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MINUTES OF THE 3RD ANNUAL MEETING OF THE BLUE DUCK LIAISON GROUP

compiled by

Murray Williams

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P.O. 10-420, Wellington

Meeting Venue: Kimi Ora Health Resort, Kaiteriteri Beach, Motueka

Dates: 29 – 31 July 1991

In Attendance:

John Adams, Hawkes Bay
Kevin Collier, DOC S&R
Grant Dumbell, Ducks Unlimited
Wayne Hutchinson, DOC, Wanganui
Ian Miller, DOC, Nelson/Marlborough
Kerry Oates, Wellington
John Preece, DOC, Motueka
Cam Speedy, DOC Tongariro/Taupo
Dale Towers, Massey University
Chris Ward, DOC, East Coast
David Barker, Kokitika
Duncan Cunningham, DOC S&R
Mike Harding, Forest & Bird
John Lyall, DOC, West Coast
Warwick Newman, DOC Motueka
Stephen Phillipson, DOC, A.Pass
Gretchen Rasch, DOC TSU
Nick Torr, DOC Te Anau
Clare Veltman, Massey Univ.
Murray Williams, DOC S&R

Meeting Content:

1. Receive and discuss annual activities report from each DOC Conservancy and Forest & Bird.

2. Receive and discuss interim and final reports of research projects.

3. Receive and discuss a report from the Captive Breeding Group and to respond to their recommendations.

4. Discuss and decide upon the future of the Blue Duck distribution database and its management.

5. Review progress of survey and monitoring programmes

6. Discuss and decide upon the need to accelerate translocation trials.

7. Discuss the role of Blue Ducks in the wider context of river conservation and management.

8. Prepare project timetable for activities in 91/92 & 92/93.

9. Forward planning for the rewriting of the Recovery Plan

Content of this Report:

All papers tabled at the meeting, or circulated beforehand, are included in this report. They have been reproduced exactly as presented and a brief "meeting comment" may follow them in order to record the essence of the discussion about the paper.

Some research papers, not tabled at the meeting, are appended to this report in order that their findings be made available before formal publication.

The report of the 'Captive Breeding Group' is included together with the minutes of the group's meeting in May 1991. Decisions arising from the recommendations of that group follow their report and minutes.

Other matters discussed are reported in summary form - emphasis is placed on the decisions made rather than recording in detail the content of the preceeding discussion.

I. CONSERVANCY REPORTS

1. BAY OF PLENTY (provided by Paul Jansen)

Little work has been done on blue duck within this conservancy since the 8 regions of DOC were subdivided into 14 conservancies and all previous blue duck monitoring sites fell outside the new BOP Conservancy boundaries.

We have continued collating records of blue duck sightings and from time to time pass these to the national data base coordinator. The numbers of records we are now getting does not justify the installation of a subset of the computerised Blue Duck National Data Base and until the computer system is better organised it is unlikely that we will be using this format.

A blue duck survey was conducted in late April within the Whirinaki river catchment, a tributary of the Rangataiki which flows into the BOP. Only a section of the main stem has been completed so far (approximately 25 km) which revealed 7 pair and five singles, 19 birds in total. Further surveys will depend on the enthusiasm of field centre staff. As a point of interest all but one bird was confirmed as an adult.

No assistance has been given to or requested from other conservancies.

2. WAIKATO (provided by Suzanne Clegg)

SUMMARY OF BLUE DUCK WORK IN WAIKATO REGION : MARCH 1990 - MARCH 1991

PUREORA FOREST PARK

1. Ongarue River (8 km)
   - surveyed in November 1990 (3 pairs)
   - surveyed in March 1991 (2 pairs, 1 single - possibly a juvenile)

2. Mangatu Stream (ca 9 km)
   - surveyed in December 1990 (1 pair, 2 singles)
   - surveyed in March 1991 (1 pair, 1 single)

3. Maramataha - iti Stream and Maramataha River (8.5 km)
   - surveyed in March 1991 for the first time (1 pair)

OTHER AREAS

A copy of the blue duck database for the Waikato was sent, with a suggestion to check a few streams in the Coromandel and Pirongia Districts. Blue ducks had been recorded in these streams 6 -7 years ago. To date, only one in Coromandel has been surveyed, with no sign of blue duck.

COMMENTS

1. Both Paul Jansen (Rotorua) and Steve McGill (Taumarunui) kindly offered to help, in our surveys, with their dogs. For various reasons, Pureora staff were not able to take up their offer this year. Hopefully they will still be available for future surveys.

2. Would we be better off conducting pre-breeding (August) rather than breeding (March) surveys, since it is considered that many adult birds are inconspicuous during March/April?

3. We are currently printing some Blue Duck Survey Cards as suggested in the Conservation Strategy, as a trial. At present, most of the reports come from hunters as a result of requests in the hunters' newsletter.

Meeting Comment: The rivers within Pureora Forest Park and (particularly) on the Coromandel Peninsula are seen as prime candidates for enhancement work. These remnant populations offer great potential for recovery work with a measureable outcome and prior information about the status and distribution of existing birds is an essential first step in the recovery operation. The Pureora populations are considered worthy of increased effort with a follow-up recovery programme. Similarly, Coromandel rivers were, until recently, within the species' natural range - their return to their former haunts would be a very positive example of restorative conservation and the Conservancy is encouraged to consider such an approach.

Convener's Comment: In response to the comments regarding survey time, surveys in August and March will provide different information as outlined in Appendix 2 of the 'Conservation Strategy'. Cryptic behaviour of birds is always a problem encountered during surveys conducted in the middle of the day. I suggest that survey be limited to late afternoon and early morning. It may even be worth attempting some survey in the first 2-3 hours of darkness using very strong torchlight.

3. EAST COAST (verbal report provided by Chris Ward)

Staff changes have again affected the planned Blue Duck field programmes. The monitoring of the Takaputahi population (one of the national 'key sites') has not yet started in earnest - a single survey of the river in early December (1990) encountered only one brood and confirmed other reports of a poor breeding season. As a result, no juveniles were supplied to the captive breeding programme as had been intended. Efforts at protecting riparian forest within the Takaputahi catchment through the Forest Heritage Trust proved unsuccessful but other avenues to achieve the desired result are being investigated.

The Waikohu River, a former Blue Duck stronghold which was decimated by Cyclone Bola, was checked to consider its readiness for a reintroduction. It was agreed to leave this for a further 2-3 years to see if the river is colonised naturally.

Further survey and interpretation of Blue Duck distribution and abundance in the Mohaka catchment has been undertaken by Keith Hawkins as part of the Mohaka Conservation Order Appeal procedure.

Meeting Comment: In order to provide 'on-site' training for staff and to promote the commencement of regular monitoring of the Takuputahi population, the services of neighbouring Conservancy staff (especially Paul Jansen (BOP) and John Adams (HB)) could be sought. There is much to be said for initial surveys and monitoring being done in the company of experienced hands.

4. HAWKES BAY (provided by John Adams)

Altogether some 57 new records were added to the National Blue Duck database over this period. Formal surveys of some major catchments in the Ruahine and Kaweka Forest Parks were carried out during the year:

Northern Ruahine Surveys

A survey of the Ikawetea/Apias catchments (tributaries of the Ngaruroro River) was carried out in November 1990. It was undoubtedly the most productive survey undertaken this past year (in terms of the numbers of blue duck found). Eighteen individuals were located (consisting 7 males, 4 pairs, and 3 unknown sex). Although no juveniles were sighted, hopefully a number of the males that were apparently holding territories had females either sitting on nests or brooding young nearby. A report from a hunter in early December (4 weeks after our survey), of a pair with 4 young ducklings at a site where a lone male bird was recorded during our survey, was encouraging in this regard.

Because of the good numbers of birds found in this catchment, and a number of blue duck being reported in adjacent catchments it has been decided to proceed with a banding study of this population in order to monitor productivity, mortality, dispersal and movement between catchments.

A rather interesting feature of this population is the occurrence of a waterfall on the Apias River just above its confluence with the Ikawetea. This forms a natural barrier to trout and the blue duck population is roughly divided in half, between the trout-inhabited waters of the Ikawetea Stream and the trout-free Apias Creek.

Other Ruahine rivers that were covered by formal survey in November 1990 were the Waikamaka, Maropea, Mangatera, Waiokotore and Whakaurekou Rivers. A further 15 blue duck were located on these rivers.

Kaweka Surveys

A number of river systems emanating from the Park that feed into the Ngaruroro and Mohaka Rivers were surveyed in March this year. These included Manson Creek, Raoraoroa Stream, Kiwi Creek, Harkness Stream, Rocks Stream (all tributaries of the Ngaruroro River), and the Mangatainoka and Makino Rivers(tributaries of the Mohaka River). A disappointing total of 4 blue duck were located during the survey, all of these recorded from the Mangatainoka valley. Three of these were positively identified as males and it is suspected that the other bird may also have been a male. Other birds have subsequently been recorded in some of the areas covered by our formal survey, however I think we can now confidently assume that the Kaweka blue ducks consist largely of a dwindling non-productive population of aging male birds.

Future Work

1. Further formal survey work is planned for other catchments within both Forest Parks this coming November and March.

2. A banding programme in the Apias/Ikawatea catchments will proceed this coming spring.

3. Huts and bivouacs in both Parks will continue to be kept stocked with blue duck report cards, and hunters, trampers and fisherman will be encouraged to report all sightings.

4. A meeting with helicopter concessionaires currently being programmed will include an agenda item which seeks their cooperation in encouraging their clients to report all blue duck sightings.

5. A recommendation to exclude the entry by dogs into the Apias/Ikawatea catchment has been included in the draft management plan currently being prepared for the Ruahine Forest Park. A similar recommendation has already received the support of the Rangitikei/Hawkes Bay Conservation Board for that part of the Mangatainoka catchment contained within the Kaweka Forest Park.

Meeting Comment: Very positive initiatives here and the meeting attendees were full of praise for the nature and extent of the field programme. Discussion on the purpose of banding helped to refine the objectives of the programme; movements between catchments and changes in the density of territorial pairs were suggested as the primary focus rather than attempting to record changes in overall numbers (residents plus transients).

5. TONGARIRO/TAUPO (provided by Cam Speedy)

Conservancy and field centre were involved in blue duck surveys summer, during the first week of December. The same stretches of the Tongariro, Whakapapa amd Wanganui catchments were searched, as in previous years.

The following summarises the numbers of birds located during annual monitoring up to December 1990:

TONGARIRO RIVER:

YEAR	ADULTS	JUVENILES	NO OF BROODS	TOTAL
1990	11	5	2	16
1989	12	7	3	19
1988	4	1	1	5
1987	8	3	1	11
1986	12	-	-	12
1983	34	-	-	34

WHAKAPAPA RIVER:

YEAR	ADULTS	JUVENILES	NO OF BROODS	TOTAL
1990	15	22	5	37
1989 (Dec)	24	11	4	33
1989 (April)	22	-	-	22

WANGANUI RIVER (AND TRIBUTARIES):

YEAR	ADULTS	JUVENILES	NUMBER OF BROODS	TOTAL
1990	18	8	3	26
1989	23	3	3	26

Plans are to continue monitoring these rivers, especially the Whakapapa/Wanganui where a total of 26 birds are now banded with colour bands identifying individuals, including eight juveniles. If these young birds turn up somewhere their birth catchments it may provide useful dispersal information.

Ohakune staff have been giving logistical support for Duncan Cunningham's juvenile dispersal work also.

The very productive breeding year last summer allowed the capture of two young females for the captive breeding programme in mid-January 1991. These were successfully transferred to Neil Haye's facility and are reportedly doing well.

Meeting Comments: Further excellent work on the western rivers with evidence of high productivity here once again. Whakapapa and Wanganui Rivers may be starting to show evidence of a dependant relationship between pair density and productivity, the number of juveniles fledging being lower at high pair density. Further population data over the next 2-3 years (provided El Nino doesn't have a major impact in 91/92 season) will help elucidate this. Cam Speedy commented that varying numbers encountered on different surveys were a source of considerable confusion and that he found it better to concentrate on mapping territories (recording sign as well as sightings) rather than being overly concerned with numbers of birds. He also noted that the best time to survey breeding success (i.e. to record number and size of broods) was in December and that this was the month in which he now concentrated most of his survey and monitoring work.

6. WANGANUI (provided by Wayne Hutchinson)

Transfer

At last year's recovery group meeting, it was decided that the success and impetus gained from the 1986 release of six captive reared blue duck on Mt Egmont should be followed with a release of wild paired blue duck.

Wild neighbouring pairs of blue duck had never been transferred from the wild to another wild location. This was a good opportunity to:

(i) enhance the population already established:
(ii) test the suitability of wild birds for transfers such as this;
(iii)to assess the impacts on the source population.

It was hoped that releasing neighbouring pairs would provide a familiar link between the pairs and that they would establish adjacent territories.

It was originally hoped that we could comfortably take four pair of blue duck from the Manganui o te ao River without having any long-term impact on the productivity of this population and that in time, the unoccupied territories would be filled.

It was already known that this population could recover from a natural catastrophe (lahar 1975) and that this artificial removal would emulate this situation.

With monthly monitoring throughout the winter and spring of 1990, we found that

numbers of birds on the river (see "Monitoring") were well down on previous years. This may be attributed to a major flood event in March 1990.

The consequence of this and an extended period of wet weather resulting in the river being in a state of "fresh" throughout the year, meant breeding was delayed and relatively poor.

The number of pairs to be transferred was reduced to two pair.

On Tuesday 19 March we caught two wild pair of blue duck from the lower gorge section of the Manganui o te ao River, and an additional single male which was associating with the second pair.

All birds were banded and weighed while the three male birds were fitted with transmitters.

The birds were then flown to the Waiwhakaiho River on Mt Egmont and released within 150 m of each other at the park boundary.

Monitoring

Egmont - 1986 Release

Since the last meeting of this group, surveys for the original release have been carried out three times; August and December 1990, and a minor survey January 1991. A further survey is to be carried out in July 1991.

The August 1990 survey revealed no birds in the Lake Dive/Puneho River area, (although three birds are seen here regularly), no birds on either the Te Popo stream or the Waiwakaiho River and two pairs on the Manganui River.

Both birds were banded of one pair while the male of the other pair was banded. These are all birds of the original release.

Both the December and January trips were on the Managanui River only and only one unbanded bird was see in the January trip.

1991 Release

As discussed earlier, monitoring of these birds was made easier with the three male birds having transmitters attached to them, or so it was planned. Unfortunately, two transmitters failed almost immediately while the remaining one appears to be functioning.

Two aerial monitoring flights have been carried out. The first discovered that the two transmitters weren't functioning while the one that is working was about 1 kilometre upstream of the release site. The second flight carried out by Duncan Cunningham located the single transmitter a further kilometre or 2 kilometres upstream of the release site.

The Waiahakaiho has been walked monthly with no sightings of the birds although some sign has been observed.

Manganui o te ao River

The Manganui o te ao river from Geraghty's bridge to Ruatiti Domain was surveyed monthly by raft through to March 1991.

Results showed a significant decrease in numbers of pairs on this part of the river possibly because reasons discussed earlier.

In November 1990 we recorded 10 pairs, four single adults and four juveniles on this stretch of the river. This compares with 17 pairs, one single adult and 12 juveniles in March 1987.

The most significant decrease being in the lower gorge section to Hoihenga bridge.

Duncan Cunningham has surveyed the river from the Makatoto viaduct to bridge Makakahi bridge (39.4 km) in May 1991.

Juvenile Dispersal

This Conservancy has provided field assistance to Duncan Cunningham's research on the dispersal of juvenile blue duck on the Manganui o te ao. Ten juveniles were caught late last year and fitted with transmitters.

New Survey

In February 1991 staff surveyed the Waitotara River from the headwaters to Train's hut, a total of 17 kilometres.

A total of eight blue duck were recorded; two pairs, three single adults, and one juvenile.

1991/92

Programmes for this financial year include regular monitoring of both the 1986 release and the 1991 release of blue duck on Mt Egmont; monitoring of the Manganui o te ao River in conjunction with Duncan's juvenile dispersal research: and a survey of the Omaru River in the Waitotara State Forest.

Meeting Comment: Considerable discussion centred around the inconspicuousness of the translocated birds on Mt Egmont./Taranaki. This represents quite a major change in behaviour by comparison with that encountered on the Manganuiateao and may indicate quite a different feeding regime for birds on the mountain. There was also discussion about the harsh lesson being learned as a result of the failure of all 3 radio transmitters - the $ cost of their failure has been considerable in requiring more time on the river and there remains the uncertainty about the ‘success’ or otherwise of the translocation experiment.

7. NELSON-MARLBOROUGH (verbal report by Ian Millar)

Monitoring is restricted to the Flora Stream in the Mt Arthur area. Although 8 birds have now been banded there, the lack of consistency in numbers encountered and the locations at which they are seen means that there is little real understanding of population size or its productivity. Two birds have been caught and banded in the Riwaka River and this apparently small population continues to be visited once each year.

Meeting Comment: In response to questions about the status of birds in the Marlborough area, Ian advised that few observations had been recorded. The suggestion was advanced that the Conservancy's efforts may be better directed towards identifying sites worthy of enhancement rather than monitoring in difficult locations or at irregular

intervals, but that there should also be certainty that there are no 'hidden' populations in the Marlborough area.

8. WEST COAST (provided by John Lyall)

No blue ducks fledged in the Styx River during the summer of 90/91. Owing to staff being involved refereeing a busy (and locally, very good) whitebaiting season on the West Coast during the spring, no monitoring of the blue duck breeding was carried out. Three, one week surveys at the end of January, mid February and the end of February were planned for, using volunteers.

The week at the end of January was very wet, Hokitika experienced a 25 year flood at the time. This first survey was abandoned because of the weather. The second planned week for the middle of February went ahead despite wet weather. Three birds were banded between showers. The party was held up for a day waiting for side streams to subside before being able to walk out. The final week of using volunteers at the end of February went very well. Good weather and some very capable, fit volunteers allowed us to look into areas of the neighbouring Valley. The idea being to look for any banded birds that may have shifted over from the Styx River.

There is now twenty three banded birds in the Styx Valley. Eighteen in 89/90 and five in 90/91. Of the twenty three blue duck banded, fifteen have been accounted for this year. There are only four banded pairs, there have been five banded birds paired with unbanded this season. There is two single banded birds. The pairs are generally staying put, the singles are moving above and below pairs nearby, but remaining near where they were first located and banded. One was banded as a juvenile in 89/90 summer has moved down approximately three kilometres and has established herself with an unbanded mate. Because of the ruggedness of the Styx in some places it is assumed other banded birds we haven't seen, this past summer are still in the valley.

Rainfall records for the Styx Catchment and the Taipo Catchment for the past 2 years were obtained from the Regional Council. Rainfall in the Styx in the summer of 90/91 was twice that of the rainfall that fell in the previous summer of 89/90. If any breeding took place last summer it is possible that nests and/or chicks may have been lost because of the exceptionally high flows. In contrast, the Taipo Valley (according to blue duck card returns) had a good breeding summer. The Styx runs east to west, is at a lower altitude and is steeper than the Taipo that runs NNE, is higher, longer and of an easier gradient than the Styx.

An aerial photograph of 11 kilometres of the Styx has been put together by DOC draughting staff in Hokitika. This has made plotting the distribution of blue duck a lot easier than when working off the one inch to one mile topographical maps.

John Lyall and Duncan Cunningham are continuing the struggle with the blue duck database.

Clare Veltman and colleagues analysed the blue duck faeces samples collected from the Styx and Rivers during the summer of 89/90. One sample indicates that blue duck have eaten fruit. Clare was able to accompany us into the Styx for five days in May.

Plans for the future are to continue to study the Styx blue duck population. Good use will be made of the aerial photo to determine the distribution of blue duck. When the water gets warmer unbanded birds will be banded. The Kokatahi River needs to be searched for any banded blue duck that may have shifted from the Styx. Volunteers will

continue to be used but with an emphasis on using fit and experienced people.

Meeting Comment: strong support and appreciation was expressed for the Styx Valley programme. The continuity of the programme and the detail of the observations make this one of the really key projects within the national Blue Duck conservation plan and its results are likely to influence future management over much of the South Island.

9. CANTERBURY (provided by Stephen Phillipson).

Report From the Timaru Field Centre.

Work Undertaken during 1990-91.

Regular surveys of four rivers/streams were undertaken between August 1990 and April 1991. The results of the surveys are summarised in table 1.

Rivers and Streams Surveyed.	Period of Surveys, Birds No's and No of Visits.						Bird Nos from Cas Obs
	Aug-Sept		Oct-Nov		Feb-Apr		
	Birds	Visits	Birds	Visits	Birds	Visits	Birds
Waihi R.	1m	1	0	2	0	2	2a+2j
Te Moana R.	0	2	0	1	0	1	-
Lynn St.	0	3	2	3	0	3	-
Boundary St.	0	1	0	1	poo	1	2a

Table 1. Table of rivers/streams surveyed in Timaru Field centre. Poo = faecal sign seen, 1m = one male seen, 2a = two adults seen, 2j = two fledglings seen and Cas Obs = casual observations from the general public.

Several attempts were made to band whio in these rivers, however, these were not successful. It appears that the whio from these rivers have extremely large territories and seldom frequent the same stretch of river for any length of time, consequently, they could not be located during banding trips.

Intended Work Programme

Monitoring of the rivers and streams mentioned in Table 1 will be continued. Further attempts to catch and band whio will also be undertaken. This work has high priority

because this appears to be the most isolated, and most eastern, of the whio populations in the Canterbury Conservancy.

Report From the Waimakariri Field Centre.

Work Undertaken During 1990-91.

A number of activities related to whio monitoring were carried out in the Waimakariri field Centre during the 1990-91.

Monthly checks on whio in the Mingha and Upper Deception rivers were made between June 1990 and February 1991. A visit was made to the head of the Avoca River to check for the presence of whio. This visit was made for two reasons - firstly it is a site from which we have received reliable, but infrequent, sightings of whio; and secondly it is one of the most easterly rivers in the Waimakariri Field Centre from which whio have been reported. A number of volunteers spent time surveying the Edwards river and the Waimakariri river (including some major tributaries) for any sign, or presence, of whio. Time was spent organising and monitoring the "blue duck sighting card" system, which is a valuable record of whio sightings made by persons recreating in the field centre.

Five fledgling whio (3 from the Otira river and 2 from the Upper Deception river) and two adults (from the Upper Deception river) were colour banded this year while two adults from the Otira river had their colour bands replaced. The work in the Otira river was done in co-operation with Mike Harding from the Forest and Bird Society. The staff involved learned much from Mike during this exercise, our thanks to you Mike.

Information Gathered.

Breeding.

By combining information from a number of sources we were able to determine the following information on breeding. Of the eight pairs of whio which are regularly observed, either directly or by public sightings, four managed to raise chicks to the fledgling stage (Table 2). Of the estimated eight chicks that fledged five were colour

banded. Of the five colour banded fledglings only one has been subsequently sighted. This bird was a female fledged in the Upper Deception river and has been regularly seen (Feb -May) in the Deception river at a point some 1.5 km below the approximate lower boundary of her parents territorial boundary.

River & Pair No.	Max. Young	No. Fledged
Crow pair 1.	?	1
Edwards pair 1.	?	3
Edwards pair 2.	?	0
Campbell pair 1.	?	0
Deception pair 1.	5	2
Mingha pair 1.	?	0
Otira pair 1.	?	0
Otira pair 2.	5	3

Table 2. The maximum number of young produced and young fledged by known pairs of whio.

Temporal Patterns in Habitat Use.

Observations made during the year suggested at least two temporal patterns of habitat use by whio.

The first of these patterns is for a pair of ducks to remain resident on a stretch of river the year and to defend that section of the river against all comers. This is the pattern of use described by Williams, as being typical for whio.

The second pattern of use is for whio to make short term use of rivers streams and tarns.

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1. Williams, M. 1990. Some social and demographic characteristics of blue duck. In: Minutes of the 2nd annual meeting of the blue duck liaison group. Department of Conservation Science and Research internal report No. 89.

Observations from our blue duck sighting card scheme show that pairs of whio were resident on two alpine tarns during the early part of 1991. A pair were regularly seen on Tarn Col (1660m a.s.l) between February and March 1991 and a pair were regularly seen on Walker Pass tarn (1060m a.s.l) between January and May 1991. Pairs of whio have been recorded on Walker Pass tarn in previous years. A pair of whio have also turned up periodically around the head of the Avoca River. Much of this information was recorded by two F.R.I. scientists who have been working in the area for a number of years. During March of 1990 a visit to the area was made by two DOC staff from this field centre and no sign of whio could be found. In January of 1991 a pair of whio was again recorded in the area.

There have also been reports during the 1990-91 period of whio turning up briefly in other areas of the field centre where they are not normally found.

The time of the year that these observations occur (usually from January onwards) suggests that these birds may be fledglings recently evicted from their natal territory. However, we have not confirmed this speculation by direct observation and so it remains a theory.

Intended Work Programme 1991-92.

This year we intend to concentrate the surveys - of our regularly monitored whio pairs - to the period around the breeding season (Oct-March). From these surveys we hope to more accurately determine the location of nests, the number of eggs/chicks produced and the numbers of chicks fledged. We intend to band these fledglings. We will also undertake some surveys of other known pairs to determine their reproductive output; organise volunteers to survey other rivers in the field centre for the absence/presence of whio; and if time permits (please repress the sniggers) we will try to check sightings of seen in the more temporary habitats to try and determine their age and sex.

Report Compiled by:	Stephen Phillipson (Waimakariri Field Centre).
Data Supplied by:	Graeme Crump (Timaru Field Centre) Mike Harding (Forest and Bird Society) Stephen Phillipson (Waimakariri Field Centre) Robin Smith (Waimakariri Field Centre) The General Public (Global).

Meeting Comments: Strong support for the priority being accorded the Mt Peel population - its isolation and remnant status can provide a useful basis upon which to consider the value of such populations being the focus of restoration efforts. The intensity of effort being given to the projects run from the Waimakariri Field Centre is reaping rich reward, especially on movements and productivity, and seasonal habitat use. Together with the Otira River work, these studies are now as pivotal to future understanding bird and its management as the Manganuiateao study is in the North Island. Problems with volunteers have arisen here and mirror those from West Coast, namely that there is a major training effort required on the volunteers which is largely wasted if those people do not participate again.

10. OTAGO (provided by Bruce McKinlay)

For this year work effort has concentrated on the collection of records of blue duck and also an attempt was made to start a PhD student on a blue duck study.

The population in the Catlins still hangs on the brink with a recent confirmed siting in the Purakanui River after a number of unconfirmed reports. This is the first time that we have ever confirmed in this catchment. We have still to receive a recent confirmed report that blue ducks are present on their traditional sites on the Catlins River.

In December 1990 a search was made of part of the Catlins River with a well trained duck dog. This search turned up nil birds.

It appears then that there are still birds present in the Catlins but at extremely low numbers.

I am not sure it is worthwhile continuing to monitor this population or accept its decline and concentrate on more viable units.

I would be more interested in proactive management but I am not convinced we would be wasting our time because we really have no idea of the direct causes of the decline of this population.

After last year's meeting I spoke to a couple of students who expressed an interest in doing a PhD study on the blue ducks in Otago, looking at the genetic relationship between relict populations, habitat use by existing populations and identification of appropriate sites for new populations. This unfortunately did not proceed, but I will try again this year.

I see this sort of study as the most important contribution that can be made in Otago to blue duck recovery. It may be, however, that if a student at another university is keen to do it we should let them get on with it.

For the received recovery plan Otago will be maintaining the distribution database because of the importance of monitoring the Catlins population. I will also be trying again to interest a student in a habitat related study of blue ducks.

11. SOUTHLAND (provided by Nick Torr)

The blue duck survey card scheme has continued to work well through the last year. Over 140 records have been added to the local database and fed into the national database. Probably the most significant report was of two blue duck seen in the headwaters of the Oreti River in mid-January. This report was followed up by staff from Burwood Bush who although not sighting the birds found sign of them. This is a long way outside the presently known distribution of blue duck in our area and is worthy of further follow up work in the coming year.

Project Conservation volunteers were used to help survey parts of six river systems over a 10 day period in December. Consistently wet weather and swollen rivers and streams over this period severely hampered these efforts with two parties not being able to complete any survey work at all. The inexperience and fitness of some volunteers also proved to be a problem. However a lot of "new water" was covered and an idea of the blue duck population status was gained for a number of rivers for which there was previously little information. These surveys can not be treated as total population counts but rather "one off" surveys to establish presence or absence and a rough idea of densities.

Three others rivers were surveyed by DOC staff with the intention of using one or more of them as population monitoring sites. The Castle River was surveyed by staff from Bush Bush in early February. Fairly good numbers of blue duck were seen and the team felt they got fairly accurate coverage of the river although some sections were too rough to survey. Dave Crouchley and myself surveyed the Snag Burn in mid-January using his dog Tara. Only one male bird was seen and no other sign found. Good numbers have been seen in this river in the past; five pairs were seen in one day in June 1987 by myself and Daryl Eason. Since our survey in January ducks have been seen regularly by DOC staff in the area. One staff member saw 3 pair and 2 single birds in March. Dave and I felt we had covered the river fairly thoroughly and using the dog didn't think we could have missed many birds. This has raised questions over timing of surveys and how accurately we can expect to survey a population on any one visit. It is anticipated to survey this Snag this winter.

The Iris Burn was surveyed by myself in late September with similar results to the Snag. Only four blue duck were seen during the course of two days spent searching but subsequent sightings from the public indicate that there were more birds present in the river over the course of the summer.

It is hoped to keep monitoring these three rivers over the coming year to see if we can work out what is required to gain an accurate picture of the population of blue duck using them. Planning is underway to survey several more rivers using Project Conservation volunteers next summer.

Meeting Comment: As was mentioned last year, Fiordland is a key area. There is the tendency to derive from the remoteness of the region and its apparent "pristine" nature the belief that the status of wildlife like Blue Duck is not subject to major change. The sheer remoteness of the area and the enormous logistical difficulties of working it (not to mention the vagaries of its climate!) conspire against regular monitoring programmes and means that any information is very hard won. However there remains a great need to obtain reports of the species from throughout the Park so as to determine whether the anecdotal information of a general decline (like that which has affected Brown Teal) can or cannot be substantiated. Complementing that is the existing monitoring activities - if these can be maintained it will provide he first information about residency of birds in the vast Fiordland mountains.

CONVENER'S OVERVIEW OF CONSERVANCY ACTIVITY (Murray Williams)

The concern expressed last year that, nationally, monitoring programmes were not as far advanced after 2 years as the Conservation Strategy's timetable had called for, has by and large been addressed. In all key areas monitoring programmes are up and running well and where both resident birds and fledglings are being banded, some exciting and new information on movements and productivity are emerging. I suspect that a further 2 years of concerted effort will advance our understanding of population dynamics greatly and give us new insights into the factors that influence their annual productivity. Will Blue Ducks prove to be even more variable in their output than we know from the Manganuioteao study? Are there greater levels of immigration/emigration than we currently know about? Just how are some of our populations sustaining themselves?

One other benefit that has emerged as a result of the monitoring activities is that during our collective discussions we are now talking more knowledgeably about Blue Duck behaviour and habits. Instead of drawing information from one or two people's studies, we are now gathering our own - we are all getting to know our animal. Another 2 years of monitoring work and related field activity (especially where birds are being banded) will see the development of a large pool of expertise throughout DOC which will serve future regional programmes within the Department well.

There remains a couple of regions in which monitoring activity has not yet got off the ground to any significant extent - I hope the value of a single monitoring programme with a relatively small time and input has been demonstrated. If help is needed to get such programmes going then the use of experienced staff from a neighbouring Conservancy is very definitely the way to go!

The two main thrusts of activity over the first 3 years of the Conservation Strategy have been (i) identifying the distribution (and if possible, the abundance) of Blue Ducks within each Conservancy; setting up a programme to monitor demographic changes and to promote 'contact' with the animal in its environment. Both of these are a necessary prelude to a more "hands on" restorative phase -an approach which I suspect will the primary focus of next year's rewrite of the Recovery Plan.

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Report to Blue Duck Liaison Group Meeting

from Forest & Bird, June 1991

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1. **Advocacy** Forest and Bird has continued campaigning nationally for the protection of rivers, particularly those unmodified rivers which have important wildlife habitat. Significant elements of this national advocacy have been:

   a) Direct involvement in the Select Committee hearing for the Resource Management Bill. Publicity, information and lobbying to ensure the new Act will encourage the protection of wild rivers and important wildlife habitat.

   b) Development of a national energy policy based on energy efficiency and energy conservation. A key objective of this policy is to prevent the construction of any further dams for hydro electricity generation.

   c) Commencement of work on an article on Blue Ducks for the Forest and Bird Journal (it is hoped this will be in draft form by the end of July).

2. **Habitat Protection** Continued financial support for the Wanganui River Flows Coalition in their campaign to restore flows to the Whakapapa River. A national appeal for funds to assist with this campaign yielded over $15,000 for the Coalition.

3. **Researching and Monitoring** Continued monitoring of Blue Duck populations in the Arthur's Pass area (see attached report) in liaison with DoC staff.

Mike Harding
Regional Field Officer
26 June 1991

II. RESEARCH REPORTS

1. National Distribution Survey of Blue Duck (Duncan Cunningham)

INVESTIGATION OVERVIEW:
Blue Ducks were once distributed throughout forested ranges in both islands (Williams 1964) and it is widely accepted that they have declined both in number; and distribution (Mills and Williams 1978). The conservation status of Blue Duck is now regarded as "threatened" (Bell 1986), with of distribution based on surveys published by Fordyce (1976), the Ornithological Society of New Zealand in 1978 (Bull *et. al.* 1978), and in 1985 (Bull *et al.* 1985). These surveys revealed a very patchy distribution of widely separated, remnant populations, a feature characteristic of populations in decline. However, a number of unpublished and verbal reports indicated that there were major gaps in the information and that a long-term, intensive survey was needed to determine national, present-day (1980s) distribution.

OBJECTIVES:
1. Determine present day (1980s) distribution from which future assessments of status can be made.
2. Record these data as a computer database for ongoing management and research use.

METHODS:
Sightings of Blue Duck were reported by of a variety of outdoor recreation groups, (mainly trampers, climbers and hunters) from March 1983 onwards. Articles placed in the Mountain Clubs and Bulletin and the newsletter of the Ornithological Society of New Zealand were the main ways by which the survey was promoted.

Surveys were carried out on a local scale by the NZ Wildlife Service prior to its integration with the new Department of Conservation in April 1987. Information was also gathered from the Department of Lands and Survey and the NZ Forest Service. Since April 1987 DOC staff have collected many more records.

Sightings were translated into map-based data (both NZMS 1 imperial and NZMS 260 metric series), and entered into a computer-based database. Where sufficient detail was available, positions of sightings were plotted to eight digit (imperial) and 10 digit (metric) map references.

INTERIM RESULTS:
1. Preliminary results reported in 1988 (Williams 1998a) and in Cunningham (1989) were from a database with only 1600 and 2000 records respectively, and included 128 pre-1980 records. The database now holds nearly 3,300 records (North Island 1532 records, South Island 1735) covering 11 breeding seasons from January 1980 to February 1991.
2. A report on an analysis of the database has been prepared and is in final draft at time of writing. The main results of the analysis are:

(i) increase in the numbers of records from 1985 which is attributable to the formation of DOC and the subsequent production of a Conservation Strategy for blue duck.

(ii) Discovery of new locations (10,000 yard grid squares) is now increasing at the race of 1.9% per 100 records in the North Island, and 2.5% in the South Island.

3. Blue ducks are present in 536 10,000 yard grid squares. The North Island land area is divided into 1,369 grid squares and blue ducks occur in 214 (15.6%) of them. Similarly, blue ducks are present in 322 (17.710) of the South Island's grid squares. Single sightings occur in 26 (12.1%) of North Island and 57 (17.7%) of South Island grid squares.

4. The second draft of a distribution paper was completed in October 1990 and commented on by M J Williams. Further work will proceed the publication of the database report.

INTERIM CONCLUSIONS:
1. Blue duck distribution is much more extensive than previous surveys have indicated.
2. The extensiveness of the survey has revealed puzzling gaps in apparently suitable habitat.

RECOMMENDATIONS:
1. That the management of the national database continue to be run centrally by Science and Research Division with the primary data collection and entry carried out by conservancies.
2. That the survey be carried out on a national scale again at the same time as the OSNZ national bird mapping

2. Dispersal, Settlement and Mortality of Juvenile Blue Ducks (Duncan Cunningham)

INVESTIGATION OVERVIEW:
Very little is known about the dispersal patterns and mortality of juvenile blue ducks which have left the natal stretch of river. The ten year study by Williams (1991) showed that the juveniles which remained on the natal river usually settled within four territories of their parents. However, results from the National Distribution Survey conducted since 1983, show that occasional individuals are seen up to 100 km from the nearest population. This suggests that blue duck are capable of long flights over land to reach other catchments. For example, a male banded as a juvenile on the Manganuioteao River was found three months later on the Whakapapa River. If the bird had stayed in the rivers, the overland section, crossing from one headwater to the other, would have been less than seven kilometres.

OBJECTIVES:
1. Determine ranges of dispersal for males and females.
2. Determine what proportion of juveniles leave the natal stretch of river.
3. Determine the timing and patterns of long-range dispersal.

METHODS:
Radio-tracking at ground level is notoriously difficult owing to the amount of signal-deflection and attenuation caused by topography and vegetation. Generally, signals cannot be accurately located at a range of about 500 metres but tracking from a light aircraft is quick, accurate, and allows searching over a large area.

Radio-transmitters were mounted on near-fledged juveniles in December in the "Study Area" part of the Manganuioteao River and tracked from both air (using a light aircraft – Cessna 172) and ground. Any signals located from the ground were subsequently only briefly checked for significant movement (> ca 1.0 km) from the air. Bird-locations were attempted once each month.

INTERIM RESULTS:
1. Four of ten transmitters are known to have definitely failed due to minimal coating to keep weight and size to a minimum. Another, not located since January 1991, may also have failed.
2. Two birds, both female, have taken up residence in separate parts of the Study Area, neither moving more than about 500m since January 1991.

3. Two males, one now resident in the Lower Gorge (with a failed transmitter), the other in the Study Area, undertake movements of up to about four kilometres within their respective stretches of river.
4. One male, resident in the Orautoha Stream from February to April, could not be located anywhere in the catchment. Another, not located anywhere in the catchment since January, was located in the Lower Reaches in May. The latter bird was also seen by kayakers with one of the failed-transmitter birds (a female).

INTERIM CONCLUSIONS:
1. Those transmitters that failed did so because water leaked in through the coating at the exit-point for the aerial. The coating was kept to a minimum to keep weight down as, to extend transmitter life to 16 months, two batteries were installed. Future transmitters will be smaller with only one battery. The weight savings will be taken up by thicker coating.
2. Male juvenile blue ducks are clearly capable of moving considerable distances, in at least out of the catchment, one later returning. This of movement has not recorded before.

COMMENTS:
1. The technique should be able to detect the kind of movement mentioned in 2. above. Future location flights will start higher (ca 800m a.g.l) and cover a larger area to increase the likelihood of locating birds the natal catchment.
2. The Study Area and the Lower Gorge each have two vacant territories. The large movements out of natal catchment appear to be independent of potential opportunities.

3. Food Supplies, Diet, and Habitat Characteristics of Blue Duck (Kevin Collier)

Introduction and Objectives:
Information on blue duck habitat, food supplies and diet is important in understanding mechanisms behind the historical decline of the species, and in assessing the suitability of sites for introductions of birds in the future as part of the conservation strategy. Over the past two years I have been investigating these issues in association with Mike Wakelin at S&R, Clare Veltman and Ian Henderson from Massey University, Sally Moralee from the RSPB in Britain and Graeme Lyon of the Nuclear Science Institute, D.S.I.R. The objectives of this work have been to determine spatial and temporal variations in blue duck diet and food supplies, to investigate relationships between these factors and feeding behaviour, and to assess factors that influence the suitability of habitat for blue duck and the abundance and composition of their food supplies.

Research Carried Out:
Spatial variations in potential food availability and diet of blue duck were assessed on one visit to several sites on Manganuiateao River, and to a number of rivers in the East Cape region. Benthic invertebrate samples were collected by kick sampling and diet was assessed by faecal analyses (both regions) and stable carbon isotope analyses of feathers (Manganuiateao River only).

2) A more intensive seasonal study was carried out on Manganuiateao River in conjunction with Massey University to look at temporal variations in food availability, diet and feeding behaviour. This involved six bi-monthly field trips in which faecal samples and feeding behaviour data were collected from known birds in two territories, and aquatic invertebrates were sampled from stones, boulders and the drift.

A survey of physical habitat and benthic invertebrate faunas was carried out in a wide range of New Zealand rivers where information on the status of blue duck could be obtained from DOC field staff. Observations on feeding behaviour were also made on some of these rivers. Data were related to the carrying capacity of rivers (mean no. km per pair of blue duck) where this was possible.

Research Findings:

1) The studies of spatial variations in blue duck diet and food supplies have shown that both can vary widely between different rivers and within the same river system. At most East Cape sites blue duck appeared to have been eating mainly larvae of the cased caddisflies *Heliopsyche* and *Pycnocentrodes,* whereas at the Manganuiateao River sites birds had been consuming large proportions of another species of cased caddisfly (probably *Beraeoptera roria*). Chironomidae and stonefly larvae were found in all faecal samples from Manganuiateao River, but were present in only one or two samples from the East Cape sites. Ivlev's Electivity Indices indicated that, overall, blue duck had consumed Leptophlebiidae, *Coloburiscus humeralis* (both mayfly groups) and Chironomidae in lower proportions that they occurred in the benthos at both sets of sites at the time of sampling, whereas cased caddisflies were consumed in greater proportions.

Stable carbon isotope analyses of blue duck feathers and benthic invertebrates also suggested that blue duck obtained less of their nutrition from invertebrate species such as the mayflies named above compared with invertebrates that feed on higher proportions of algae. This may partly reflect different levels of activity of different invertebrate species on upper stone surfaces where they would be more susceptible to predation by blue duck, and the ability of fast-moving mayfly species to escape predation.

2) Analyses of the seasonal study on Manganuiateao River indicate that Chironomidae and cased caddisflies were the most abundant taxa (up to 95% and 65% of the total fauna, respectively) on stones and boulders, and were also the most frequently encountered taxa in the faeces of blue duck (present in 50-100% and 40-100%, respectively, of faeces collected on six dates). Chironomids and cased caddisflies were also relatively abundant in the drift, but observations of feeding behaviour indicated that drift was not a major source of food for blue duck on Manganuiateao River.

Densities of invertebrates at the two sites on this river ranged from 1476 to 14899 m^{-2} of rock surface during the course of this study. This wide variation in potential food availability appeared to be related to the frequency of large floods, some of which reduced benthic invertebrate densities by 70%. Subsequent work on this part of the project will examine temporal trends in selection of invertebrate prey by blue duck, and assess how blue duck feeding behaviour responded the large variations in the abundance of invertebrate prey.

3) Data from the extensive survey of blue duck habitat and food supplies has been partially analysed. Sections of river that supported pairs of blue duck at the time of the survey tended to have narrower channels, higher gradients and stability, lower spot summer water temperatures, greater relative abundance of boulders on the river bed, more riparian vegetation in native forest, fewer bed substrates as cobbles and less riparian vegetation in scrub compared with sections of river where only single birds were present or where pairs birds had not been recorded in recent years. Using channel gradient and relative abundance class of small cobbles in a discriminant analysis, 71% of river sections in a test data set were correctly predicted as supporting pairs of blue duck.

Physical stability of the river channel was the only variable measured that was signify-cantly correlated with river carrying capacity such that more stable sections supported more pairs of birds. Where carrying capacity was <2km per pair, Pfankuch stability scores were between 61 and 90, and in addition the maximum spot summer water temperature was lower (14°C) than for all sites where pairs were present. Lower summer water temperature is thought partly to reflect the predominance of native forest alongside most sections of river where blue duck pairs were present. It is hoped to use some of the variables described here to establish criteria for selecting sites for future introductions of blue duck.
Invertebrate faunas of sections of river that supported pairs of blue duck were dominated by the mayflies *Deleatidium, Coloburiscus*, or *Nasameletus*, the caddisflies *Olinga, Confluens, Beraeoptera* or *Aoteapsyche, Zelandoperla* (a stonefly), Elmidae (a beetle), or Chironomidae larvae. Preliminary analyses have not revealed any obvious difference in community dominance in sections of river that did not support blue duck. However, the abundance and richness of invertebrate food supplies was significantly correlated with river stability, suggesting that it may be possible to use this variable as a partial indicator of food resources for blue duck where other factors such as water pollution and not regulating invertebrate numbers.

4. Demography of Manganuiateao River Blue Ducks (Murray Williams)

INVESTIGATION OVERVIEW:
The biology and population dynamics of Blue Ducks inhabiting a 9.3 km section of the Manganuiateao River have been studied since 1980 (ie. for slightly longer than the average of a Blue Duck) so as to provide basic knowledge upon which a national recovery plan for this threatened species may be based. The study will extend to cover at least two complete generations of Blue Ducks so that the dynamics of populations of this long-lived, erratic breeding species are better understood and nationwide monitoring programmes have a better baseline.

OBJECTIVES:
a) To study the long-term changes in the population by measuring such parameters as the number of young produced annually, survival and dispersal of juveniles, longevity of adults, and changes in breeding and population density.
b) To determine what proportion of each year's production of juveniles may be removed (to establish populations elsewhere) without having a long-term effect on the population.

METHODS:
All territorial pairs and their progeny are caught and banded with individual combinations of colour bands. The study is based on compiling dossiers on these individual birds, the information coming from 3-day visits to the study area at regular intervals throughout the year. Blue Ducks are also present on a further 20 km of river above the study area; this mostly inaccessible section of the river is surveyed biennially to locate banded birds and to assess breeding output there.

INTERIM RESULTS (1990/91):
a) For the 4th successive year no ducklings were reared by pairs territorial in the 9 km section immediately upriver of the study river. Furthermore, no ducklings could be located in headwater streams in December. Production from within the study area

appeared to provide the bulk of the fledglings raised on river.
b) Ten ducklings were raised by three pairs in the study area.
c) Population density was lower than at any time since 1986, the result of high female mortality in 1989 and poor production in that year. Two territories were unoccupied over the full 12 month period.
d) Two adjacent territorial pairs and an unpaired male were transferred from the 'lower gorge' section of the river to Mt Egmont as part of a translocation experiment to the ability of older birds to establish in new environments. This transfer was coordinated by Wanganui Conservancy and they will now monitor the fate of the translocated birds. The rate at which the vacated territories are reoccupied will be monitored as part of this population study.

INTERIM CONCLUSIONS:
The intensity of the population study can now be lowered to the level of "monitoring" for the next five years so as to cover the lifespan of a second generation of birds. Genetic relationships, a most revealing feature of this study to date, can be monitored by banding all young produced and blood sampling (for later fingerprinting) all immigrant or unbanded individuals: the genetic aspects of this study have major implications for conservation of other long-lived, poor dispersing endemic avifauna.

Two aspects related to the study arise as candidates for further study: dispersal and settlement of juveniles, and field energetics. Dispersal and settlement of juveniles is a major component of the process by which birds are recruited into the breeding population and hence influence the dynamics of the population. Although considerable information has been compiled over the past 10 years, it is limited raised in the study area where opportunities for settlement close to the natal area were high. How the process takes place in areas with fewer settlement opportunities close at hand eg. in headwater sections or on rivers with very limited habitat is a key question with high conservation relevance.
Considerable effort has been devoted (in related studies) to appraising the link between the river's resources and the Blue Duck's needs. Selection of habitat for the establishment of new populations is based largely on this work. Present approaches ignore the ability of the bird to exploit rivers containing variable invertebrate abundance, an understanding that can only be addressed by understanding energy budgets of birds (using double-labelled water techniques) in these different circumstances.

5. Massey University Blue Duck Research Activities 1990/91 (Ian Henderson, Clare Veltman and associates)

PROJECT: Seasonal changes in the diet of blue ducks on the Manganuiateao River

AIM: To discover seasonal variations in prey availability and prey use by blue ducks on the Manganuiateao River, and to relate them to variations in foraging behaviour.

PERSONNEL: Kevin Collier (DOC), Lisa Newton, Ian Henderson, Clare Veltman

STATUS: Fieldwork was completed in 1989, and some results were summarised for the Liaison Group Meeting in 1990. We are now completing the statistical analyses and drafting a manuscript for publication. Dietary changes can be related to changes in prey availability, but foraging behaviour is not a useful predictor of prey type. Blue ducks in two territories on the Manganuiateao preferred *Aoteapsyche* and Hydrobiosidae.

PROJECT: The blue duck mating system – are river specialists any different?

PERSONNEL: Clare Veltman, Sue Triggs, Murray Williams, Kevin Collier, Brian McNab, Lisa Newton, Maria Haskell and Ian Henderson.

AIM: To establish how blue duck territoriality evolved, using data on territoriality, mating system, metabolic rate, and food availability.

STATUS: A paper arguing that blue duck territoriality evolved from mate defense by male birds was delivered to the International Ornithogical Congress in Christchurch last December. The idea that blue duck territoriality is related to food defense was rejected.

PROJECT: Development of a modelling technique suitable for small populations.

AIM: To simulate demographic changes in small populations using a method suited to individual variation.

PERSONNEL: Christopher Craig, Ian Henderson, Ed Minot, Murray Williams

STATUS: Completed. Data from the Managanuiateao study were used to test the model. See the explanation provided by Ian Henderson.

PROJECT: The diet of blue ducks on the Arahura and Styx Rivers.

AIM: To describe the summer diet of the blue ducks on the Arahura and Styx Rivers from analysis of faecal and prey samples.

PERSONNEL: David Barker, Ian Henderson, Clare Veltman and David Fountain.

STATUS: Completed. The most common prey in the benthic samples were *Deleatidium* and *Neocurupira hudsoni.*. The Blephariceridi *(Neocurupira)* dominated all 8 faecal samples. One faecal sample contained seeds of a *Coprosma* and a podocarp, possibly miro.

PROJECT: Competition between blue duck and trout populations.

AIM: To measure niche overlap between trout and blue duck populations, and to test the hypothesis that competition for prey by trout reduces blue duck productivity.

PERSONNEL: Dale Towers, Clare Veltman, Ian Henderson and Murray Williams.

STATUS: Underway. A pilot project reported to the Liaison Group last year found a significant effect of trout on prey availability and diet preferences of blue duck. We will now investigate the extent of niche overlap between the fish and bird populations, and attempt experimentally to determine the impact of trout.

PROJECT: Nitrogen and energy in blue duck foods.

AIM: To determine what proportion of available nitrogen and energy is assimilated from captive and natural diets by captive and wild blue ducks.

PERSONNEL: Gary Bramley, Ross King and Clare Veltman.

STATUS: Five faecal samples were collected from each of 6 captive birds at Mt Bruce, and 3 food samples were obtained during May 1991. Three samples of invertebrates and 17 faecal samples were collected from the Manganuiateao at the same time. All samples have now been freeze-dried and will be 'bombed' in July to determine the energy and nitrogen extraction effieciences of captive and wild blue ducks.

PROJECT: Responses to call playbacks by territorial and transient blue ducks.

AIM: To test the hypothesis that male blue ducks are defending their partners, and to evaluate the use of playbacks for population size estimation.

PERSONNEL: Nicky McDonald and Clare Veltman

STATUS: Fieldwork on the Manganuiateao and Styx Rivers has been completed. Males are the first to vocalise in response to call playbacks, but not all males respond. Data are consistent with the hypothesis that territorial males are defending their mates.

All birds present in the Manganuiateao River study area were enumerated, and 65% of them responded to call playbacks. The birds that did not respond were transient individuals. Territorial birds present on the Styx River did not always respond to call playbacks, but were always located by a trained dog. We conclude that call playbacks are less useful than a dog for locating blue ducks.

Report on Modelling of Blue Duck Populations

Ian Henderson
Department of Botany and Zoology, Massey University
17 June, 1991.

Small populations are vulnerable to extinction due to the stochastic nature of population processes. Although birth and death rates may be such that in the long term the population is stable, in any one year the chance effects of weather, predation, or even the sex ratio of offspring, may produce very good, or very poor results. The smaller the population, the more likely these stochastic fluctuations in population size will result in extinction. Although the total blue duck population is above the range where stochastic factors are important, isolated populations are not. In the case of the blue duck, the species is threatened because each of its isolated populations is endangered.

Although some 'rules of thumb' have been proposed for minimum viable populations (MVP's) analysis of population models has shown that demographic parameters such as birth rates, longevity, and particularly the variability from year to year in these parameters, are very important in determining MVP's.

In 1990, a student at Massey University, Christopher Craig, developed a stochastic simulation model for examining the viability of blue duck populations (Craig 1990). Demographic parameters were estimated from Murray William's data on the Manganuiateao River population from 1980-1989. The project also involved investigation of a new modelling approach in which demographic parameters are allowed to vary between individuals (e.g. some pairs produce more offspring than others). This approach is more realistic than standard 'homogeneous' models and at small population sizes can give significantly different predictions. A non-homogeneous model includes the additional stochastic components associated with individual variability. For example, when particularly productive birds die, the population suffers greatly.

Simulation of a blue duck population with a carrying capacity of 12 pairs (the size of the intensive study population on the Manganuiateao) showed that the mean time to extinction was only 25 years. We consider this a very pessimistic estimate since no density dependence was built into the model, only a fixed upper limit of It is generally expected that when populations decline due to some stochastic event, reproductive success of those remaining is enhanced due to easier access to resources. This would allow a population to 'bounce back' from a bad year but we have no evidence that reproductive success or death rates are density dependent in blue duck. This is an area where further long term population studies could improve our understanding of blue duck population processes.

Sensitivity analysis of the model was also performed in which model parameters are varied to determine which ones have the greatest influence on the outputs. Two parameters were found to be particularly important, resident female mortality rate, and male fledgeling mortality rate. Sensitivity analysis allows us to identify areas where better data will improve the precision of our predictions, and also suggests areas where management could be directed. Our modelling suggests that variability in death rates is more important than variablility in birth rates for blue duck population.

Reference

Craig, C. 1990. Homogeneous and non-homogeneous population models: with special reference to the blue duck (*Hymenolaimus malacorynchus*). Unpublished BSc hons project, Massey University.

6. Arthur's Pass Blue Duck Study (Mike Harding)

1.0 INTRODUCTION:

This report summarizes the results of monitoring a small-Blue Duck population on the Otira River for the 12 months ending 28 February 1991. A similar report was produced for the period 1 January 1989 to 28 February 1990.

The work described is part of a wider programme covering the Otira, Bealey, Mingha and Deception Rivers within Arthur's Pass National Park. Department of Conservation staff at Arthur's Pass (particularly Stephen Phillipson and Robin Smith) have been monitoring Blue Duck populations on the Mingha and Deception Rivers, complementing the work described here for the Otira and Bealey Rivers.

The intention of this report is to make available a description of the work undertaken, the information gained, and an update on the status of the Blue Duck population in the study area.

2.0 OBJECTIVES OF THE STUDY:

To monitor survival, breeding success, and recruitment of young into the adult population, on the upper Otira River, Arthur's Pass National Park.

To monitor the dispersal of young birds from, and the arrival of any new birds to, the upper Otira River.

To maintain a log of Blue Duck activity and general observations of environmental conditions at the study site.

3.0 METHODS:

Otira River Study area:

a) Undertake regular river surveys to locate birds and determine whether nesting is attempted.
b) Monitor nests and family groups till young disperse.
c) Colour-band all young birds before dispersal, and any other new birds in the study area.

General:

a) Continue to monitor Blue Duck sightings from the study area.
b) Maintain a check on nearby rivers, particularly the upper Bealey River.
c) Store sightings on a computer database with card backup.
d) Liaise with DOC staff over work in adjoining rivers.

4.0 RECORD OF EVENTS:

The following is a record of significant events recorded in the study area. Location of sightings in the study area is by river section numbers (eg, s26 = river section 26) as shown on the map of the study site - Appendix 1). A more detailed account of all observations is contained in a Study Area Log, which is too detailed to reproduce here.

4.1 Otira River Study Area:

Forty two visits were made to the study area over the last twelve months, mostly between late October and February. On most occasions birds were seen, and the amount and range of faecal sign was usually recorded. Visits ranged from inspections to full river surveys lasting several hours.

The more significant events are listed below, in chronological order:

13/03/90 Both pairs present (Red/Metal-Red and White/Metal-Red, s27); (Blue/Metal-Red and Yellow/Metal-Red, s08).
11/06/90 Early winter survey: faecal sign over full length of study site, right to moraine at head of valley.
21/07/90 Mid winter survey: both pairs present (R/M-R and W/M-R, s25); (B/M-R and Y/M-R, s17).
04/10/90 First indication of nesting: both males (W/M-R and Y/M-R) sighted alone within 100 metres of each other, s21 to s22.
24/10/90 Both pairs overflying each other at s21, presumed territory boundary.
29/10/90 Located nest of lower pair (B/M-R and Y/M-R) s20.
17/11/90 Nest of lower pair vacated (probably on about 10/11/90). Remains of five eggs found.
19/11/90 Family group located s17 (B/M-R and Y/M-R and 5 young).
04/12/90 Determined general location of nest of upper pair (R/M-R and W/M-R) s28.
09/12/90 Last sighting of family group with all five young present, s08.
17/12/90 Located nest of upper pair (s 28) recently vacated (probably on about 08/12/90). Remains of one egg found. Located upper pair (R/M-R and W/M-R) s29, with no young.
09/01/91 Family group located with only 2 young, s08.
11/01/91 Located single juvenile, s16, and colour-banded (Metal-Red/Red).
Located lower pair (B/M-R and Y/M-R) and two juveniles, s03. Colour banded juveniles (Metal- White/Red and Metal-Red/Yellow) and replaced worn colour-bands on adults (same colours).
13/01/91 Family group sighted together, s07 (B/M-R; Y/M-R; M-R/R; M-W/R; M-R/Y).
29/01/91 Last sighting of juvenile M-R/Y (with adults B/M-R and Y/M-R and juvenile M-R/R), s16.

03/02/91 Last sighting of juvenile M-W/R (with adults B/M-R and Y/M-R and juvenile M-R/R), s02.
16/02/91 Last sighting of juvenile M-R/R, alone, s03.

Summary

- Two adult pairs remain in the study area, though both are moulting and very discreet at the time of writing.
- Both pairs nested, the upper pair (one egg) unsuccessfully; and the lower pair (five eggs) successfully, raising 3 young to 11 weeks.
- Of the family group, all five young were present for about four weeks, and three (banded) young remained for about eleven weeks. Young may still be present, but have not been located in four visits since the 18 February.
- Surveys of nearby rivers have are being carried out, but no sightings of young birds have yet been recorded, except in the Bealey River - see below (4.2).
- Both nests were located by watching the movement of the birds, though the nest of upper pair was not checked till nesting was over. Nests are described on nest record cards -Appendix 2.
- A single adult male which arrived, and was colour-banded, in the study area in September 1989, was sighted in the Mingha River in 1990.

4.2 Bealey River:

12/06/90 Full survey of upper Bealey Valley: no sign of Blue Ducks.
??/09/90 Unconfirmed sighting of pair in upper valley.
24/10/90 Full survey of upper valley: sparse faecal sign but no birds seen.
28/02/91 Single unbanded juvenile sighted in upper valley.
04/03/91 Unbanded juvenile female relocated. Unsuccessful attempt to capture and band.

Summary

There have been no confirmed records of Blue Duck in the upper Bealey Valley since April 1989, though there has occasionally been sufficien faecal sign to indicate the presence of one bird. The newly-arrived unbanded juvenile is probably one of the brood from the upper Otira River.

5.0 CONCLUSIONS:

This study has successfully monitored the small Blue Duck populations of the Otira and upper Bealey Rivers.

It has been particularly successful in monitoring this season's breeding effort on the Otira River, where both nests were located and monitored, and young birds were banded before dispersal.

Both pairs, banded in January 1989, remain in the study area, the lower pair (B/M-R and Y/M-R) being more successful breeders than the upper pair (R/M-R and W/M-R). A

different nest site than that of the previous year was used by the upper pair, but with no greater success.

The study is beginning to provide much clearer information on the dynamics of this small Blue Duck population. There is also increasing evidence to suggest that movement of birds between catchments is more common than previously expected.

6.0 ACKNOWLEDGEMENTS:

This study has been undertaken entirely as a voluntary project.
However the support and assistance of Anne Relling has been crucial to its success, and the assistance of Department of Conservation staff at Arthur's Pass, in particular Robin Smith, Stephen Phillipson and Jenny Stevens, has been valuable. The support of the Royal Forest and Bird Protection Society and the assistance provided by various people in the field is gratefully acknowledged.

7.0 APPENDICES:

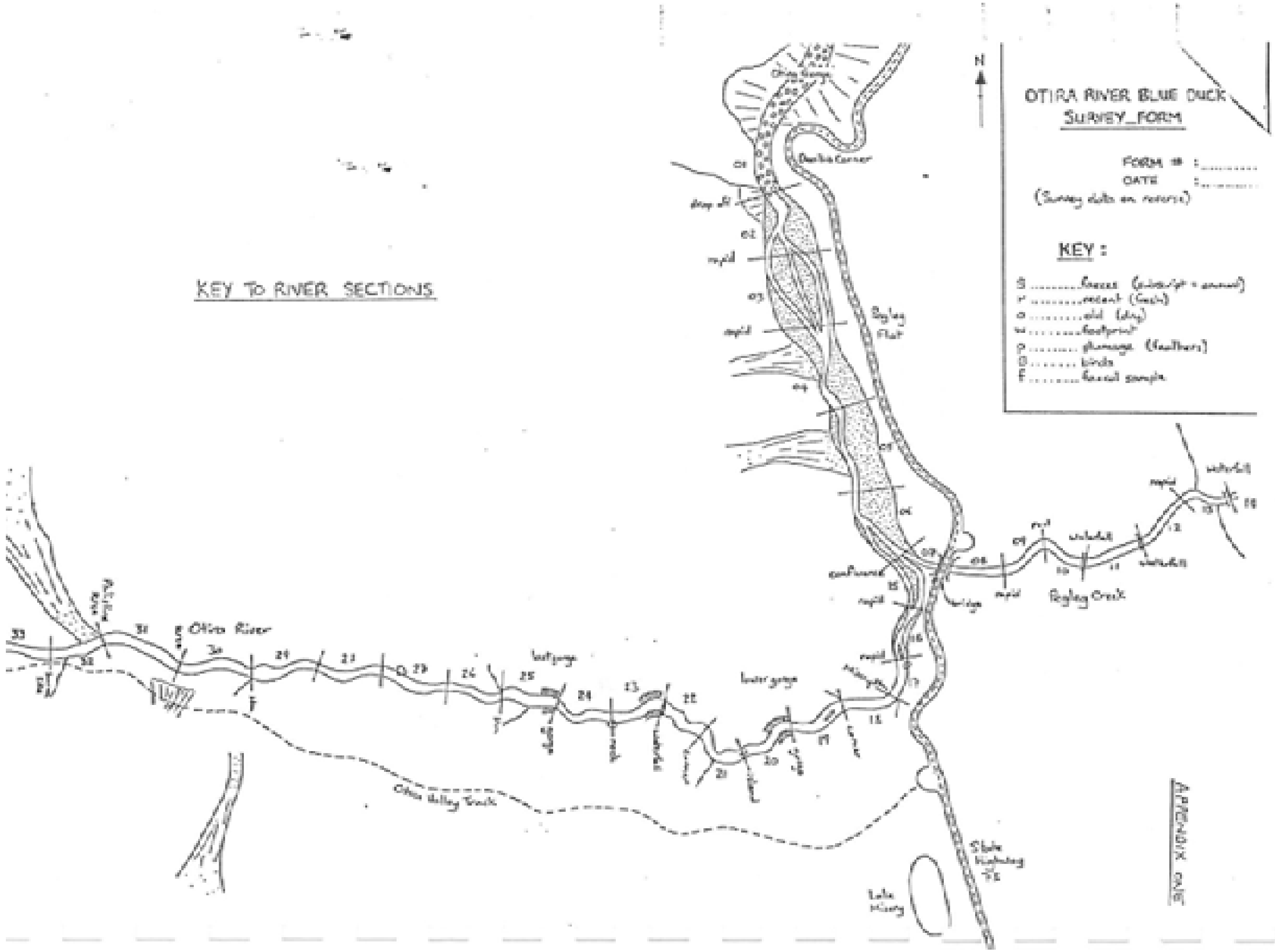
1. Map of study site, with river section numbers.
2. Copies of nest record cards.

Circulation:

Department of Conservation, Arthur's Pass (attn: Robin Smith).
Department of Conservation, Christchurch (attn: Ken Hughey).
Department of Conservation, Hokitika (attn: Dave Barker).
Department of Conservation, Wellington (attn: Murray Williams).
Royal Forest and Bird Protection Society, Wellington.
Dr Ewan Fordyce, Otago University.
Dr Claire Veltman, Massey University.

Mike Harding
21 Piko Crescent
Riccarton
Christchurch

12 March 1991


OTIRA RIVER BLUE DUCK
SURVEY FORM
FORM # :
DATE :
KEY :
KEY TO RIVER SECTIONS
APPENDIX ONE
Otira River
Rugby Creek
Rugby Flat
State Highway 73
Otira Valley Track
Lake Misery
bridge
confluence
lower gorge
waterfall
rapid
N

OBSERVER	SPECIES	(For Office Use Only) Year	No.
Mike Harding	Blue Duck		

LOCALITY (District) Arthurs Pass N P (Otira R.) OBSERVER'S REFERENCE – 5.20

HABITAT (e.g., forest, scrub, scattered bush, suburban, swamp, shingle, etc.)
Subalpine riparian shrubland / low forest.

SITE (Name of tree or shrub, dense, open, etc.) Beneath rock

NESTING MATERIALS Dry plant material: Chionochloa [illegible], Lycopodium scariosum, Brachyglottis bennettii, Dracophyllum uniflorum, moss and abundant down.

HEIGHT OF NEST (metres) 0 REFERENCE NUMBER (of other nests of same pair)

BAND NUMBERS (if bands used): Blue/Metal – Red L 26853

GENERAL Nest located beneath large rock c. 7m from river, and c. 5m above river. Narrow sloping gap between rock and soil c. 15cm wide. Within shrubs, but relatively open in front of nest.

BAIGENT PRINT

(For Office Use Only)	
First Egg Laid	
Last Egg Laid	
First Young Hatched	
Last Young Hatched	
First Young Left Nest	
Last Young Left Nest	
Full Clutch Size	
Number Hatched	
Number Left Nest	
Incubation Period	

Year 1990

NEST RECORD CARD

THE ORNITHOLOGICAL SOCIETY OF NEW ZEALAND

(For Office Use Only) Year No.

DATE (Each Visit) Day	Month	TIME	No. Eggs	No. Young	Was Bird on Nest? Yes/No	Sex	REMARKS (Building, Weather, Cause of Destruction, Etc.)
04	10						Nesting first suspected. General location of nest determined
25	10	1846 hrs					Female leaves nest to feed.
28	10	1855 hrs					Female leaves nest to feed.
		1957 hrs					Female returns to nest. Nest site located
29	10	0655 hrs			Y	?	Bird on nest
31	10	1920 hrs					Female leaves nest to feed.
5	11	1900 hrs	?				Female leaves nest to feed. Could not reach eggs to check.
17	11	1100 hrs	5		N		Nesting over. Remains of 5 eggs.
19	11						Brood located. 2 Adults and 5 chicks.

Instructions

1—Record Facts only. Note no estimates or guesses.
2—Dates on which no change was noted can be shown under Remarks.
3—Use a separate card for Each Nest. If full continue on second card — show same reference number.
4—Do not write in columns "For Office use only."
5—Use the cards for all nests found containing eggs or young — even if information is incomplete.

OBSERVER	SPECIES	(For Office Use Only)	
Mike Harding	Blue Duck	Year	No.

LOCALITY (District) Arthur's Pass N.P. (Otira River) OBSERVER'S REFERENCE — S.28

HABITAT (e.g., forest, scrub, scattered bush, suburban, swamp, shingle, etc.)

Low riparian vegetation; shrubs and herbs – subalpine.

SITE (Name of tree or shrub, dense, open, etc.) Beneath small rock and shrubs.

NESTING MATERIALS Dry plant matter and down; Chionochloa [illegible], C. flavescens, Olearia [illegible], moss, small twigs.

HEIGHT OF NEST (metres) 0 REFERENCE NUMBER (of other nests of same pair)

BAND NUMBERS (if bands used): Red/Metal – Red L 26851

GENERAL Nest located partly beneath small rock and partly beneath prostrate shrub (Olearia [illegible]) – not visible from above. Approx. 2 m from river and c. 1.5 m above water. On gorgy gradient river section.

(For Office Use Only)	
First Egg Laid	
Last Egg Laid	
First Young Hatched	
Last Young Hatched	
First Young Left Nest	
Last Young Left Nest	
Full Clutch Size	
Number Hatched	
Number Left Nest	
Incubation Period	

NEST RECORD CARD

THE ORNITHOLOGICAL SOCIETY OF NEW ZEALAND

Year 1990

(For Office Use Only) Year No.

DATE (Each Visit)

Day	Month	TIME	No. Eggs	No. Young	Was Bird on Nest ? Yes/No	Sex	REMARKS (Building, Weather, Cause of Destruction, Etc.)
5	11						Nesting first suspected. General nest location determined
1	12	2047hrs					Female returning to nest.
4	12	2000hrs					Female returning to nest.
17	12		1		N		Located nest with remains of one egg.
							[illegible] located with no young

Instructions

1—Record Nests only; make no estimates or guesses.
2—Dates on which no change was noted can be shown under Remarks.
3—Use a separate card for Each Nest; if full continue on second card — show same reference number.
4—Do not write in columns "For Office use only."
5—Use cards for all nests found containing eggs or young — even if information is incomplete.

7. Defining Territories of Breeding Blue Duck Pairs on the Upper Manganuiateao River (Kerry Oates, Mark Simmonds)

An extensive mutual interest in studying native birds, particularly bush and waterfowl, inspired this research, of 3 ½ years duration, which aimed to:

1) Count Blue Duck present within the study area and record annual changes in population density.

2) To determine the number of territories within the area by counting resident pairs and to define their territory lengths.

3) To make some comment on the use Blue Duck make of territory space by recording frequency and location of sightings within each territory.

4) To record breeding success of resident pairs by counting the number of young that reach inderpendence.

The study area: Located 21 km north of Raetihi on State Highway 4, about 6km in length. Co-ordinates = N.Z.M.S. 260 (S20) 148114 – 189109. Average depth 73 cm. Average width 4 m, with a bed of approx 6 m. River descends through 63 pool/riffle systems. Mean annual temp 7.7°c. Range 2° – 14°.

Forty visits were made between September 1986 and December 1989. Visits usually lasted 36 hours. The study area was walked 218 times recording 1,131 sightings. Every pool and riffle was marked and numbered from -15 to +47 going upstream. Sightings were recorded and plotted on a master the area, and were analysed. Pairs were identified by colour banding. Territory boundaries were determined and marked on the master map and were constantly field tested.

Changes in territory boundaries were not recorded during the study, but a slight down stream movement in preferred areas was noted. All three resident pairs retained the same partner and population density showed little fluctuation range 8-10 birds. Mean of 9. 3 Pairs and 2 individuals.

Results: Territories were not walked equivalently. Territory 2 being central, received more coverage.

Territory 1 -23 Pool/riffle systems. Walked 31 times. 325 Sightings. 52% of sightings on riffles. On 10 occasions (32%), birds were not seen. Territory boundaries = 15 pool to Riffle 7. Pair 1 were recorded on all pool/riffle systems in their territory.47% of sightings occurred between -6 pool and -12 riffle. This area amounts to 30% of the territory.

Territory 2 – 29 Pool/riffles. Walked 101 tims, obtaining 618 sightings. On 52 occasions birds were not seen. 51% on sightings occurred on riffles. Territory boundary = Pool 1 to riffle 29. An overlap with pair 1 of 7 pool/riffle systems, was recorded. 47% of sightings occurred between riffle 7 and riffle 14. This area = 26% of the territory.

Territory 3 – 17 Pool/riffle systems. From riffle 31 to pool 47. Walked 86 times, obtaining 182 sightings. 52% on riffles. 64% of walks resulted in birds not being seen. 3 pool/riffle systems (35-37) produced 44.5% of sightings. This area = only 17.6% of territory.

The consolidation of spacial use by pairs, suggests the populations has room to increase with in the study area. However, it is our speculation that food supply is the limiting factor.

Continuing research: Breeding success has been since commencing the study and continues to be recorded. Results:

BREEDING SUCCESS / POPULATION DENSITY

SEASON	PAIR	CHICKS FLEDGED	INDIVIDUALS/ TERRITORY	TOTAL
86/87	1	0	—	
	2	2	—	
	3	0	1	
TOTAL	6	2	1	9 @ 31/3/87
87/88	1	2	—	
	2	2	—	
	3	0	—	
TOTAL	6	4	0	1c @ 31/3/88
88/89	1	0	2	
	2	0	—	
	3	0	—	
TOTAL	6	0	2	8 @ 31/3/89
89/90	1	1	1	
	2	0	1	
	3	0	0	
TOTAL	6	1	2	9 @ 31/3/90
90/91	*	0	0	
	3	0	0 .	
	*	1	0	
TOTAL	6	1	0	7 @ 31/3/91

* = 2 NEW PAIRS WHICH MOVED IN DURING 1990.

III. CAPTIVE BREEDING GROUP ACTIVITIES

1. Minutes of the 3rd Captive Breeding Group Meeting,
National Wildlife Centre, 3 May 1991.

Present: Neil Hayes (DU), Grant Dumbell (DU), Jim Campbell (DU), Eric Fox (DU), Melvin Pike (DU), David Butler (DOC STU), Martin Bell (NWC), Hilary Aitken (NWC), Jim Glover (DU), Sue Anderson (NWC, arrived late).

Neil Hayes opened the meeting at 10.25am andwelcomed everyone to the third meeting of the Blue Duck Captive Breeding Group. He noted the attendance of David Butler who is now representing the Threatened Species Unit.

Apologies: Dave Johnston (DU), John Simester (Staglands).

Confirmation Of The Minutes Dated 4-5-90: These were taken as read and correct. Moved PIKE / Seconded FOX Carried.

Matters Arising: None.

1990 Blue Duck Liaison Group Meeting: Grant Dumbell gave a summary of the 1990 BDLG Meeting held at Cass last year. The meeting received reports and recommendations from all agencies involved with Blue Duck. This included substantial reports on both completed and planned research. The meeting also decided to make an experimental translocation of birds from the Maunganuiataeo River to Mt Egmont. A debate on the potential differences between SI and NI Blue Duck populations also arose. This will need further investigation.

The meeting agreed to the BDCBG being supplied with new blood in the form of some wild caught females. Two birds were to be taken immediately, with provision for up to five more to be taken in early 1991 to allow the captive stock sex ratio to be balanced. However, soon after the meeting closed objection to this was received from the Gisborne conservancy with the result that no females were removed from the wild until early 1991. As part of this, TSU agreed to allow the BDCBG to take up to 10 females from the wild, spread over a long period of time. This would allow the BDCBG to cover the current sex ratio imbalance and to make provision for any future problems. In general, the meeting felt that the captive breeding programme was progressing well and that a major article should be prepared for "Flight". Unfortunately this has had to be postponed due to other commitments.

General matters included the realisation that agency representatives needed to be able to speak for and on behalf of the agency, and not be second guessed by a manager after the meeting. The meeting also stressed that the Conservation Strategy needed to be approved as a Recovery Plan if it was to gain the full backing of conservancies. This was achieved in the 1991 meeting will be held in Nelson.

After this report, discussion arose about future meetings of the now Blue Duck Recovery Group. The BDCBG resolved to recommend to the Nelson meeting of the Recovery Group that it was imperative that a national focus should be maintained for blue duck and that the consensus format provided by the annual meetings should not be lost. As a result, the redrafted Recovery Plan should involve the same meeting format, but be held every 18 months in order to satisfy cost considerations. Agency representatives should also be able to speak for the agency while meeting resolutions should be binding on the agency. Otherwise, the effectiveness of the Recovery Group will be rapidly undermined.

Removal Of Females From The Wild: Neil Hayes reported that one juvenile female Blue Duck was removed from each of the Wanganui and the Whakapapa Rivers during January. Both these birds have settled into captivity very well, and the timing of their capture appeared to be excellent.

1990 Breeding Season Results: Neil Hayes reported that the final figure from the 1990 breeding season was a total of 9 birds raised from a total of three pairs. This represents a 125% increase on the previous season. Melvin Pike reared 2 males from 1 pair, Dave Johnston reared a male and a female from 1 pair and NWC reared 3 males and 2 females from 1 pair. Eric Fox, Mary Atkinson, Ron Munro, Nga Manu, and Hilldale Zoo all drew blanks. More complete breeding statistics will be colated for the Recovery Group meeting, and will be circulated to all breeders.

In discussion about the results of the season those present felt that aviary size could be critical and that the guidelines need to be changed to provide larger aviaries. These could also be more rectangular rather than square. It was decided to send a questionaire to all breeders to try and get more information on this and other areas of management.

Melvin Pike raised the question of using secondary males as breeding stimuli and felt that this should become policy. He had noted a large change in behaviour of his birds once the second male had arrived. David Butler also asked about diet. Eric Fow reported that OKH were not now using trout pellets due to a manufacture change. Martin Bell reported that NWC were actively working on Blue Duck diets. Melvin Pike still uses trout pellets in a ratio of 75% poultry pellets and 25% trout pellets mixed with peas, maize, cereal etc. Eric Fox got fertile eggs using only hilay pellets. Diet questions will also be included in the questionaire. Further information is also needed on general observations. NWC and Melvin Pike have both found incubation times over 40 days and hatching spread over 5 days.

Plans For 1991 Breeding Season: In addition to current pairs and current surplus males, a further 2 wild caught females, 3 juvenile females and 6 juvenile males are available for placement. In addition, some existing pairs will be up for repairing given that they have not bred for two consecutive seasons.

A review of aviaries showed 13 existing aviaries and 7 aviaries which will be ready before this season. Other display aviaries may be used to house surplus birds. The breakdown is:

EXISTING		NEW		DISPLAY	
Nat Wildlife Centre	3	Melvin Pike	2	Nat Wildlife Centre	1
Otorohanga Kivi House	2	Mary Atkinson	1	Willowbank	1
Ron Munro	2	Dave Johnston	1	Katikati Bird Garden	?
Hilldale Zoo	2	Jim Glover	1	Peacock Springs	?
Melvin Pike	1	Jim Campbell	1	Staglands	?
Mary Atkinson	1	Russell Langdon	1		
Nga Manu	1				
Dave Johnston	1				
TOTAL	13	TOTAL	7	TOTAL	min 2

A brief preview of the 1991 season shows that 5 pairs will be retained, 6 pairs will be repaired, a total of 17 pairs will be in captivity and 8 spare males will need to be housed. A total of 42 birds are now in captivity.

Re-pairings will be made using the following rules:

1. Wild birds will go to successful breeders
2. Wild-Wild pairings will be made where possible
3. Even aged pairs will be made where possible
4. Possible exceptions to birds less than 3 years old
5. All new pairings to be housed in different aviaries
6. All bird movements will be co-ordinated through Neil Hayes aviary
7. Where possible, spare males will be used for stimulants

Removal Of Further Birds From Wild:
The requirement for further wild blood will be gauged once the repairings have been decided as one or two birds may be retired.

Report From Wetlands Trust:
Grant Dumbell read a report from WWT about the progress of their birds. Unfortunately, related birds were sent to Britain and due to a death they are now restricted to one family line. The possibility of further birds being requested by WWT was discussed. David Butler asked would the British stock be used for distribution, research or advocacy. The meeting agreed that they could be used for all three of these, however, WWT should be encouraged to keep their studbook up to date, and to furnish an annual report of their progress.

Studbook Progress:
Grant Dumbell reported that the studbook now contained all known information, however, some bird movements had not been notified quickly enough. Breeders should record band numbers of all birds coming and going and their points of origin/ destination and send the information quickly to Ducks Unlimited, P.O. Box 9795, Auckland. The possibility of eventually transferring the information to "Sparks" was also discussed.

Sponsorship:
Grant Dumbell reported on a major sponsorship proposal which had been sent to S.C. Johnson & Son in respect of "Toilet Duck" products. In spite of a favourable response from the company the proposal was eventually declined.

Translocation of Wild Caught Birds:
The meeting heard how DOC had shifted two pairs of birds from the Maunganui River to Mt Egmont in March. A full report of this will be sought at the coming Recovery Group meeting. Melvin Pike reported that the Tararua wild male was still there. The meeting also heard 3 Blue Duck were bred and raised by wild Blue Duck on a pond near Kuratau. This should be compared to the records of captive released birds on Lake Dive on Mt Egmont and the existing historical records of Blue Duck on slow water.

Any Other Matters:
Martin Bell reported that the NWC had put its large Blue Duck display aviary on hold due to changing priorities. As a result Blue Duck were now not on display at the NWC. This could be rectified using some of the old birds in captivity who are pinioned.

David Butler raised the issue of a captive breeding handbook for the programme. The existing programme guidelines could be colated into a manual. The WWT incubation protocol needs to be received and circulated. Both these points need to be tied into the recovery plan and flagged for the Nelson meeting. It would also be useful for a second Blue Duck seminar to be planned for sometime in the next two years to tie everyone together again. Further thought also needs to be given to the issue of disease.

There being no further business Neil Hayes closed the meeting at 2.35pm.

2. Report of Captive Breeding Group (provided by Grant Dumbell)

The Blue Duck Captive Breeding Group met for the third time on 3 May 1990. There have been no changes in the composition of the Captive Breeding Group over the past year, and the minutes of that meeting have been circulated to all attendees, blue duck breeders, TSU and S&R, and are available from Ducks Unlimited. A summary of the 1990 Duck Liaison Group meeting was presented at the meeting, and an out line on the translocation that had been by the Liaison Group was given. The problems that had been experienced obtaining wild caught juveniles over the past year also discussed, and the agreed resolution was accepted by the BDCBG. With the coming rewrite of the Blue Duck Recovery Plan, and the concerns regarding the availability of resources for large scale meetings, such as the Liaison Group, BDCBG felt that the national perspective for blue duck conservation must not be lost and a national blue duck forum must be maintained, even if it meant fewer meetings.

1990 Breeding Season: The 1990 breeding season a great improvement over the 1989 breeding season, although only a small number of young birds was again raised. There were no deaths during the 1990 breeding season. The final statistics are summarised in the tables below, and a comparison with 1989 is included.

A total of 31 birds were in captivity for the 1990 breeding season. The same eleven pairs were held by the same eight breeders, however, this year breeders held surplus males adjacent to their breeding pair to act as a stimulant for the breeding pair. In addition to the breeding pairs, six surplus males were housed and the 1989 bred female was housed with two young males to ascertain if a pairing could be established by natural mate choice.

These two males were both suitable potential mates, and the reasons behind this small scale flock mating trial was to ascertain if this technique could be developed to reduce the lead time between birds being introduced to each other and offspring being produced, as detailed in last year's report. While the three birds lived together quite happily over the whole breeding season, without any signs of aggression, there no indication that a pair bond had formed between the female and one of the males. As a result, the female will be arbitrarily paired with one of the males for the breeding season.

Table 1 summarises the breeding progress by each pair of birds during 1990, and compares the results obtained with their breeding performance in 1989. Increases were recorded in all performance measures except the number of pairs that laid multiple clutches. The 20% decline in this indicator is attributed to the increases in the number of pairs that proceeded past the fertile egg stage of their breeding attempt. The 100% increase in the number of pairs laying fertile eggs translated into a 250% increase in the number of pairs hatching ducklings, but only a 50% increase in the number of pairs produced young to fledging. Importantly, while only one of the pairs who successfully raised young in 1989 did so in 1990, two pairs reared young for the first time. The successful 1989 pair who failed to raise young in 1990 (OKH1) did hatch a duckling, but was unsuccessful in raising it.

This same pattern was seen in the performance of the individual eggs that were laid during the season as set out in Table 2. While the number of clutches laid remained static, the number of eggs laid increased 13% with only a small increase in the of eggs laid normally. In fact, the number of eggs laid abnormally jumped from six to 11, an increase of 83%. This is almost entirely due to the Nga Manu pair laying six eggs on the

aviary floor before settling down to normally lay a clutch of four eggs, one of which hatched, a marked improvement over the pair's performance in 1989. The Munro pair again laid abnormal eggs, and did not successfully lay a fertile egg. The Atkinson pair laid two abnormal eggs, but this was the first attempt at egg laying for that particular female.

Table 1: A summary of the breeding success of each blue duck pair in captivity in 1990, and a comparison with 1989 results.

Pair	Mate	Nest	Eggs	Norm	Fert	Hatch	Rear	Multi
OKH1	1	1	1	1	1	1	0	1
OKH2	1	1	0	0	0	0	0	0
NWC1	1	1	1	1	1	1	1	1
NWC2	1	1	1	1	1	0	0	1
NWC3	0	0	0	0	0	0	0	0
Pike	1	1	1	1	1	1	1	1
Nga Manu	1	1	1	1	1	1	0	?
Munro	?	1	1	1	0	0	0	0
Hilldale	0	0	0	0	0	0	0	0
Atkinson	1	1	1	0	0	0	0	0
Johnston	1	1	1	1	1	1	1	0
1990 Total	8	9	8	7	6	5	3	4
Percentage	73%	82%	73%	64%	55%	45%	27%	36%
1989 Total	5	7	7	5	3	2	2	5
Percentage	45%	64%	64%	45%	27%	18%	18%	45%
Increase	3	2	1	2	3	3	1	-1
Percentage	60%	22%	14%	40%	100%	250%	50%	-20%

Over half of the normally laid eggs were fertile in 1990, a jump of 155% over the 1989 result where less than a quarter of normally laid eggs were fertile. This problem was identified as the most immediate concern of the breeding programme after the 1989 breeding season, however, the 1990 results indicate that this has been successfully addressed by the breeders. As a result of having more fertile eggs, the number of ducklings that hatched from them increased by 167%, however, the proportion of fertile eggs that hatched remained constant. Unfortunately the number of fertile eggs that did not hatch increased from five in 1989 to 12 in 1990, an increase of 140%. The indications are that this may be due to the use of artificial incubators in the absence of a proven artificial incubation protocol, however, it may also simply be due to chance events given the proportions involved.

These increases translated into a 125% increase in the number of young reared from four to nine. It now seems clear that while the number of infertile eggs must still be of concern, a more immediate problem to address to give sustainable increases in the overall success of the programme is the management of fertile eggs and the rearing of ducklings. Here lies a potential trap as while natural incubation may give better hatching success, parent rearing may provide more risks for the ducklings. On the other hand,

artificial rearing may be safer for the ducklings but may provide hidden social problems. Likewise artificial incubation may provide a lower hatch rate than natural incubation over the short term while an artificial incubation protocol is proven. The BDCBG is currently awaiting the arrival of details of the artificial incubation protocol used successfully by the Wildfowl and Wetlands Trust in Britain. It is worth noting that seven of the nine ducklings were raised from two broods hatched from second clutches, however, in one case the first clutch was fertile and in one case the first clutch was not fertile.

The number of first clutches laid raised from five to eight, an increase of 60%. The average first clutch size did not change and remained at 5.0 eggs. The number of second clutches increased by one, to five, while the average second clutch was almost unchanged at 4.4 eggs compared to 4.3 eggs in 1989. There were no third clutches laid in 1990.

Egg Infertility:
In the 1989 report of the BDCBG three potential reasons for the high levels of egg infertility were identified. With the large increase in the number of fertile eggs recorded in 1990 it seems that inbreeding depression is playing a minor role at best. Nevertheless this factor should not be completely disregarded given the relatedness of the birds in the programme. Confirmation of the minor importance of this factor will be gained if a large increase in fertility is recorded in 1991.

Diet was also identified, but without embarking on a major nutritional study of blue ducks the management of this factor has been approached by implication from what is already known about blue duck diets in the wild, blue duck and waterfowl digestion in general. Field data shows that wild blue ducks have a high protein intake and a high metabolic rate. These two factors are linked and implies that maintenance demands on there diet may potentially reduce fertility in the absence of an adequate diet. However, this must be balanced against the known toxicity of protein metabolites, and the potential for renal problems in birds with excessive protein intake. The added unknown effects of bioavailability of wild versus captive diets, sexual differences, and seasonal shifts in metabolic demands means that the simplest dietary regime in captivity is for breeders to feed cafeteria style with grain, low protein pellets, and high protein pellets available throughout the year to allow the birds to make their own choices.

The third infertility factor identified was socialisation, and during 1990 a serendipitous experiment clearly illustrated the power of this factor. Melvin pair laid a 100% infertile seven egg clutch before a surplus male was housed near the breeding pair. Immediately this second male arrived the pair male completely changed his behaviour and spent prolonged periods patrolling the aviary and calling at night. The female then laid a six egg second clutch, which was 100% fertile and produced two fledged young. Both clutches were substantially larger than average. Similarly, Dave Johnston successfully fledged young with secondary males in place whereas the National Wildlife Centre also fledged young with more than than one pair present.

Notwithstanding this, Otorohatiga and Ron Munro unsuccessful in fledging young, even though they had other blue ducks whereas Nga Manu was very unlucky not to raise a duckling even though a secondary male was not used. As a result, it can only be recommended that breeders hold two pairs of blue ducks, or a pair and a secondary male, as success is not guaranteed with social stimulation and the logistics of holding birds in second aviaries may exclude some breeders from the programme, obviously to the detriment of the programme.

Aggression and inexperience are two further potential reasons for the recorded levels of infertile eggs. The aggression problem is countered by the programme guideline that the two birds of a pair are introduced into a new aviary together. This removes the problem of one member of the pair being subordinate to the other member as a result of the subordinate member being introdured into an aviary where the dominant has established a history of prior residency. If inexperience is a problem, this will obviously correct itself with time, however, an analysis of ages of first breeding suggest that inexperience may be a factor in the level of egg infertility. It may also be a perceived problem, and that other aspect of blue duck captive management is responsible. The effect of time will most likely resolve this dilemma.

Age of First Breeding: An analysis of all blue duck breeding records available to date has shown that six females and seven males have so far bred in captivity. Of the females, one was a wild bird, three were captive bred, and the origins of two are unknown. The average age of first breeding far these birds was at three years of age. Of the males, three have been wild birds whereas four were bred in captivity. The average age of first breeding for these birds is four years. Both these average ages are substantially above the age at the birds are capable of breeding in the wild, and will be monitored to assess whether it decreases in the future.

To date, wild bred birds that have bred in the programme have produced average of 5.0 young each whereas successful captive bred breeders have produced an average of 5.4 young each. These data indicate that the captive breeding performance of captive bred birds is not lower than wild bred birds, and also supports the interpretation that inbreeding depression is thus far a minor problem.

1991 Breeding Season: For the 1991 breeding season, two wild caught females from the central North Island will expand the programme by introducing new wild blood. With the nine birds bred in 1990 the total number of birds in captivity has risen to 42. Some birds will be assessed for repairing as they have not been successful over the past two breeding seasons. Any pairings that are made will be made to agreed rules where wild-wild pairings will be favoured, like aged birds will be paired using the most distant relationships possible, and leniency will be shown to birds that are less than three years ago given the recorded ages of first breeding of blue ducks in the wild. For the consideration of repairings, a fertile pair will be defined as a pair of blue ducks that have produced at least one fertile egg in the past two seasons.

The best case scenario for the 1991 breeding season is an increase from 11 to 16 pairs in captivity, an increase from one to three family lines in the programme, like aged pairs will be established, and one or two very old birds will be able to be retired. During the year the forward requirements for aviary space will be determined, and the question of artificial incubation will be addressed to begin drawing up a protocol for use by breeders. It is also planned to circulate a breeders questionnaire in an attempt to gain understanding of the effects of aviary size, and other factors, with a view towards redrafting the captive breeding programme guidelines. At the end of the 1991 breeding season the need for wild caught birds will again be assessed in the light of the success of the breeding season.

Table 2: A summary of the fate of each blue duck egg laid during the 1990 breeding season, and a comparison with 1989 results.

Pair	Clutch	Egg	Laid	Normal	Fertile	Hatched	Reared
DOC	1	1	1	1	1	1	0
		2	1	1	1	0	0
		3	1	1	1	0	0
		4	1	1	1	0	0
		5	1	1	0	0	0
	2	6	1	0	0	0	0
NAC1	1	7	1	1	1	0	0
		8	1	1	1	0	0
		9	1	1	1	0	0
		10	1	1	1	0	0
	2	11	1	1	1	1	1
		12	1	1	1	1	1
		13	1	1	1	1	1
		14	1	1	1	1	1
		15	1	1	1	1	1
		16	1	1	1	1	0
NAC2	1	17	1	0	0	0	0
		18	1	0	0	0	0
		19	1	0	0	0	0
		20	1	0	0	0	0
		21	1	0	0	0	0
		22	1	0	0	0	0
	2	23	1	1	0	0	0
		24	1	1	0	0	0
		25	1	0	0	0	0
		26	1	0	0	0	0
		27	1	0	0	0	0
Pike	1	28	1	0	0	0	0
		29	1	0	0	0	0
		30	1	0	0	0	0
		31	1	0	0	0	0
		32	1	0	0	0	0
		33	1	0	0	0	0
		34	1	0	0	0	0
	2	35	1	1	1	1	1
		36	1	1	1	1	1
		37	1	1	1	1	0
		38	1	1	1	1	0
		39	1	1	1	1	0
		40	1	1	0	0	0
Nga Manu	1	41	0	0	0	0	0
		42	0	0	0	0	0
		43	0	0	0	0	0
		44	0	0	0	0	0
		45	0	0	0	0	0
		46	0	0	0	0	0
	2	47	1	1	1	1	0
		48	1	1	1	0	0
		49	1	1	1	0	0
		50	1	1	0	0	0
Munro	1	51	1	1	0	0	0
		52	1	1	0	0	0
		53	0	0	0	0	0
		54	0	0	0	0	0
		55	0	0	0	0	0
Atkinson	1	56	0	0	0	0	0
		57	0	0	0	0	0
Johnston	1	58	1	1	1	1	1
		59	1	1	1	1	1
		60	1	1	1	1	0
		61	1	1	0	0	0
		62	1	1	0	0	0
1990 Total	13	62	51	28	16	9	
Percentage	100%	100%	82%	55%	57%	57%	
1989 Total	13	55	49	11	6	4	
Percentage	100%	100%	89%	22%	55%	67%	
Increase	0	7	2	17	10	5	
Percentage	0%	13%	4%	155%	167%	125%	

Meeting Comment:
The Captive Breeding Group was commended for its considerable achievements and thanked for its continuing, largely voluntary, participation. The level of overview and ongoing analysis of results was particularly valued and Ducks Unlimited were thanked for allowing its Executive Director to participate in this way at its expense.

For the formal record it was recorded that the capture of birds for the captive breeding programme, as agreed at last Liaison Group Meeting, did not take place. Instead, post-meeting discussions decided that fledglings, not adults, would be captured. No females were taken from Gisborne-East Coast because of the very poor breeding season experienced there in 1990/91. Two females were taken from the Whanganui headwaters in Toingariro/Taupo Conservancy. The introduction of South Island birds into the programme was held in abeyance pending further discussion about the genetic need to keep island stock separate. No request for stock was made to Waikato Conservancy.

Need For Further Stock

There was support for the need to increase the number of family lines within the captive stock. It was agreed that 2 female fledglings should be taken into captivity in early 1992 and that these should come from
(i) Gisborne -Takaputahi area
(ii) Pureora population
(Action: Chris Ward (East Coast), Phil Thompson (Waikato), Murray Williams)

Related Issues

(i) Release of surplus captive males: It was agreed that these birds represented a source of potential pioneers for new habitat but that there was really little point in releasing them without females also being part of the release. It would be preferable to release any surplus birds into existing populations being established from captive-reared stock, such as on Mt Egmont/Taranaki where there are birds with which they could interact. Caution was urged about releasing too many of these males in case they severely altered the sex ratio of the population into which they added. The possible role of these surplus males as for captive pairs should be considered ahead of their release.

(ii) Genetic issues associated with releases: Should captive-reared birds be released into areas in which wild birds are present? Should captive-reared birds be placed into contact with birds with whom they do not share similar genetic origins? Neither of these isuues were resolved. There is at present little information to guide such a policy decision and the conservative approach must remain in force i.e. as far as possible birds of different genetic origins are not mixed. The issue deserves a more thorough discussion and should form one of the topics addressed in the review of the recovery plan.

(iii) North v South Island stock: The present policy is to keep stock from the two islands separate pending future genetic studies. The origins of birds held in captivity by South Island breeders needs determining and the possibility of commencing a South Island based breeding programme evaluated (*Action, Grant Dumbell*).

V. MONITORING, SURVEY & BANDING

A general discussion on methods and techniques associated with Blue Duck field programmes took place during which common problems or approaches were highlighted and information was shared. Some general points were:

(i) Monitoring Methodology

The information provided in Appendix 2 of the "Conservation Strategy" remains, by and large, a helpful guide to survey and monitoring procedure.

(a) Timing of visits: Experience is showing that pre-breeding surveys (August to October) are generally unreliable unless the distribution of pairs along the river is already well known. The males are just a little too inconspicuous to provide an accurate estimate of pair density. From a monitoring point of view it is probably best not to attempt survey at this time of year but instead to concentrate activity (to record breeding output) in November-December.
Mid November to mid-late December is proving to be the most productive and least ambiguous time to undertake survey or monitoring for not only are all broods on the rivers at that time but so too are failed breeders in the early stages of their annual moult. Post-breeding surveys in March and April while successful appear to be causing just a few problems of interpretation. Some staff are finding it difficult to distinguish resident pairs from transients and fledglings and feel that these surveys are not really giving them a satisfactory estimate of the size of the population present in the surveyed section of river. When conducting surveys at this time of year it is important to realise the limitations or advantages which the annual cycle of the birds provides (see Appendix 2 of "Conservation Strategy"). These surveys can provide an estimate of fledged young before they move widely throughout the catchment; these surveys can indicate the presence of non-established birds in adult plumage (they tend to move downriver ahead of you rather than fly back over you as territorial pairs do); but these surveys cannot provide an accurate estimate of the size of the resident territorial population.
The general message is to conduct your surveys at the time of year that will best give you the type of information you seek.

(b) Time of Day: Dawn and dusk remain the most productive survey in most localities. Generally the birds are most likely to be conspicuously feeding on the river in the 2-3 hrs after dawn and before dark, but don't forget the possibility of some nocturnal activity. Wandering a river (particularly small ones) with a strong spotlight in the 2-3 hrs after dark may, in some areas, prove very successful for locating the presence of birds not previously seen. It is apparent that many surveys /monitoring programmes are organised to coincide with human work habits rather than in response to the behaviour of the target animals. Surveying a section of river for Blue Ducks between about 10am and 4pm is generally a complete waste of time!!!!!!

(c) Mapping: The most successful and useful monitoring tool is proving to be a large-scale map. Generally the scale of the standard topographical map is not sufficient to record detail with precision or to locate specific key features on the river. Maps compiled from aerial photographs with a scale of 1:3000 to 1:5000 allow riffles and pools to be demarkated and other helpful features to be depicted. With maps of this scale ranges of resident pairs can be accurately determined by noting
- conspicuous collections of droppings
- location of any bird(s) seen
-location at which an individual or pair turns back after having been forced downriver ahead of you.

(ii) Banding Protocols

(a) Band Sizes: Two different size metal bands can be used on Blue Ducks. Generally, the Banding Office supplies "L-bands" which are about 12mm high. This is too high to allow a colour band to be placed above the metal on the leg of even the largest male. An alternative is to ask for "S-bands". They have the same internal diameter but are 9-10mm high. Subject to the comment below, a colour band can be placed above them. Generally, the comfortable zone of the leg on which to place bands is 19-20mm. It may stretch 1-2mm more than that but by then your bands are hard against both the foot and the knee joint. Better to have 2-4mm free space between the top of your band and the knee joint. This means that when putting 2 bands on the one leg, 18mm is really their maximum combined height. Most of the colour bands supplied by the Banding Office are 10mm high. They should generally be ground down to 8-9mm by holding against the side of a grindstone (note that by doing this you will make the ground edge rather sharp -a little sandpaper against the internal and external edges solves this problem).

(b) Fitting Colour Bands: As a timely reminder, four tips were provided
-always glue plastic bands. The glue must: be a solvent glue such as PVC (e.g. glue), acetone, or non-gel superglue. The PVC glue for plastic guttering and downpipes has proved the easiest to use to date.
-inevitably colour bands are unravelled to the extent that their tightly-curled shape is distorted and the outside of the band doesnt sit tightly against the rest of the fitted. The solution, after having applied glue to the band, is to squeeze the band tightly and stick some sellotape over the band end so as to hold the tight shape while the glue sets. Caution – don't put the sellotape right round the band or it will catch around the leg when later it comes off the band in the water.
-when applying 2 colour bands to the same leg, wrap them around the leg in different directions. This will prevent them working into each other should you use the wrong glue or not have used any.
-if you have a previously-banded bird in the hand, always check the condition of its bands. In some rivers (eg Urewera rivers and probably in others carrying a high sediment load) colour bands may wear very fast and be paper-thin within 2 years, elsewhere 4-5 years may be the life of a colour band. Metal bands should last the life of the bird.
As an aid to making colour bands more visible, can reflective tape be applied to them? Yes, but don't expect the tape to last the life of the colour band.

(c) Colour Band Combinations: As a general rule it is unwise to use the same colour band combinations in neighbouring catchments or in different rivers within the same catchment. Thus, amongst present studies:
1. Whanganui catchment studies should co-ordinate their banding protocols (i.e. Pureora/Ongarue, Whakapapa/Whanganui headwaters, Manganuiateao studies)
2. Styx River and the Arthurs Pass studies should coordinate their banding protocols
3. Existing monitoring in all other areas (Gisborne, Hawkes Bay, Nelson, Mt Peel, Fiordland) can use the same combinations.

(iii) Survey

Duncan Cunningham raised the issue of encouraging greater public involvement in survey and monitoring tasks. He reported success from including canoeists in his surveys of Manganuiateao headwaters but noted that he had to "school" them first in order to be sure that band combinations were being reported accurately. Arthurs Pass and Styx studies have previously used volunteers and reported the problems of training people for one field trip never to see them again. The need for feedback for public participants was emphasised. The general feeling was that "public" involvement was not helpful as a "one-off" activity, the benefit came when individuals returned several times to have an involvement.

Duncan floated a possible new design for a public reporting card. It was generally felt that the existing Conservancy reporting cards were more than adequate - they had the virtue of simplicity and restricted their request for easily-reported information on bird location and number.

(iv) National Distribution Database

The initial aim of the record scheme - to record the present-day (1980s) distribution of Blue Ducks has largely been satisfied. This is especially the case in the North Island but as Duncan's report highlights, it would seem that the distribution in the South Island is still not fully recorded. The Blue Duck database is one of the SITES databases now available within DOC on the new LAN computer systems and will shortly become a GIS-based recording scheme.

The future maintenance and scope of the scheme was discussed. It was agreed that there was a need to maintain a national distribution recording scheme. It was further agreed that this would be based on the various regional databases that have been set up and that the national database would be updated annually by input from the regional schemes.

VI. BLUE DUCKS & RIVER CONSERVATION

Blue Ducks have featured in some recent Planning Tribunal hearings (eg. Whanganui and Mohaka River cases) where their presence has been used as an advocate for the natural values of the waterway. Statements of the sort “the river contains x breedings pairs… the river is capable of supporting y pairs… the species is regarded as threatened…etc” are statements of fact but they are not in themselves a particularly strong vehicle for the conservation cause (which it is DOC’s mandate to advocate).

Blue Ducks, as a conservation advocate, can be viewed at two levels:

1. as an entity worth saving in their own right. The species is threatened; it has declined significantly in both numbers and range in historic times; it is unique to NZ and birds with its habitat preferences are very rare worldwide.

2. as a member of a riverine community. The presence of the bird is indicative of the very highest natural value of the waterway; it resides on the most stable section of river and on the most stable of rivers; they are demanding of relatively unmodified catchments; given their former widespread distribution their presence on a river signifies a much lower level of modification to that waterway than to those rivers where they are no longer residing.

Blue Ducks are worthy agents for a more "holistic' approach to riverine conservation - they can be viewed as important keystone species such that their densities may tell us much about the "nature" of the river (but being long-lived they will be slow to respond) and the quality of its waters and catchment management. Blue Ducks are part of a total system and there are fewer and fewer total systems left.

VII. IS THERE A NEED TO ADVANCE THE TRANSLOCATION PROGRAMME?

The emphasis of the first 4 years of Blue Duck recovery efforts has been:

1. to determine the distribution (and if possible, the abundance) of Blue Ducks nationally;
2. to identify key habitats and to move to provide these with enduring protection; to commence monitoring of key populations so as to determine, over time (for the species is long-lived), the demographic health of these populations;
3. to prepare the ground for establishing new populations in areas where the birds do not presently reside; and
4. to conduct research relevant to the conservation of the species.

Generally, the conservation efforts are up to, and in some cases ahead of, the schedule outlined in the "Conservation Strategy". The emphasis in the forthcoming revision of the

recovery efforts is likely to be a more restorative one -perhaps seeking to increase the carrying capacity of existing habitat and (definitely) the establishment of new populations. How well prepared are we for this next phase? Has the necessary homework been done?

The recent research effort has attempted to lay some of necessary groundwork by identifying key elements of Blue Duck habitat and outlining methods for assessing the suitability of a river to sustain a new population. The long-term population study and the various monitoring projects have or are highlighting the considerable annual and regional variability in Blue Duck breeding success, a variability that clearly suggests we will not be able to "crop" populations on an annual basis. Instead, removing birds from a population to establish a new one will be on a "boom and bust" basis and the recovery time for the donor population which "gave" 3-4 pairs may be as long as years.

The captive breeding programme, while still feeling its way, is making solid progress, its activity having the positive reinforcement provided by the 1986 release on Mt Egmont/Taranaki and the continued survival and breeding of some of those released birds.

What is presently lacking is information upon which to base any translocation programme -eg. the sex and age composition of any release, best time of year for transfer, best sources of birds for translocation etc. Is there a case, therefore, for conducting a series of "experimental" transfers now in advance of any new schedule arising from the revision of the "Conservation Strategy"?

Some of the points raised and canvassed in the general discussion and points of agreement were:

- any testing of translocation techniques should also seek to establish a new population. Thus initial trials should be concentrated on Mt Egmont/Taranaki and not at several different localities.

- sources of birds for translocation should be the "healthy" populations, especially those being well monitored or capable of being monitored inexpensively. This will inevitably raise a problem of supply given that it will take several years for any of the major populations to replace the birds removed. It is not appropriate, at this time, to extract birds from "remnant" populations. Need to look at other possibilities for supply of wild birds for translocation eg. several smaller rivers from which 1 or 2 birds only are removed.

- testing of techniques should not be limited to 'one-off' trials. The single transfer of established pairs undertaken in March 1991 should be repeated. Juvenile translocations should be repeated 2 or 3 times. Pre-fledged young should not be considered.

- there is a need for guidance on "cropping rate" of juveniles or pairs especially if small rivers are to be seen as a source. As an initial suggestion
    1) the section of river from which pairs are taken must be a known productive stretch.
    2) removal rate should not exceed 1 pair in 5.
    3) juvenile removal rate should not exceed 1 for every pair with a minimum of 5 productive pairs on the affected stretch of river.

- augmenting of existing "remnant" populations worthy of more consideration. If dispersal is a factor which is limiting their size then adding birds to them may be very instructive.

- Options for 1992? Agreed that, subject to a productive breeding season in 1991/92, and subject to support and finance being available in the participating Conservancies, a translocation of juveniles from central North Island rivers to Stony River headwaters on should take place. *(ACTION: Cam Speedy and Wayne Hutchinson).* If this is not possible, this translocation should be scheduled for the following year together with a repeat of the adult translocation.

VII. REVISION OF RECOVERY PLAN

It was agreed that a draft of a revised recovery plan should be prepared in about April 1992 for circulation to Liaison Group members and that this draft would be the principal topic of discussion at the 1992 Liason Group Meeting.

It was agreed that the revised recovery plan should emphasise necessary management and be written from a manager's perspective ie. with an emphasis and in a format that makes its implementation easy at Conservancy level. The group to prepare the draft plan should comprise 3 Conservancy staff, 1 TSU member and 1 researcher. (Action: Murray Williams to organise final composition of group and its time and place of meeting).

Some of the topics raised that require attention in the revised plan are:

- How long to monitor key populations;
- Are monitoring programmes collecting all the appropriate data?;
- Protocols for releases (including composition of releases, mixing of wild and captive-reared birds, North Island sources for release, inventory of release sites)
- New research topics (if any).

VIII. SCHEDULE OF ACTIVITIES 1992, 1993

Conservancy	1991/92	1992/93
Waikato	monitor Pureora Rivers	ditto
	capture 1 juv. female for captive breeding programme	
	identify possible release sites	
Bay of Plenty	survey Whirinaki River	?
	identify possible release sites	
Wanganui	monitor Egmont releases	ditto
	monitor Manganuiateao R.	ditto
	survey Omaru River	
	assist Manganuiateao research	ditto
	conduct further Egmont releases	ditto
East Coast	monitor Takaputahi River	ditto
	capture 1 juv. female for captive breeding programme	
	identify possible release sites	
Hawkes Bay	band and monitor in Apias and Ikawatea Rivers	ditto
	survey of rivers in Kaweka and Ruahine Forest Parks	ditto
Tongariro/Taupo	monitor Tongariro River	ditto
	monitor Whakapapa River	ditto
	assist dispersal study	ditto
	provide birds for further Egmont releases	ditto
Wellington	identify possible release sites	
Nelson/Marlborough	monitor Flora Stream	ditto
	monitor Riwaka River	ditto
	appraise distribution in Marlborough	
West Coast	monitor Styx River	ditto
	survey adjacent catchments	ditto
Canterbury	monitor Peel Forest	ditto
	monitor Arthurs Pass and band fledglings	ditto
Otago	survey of Catlins?	
	identify possible release sites	

Southland	monitor Castle River, Snag Burn and Iris Burn	ditto
Science & Research	maintain distribution database	ditto
	radiotelemetry study of juvenile dispersal	ditto
	monitor Manganuiateao productivity, band juvs.	ditto
Massey University	Blue Duck-Trout interaction (Dale Towers)	ditto
Kerry Oates	monitor Manganuiateao headwaters	?
Mike Harding	monitor Otira & Bealey Rivers	?

IX. REVIEW OF RESEARCH PROJECTS

Summarised records of a meeting held at Massey University, 24 September 1991.

Present: Murray Williams (convener), Kevin Collier, Duncan Cunningham, Greg Sherley, Richard Sadleir (DOC S&R), Clare Veltman, Ian Henderson, Dale Towers (Massey Univ.)

Purpose:
1. To determine whether all completed projects met their intended objectives;
2. To determine whether the research objectives and approach faithfully followed those originally requested in the "Conservation Strategy"
3. To consider topics or questions that should guide future research support for Blue Duck conservation efforts.

Studies reviewed, their present status and intended activity were:

1. National Distribution Survey of Blue Duck

Objective:
1. Determine 1980s distribution
2. Establish & maintain computer database of distribution records

Personnel: 1, 2. Duncan Cunningham

Tasks completed:

1. Publication of S&R Internal Report providing full listing of all 1980s records
2. Establishment of central computer database (maintained by S&R) and 6 regional subsets maintained by Conservancy staff

Tasks to do:
1. Analysis of distribution relative to records to determine recent trends
2. Analysis of general characteristics of rivers presently occupied by Blue Ducks and of those from which birds have recently disappeared

Planned Future Activity
1. Conservancies to maintain and update their databases and to (annually?) pass these on for adding to central database

2. Genetic Structure of Blue Duck Populations

Objective:
1. To determine the genetic structure of Blue Duck populations including the extent of inbreeding
2. To compare the genetic structure of a potentially isolated population from a modified habitat with a population from a largely unmodified habitat.

Personnel:
1. Sue Triggs, Murray Williams
2. Sue Triggs

Tasks completed:
1. Appraisal of the within-population genetic relationships of Manganuiateao birds over short, middle and long distances on the river
2. Comparison of genetic structure of Manganuioteao and Takaputahi (Motu catchment) population (to meet objective 2)

Tasks to do:
nil

Planned Future Activity:
nil

3. Blue Duck Dispersal Studies

Objectives:
1. To determine, by biochemical means, the nature and extent of Blue Duck dispersal between adjacent populations
2. To determine the timing and extent of dispersal of juveniles, and any differences in the dispersal and settlement patterns of young males and females

Personnel:
1. Sue Triggs
2. Duncan Cunningham, Murray Williams

Tasks Completed:
1. Appraisal of between-population genetic relationships both over short and long distance and between islands

Activity in progress:
1. Study of the post-fledgling dispersal of 10 juveniles on the Manganuiateao. Planned to cover max. of 3 years and the records of a min. of 30 fledglings. Possible extention to adjacent river.

Possible Future Activity:
1. Comparison of genetic characteristics of NI and SI Blue Ducks in order to determine whether a “no transfer between islands" policy is warranted

4. Population Studies

Objectives:
1. To study the long-term changes in a population by measuring a variety of demographic parameters
2. To examine the viability of Blue Duck populations by way of stochastic simulation modelling

Personnel:
1. Murray Williams
2. Chris Craig, Ian Henderson

Tasks Completed:
1. The Manganuiateao study population has been subjected to 11 years of observation, barely one generation time. Results to date have been conpiled, recording a 250% increase in population over the first 10 years and highlighting many of the biological characteristics of the species.
2. Initial modelling completed using both homogeneous and non-homogeneous population models.

Tasks in progress:
1. Manganuiateao population monitoring continuing at a low level on a year-by-year basis

Possible Future Activity:
1. Expansion of the modelling work to improve structure and predictive capability (with expansion of example to other species at risk)

5. South Island and Habitat Use Study

Objective:
1. To monitor survival, breeding success, and levels of recruitment into, the resident population of Blue Ducks on the upper Otira River, Arthurs Pass National Park
2. To monitor juvenile dispersal and settlement in alpine rivers
3. To investigate temporal patterns of habitat use in alpine rivers, especially the Bealey, Minga and Deception headwater rivers in the Waimakariri catchment

Personnel:
1,2 Mike Harding (F & B)
2,3 Stephen Phillipson, Rob Smith (DOC, Waimakariri)

Tasks in Progress:
1. Regular monitoring of resident pairs on Upper Otira River since August 1988 & with a11 young banded at fledging. Identity and location of all transient birds recorded. Work ongoing.
2. Regular monitoring of Bealey River since April 1989 and of Minga, Deception and Edwards Rivers since June 1990. Latter 3 rivers are now covered at monthly intervals in order to extend knowledge of habitat use. Work ongoing

Planned Future Work:
To maintain existing activities for 5-year period.

6. Blue Duck -Trout Relationships

Objective:
1. To determine whether trout affect the prey availability and diet preferences of Blue Duck
2. To measure niche overlap between trout and blue duck populations
3. Test hypothesis that competition for prey reduces blue duck productivity

Personnel:
1. Martin Williams, Clare Veltman, Ian Henderson
2,3 Dale Towers, Clare Veltman, Ian Henderson

Tasks Completed:
1. Pilot project (Objective 1) identified significant effect of trout on prey availability and diet preferences of blue duck but noted the effect was different in different streams.

Tasks in Progress:
1. Objectives 2,3 the focus of a PhD investigation just commenced

7. Dietary Studies

Several separate but ultimately related studies which seek to describe and appraise blue duck foods and feeding

a. Arahura and Styx Rivers

Objectives:
1. To describe the summer diet of blue ducks on the Arahura & Styx Rivers

Personnel: David Barker, Ian Henderson, Clare Veltman, David Fountain

Task Completed: Analyses completed

Task to do: Write-up of results ???

b. Manganuioteao and East Cape Rivers

Objective:
1. To investigate spatial variations in potential food availability and the diet of blue ducks on selected rivers
2. To determine sources of carbon assimilated by blue ducks at several sites on the Manganuiateao River and to elucidate pathways of energy transfer

Personnel:
1. Kevin Collier
2. Kevin collier, Graeme Lyon

Tasks completed:

1. Food supplies and diet appraised and reported on
2. Trophic pathways and diet determined by way of stable carbon isotope study. Work published

Future Tasks: nil ?

c. Temporal variations in food availability, diet and feeding behaviour

Objective: 1. To identify seasonal variations in prey availability, and in the diet of blue ducks and to relate these to variations in foraging behaviour

Personnel: Kevin Collier, Mike Wakelin, Lisa Newton, Clare Veltman, Ian Henderson

Tasks Completed:

1. Six bi-monthly samplings of stream invertebrates, collections of faeces, and sets of feeding observations completed by end of 1989.
2. All data analyses completed

Tasks to do:

1. Write-up of results

Planned Future Activities:

nil ???

d. Nitrogen and Energy in Blue Duck Foods

Objective: 1. To determine levels of nitrogen assimilation artificial and natural foods by captive and wild Blue Ducks

Personnel: Gary Bramley, Ross King, Clare Veltman

Task in Progress: details given below

Future Activities: Widespread appraisal of energy content (especially nitrogen content) of foods given to captive Blue Ducks during the breeding season ???

8. Time-budget Studies (& including the spatial use of habitat)

Objectives:
1. To determine the winter (non-breeding time) use of time and space by resident pairs on the Manganuiateao River
2. To determine the diurnal use of time and space breeding Blue Ducks
3. To investigate the nature and extent of nocturnal activity by territorial pairs

Personnel:
1. Dianne Noda , Patricia Faris (Stanton)
2. Clare Veltman, Murray Williams
3. Murray Douglas, Ross Pickard

Tasks Completed:
1. An April-September (1985) field study covered 6 pairs and identified a low (approx 20-25%) of daylight hours spent feeding in winter months. Some parts of study lack statistical rigour and should not be seen as the final word. Published as "internal report"
2. Fieldwork in 1986 on 2 pairs, 1 of which produced young, the other losing their nest. Good comparison and a helpful initial appraisal of breeding time demands and behaviour. Paper published
3. Fieldwork restricted to February -May (1990) as pilot study only, cut short by subject animals dying (predation). Identified extensive nocturnal foraging.

Tasks to do:
1. Write up results of behaviour (technical details of methodology already written and submitted)

Planned Future Activity:
To conduct nocturnal behaviour study over a full 12 month period (hopefully 93/94 year)

<u>9. Habitat Characteristics</u>

Objective:
1. To determine the biological and physical characteristics common to rivers in which blue ducks presently occur
2. To relate these characteristic to present blue duck density
3. To compare these characteristics with those of rivers or sections of rivers in which blue ducks do not occur

Personnel: Kevin Collier, Mike Wakelin, Sally Moralee

Tasks completed: All fieldwork completed summer 1989/90
Data analysis all but finished
Feeding rate data collected at same time (by SM) written up in contract report form.

Tasks to do:
Complete write-up

Future activity: ???

10. Response to Playing of Male Calls

Objective: 1. To evaluate the use of playing male calls as a survey technique.

Personnel: Nicky McDonald, Clare Veltman

Tasks completed:

1. Fieldwork on Manganuiateao and Styx Rivers completed.

2. Results written up as a student project at Massey University.

Tasks to do: nil

Planned Future Activity:
nil

11. Blue Duck Mating Systems

Objective: To establish how Blue Duck territoriality evolved using data on territoriality, mating relationships, breeding performance, metabolic rate and food availability.

Personnel: Clare Veltman (using data supplied by Kevin Collier, Murray Williams, Sue Triggs, Brian Lisa Newton, Ian Henderson and Marie Haskell)

Task Completed:

1. Presentation of symposium paper at IOC
2. Publication of paper in Proceedings of the International Ornithological Congress.

Tasks to do: nil

Planned Future Activity:
nil

12. Macroinvertebrate Distribution

Objective: To determine the impact of rock size, position of rock, water velocity, water depth, location on rock and location in riffle as determinants of invertebrate species diversity, distribution and abundance

Personnel: Marie Haskell, Ian Henderson, Clare Veltman

Tasks Completed: Fieldwork completed in 1986, all data analysed and written up as a student project.

Tasks to do: write-up for formal publication?

Planned Future Activity: nil

Comments:
In general, projects have followed very closely, the topics outlined in the "Conservation Strategy". Additionally, with the particular assistance on Massey University staff and students, other topics of relevance have been addressed.

Topic 4 on the original list ("Identify factors that have caused the demise of Blue Ducks in catchments from which they have recently disappeared") has not been addressed directly. Instead, the characteristics of rivers presently occupied by Blue Ducks has been assessed (Project 9 above) complemented by the various dietary and time budget studies which serve to define the relationship between bird and its habitat.

Topic 7 on the original list ("Determine ways of increasing the productivity of some accessible Blue Duck populations") has not been attempted yet. Approaching this topic in advance of an understanding of Blue Duck biology, population dynamics and feeding relationships was considered inappropriate. Furthermore, the study calls for a high level of intervention in advance of trying more simple restorative approaches. The need for and the priority of this topic requires reassessment as part of the Recovery Plan revision.

It was the group's view that all studies had satisfactorily met their stated research objectives or were proceeding along appropriate lines of inquiry.

Where to now (if anywhere)?

The single long-term population study, the population modelling study and the monitoring projects have the potential to identify the important key question "what are the key factors influencing population processes in the various Blue Duck populations?" The modelling study suggests that female mortality within a population may be the single most important factor; the Manganuiateao study provides evidence that immigration/emmigration is virtually nonexistent. Does this suggest that the decline in populations is mortality controlled, or are at least some of those declines the result of no immigration? One test is to see if, by adding birds (artificial immigration), any existing decline in a population can be halted - essentially a case for adding birds to some existing remnant populations.

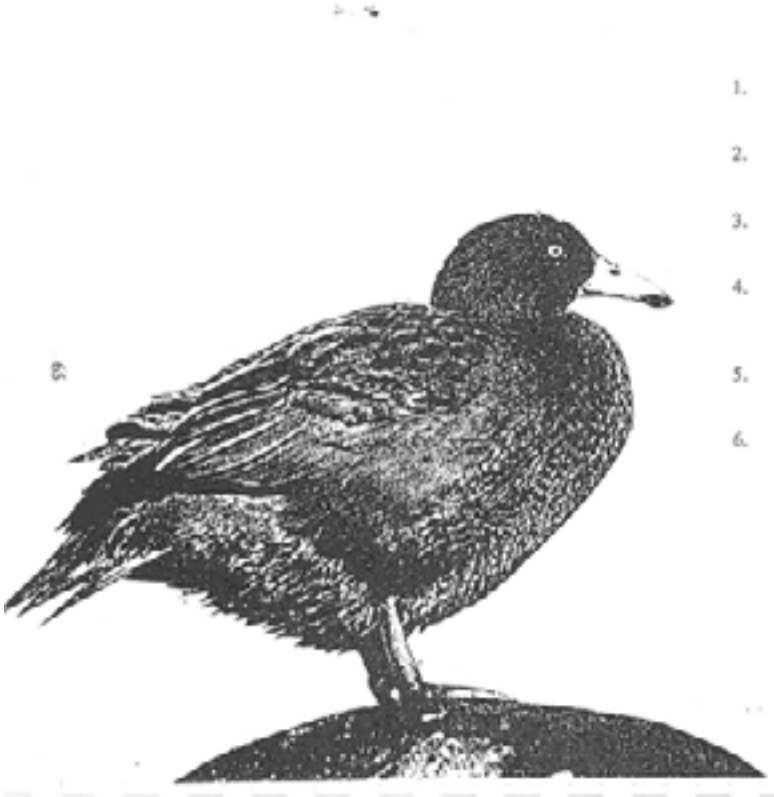
The questions for new information to assist the conservation efforts were considered to be:

1. Are declines in populations principally influenced by rate of mortality or rates of dispersal?
2. Are declines reduceable or reversible by artificially adding birds?
3. How are places for colonisation to be selected?
4. How to measure the present or potential capability of a waterway as Blue Duck habitat?

To combine these questions into a practical approach, the following schema was suggested

Monitor populations –add birds –question 2.
Studies of natural dispersal and immigration –question 1
Translocations A. –work out Q.3 –based on Q.4 –liberate
B. –liberate direct and monitor

These suggestions should form part of the discussions associated with the revision of the Recovery Plan.



Draft Research Papers

1. Seasonal changes in the invertebrate diet of the Blue Duck - Lisa Newton
2. The impact of introduced trout on the diet of the Blue Duck - Martin Williams
3. The Blue Duck mating system - are river specialists any different? - Clare Veltman and others
4. Trophic pathways and diet of Blue Duck on the Manganuiateao River - a carbon isotope study. Kevin Collier and Graeme Lyon
5. Food supplies and diet of Blue Duck on rivers in two regions of North Island - Kevin Collier
6. Factors affecting the distribution of Blue Duck on New Zealand rivers - Kevin Collier, Mike Wakelin and Sally Moralee

The Draft Research papers for Science & Research Internal Report 116 are not currently available in electronic form.

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knowledge.services@doc.govt.nz