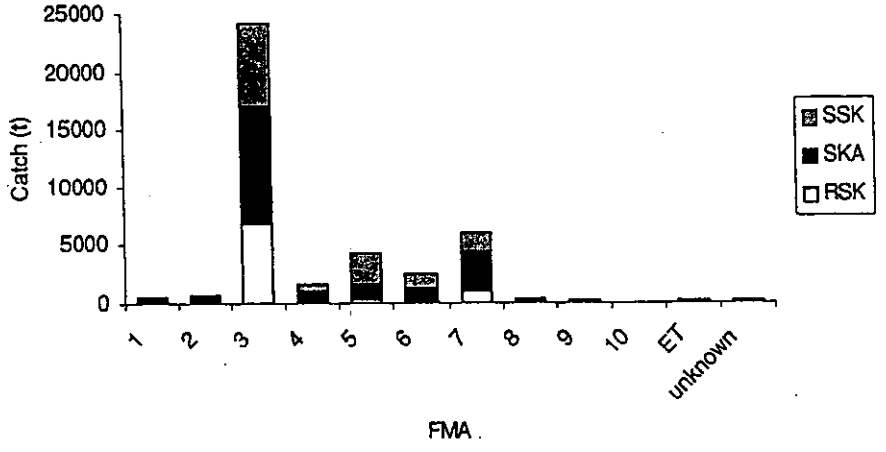

Figure 3: Total skate catch reported by CLR and CELR by species code and FMA for fishing years 1989–90 to 2003–04. FMA, Fisheries Management Area; ET, extraterritorial; SSK, smooth skate; RSK, rough skate; SKA unspecified skate.

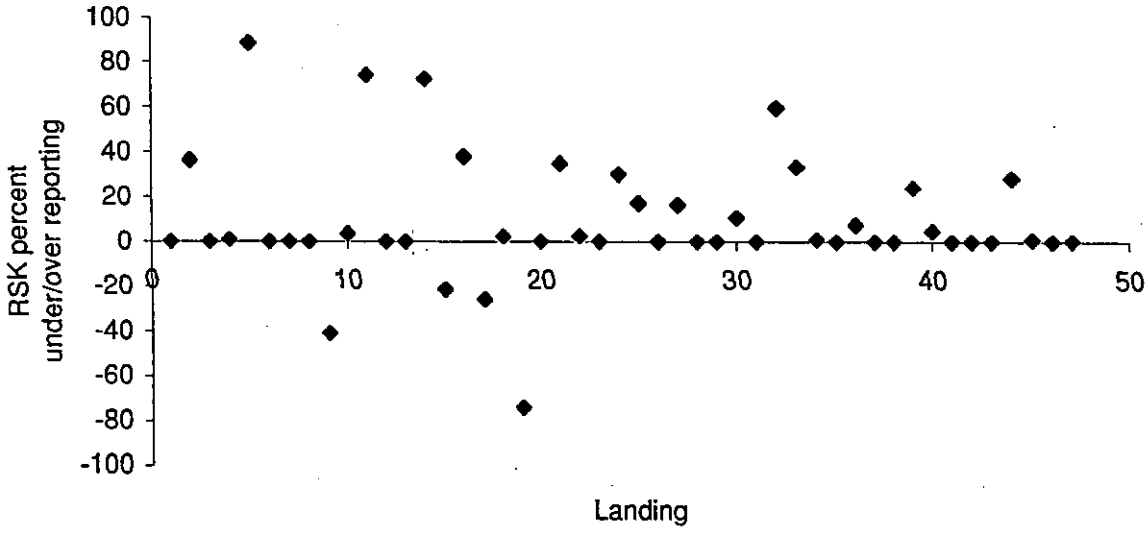

Figure 4: Skate catch reporting accuracy of processors for each landing sampled (N=47). A zero value for a landing indicates that the processor reported the catch of RSK and SSK correctly. A value above zero indicates that RSK has been over-reported and SSK under-reported, and a value below zero indicates that RSK has been under-reported and SSK over-reported.

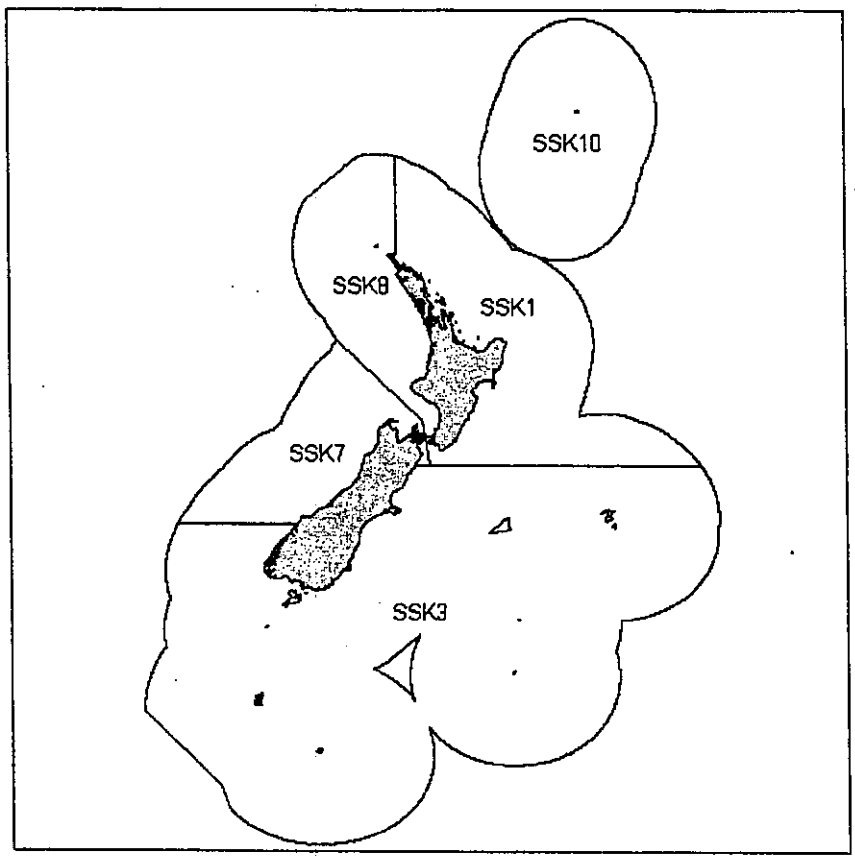

Figure 5: Smooth skate Quota Management Areas (QMAs). Rough skate QMAs are identical.

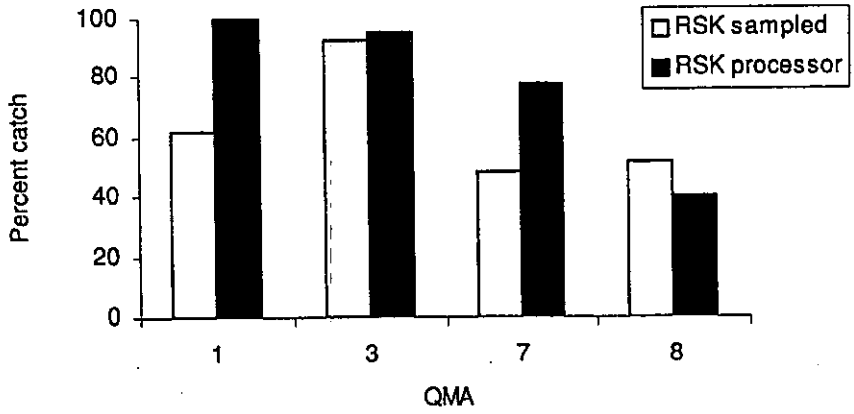

Figure 6: Processors' reported catch and actual catch of RSK from sampling. Remainder of the catch is SSK.

Figure 7: Dorsal surface of rough skate (left) and smooth skate (right). Note the marbled pattern with many white and black spots, and the two faint eye spots on the rough skate. The smooth skate is uniform grey with large black blotches. (Photo by Michael Beentjes).

Figure 8: Ventral surface of rough skate (left) and smooth skate (right). Note the grey/black of the smooth skate compared to the white and well defined small black spots of the rough skate. (Photo by Michael Beentjes).

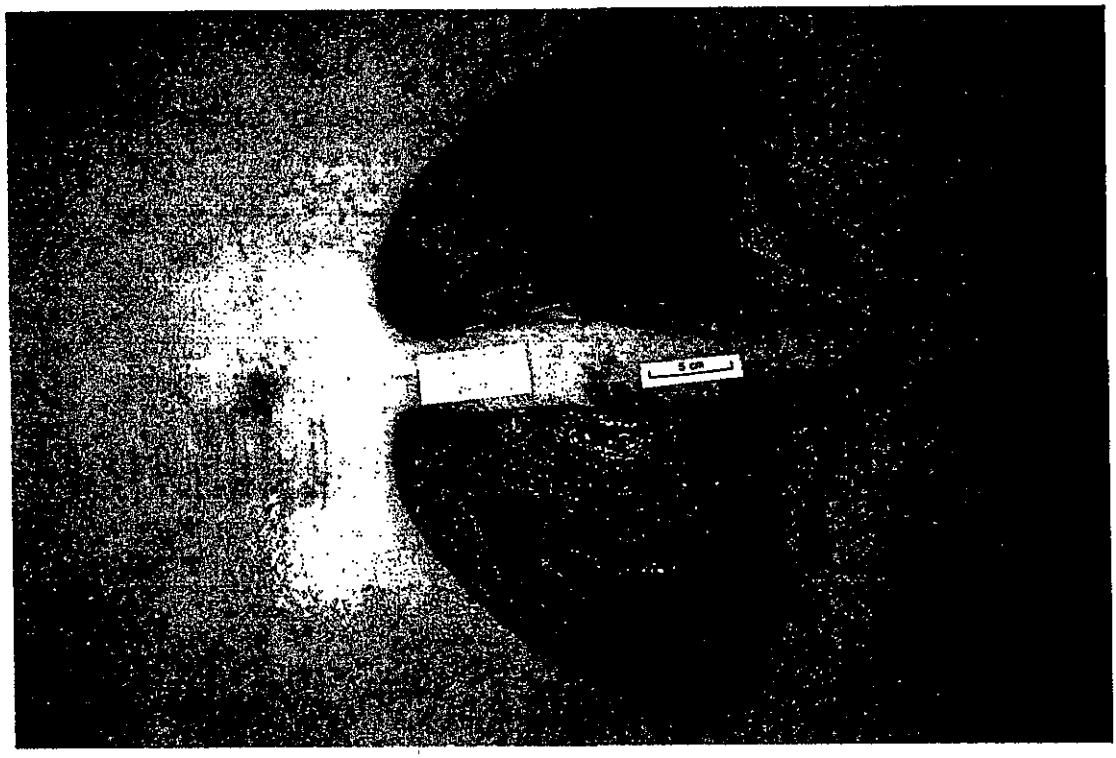

Figure 9. Rough skate wings (dorsal surface). (Photo by Michael Beentjes).

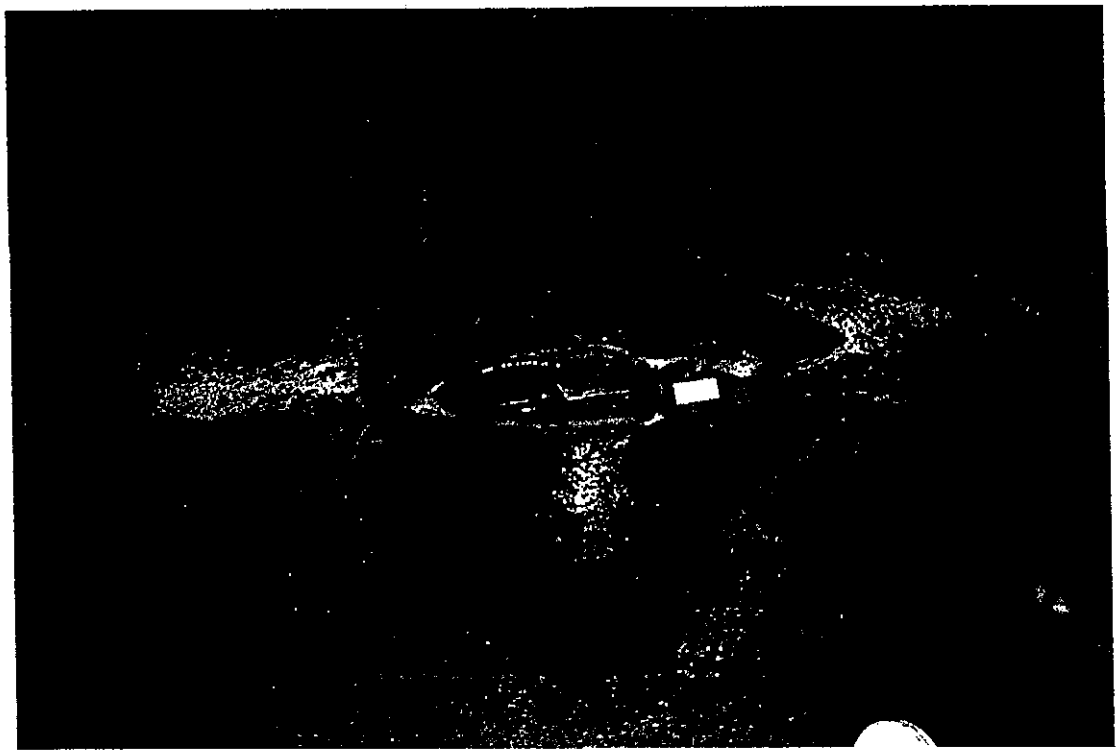

Figure 10: Smooth skate wings (dorsal surface). (Photo by Michael Beentjes).

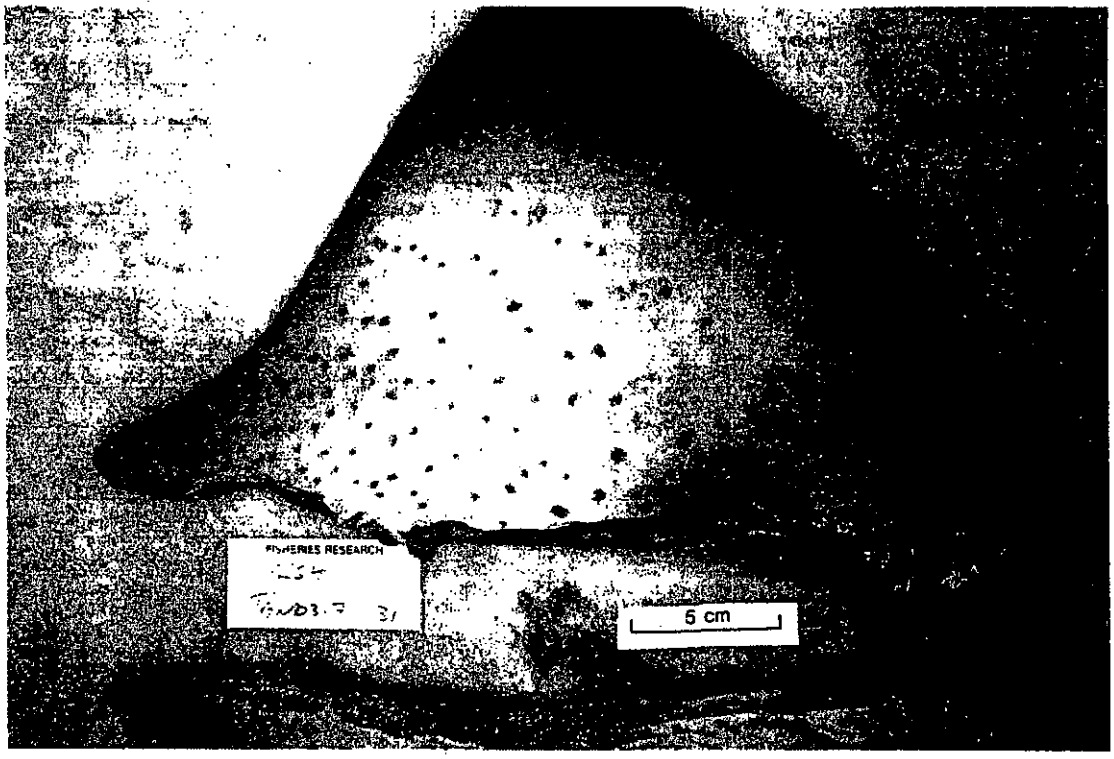

Figure 11: Rough skate wings (ventral surface). Note white background and well defined small black spots. (Photo by Michael Beentjes).

Figure 12: Rough skate (left) and smooth skate (right) showing the difference in colour and patterns on the ventral surface. (Photo by Michael Beentjes).