

**Before the Independent Commissioners
Under the Resource Management Act 1991**

**And In the Matter of the Proposed Canterbury Land
and Water Regional Plan**

Statement of Evidence Provided By:

James Norman Jolly

On Behalf of Jolly Consulting Ltd.

STATEMENT OF EVIDENCE OF JAMES NORMAN JOLLY

1. QUALIFICATIONS AND EXPERIENCE

- 1.1 My full name is James Norman Jolly. I am the director and principal ecologist of Jolly Consulting Limited. I hold the qualifications of M.Sc (Hons equiv.) in Zoology from the University of Canterbury. I have been a professional ecologist for the past thirty five years and have specialised in avifauna for thirty years. I was a scientist in the Forest Research Institute from 1975 – 1979 working on possum control. From 1979 – 1989 I was a scientist in the NZ Wildlife Service/DoC working on kiwi. Since 1989 I have worked as a wildlife consultant, writer, and lecturer, as well as having a significant input into district plans and other resource management issues.
- 1.2 During the last ten years I have either organised or assisted with surveys of riverbed birds in the Ashburton River, both the Upper and Lower Rangitata, Waimakariri, the Wairau River as well as the Orari River. I have assessed the factors affecting birds on both the Rangitata, Waimakariri, Wairau and Ashburton Rivers. I presented evidence to both the Special Tribunal and the Environment Court hearings of the Rangitata Water Conservation Order as well as to the Marlborough District Council on the affect on birds of the Wairau Hydroelectric Power Scheme. I also submitted evidence on riverbed birds on behalf of Rangitata Diversion Race Management Ltd for their resource consent application to take water from the Rangitata and Ashburton Rivers, and for an application for gravel extraction on the Shotover River. Jolly Consulting Ltd also peer reviewed evidence for the Mokihinui hydro scheme on behalf of the Westland Regional Council and gave evidence on the extraction of water from the Rakaia River. I gave a paper to the Australasian Ornithological Congress on the birds of the Rangitata River and gave presentations, data, and advice to Environment Canterbury's Orari Catchment Management Strategy on birds of the Orari river.
- 1.3 I have taken part in each of the six surveys of birds of the lower Orari River organised by the Orari River Protection Society.
- 1.4 I confirm that I have read and am familiar with the "Code of Conduct for Expert Witnesses" in the Environment Court Practice Note (31 March 2005). The evidence I have presented relies on my expertise and the results of the bird

surveys provided by the Orari River Protection Society. I have also relied on hydrological research provided by Environment Canterbury (Ritson, 2013) and a report on stream biology, fauna habitat requirements, and ecological flow requirements of the Orari River by Golder Associates (Golder Associates, 2013).

1.5 I agree to comply with the Code.

2. OBJECTIVES AND SCOPE OF MY EVIDENCE

2.1 My evidence provides factual background to my personal submission (No. 115)

2.2 My objective is to add information on the avifauna of the Orari River that was unavailable in the development of the proposed Canterbury Land and Water Regional Plan, particularly with regard to the significance of the avifauna on the river and adverse effects on it.

2.3 I will report primarily on the populations of birds on the Orari River, their significance, and the biodiversity of the avifauna.

2.4 I will discuss the effects of the current flow regime on the avifauna, particularly in relation to the number of dry days.

2.5 I will comment on the options under consideration for revised flow regimes and indicate deficiencies in the information provided.

3. INTRODUCTION

3.1 The Orari River is a medium sized, foothills-sourced river that is braided from below its gorge and through most of its plains reach.

3.2 My evidence and the bird surveys relate to the plains reach of about 38 Km.

3.3 The river is extensively stop-banked and the banks planted in erosion control trees. This has probably reduced the width of riverbed fairway and the degree of braiding.

- 3.4 Shrub weed growth on the riverbed is extensive and further reduces the quality of habitat for nesting birds but the river is not damned and major floods can remove weed growth.
- 3.5 Nevertheless, the river provides a considerable area of clear substrate that is suitable for birds that nest on open, gravel bed rivers.
- 3.6 However, the quality of this habitat is severely reduced by low flows in mid and late summer. In most years the plains reach of the river runs dry in its mid-section. Larned et al (2011) found that in extremely dry years the river can be dry all the way to the mouth from a point downstream of the Gorge (approximately 27 km¹) but is dry for less than 10 km. and for only brief periods in wet years.
- 3.7 The riverbed birds of the Orari were first surveyed by the NZ Wildlife Service in 1985 and 1987. Members of the Ornithological Society of New Zealand surveyed the river in 1994. Recently, the Orari River Protection Society surveyed the river in 2006, 2008, 2009, 2010, 2011, and 2012.

4. METHODS

4.1 Bird surveys

River birds were counted in a formal walk-through survey, a standard method on braided rivers (O'Donnell and Moore, 1983; Maloney et al, 1997). The counts were made from the foot of the Gorge to the river mouth. Two or three observers were assigned to each of 7 sections. The North (or Old) lagoon was surveyed in some years. The counts were made in November at the height of the nesting season when the maximum number of birds were present on the river.

The survey technique is better suited to estimates of relative abundance rather than absolute numbers because inconspicuous birds, such as the small waders, tend to be under-estimated in the counts and others, such as the terns, tend to be over-estimated because of their habit of flying up and down the river while feeding. Steps are taken within the standardised technique to help reduce these

¹ A factor of 0.5 has been applied to the distance figures of Larned et al (2011) to adjust for an error in scaling.

biases. The assumption is that the biases are similar on each count and therefore valid comparisons can be made between counts and with counts on other rivers

4.2 Ranking System

The New Zealand Threat Classification System (Taylor et al, 2008; Miskelly et al, 2008) is used to assess the conservation status and significance of the species on the river. The system has limitations in that essential data, such as the total population of a species, is often deficient.

The system ranks species in the Threatened category from the endangered (“Nationally Critical” with a small total population less than 250 adults or a very high rate of decline greater than 70% and “Nationally Endangered” with a population up to 5000 or a decline up to 70% in three generations or 10 years) to “Nationally Vulnerable” with larger populations of up to 200,000 and declines of less than 70%. Lower ranked species not considered threatened may be in the “At Risk” category either in declining, recovering, relict, or naturally uncommon sub-categories

4.3 Measure of biodiversity

In assessing the significance of the Orari River for riverbed birds it was necessary to measure the ecological diversity of the bird community. The protocols of O’Donnell (2000) were followed in this regard, using the eight guilds of wetland bird species whose presence provides a measure of species richness and the representativeness of a braided river.

- open water divers (shags),
- deep water waders (herons, stilts and oystercatchers),
- shallow water waders (dotterels),
- dabbling waterfowl (ducks and geese),
- torrent specialists (blue duck),
- aerial hunting gulls and terns,
- swamp specialists,

- riparian wetland specialists.

5. RESULTS OF BIRD SURVEYS

5.1 Description of key species present

Banded dotterel (Tuturiwhatu) (*Charadrius bicinctus*): a small wader that breeds only in New Zealand, on sandy beaches and shell banks as well as riverbeds. In the South Island lowlands it breeds from August to December and most birds migrate north in autumn and winter with many reaching Australia. It feeds on invertebrates at the edge of water and in shallow side channels as well as on nearby farmland. Population was reported to be c. 50,000 (Heather and Robertson, 2000).

Black-fronted tern (Tarapiroe) (*Chlidonias albostratus*):

Breeds solely on the braided riverbeds of the eastern South Island from October to December. Mainly dependent on the main channels of the river for its food of insects and small fish, but it also hawks over farmland and forest. Most birds migrate to the coast in autumn and appear to drift northwards feeding at sea. Some birds remain on the rivers in winter.

Estimation of its total population is difficult as the sites of breeding colonies appear unpredictable year to year, and the colonies are inconspicuous from aerial survey. Indications are that the species is in serious decline, probably 8000-10,000 birds remaining.

Black-billed gull (*Larus bulleri*):

An endemic species that breeds mainly on the riverbeds and lake margins of the South Island, but appears to be extending its breeding range into the North Island, particularly along the coast (Heather and Robertson, 2000). It breeds from late September to December with most birds migrating to the coast in autumn and tending to move northwards. It feeds on invertebrates and small fish both by hawking from the air and from the water's edge, as well as on invertebrates opportunistically by following the plough, etc.

South Island pied oystercatcher (Torea) (*Haematopus finschi*): it breeds inland on riverbeds and farmland from July to December and migrates to the coast in autumn and

winter. It feeds on a variety of aquatic and terrestrial invertebrates in deeper water than the banded dotterel.

Pied stilt (Poaka) (*Himantopus himantopus leucocephalus*): a protected common native that occurs in the south western Pacific as well as Australasia. It is widespread in New Zealand breeding on riverbeds, swamps and lake margins from August to November, and migrating to the coast in autumn and winter. It feeds on small invertebrates by probing with its long bill into mud-flats or dipping into pools.

5.2 Bird survey results

Results for threatened and some At Risk species are given in Table 1. The full survey results including all species and counts split into the 7 survey sections are given in the Appendix.

Between 2006 and 2011 26 riverbed and riparian species were recorded with an average count of 634 birds per survey. In 2012 this count rose to 2650 birds. All six of the 8 guilds whose habitat is present on the River were represented by more than one species. In 1985 419 birds were counted and 286 in 1994 but 3211 were counted in 1987.

The two nationally endangered species that nest on the river, black-billed gull (*Larus bulleri*) and black-fronted tern (*Chlidonias albostratus*) were found in large numbers in some years (1623 and 785 respectively in 2012) but as few as 4 and 3 respectively in other years. This high variability in their counts precludes any analysis of trend over the years.

The nationally vulnerable banded dotterel (*Charadrius bicinctus*) was generally in much lower numbers from 2006 to 2012 (Mean = 10.7) than in the three earlier years (1985, 1987, and 1994) (Mean = 33.7).

The two At Risk species, South Island pied oystercatcher (*Haematopus finschi*) and pied stilt (*Himantopus himantopus leucocephalus*) appear to have maintained their numbers on the Orari River throughout the period of surveys.

TABLE 1. NUMBERS OF THREATENED AND AT RISK BIRD SPECIES ON THE ORARI RIVER

	1985	1987	1994	2006	2008	2009	2010	2011	2012
South Island pied oystercatcher	21	43	11	19	22	36	19	34	12
Banded dotterel	21	59	21	5	3	18	21	6	11
Pied stilt	27	102	12	71	78	139	63	34	24
Black-billed gull	78	2401	40	77	89	176	4	115	1623
Black-fronted tern	38	162	3	158	73	58	64	71	775

It is significant that the very high counts of black-billed gulls and black-fronted terns in both 2012 and 1987 followed major floods earlier in the year in 2012 (413 m³/s in August 2012) and in March 1986. In 2012 water flow continued through the usually dry reach much later into summer. The combination of water flow and the fairway cleared of shrub weeds by the flood together with a refreshing of the substrate and likely increase in invertebrate and fish foods is likely to have produced conditions conducive to nesting. In addition there were no floods during the nesting season in 2012.

Considering the sections with nesting colonies of black-fronted terns and black-billed gulls recorded between 2006 and 2012, the majority (12 of a total of 17 colonies) were in the reach between Burdons Road and State Highway 1.

The Orari River is an important river for riverbed birds in terms of the total number of birds present, the diversity of species present, their representativeness and ecological diversity, and the presence of significant

populations of two nationally endangered species, the black-fronted tern and black-billed gull.

6. THREATS TO THE HABITAT

6.1 Dry Reach

It is of concern that abstraction has increased the number of dry days (Ritson 2013) in the 14 Km. reach (Burdons Road to State Highway 1) that has most of the nesting colonies of black-fronted terns and black-billed gulls. The LWRP regime does not reduce this to natural level in the mid-section of the plains reach (Golders 2013 section 7.4.3). Larned et al (2011) have shown that the length and frequency of the dry reach is dependent on the inflow of water from the Upper River but the effect of water takes on the degree of intermittency has not been assessed and is likely to be significant (Golders, 2013 section 6.2).

Birds would be likely to abandon nests once the river dries even though some food is available off-river. There is one observation of abandonment of a nesting colony of 20 black-fronted terns following drying of the river (Johnson, Orari River protection Group, pers. comm.). As well as the loss of fish and invertebrate foods, there is likely to be an increased risk of predation on a dry riverbed. Although most mammalian predators would have access to nests on the Orari River where there are fewer braids and lower flow than the major braided rivers, access would be even easier across a dry bed.

6.2 Floods and flushing flows

The requirement for floods and flushing flows indicated by Golders (2013 section 6.1) is particularly important for birds. Floods can clear shrub weeds from the fairway leaving more open bare substrate that is less favoured by mammalian predators.

Flushing flows (freshes) help to improve the habitat for the birds' invertebrate and small fish foods by removing fine sediment and by clearing periphon and macrophytes.

A dam that could effect the size of floods or the frequency of flushing flows would have a significant adverse effect on the birds. Similar adverse effects could result from water abstraction rates or a flow regime that reduces the size or frequency of flushing flows.

6.3 Environmental flow regime

The main concern for birds is the mid-section of the plains reach where the majority of nesting colonies occur and where there are the lowest flows and most frequent drying of the riverbed. I concur with Golders (2011 section 6.2) that a much higher minimum flow requirement is required than the current 200 li/s. However, in the absence of habitat simulations and habitat retention curves for birds based on data from the Orari River a precautionary approach is suggested. A higher minimum flow (1350 li/s) is more appropriate for the bird nesting and pre-nesting seasons than the options considered (up to 900 li/s). The pre-nesting season is important particularly for some of the threatened species present that have returned from migrations to Australia (banded dotterels), northern estuaries (South Island pied oystercatcher and some banded dotterels) or eastern coastlines of the North and South Islands (black-fronted terns). The birds need to build their energy reserves prior to the nesting season

The critical period for higher flows is from at least the beginning of August to the fledging of chicks of some species up to the end of January.

The ELFMOD assessment of flow intermittency (Larned et al, 2011), or any other method of estimating the length of dry reach, have not been applied to the flow options that have been suggested. There is only a measure of the number of dry days under the various options all of which substantially exceed the number of dry days under “naturalised” conditions in the mid-reaches of the river (Golders, 2013 section 7.2).

In my opinion, there is insufficient information available to assess the adverse effects of the various flow options in the mid-reaches of the river. Flow gauging, number of dry days and extent of dry riverbed within this reach could monitor the effects of the chosen flow regime.

6.4 Proposed CLWRP environmental flow regime

The year round staged increase in minimum flows under the CLWRP (500 li/s and 1:1 flow sharing up to 1500 li/s within three years) and 900 li/s and 1;1 flow sharing up to 1500 li/s by year 2040) will reduce the adverse effects of water takes in the lower reaches of the river (Golders, 2013 section 7.4). However, both low flows and a high number of dry days would remain in the mid-section of the river (Golders, 2013, section 7.4.3) where most of the nesting colonies of

black-fronted terns and black-billed gulls occur. In addition, the long lead time to the higher minimum flows by 2040 is not compatible, in my opinion, with the presence of significant populations of these two endangered species.

There is an option for improving this situation by increasing minimum flows in the nesting season as indicated in section 6.3.

As suggested in section 6.3 this option could be monitored for its effect within the mid-reach of the river. Adjustments could be made once the effect of the flow regime has been determined.

7. CONCLUSIONS

The lower Orari River has important populations of two endangered species, black-fronted terns and black-billed gulls, a third threatened species, the banded dotterel, and a diversity of other species nesting on the riverbed. The river provides a substantial area of gravel bed habitat that is periodically cleared of shrub weeds by floods. The quality of the habitat is depleted by low flows and a high number of dry days over a length of up to 25 km. The low flows and drying of the river are exacerbated by water takes. There is no distinct downward trend in the numbers of the two endangered species discernible from the survey data available but the threatened banded dotterel is in decline on the river. The proposed CLWRP environmental flow regime ameliorates the low flow situation to an extent but a more than minor adverse effect on the habitat of the birds is likely to remain in the mid-section of the river where many birds nest. I recommend a precautionary approach to safeguard the conservation values of the river with water take restrictions applied at higher minimum flows than envisaged in the proposed CLWRP and with a shorter lead time. The effects of the chosen flow regime should be monitored for length of dry river, number of dry days and flow within the mid-reach of the river that is prone to drying.

8. REFERENCES

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9. APPENDIX

Orari Bird Survey December 4 2006						
	Gorge - Thatcher Rd	Thatchers Rd - Bennetts	Bennets Rd Hwy1	Hwy1 Badham	Badham Rd - Coast	TOTALS
						0
black cormorant		1			7	8
little black cormorant						0
little cormorant					6	6
spotted shag						0
white-faced heron		2	3		5	10
royal spoonbill						0
black swan						0
Canada goose		6				6
paradise shelduck	1	6	18	17	35	77
mallard		3	2	2	24	31
grey duck						0
grey teal					25	25
NZ shoveler						0
NZ scaup						0
unidentified duck sp.					12	12
pukeko			1			1
SI pied oystercatcher	1	8	5	2	3	19
Variable oystercatcher					1	1
spur-winged plover		2			4	6
banded dotterel		1	4			5
black-fronted dotterel						0
wrybill						0
pied stilt		3	26	9	33	71
black-backed gull	1	11	18	5	37	72
red-billed gull						0
black-billed gull		74			3	77
Caspian tern					2	2
black-fronted tern		112	12	4	30	158
white-fronted tern					29	29
white-winged black tern		1				1
welcome swallow						0
NZ kingfisher	1					1
harrier	4	3	3		1	11
Shining Cuckoo						0
Californian Quail	2	7				9
Total birds						638
Flow m ³ /s		19.5				

**Orari Bird
Survey
November
2008**

	En d of Gor ge to Bur ton Rd	Bur don Rd - SH7 8	SH7 8- Benn ets Rd	Benn etts Rd - Main Rd	Mai n Rd - Fact ory Rd	Factory Rd - Milford/Clan deboye Rd	Milford/Clan deboye Rd	Nort h Wetl and	TOT ALS
black cormorant	1	1					1	3	
little black cormorant								0	
little cormorant								0	
spotted shag								0	
white- faced heron		1	1		2	2		6	
royal spoonbill								0	
black swan								0	
Canada goose	9 + 8c	7				3	2	21	
paradise shelduck	6			4	6	5	2	23	
mallard	11	2		1	3	16	18	55	
grey duck							3	3	
grey teal NZ								0	
shoveler							4	2	
NZ scaup unidentifie d duck sp.							1	19	
pukeko SI pied								0	
oystercatc her			3	11	5	1	2	22	
Variable oystercatc her								0	
spur- winged plover	2		1	4	6	8 +c		21	
banded dotterel				3				3	
black- fronted dotterel							2	3	
wrybill								0	
pied stilt	4	6	11	6	12	27	12	78	
black- backed gull	7	8	4	9	23	7	2	7	
red-billed gull								0	
black- billed gull				1	1		87	89	
Caspian tern								0	
black- fronted tern	7	31	8			26	1	73	

white-fronted tern						49	49
white-winged black tern							0
welcome swallow NZ			1	2		8	11
kingfisher		1				2	3
harrier	4		2	3	2		11
Shining Cuckoo	1		2				3
Californian Quail		1		2	4	1	8
Total birds							611
Flow	3.8						

**Orari Bird Survey 1
November 2010**

	Nth water race to Burdon Road	Burdon Road-SH72	SH72-Bennetts Road	Bennetts Road-Main Road	Main Road-Badham Road	Badham Road-Milford/Clandeboye Road	Milford/Clandeboye Road-Sea	North lagoon	Total
black cormorant	1	2			1	1	1		6
little black cormorant								2	2
little cormorant									
spotted shag									
white-faced heron		1					3		4
royal spoonbill									
black swan								2	6
Canada goose	22	17		2	2	2		11	56
paradise shelduck	20	2	6	25	31	20	5	2	111
mallard	6	1		4	7	8	10	1	42
grey duck									
grey teal									
NZ shoveler								3	3
NZ scaup									
unidentified duck sp.									
pukeko									
SI pied oystercatcher		10		4	5				19
Variable oystercatcher									
spur-winged plover		2	2	2			2		8
banded dotterel		9	9	2			1		21
black-fronted dotterel									
wrybill									
pied stilt	4	11	2	9	26	11			63
black-backed gull	4	27	3	2	4				41
red-billed gull		1							1
black-billed gull		4							4
Caspian tern									
black-fronted tern	7	10	15	20	2	1	9		64
white-fronted tern							2		2
white-winged black tern									
welcome swallow		4	1						5
NZ kingfisher	1				1				2
harrier	4	1		3		1	6		15
Total birds									47

Flow 6 m3/s

Orari bird survey 22 October 1994

	End of Gorge to SH72 bridge	SH72 bridge to Burnham Road	Burnham Road to Orari Lagoon	Total
black cormorant	1	2	3	6
little black cormorant				0
little cormorant				0
spotted shag				
white-faced heron			2	2
royal spoonbill				
black swan				
Canada goose		2	2	4
paradise shelduck	2	2	2	6
mallard	18	20	53	91
grey duck		2		2
grey teal				
NZ shoveler				
NZ scaup				
unidentified duck sp.				
pukeko				
SI pied oystercatcher	4	2	5	11
Variable oystercatcher				
spur-winged plover	15	7	5	27
banded dotterel	1	16	4	21
black-fronted dotterel		1	8	9
wrybill				
pied stilt		10	2	12
black-backed gull	4	7	9	20
red-billed gull				
black-billed gull			40	40
Caspian tern			1	1
black-fronted tern	2		1	3
white-fronted tern			1	1
white-winged black tern				
welcome swallow		12	14	26
NZ kingfisher		2	2	4
harrier				
Shining Cuckoo				
Total birds				286
riverbed clear of vegetation following May 1994 flood				

Orari bird survey 1987

**Total
(End of
Gorge to
Orari
Lagoon)**

black cormorant	5
little black cormorant	
little cormorant	1
spotted shag	
white-faced heron	7
royal spoonbill	
black swan	
Canada goose	3
paradise shelduck	22
mallard	106
grey duck	
grey teal	
NZ shoveler	2
NZ scaup	
unidentified duck sp.	
pukeko	2
SI pied oystercatcher	43
Variable oystercatcher	
spur-winged plover	41
banded dotterel	59
black-fronted dotterel	23
wrybill	
pied stilt	102
black-backed gull	179
red-billed gull	
black-billed gull	2401
Caspian tern	
black-fronted tern	162
white-fronted tern	
white-winged black tern	
welcome swallow	47
NZ kingfisher	6
harrier	
Shining Cuckoo	

3211

shrub weeds probably
reduced on riverbed
following March 1986
major flood

Orari bird survey 1985

**Total
(End of
Gorge to
Orari
Lagoon)**

black cormorant	3
little black cormorant	
little cormorant	
spotted shag	
white-faced heron	7
royal spoonbill	
black swan	
Canada goose	
paradise shelduck	
mallard	56
grey duck	
grey teal	
NZ shoveler	
NZ scaup	
unidentified duck sp.	3
pukeko	1
SI pied oystercatcher	21
Variable oystercatcher	
spur-winged plover	44
banded dotterel	21
black-fronted dotterel	15
wrybill	
pied stilt	27
black-backed gull	101
red-billed gull	
black-billed gull	78
Caspian tern	2
black-fronted tern	38
white-fronted tern	2
white-winged black tern	
welcome swallow	
NZ kingfisher	
harrier	
Shining Cuckoo	

419