INT2009/02 Photo-identification of live seabirds captured in New Zealand fisheries

Progress Report
October 2010

Marine Conservation Services,
Department of Conservation

Background

New Zealand fisheries waters support some of the highest diversity of seabird species in the world. Birds with significant differences in conservation status can appear morphologically similar. The accurate determination of the taxon of seabirds captured in New Zealand fisheries is vital for examining the potential impact of fisheries interactions with these species. Government observers are placed on commercial vessels in order to investigate (often alongside other duties) the nature and extent of interactions with protected species[1]. These observers are not always able to identify seabirds at sea with high precision. An autopsy programme[2] has been in place to accurately determine the identification of specimens recovered dead by observers, but the identification reported for seabirds released alive were often non-specific (e.g. unidentified petrel) and were not confirmed by an expert. This project utilises photographs taken by observers of birds interacting with vessels (caught or impacting against vessel) whether alive or dead, enabling correct identification to be determined at a later date.

Objective
The overall objective of the project was, using photographs taken by observers, to accurately identify seabirds captured and released alive following interactions with New Zealand fishing vessels during the period 1 October 2004 to 30 September 2010.

Scope of work completed
This report summarises work completed using photographs of seabirds from 1 July 2005 to 30 June 2009. Photographs from 2009/10 year were not complete at the time of analysis and photographs from 2004/05 were not used as they were not all digital/readily available. Only digital photographs were used in this project.
The photographs used were of seabird captures where records indicated only an observer identification was made, and not a confirmed identification following autopsy. This encompassed live captures, mortalities where a specimen was not returned for autopsy for some reason, and some birds that had been autopsied but where this was not reflected in the database extract used. There were also photographs of a few bird interactions missing from the extracts. For the purpose of this project we report on all photographs examined.

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[1] See project INT2010/01 of the *Marine Conservation Services Annual Plan 2010/11* for further details. Available for download from http://www.doc.govt.nz/mcs
[2] See project INT2010/02 of the *Marine Conservation Services Annual Plan 2010/11* for further details. Available for download from http://www.doc.govt.nz/mcs
Note that identification from photographs has been incorporated into the above project for future years.

Protocol for observers

Over the period 2005-2009 observers have been instructed to (amongst other duties):

- obtain photographs of all marine mammal and seabirds captured (including those released alive if possible); and
- make an entry in a photo log for every photograph taken.

Methods

Extracts from Ministry of Fisheries databases were obtained to list all seabird interactions recorded by observers from 2005-2009. The extract included fields detailing the identification made by the observer, any identification made at autopsy, whether the specimen was dead or released alive, details of the trip, date of capture and information on the fishery.

Photographs were sought for all seabird captures where there was no value for identification at autopsy.

All photographs related to protected species interactions or mitigation were stored organised by observed trip. Photo logs were available, although not always fully complete. Photographs were matched to the captures identified by using trip number, station number (a sequential number for fishing events within an observed trip), specimen number (assigned by the observer, by trip), date, time and comments on the photo log.

Dead specimens are normally photographed together with an autopsy label containing trip, station and specimen number making matching straight forward.

Photographs of live captures however often contain no information on station and specimen numbers to aid matching. If the camera was set correctly the date and time the photograph was taken is available, and aids matching. Otherwise matching within a trip is reliant on the photo log, which should list every photograph and contain a comment linking that photograph to a capture event.

Problems encountered with the photo logs included:

- that the logs were pre-numbered 1 to 37, corresponding to the photograph numbers on a roll of 36 exposure film, but not necessarily that on a digital camera where the sequence may not start at 1 and where photographs may have been deleted; and
- details recorded for the photograph did not always contain the specimen number related to the capture.

Once photographs were matched they were provided to an expert (David Thompson) for determination of identification.

Results

A total of 223 seabirds photographed were examined, with a maximum of 90 from any one year (Table 1). There were considerably fewer cases in 2005/06. Over half were of live seabird interactions.

Table 1. Number of seabird interactions photographed and analysed in this project, by year and life status.

Year*	Dead	Live	Total
2005/06	2	17	19
2006/07	60	30	90
2007/08	36	24	60
2008/09	23	31	54
Total	121	102	223

*Observer year, 1 July-30 June

Of the interactions examined, expert identification of photographs confirmed the identification made by observers in approximately two thirds of cases, with a further 5% of cases where the observer made identification was at a lower taxomonic level than, but consistent with, the expert determination (Table 2). In almost 20% of cases expert determination was to a lower, and consistent, taxonomic level to that made by the observer, with an additional 10% of cases where expert identification was inconsistent with the observer identification.

Table 2. Result of expert photograph determination, by year.
Confirmed = expert identification confirmed observer identification, Retained = observer identification was at lower taxonomic level than expert determination, and consistent with it, so retained, New, consistent = expert identification was to a lower taxonomic level and consistent with the observer identification, New, not consistent = expert identification was not consistent with observer identification.

Year*	Confirmed	Retained	New, consistent	New, not consistent	Total
2005/06	8	3	4	4	19
2006/07	55	2	22	11	90
2007/08	43	3	7	7	60
2008/09	41	4	7	2	54
Total	147	12	40	24	223

*Observer year, 1 July-30 June

The proportion of dead birds identified by observers to the same taxon as the expert was higher than the proportion for live birds, many of which were identified to a species group level (Table 3).

Table 3. Result of expert photograph determination, by life status of seabird.
Confirmed = expert identification confirmed observer identification, Retained = observer identification was at lower taxonomic level than expert determination, and consistent with it, so retained, New, consistent = expert identification was to a lower taxonomic level and consistent with the observer identification, New, not consistent = expert identification was not consistent with observer identification.

Life status	Confirmed	Retained	New, consistent	New, not consistent	Total
Dead	93	3	11	14	121
Live	54	9	29	10	102
Total	147	12	40	24	223

Table 4. Result of expert photograph determination, by observer identification.
Confirmed = expert identification confirmed observer identification, Retained = observer identification was at lower taxonomic level than expert determination, and consistent with it, so retained, New, consistent = expert identification was to a lower taxonomic level and consistent with the observer identification, New, not consistent = expert identification was not consistent with observer identification.

Species (observer)	Confirmed	Retained	New, consistent	New, not consistent	Total
Non-specific identification					
Albatross (unidentified)	1		5	1	7
Black-browed albatross (unidentified)	2		1	1	4
Cape petrels		1	1	1	3
Penguins			1		1
Petrel (unidentified)	6		3		9
Prions (unidentified)	2				2
Seabird - large			3		3
Storm petrels			1		1
Unidentified fish				1	1
Wandering albatross (unidentified)			21		21
Average	21%	2%	69%	8%	
Species-level identification					
Black petrel	4				4
Black-backed gull	1				1
Black-bellied storm petrel	1		1		2
Buller's albatross	17	2			19
Buller's shearwater		3	1		4
Cape petrel	2		1		3
Chatham Island albatross	1				1
Common diving petrel	4			1	5
Fairy prion		2		1	3
Flesh-footed shearwater	6				6
Grey petrel	5				5
Grey-backed storm petrel		1		2	3
Northern royal albatross	1				1
Salvin's albatross	14			1	15
Shy albatross				7	7
Sooty shearwater	27		1		28
Southern giant petrel				4	4
Southern royal albatross	1				1
Wandering (Snowy) albatross				3	3
Westland petrel	2				2
White chinned petrel		1			1
White-capped albatross	17	1			18
White-chinned petrel	29	1		1	31
White-faced storm petrel	3				3
Yellow-eyed penguin	1				1
Average	80%	6%	2%	12%	

Examination of expert determination by observer identification (Table 4) shows some species known to be hard to identify, such as black petrel and flesh-footed shearwater were identified correctly by observers in all cases. Other species such as wandering albatross species were less successfully identified, with all three records of wandering

(snowy) albatross being misidentified. In some cases misidentification was due to coding issues, for example the four southern giant petrels (code XSP) were the result of the observer miscoding unidentified storm petrels (code XST). Other cases were likely influenced by changes in taxonomy, such as the seven cases of shy albatross that were all re-identified to white-capped albatross; previously white-capped albatross was considered a subspecies of shy albatross.

Quality of photographs
In processing photographs for this project a number of issues were identified that impact on their use in identification determination. Problems included:
- often only one photograph per specimen;
- not all key identification features captured;
- poor focus; and
- under- or over-exposure.

Expert report
A report by the expert (David Thompson) who made all the identification determinations reported here is provided as Appendix 1.

Discussion

It is unwise to make any generalisations about observer identifications from the results presented here as they are a non-random sample of interactions. It is clear that photographic records have been incomplete, but it is not possible to determine how often it would be reasonably possible to obtain photographs from the non-photographed interactions. Observer identification of seabirds is likely to be impacted by a number of factors including observer experience and skill, the characteristics of different seabird taxa, changing seabird taxonomy and possible errors in coding. Having photographs examined by experts to determine identification provides a sound mechanism to mitigate many of these factors and help ensure the highest quality information on seabird identification is obtained.

Recommendations

As a result of this project a number of actions have already been implemented:
- training for new observers is provided on the importance of photography as a tool for protected species identification;
- training for new observers is provided on how to take suitable photographs for identification use, and overcome common problems encountered;
- training for new observers is provided on filling out photo logs and setting camera date/time so as to facilitate matching to interaction events; and
- expert identification of photographs of seabirds not returned for autopsy is conducted routinely alongside the autopsy programme.

Further recommendations, to maximise the utility of photography as a means of identifying bycaught seabirds, include:
- ensure training on photographic methods is provided to all existing observers;

- update the observer manual to more fully describe the nature of photographs that observers should obtain;
- require photograph numbers be entered into comments field of observer non-fish bycatch form;
- update the photo log provided to observers to help ensure full matching information is collected; and
- ongoing monitoring of the extent and utility of observer photographic records (i.e. what proportion of interactions are photographed, and how suitable those photographs are for determining identification).

Conclusion

This project showed the potential for using photographs to identify specimens in certain conditions if suitable protocols are implemented. Based on current operating costs, it is cheaper to determine the identification of seabirds from photographs rather than by autopsy, although a range of additional information is obtained from autopsy that is not available from photographs. We consider an optimal programme for identifying seabirds that interact with commercial fishing operations will contain components of both autopsy of returned specimens and photographs of non-returned specimens.

Appendix 1. Report by David Thompson, NIWA

Photo Identification of Seabirds

David Thompson
NIWA, Wellington.

July, 2010.

Introduction

A selection of photographs, taken by Government observers on board fishing vessels from the 2005-06 to 2008-09 fishing years, inclusive, were made available for identification of seabirds. The photographs were of birds both alive and dead, and were a mixture of dead birds returned for autopsy, dead birds not returned for autopsy, and birds released alive.

Methods

Images were supplied as digital files and were of variable quality. In most cases, the images were 'sharp' and captured the key features required for an unambiguous identification to species. It was possible, for the best images, to enlarge specific features using a 'zoom' facility in order to better clarify particular identifications. At the other extreme, some images were badly out of focus or revealed so little of the subject as to make identification to species impossible.

Notwithstanding the range in image quality, in all cases the subject was identified to the lowest possible taxon. Standard seabird identification references were used (notably Marchant & Higgins 1990, Shirihai 2002, Onley & Scofield 2007) to confirm identifications. For most taxa, bill and head morphology and colouration was usually sufficient to allow identification to species. This was particularly the case for albatross and larger petrel taxa. Other key identification criteria were body colouration, overall size (where there was some reference scaling object in the image) and shape and leg/feet colouration. Generally, specific identifications were not possible where these key features were not clearly visible in the image or where the image was badly out of focus. In these cases, identification to a higher, 'generic' grouping was made.

Identifications were entered into a pre-formatted spreadsheet, which contained linking information to photographs, details about the trip from which the bird was photographed, the state of the bird and the observer's identification. In each case, the subject was assigned a three-letter identification code (the 'X' codes used by the Department of Conservation and Ministry of Fisheries) and the corresponding species name (or the 'generic' grouping name if identification to species was not possible), and the features used for identification were noted. Additionally, it was recorded whether the observer's identification was to be superseded by the present identification: this tended to happen only where the observer's identification was clearly inaccurate or where the present identification, based on the photographic

material, could be made to a 'generic' level only whereas the observer was able to provide an identification to a lower taxonomic level.

Notes and Suggestions

For any future photographic identification work it might prove valuable to standardise, as much as possible, the photographs taken by observers. In all cases, observers should check and confirm that images are in focus and 'sharp'. Clear shots of 1) the head and bill from the side and 2) from above, together with shots of 3) the side of the bird and of 4) the dorsal surface of the bird, preferably with one wing gently extended to reveal upper-wing patterns and 5) a shot of the legs and feet would be the ideal. Clearly this selection of images may not be possible to achieve given the constraints under which observers often operate. It would be additionally useful to have a scaling object present in each image taken, particularly for the smaller petrels, prions, shearwaters, diving petrels and storm petrels – something a simple and as readily available as an 'autopsy label' would be helpful.

References

Marchant, S. & Higgins, P.J. (1990). Handbook of Australian, New Zealand and Antarctic birds. Volume 1, Part A. Oxford University Press, Melbourne. 735p.
Onley, D. & Scofield, P. (2007). Albatrosses, petrels and shearwaters of the world. Princeton University Press, Princeton, USA. 240p.
Shirihai, H. (2002). A complete guide to Antarctic wildlife. The birds and marine mammals of the Antarctic continent and Southern Ocean. Alula Press Oy, Finland. 510p.