COORONG WADER CENSUS
FEBRUARY 2012

Australasian Wader Studies Group

AWSG
Australasian Wader Studies Group

Government of South Australia
Department of Environment,
Water and Natural Resources

birdlife
AUSTRALIA

Curlew and Sharp-tailed Sandpiper in flight, , Opposite Beacon 19, Coorong National Park.
Photo Paul Wainwright

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SUMMARY.

The Coorong and adjacent lakes are listed as Wetlands of International Importance under the *Ramsar Convention on Wetlands* because of the diversity of aquatic habitats found across the site, and the many wetland dependent species they support.

Shorebirds or waders are an important component of the ecological character of the Coorong. Some are residential and require habitat for breeding; others are migratory and seek only to rest and re-fuel for their next migratory journey.

In the 1980's the Australasian Wader Studies Group (AWSG), a special interest group of Birdlife Australia, recorded abundances close to and exceeding 250, 000 shorebirds at the site. Sadly the number of migratory shorebirds has shown dramatic declines over the last 30 years. In February 2012, ignoring the ephemeral species of Banded Stilt and Red-necked Avocet, the number of waders counted was 47,082. This is the highest count recorded since 2006, and whilst there is cause here for some optimism, the count remains well short of historical abundances for most species.

The Red-necked Stint is nominally the most abundant wader observed at the Coorong. The species has shown something of a recovery in 2012 (21029 individuals) to record the highest abundance observed since 2006.

Sharp-tailed Sandpiper were present at the Coorong in significantly larger numbers in 2012 (14222) compared with 2011 (342). The abundance of this species at the site shows an erratic trend through time which appears to be influenced by the availability of alternative freshwater habitats in the interior.

The distribution of birds along the length of the Coorong in 2012 confirmed a preference for two distinct areas of the site. The first was the Hells Gate area in the south of the North Lagoon. The second was the estuarine area between Pelican Point and the Murray Mouth. In contrast, the southern lagoon supported 13% of the total shorebird abundance.

There is considerable evidence to demonstrate that the Coorong is an important refuge for a range of waterbirds in times of drought, however it is difficult to measure the seasonal value of a site for migratory species because many other factors (such as breeding success in the northern hemisphere) play a critical role in determining the abundance of over-wintering birds in southern Australia.

As a biological indicator, the abundances of waders measured at the Coorong in 2012 suggest that there has been a reasonable improvement in habitat quality in the northern lagoon, perhaps as far south as Hacks Point. It is essential that water quantity and quality are closely monitored and effectively delivered throughout the Coorong because both are pivotal to the ecological recovery of the wetland and the provision of food resources to higher order consumers such as waders.

INTRODUCTION.

The Coorong is a body of marine to hypermarine water confined by the coastal dunes of the Younghusband and Sir Richard Peninsulas. It is comprised of two linear lagoons and a number of ephemeral lakes which span a distance of 140 kilometres. Historically, the Coorong waters ranged from seasonally fresh water near the barrages during periods of high flow, to brackish in the Murray Mouth area, to hypermarine in the southern lagoon. These days, the water regime is dictated principally by tidal movements of marine water through the Murray Mouth supplemented by freshwater in-flows from the River Murray. Presently, there is sufficient River Murray flow to allow the barrages to be open, and thus deliver freshwater into the Coorong. During the millennium drought (2002-2010) the inability to deliver freshwater inflows meant that the Coorong acted as a dysfunctional estuary much of the time.

During summer water levels in the southern lagoon are low. This exposes mud flats and shallow sandbars which are habitat for a number of species of wader.

The Coorong (including Lakes Alexandrina and Albert) was listed as a Wetland of International Importance under the *Ramsar Convention on Wetlands* in 1985. In 2006 the Department of Environment, Water and Natural Resources (SA) published a document describing the Ecological Character of the Coorong, Lakes Alexandrina and Albert Wetland of International Importance (Phillips and Muller 2006) aimed at establishing a benchmark for planning and management. This document clearly shows that the ecological character of this site has been altered significantly particularly over the last 20-30 years. The underlying cause of this change 'would appear to have been accelerated and exacerbated by water extractions that are too high for the system to be able to sustain itself through the recent drought conditions, as it would have under natural conditions'. One of the objectives of the AWSG wader survey is to contribute robust data that can be used in the ongoing assessment of this important area.

The waders in the Coorong have previously been counted in 1981, 1982, 1987 and 2000 to 2008 (Jaensch & Barter 1988, Wilson 2000 and 2001[a], Gosbell *et al* 2002, 2003[b], Gosbell & Christie 2004[c], 2005[d] , 2006[e] and 2007[f]). In the 1980s the Coorong was the third most important wader site in Australia, after Eighty Mile Beach and Roebuck Bay in N.W. Australia (Watkins,1993). This is no longer the case. The counts showed a reduction in the total number of waders from 141,614 in 1981 and 234,543 in 1982 to 130,483 in 1987, 68,599 in 2000 to a low of 48,425 in 2001. The magnitude of these declines are a cause for concern, and for that reason the Australasian Wader Studies Group (AWSG) has been contracted by DEH(SA) to co-ordinate counts at the Coorong since 2001. This report gives the results of the 2008 count, compares the results with previous counts for each species and documents the wader distribution within the Coorong.

THE COUNT PERIOD AND COVERAGE.

The Coorong was counted by the AWSG over a two day period, 4 February and 25 Feb 2012. Under normal circumstances the count would occur on consecutive days, but strong winds on 5 February forced organisers to post pone the survey. The count Sections (Figure 2) were the same as used in 1987, Jaensch & Barter 1988, Wilson 2000, Wilson 2001[a] and Gosbell, Christie and Wainwright 2002 to 2010. In 2012 all sections were counted comprehensively. Overall, coverage was similar to that achieved in 2003 to 2010 due to the availability of excellent resources (counters and boats) and favorable weather conditions.

Commencing on the morning of 4 February 2012 five land based teams and two teams in two boats counted the Southern Section of the Coorong. Teams were deployed as follows:

DAY 1 – South Lagoon		
Team 1	Sections 10 (part),12	NE side, 'Braeside' to south.
Team 2	Sections 6,8 (part)	NE and SW side, Tea Tree Crossing to Policeman's Point.
Team 3	Sections 14, 15	NE side, 'Braeside' to Magrath Flat including Hacks Point and S side of Parnka Point
Team 4	Sections 16,17	Magrath Flat, N side of Parnka Point including Rabbit and Snake Islands to the Needles.
Team 5 (DEH Boat)	Sections 9,11	Younghusband Peninsula side, Salt Creek to Jack Point
Team 6 (Fisher Boat)	Sections 13,15(Pt)	Younghusband Peninsula side, Woods Well to Parnka Point.
Team 7	Sections 10 (pt) and 8(pt)	NE side from Jack Point south

On the morning of 25 February 2012 two land based and four teams utilising five boats counted the Northern Section of the Coorong. These teams were deployed as follows:

DAY 2 – North Lagoon		
Team 1	Sections 18,20	NE side, The Needles to Long Point
Team 2	Sections 22 and 24	NE side, Long Point to Pelican Point
Team 3 (Fisher Boat)	Sections 19,21,23	Younghusband Penninsula side, Long Point to the Needles.
Team 4 (DEH Boat)	Sections 23,25	Younghusband Penninsula side, Pelican Point to Long Point
Team 5, 6 (DEH + Fisher Boats)	Sections 26,27,28,29	Pelican Point to Murray Mouth and up Mundoo channel to barrage.
Team 7 (Boat)	Sections 30,31	Goolwa (19th Beacon) to Murray Mouth.

Nineteen (19) counters and two boats (1 DEH and 1 fisher) were involved on Day 1, while 17 counters and five boats (2 DEH and 3 fisher) were involved with Day 2 of the count. Each team had at least one experienced counter with telescope and all counters had binoculars. In general, movements of birds within and between areas were noted in order to minimise the possibility for double counting.

CONDITIONS AT THE TIME OF THE COUNT.

The first day of the count, 4 February was mild and sunny (22^0 – 24^0 C) with light winds (5 -10knts) in the morning followed by much stronger southerly winds in the afternoon (20-30knts). Day two, 25 February, was overcast with some short sunny spells. Winds were amoderate 15-20knts. Temperature is likely to have been within the range of 18-22^0 C with a similar wind pattern, again strengthening throughout the afternoon. The low water levels created difficulties for boats to move close inshore particularly in the southern lagoon. It is again a credit to the boatmen and team members that such an extensive survey was carried out under these adverse conditions.

RESULTS.

Total counts for 1981, 1982, 1987, 2000 to 2011 in the Coorong are shown in Tables 1 and 2, together with population estimates from Bamford and Watkins (in prep).

TABLE 1. AWSG Wader Count - Coorong	Watkins 1993	1981	1982	1987	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010	2011	2012	IMP
Black-tailed Godwit	150	133	185	105	210	115	0	21	98		5	99	2	11	0		
Bar-tailed Godwit	25	15	0	3	8	0	0	20	5	58	116	21	150	58	37	11	
Eastern Curlew	24	17	24	8	15	16	2	2	13	15	23	29	10	17	2	6	
Marsh Sandpiper	30	0	2	30	0	0	68	1	2	1	9	3	4	0	1	0	
Greenshank	720	600	717	596	557	305	323	312	355	616	520	416	436	226	167	252	N
Terek Sandpiper		0	0	0	0	0	1		0				1	0	0	0	
Common Sandpiper	5	13	1	1	0	1		2	0		8	2	0	0	0	0	
Ruddy Turnstone		0	1	0	1	0			0		3		0	0	0	0	
Great Knot	5	3	4	0	1	0					1		1	0	0	0	
Red Knot	100	57	67	0	80	0	30		12		1		0	0	0	0	
Sanderling	930	113	929	308	512	53	10	120	165	235	173	16	131	147	99	20	
Sharp-tailed Sandpiper	55700	24871	55739	22898	10697	5718	17067	6992	6535	10447	33740	3848	6222	11542	342	14222	I
Pectoral Sandpiper		0	1	0	0	0	0						0	0	0	0	
Red-necked Stint	63800	54743	63794	54710	30145	18368	44544	46067	28772	29265	32114	20298	12288	10894	12191	21029	I
Curlew Sandpiper	40000	39882	22614	22512	13124	4309	9177	13430	3304	7052	2388	2171	3988	1017	8	806	N
Pied Oystercatcher	630	108	297	84	92	9	208	149	255	58	258	200	77	134	152	14	I
Sooty Oystercatcher	18	0	0	3	3	3	24			12	19	5	4	2	0	1	
Black-winged Stilt	600	238	991	291	340	183	712	282	238	180	399	132	700	148	27	345	N
Banded Stilt	77000	13782	77149	18692	11299	15611	24552	8602	12055	29195	92522	9106	261229	140411	3817	1731	N
Red-necked Avocet	5400	1449	5401	3589	93	260	3856	4122	5687	3331	2411	165	195	575	204	1720	I
Pacific Golden Plover	290	289	230	144	84	103	43	43	30	91	256	50	34	89	18	10	
Grey Plover		1	0	0	12	0	2	3	1	11	5		1	11	1	0	
Red-capped Plover	5700	4677	5152	2533	1089	1288	968	2897	817	803	1231	737	1065	812	338	1174	I
Black-fronted Plover	15	0	2	0	0	0		1					0	0	0	0	
Hooded Plover		0	0	12	3	4	12	7	8	15	23	6	21	20	13	5	
Red-kneed Dotterel	10	14	17	0	0	0	1	3	18	9	4		2	9	0	0	
Banded Lapwing	150	0	248	130	0	0						18	0	0	0	108	
Masked Lapwing	800	591	978	765	233	355	337	423	284	328	540	512	348	467	333	345	
Unidentified medium												20	20	73	0	4744	
Unidentified small				3064		1724	1912	539	103	55	1103	200	383	21	32	3990	
TOTAL	252252	141614	234543	130483	68599	48425	103851	84039	58757	81777	167872	38056	**287313**	**166684**	**17782**	50533	
Band Stilt+RN Avocet	82400	15231	82550	22281	11392	15871	28408	12724	17742	32526	94933	9271	**261424**	**140986**	**4021**	3451	
TOTAL less BS+RNA	169852	126383	151993	108202	57207	32554	75443	71315	41015	49251	72939	28785	**25889**	**25698**	**13761**	47082	

Wader abundance in the Coorong.

The total number of waders recorded in the Coorong was 50,533, this compares with 17,782 counted in 2011 (Table1). Table 2 shows aggregated figures for four distinct areas of the Coorong from the south to the north. An interesting result is the large number of waders using the Hells Gate section of the Coorong. Historically the 'Northern Channels' have supported the largest abundance of waders at the site. When compared with the peak recorded counts of 1982, migratory species have reduced in abundance approx 80%, however when the Banded Stilt is excluded, the 2012 count is highest observed since 2007.

TABLE 2 – wader abundance Coorong 2012

Wader Species	Sth Lagoon	Hells Gate	Nth Lagoon	Nth Channels	TOTAL
Black-tailed Godwit	0	0	0	0	**0**
Bar-tailed Godwit	0	0	0	0	**11**
Eastern Curlew	0	0		0	**6**
Common Greenshank	20	4	22	46	**252**
Sanderling		20		20	**20**
Red-Necked Stint	3670	8776	1271	13717	**21029**
Sharp-tailed Sandpiper	33	11666	308	12007	**14222**
Curlew Sandpiper	3	208	300	511	**806**
Pied Oystercatcher	5	0	4	9	**14**
Sooty Oystercatcher	1	0	0	1	**1**
Black-winged Stilt	197	0	1	198	**345**
Banded Stilt	948	466	119	1533	**1731**
Red-necked Avocet	819	30	580	1429	**1720**
Pacific Golden Plover	9	0	0	9	**10**
Grey Plover	0	0	0	0	**0**
Red-capped Plover	639	208	93	940	**1174**
Hooded Plover	5	0	0	5	**5**
Red-Kneed Dotterel	0	0	0	0	**0**
Masked Lapwing	116	27	82	225	**345**
Unidentified Medium	0	4500	210	4710	**4744**
Unidentified Small	0	2400	1325	3725	**3990**
Banded Lapwing	0	0	108	108	**108**
TOTAL	6465	28305	4423	11340	**50533**

Figure 1 compares the abundance of Banded Stilt and Red-necked Avocet, both resident waders, with the abundance of all other waders. It indicates that neither species were present in large numbers at the Coorong in February 2012.

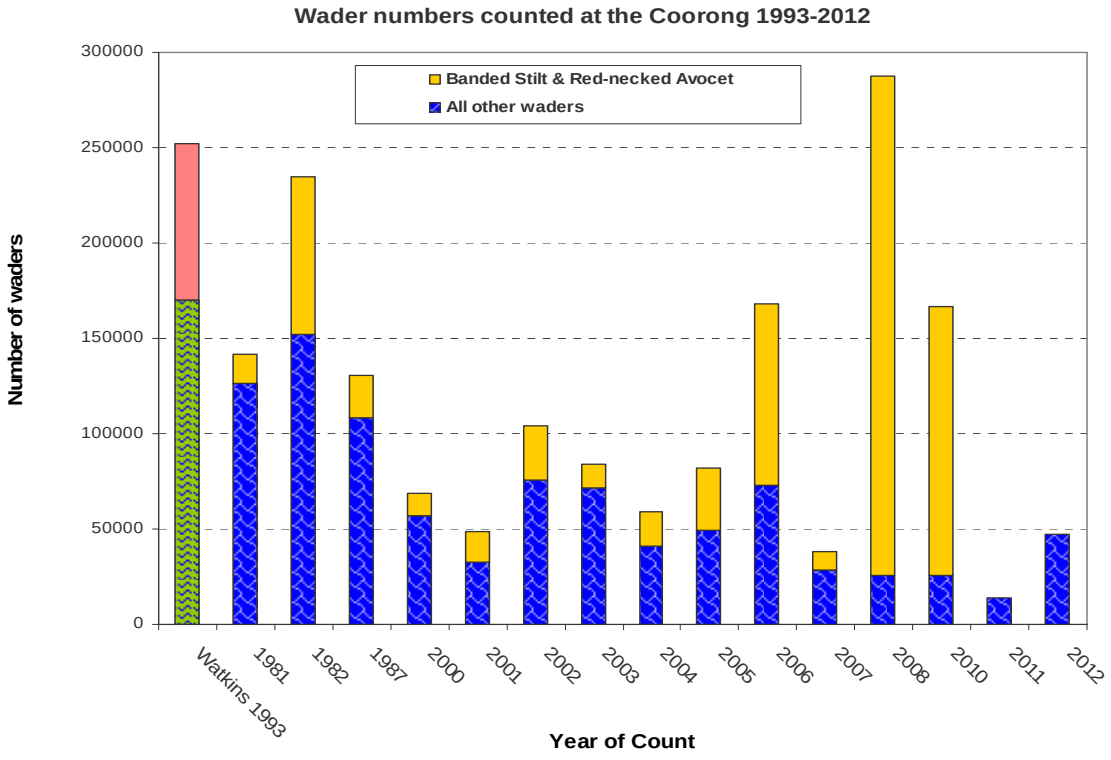

Figure 1 – Abundance of Banded Stilt and Red-necked Avocet compared with all other waders (aggregated).

The distribution of waders in the Coorong.

Figure 2 shows the distribution in the Coorong according to count section in 2012.

Although total abundance has shown significant variability over the years, the proportional distribution of all species combined only showed small changes up to 2001. During the millennium drought (2003-2010) there was a definite movement of waders to the Northern channels at a time when the southern section of the Coorong became hyper saline and the abundance of animal life in the mud flats was adversely affected. The provision of freshwater flows during 2011 and 2012 has increased the productive capacity of mudflats further south in the north lagoon (including the Hells Gate section). Waders subsequently capitalized on the larger area of food-rich mudflats, and shifted their distribution southwards. The carrying capacity of the site for waders has effectively increased since 2011 – though this will only be maintained through careful water delivery.

The distributions are described in more detail under each individual species below.

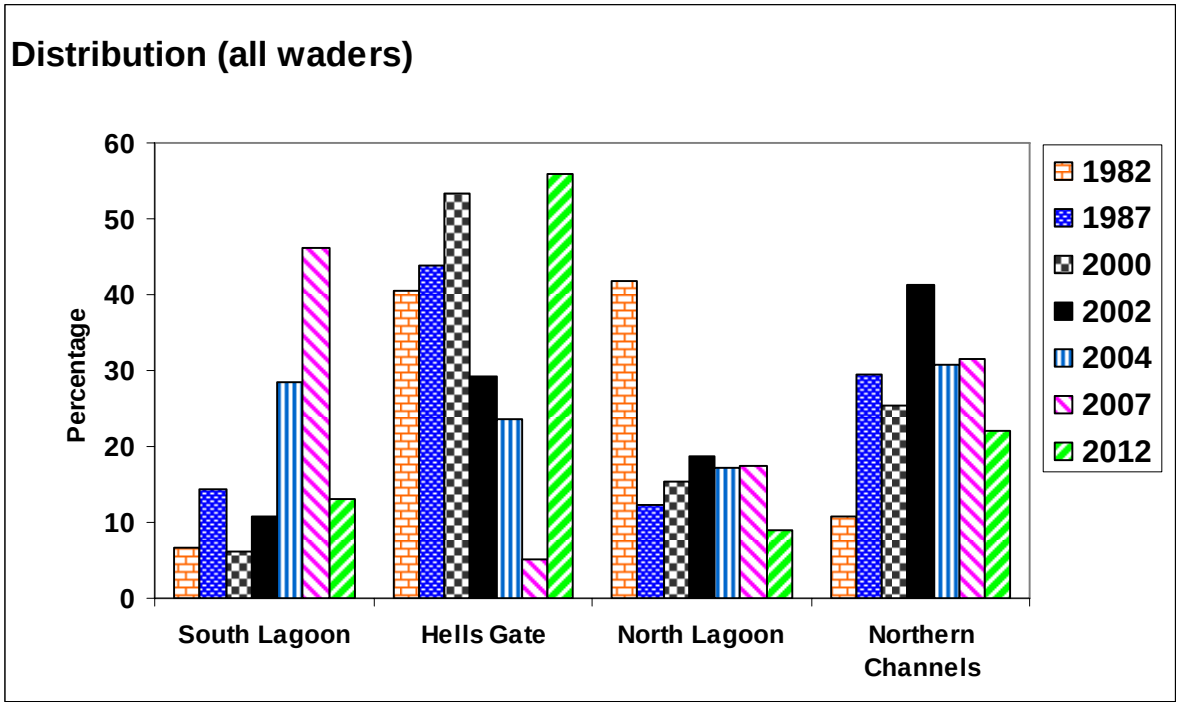

Figure 2: Distribution of all waders at the Coorong, February 2012

Population changes in individual species.

Common Greenshank.
Numbers have varied between a maximum of 717 in 1982 and a minimum of 277 in 2001. There were 252 counted in 2012 mainly roosting in the Northern Channels.

Sanderling.
These are normally found on the sandbanks in the vicinity of the Murray Mouth both on the ocean beach and on the lagoon side. In 2012, 20 birds were recorded on the lagoon side while none were seen on the Ocean Beach. This compares with the 131 birds observed during the 2011 count. Sanderling are known to roam along the South Australian beaches and flocks of 500-1000 are regularly observed at Danger Point in the Lower SE (Christie pers. comm). In February 2007 there was approximately 600 Sanderling at Green Point Jeff Campbell pers. com.

Sharp-tailed Sandpiper.
Sharp-tailed Sandpiper numbers at the Coorong vary significantly through time. Abundances have ranged from 340 to 55,000 in the early 1980's. This year the number counted was 14,222, significantly more than the 342 counted in 2011. Presence is influenced by the availability of other freshwater environs for feeding. In year's when the interior of the Australian continent is wet, numbers at the Coorong are generally low.
The distribution of Sharp-tailed Sandpiper in the Coorong was skewed strongly to the Northern Channels in the period 2003-2007 however more than 70% of the birds this year were counted in the Hells Gate section.

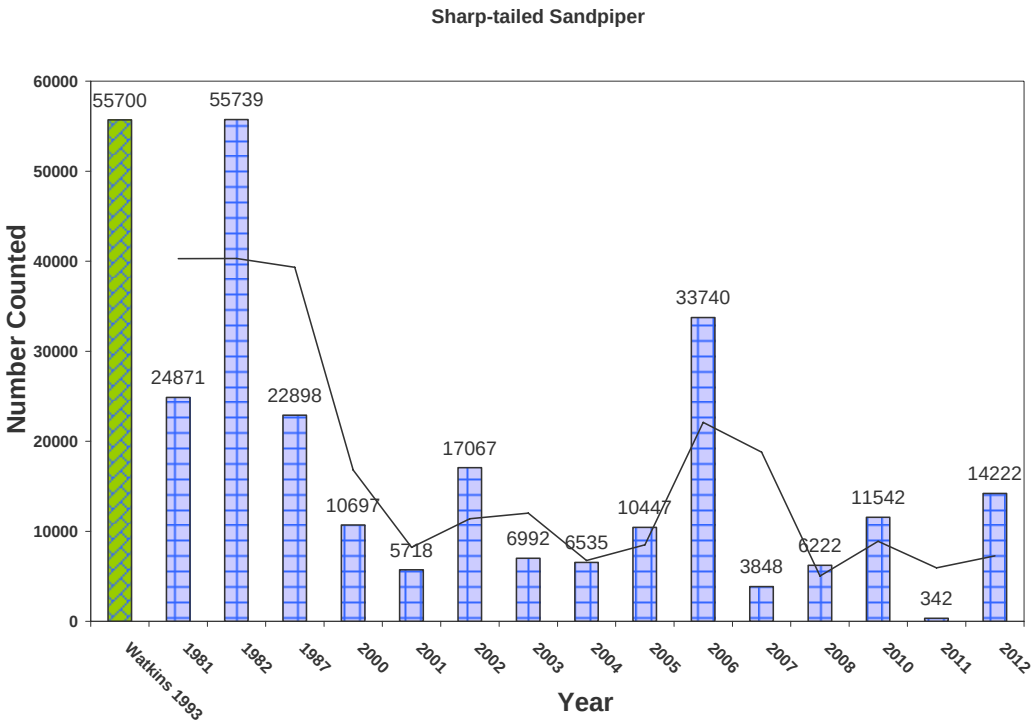

Figure 3: Abundance of Sharp-tailed Sandpiper at the Coorong 1981-2012

Red-necked Stint.

There were about 50,000-60,000 Red-necked Stint in the Coorong in the 1980's. Despite large decreases in abundance through time, this year 21,029 were recorded which is the highest figure since 2006., Figure 4 graphically shows the variation in numbers since the highs of the 1980's.

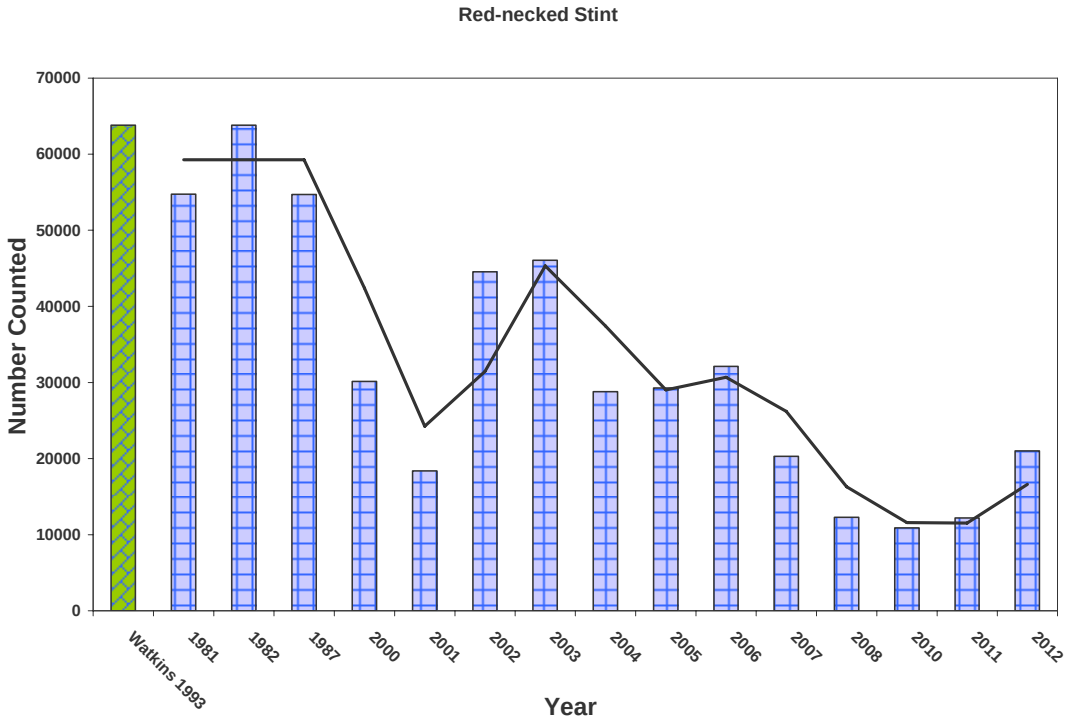

Figure 4: Abundance of Red-necked Stint at the Coorong, 1981- 2012

Curlew Sandpiper.

Curlew Sandpiper have shown a very widespread and large population decline in southern Australia since the 1980s. Gosbell and Clemens 2006 show that there has been a significantly declining trend in this species at a number of sites in Victoria and South Australia. These indicators are not reflected in the numbers observed in the Coorong to the same extent as for the other *Calidris* species. The large fall (up to 95% reduction) in this species in the Coorong is of particular significance and concern. While Gosbell and Clemens 2006 suggest this is due to lower survival rates, in part arising from influences at stopover sites, the impact of local factors in the non breeding areas need further research.

In the 1980's the Curlew Sandpiper population varied from 22,000 to 40,000, but over time this species has shown a sustained decline in abundance at the Coorong (and at many other sites in southern Australia). In 2012, 806 individuals were observed (Figure 5).

2012 data shows a redistribution of birds from the Northern Channels (where most of the population were observed in the period 2002-1007) to Hells Gate. 55% of the 2012 population were observed in the Northern Channels and 45% at Hells Gate. This species, unlike the Red-necked Stint has been mostly absent from the southern lagoon since 2005.

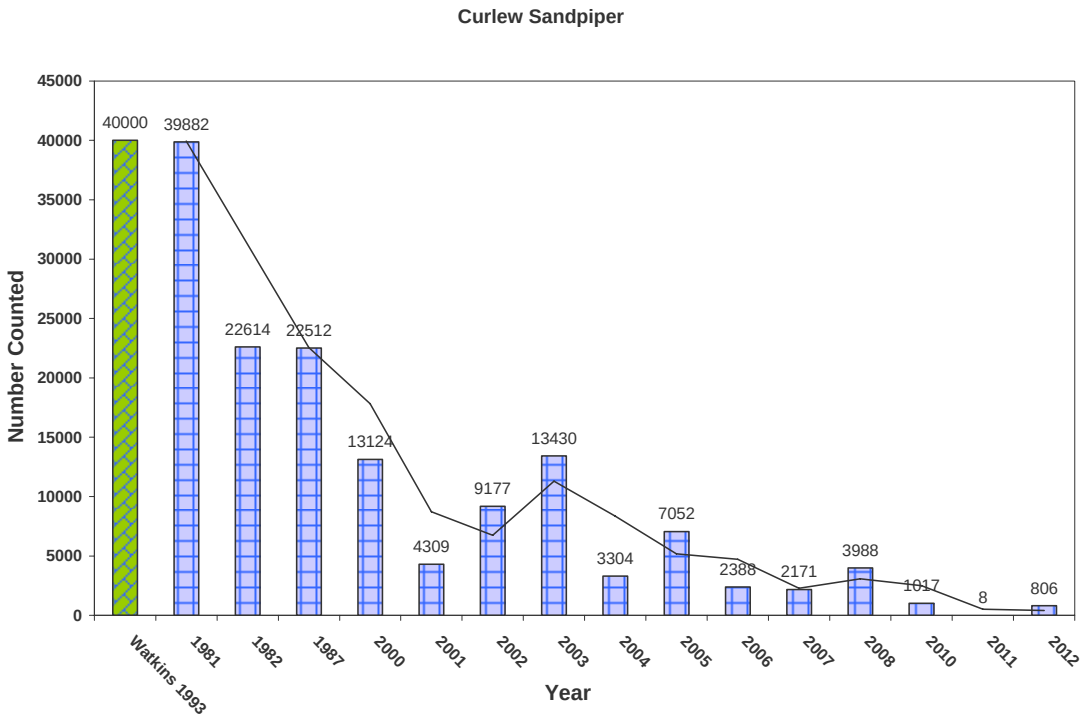

Figure 5: Abundance of Curlew Sandpiper at the Coorong, 1981-2012

Pied Oystercatcher.

14 Pied Oystercatcher were counted inside the Coorong lagoon in 2012. his figure is lower than the average (mean 145) but likely to be confounded by bird movements between the ocean beach at the Coorong.

Black-winged Stilt.
345 were recorded in 2012. The maximum number recorded is 891 in 1982 and minimum is 182 in 2001. The numbers have remained fairly stable within this general band.

Banded Stilt.
1731 Banded Stilt were observed at the Coorong in 2012 (Figure 6), only a fraction of the population that has been present in recent years. In 2007 a record high 261,229 Banded Stilt were counted. At the time, this species was single-handedly exploiting the hyper-saline conditions in the southern lagoon. In 2012 all Banded Stilt were found in the south lagoon or in the south of the Hells Gate section, reflecting the attractive food resources available in the marine to hyper-marine conditions. Approximately 95% of these individuals were considered to be juveniles. No breeding was observed.

At the time of the Coorong survey, a Banded Stilt breeding event was occurring at Lake Eyre South and many of the large salt lakes in central and NE South Australia contained water. This breeding event subsequently failed because of predation by Silver Gulls.

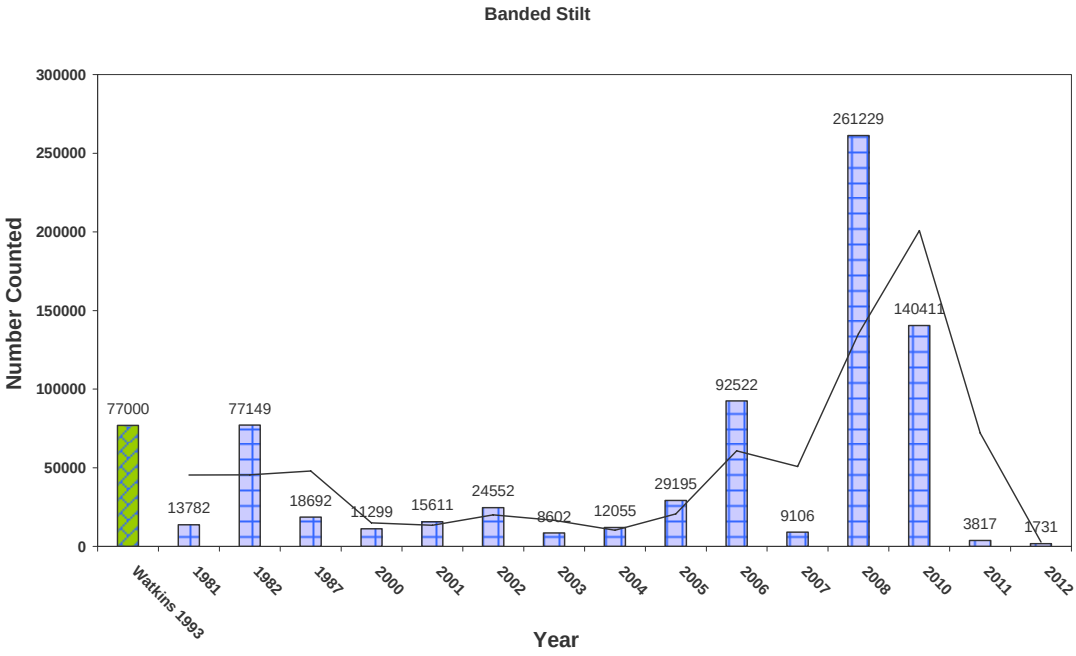

Figure 6: Abundance of Banded Stilt at the Coorong, 1981-2012

Red-necked Avocet.
The number of Red-necked Avocet, 1720 individuals, was the highest observed since 2006. There was no indication of breeding in 2012. Red-necked Avocet were distributed over all sectors of the Coorong but showed a preference for the southern lagoon.

Red-capped Plover.
Red-capped Plover numbers show reasonable stability at the Coorong over time. 1174 individuals were counted in 2012 (Figure 7). The figure recorded is considered to be extremely conservative due to the likelihood of missing birds roosting on out-cropping limestone.

This species has historically showed a preference for the areas south of Parnka Point where there are usually extensive areas of dry mud-salt being exposed. In 2012 60% of the population was observed on sand flats in the Hells Gate section. 30 % were observed in the south lagoon.

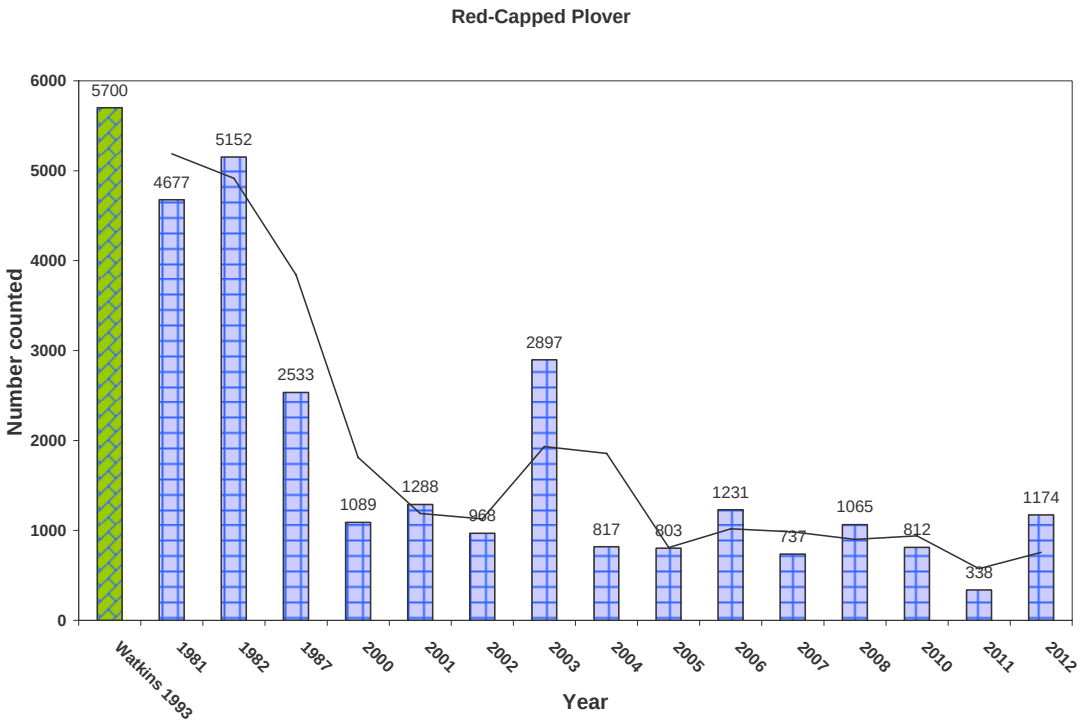

Figure 7: Abundance of Red-capped Plover at the Coorong, 1981-2012

Masked Lapwing

The number recorded in 2012 was 345. This is another species that shows reasonable stability in population size at the Coorong. The maximum number recorded was 863 in 1982 and minimum numbers were 233 in 2000. The numbers remain stable within this general band.

Hooded Plover

Five Hooded Plover were observed in the Coorong in 2012. The number is well short of the 15-20 individuals which have been observed each year for the past three years. A survey is usually carried out in November and this would provide a more accurate estimate of population trends for this species (Iain Stewart pers. comm.)

DISCUSSION.

Potential Influences on Wader Numbers

The Coorong is an important area for some 85 species of waterbirds (Carpenter 1995) including waders. Wader numbers at the Coorong have been counted on fourteen occasions between 1981 and 2008. The survey in 2012 recorded 19 species of waders.

Significant numbers (internationally or nationally) of nine wader species regularly use the Coorong lagoon system. These comprise four long-distance migrants that breed in Siberia - Red-necked Stint, Curlew Sandpiper, Sharp-tailed Sandpiper and Common Greenshank - and five species that breed in Australia – Red-capped Plover, Banded Stilt, Red-necked Avocet, Black-winged Stilt and Pied Oystercatcher. Although several other wader species use the Coorong they occur in small numbers only and are of little significance in an Australian context. Using the 1% criteria for sites of International and National Importance (Bamford, M. *et al* 2008), the 20012 survey resulted in 4 species being present in numbers of International Importance.

The historical Coorong wader dataset, beginning in 1981, shows great variability in total abundance and species abundance. One of the reasons for counting the Coorong is to assess how well it is being managed for birds, a matter of considerable interest given the large human influence on the hydrology of the region and the importance of the habitat for waders in Australia. This is not entirely straightforward because changes in the numbers of waders do not necessarily reflect changes in the condition of the Coorong. The main factors affecting numbers are discussed below:

- **Changes in habitat quality at the Coorong**.

Birds are likely to show a numerical response to the suitability of the Coorong, in particular the availability of feeding grounds and the density of invertebrate populations. In the Coorong one of the major factors affecting the aquatic food supply is the salinity level.

- **Changes in habitat quality at alternative sites**.

A feature of the ecology of most waders is their mobility. To varying degrees all nine of the wader species examined here also use alternative sites, in particular ephemeral wetlands in central Australia. Therefore, a change in number in the Coorong may reflect changes in habitat availability elsewhere. It is unfortunate that neither the availability of alternative sites nor the numbers of waders using them has been monitored regularly. Because species differ in their habitat requirements and extent of mobility they are likely to respond differently to the changes occurring at alternative sites. For the Siberian migrants, the Coorong is located at the far southern-end of the flyway. The extent to which birds choose to fly this far is likely to depend on the quality of other sites encountered en route and the extent of non-breeding site fidelity.

While the low levels of the adjacent lakes Alexandrina and Albert exposed areas of mudflat, personal observations and those of Mr David Dadd who undertakes regular point counts, do not support any large increase of use by waders. The area of 'wetted edge' or foraging zone remains uniform irrespective of the lake level.

- **Changes in flyway population estimates.**

Total population size results from changes in breeding success or survival rates, and will inevitably affect the numbers of birds at a particular site. It is essential to understand these processes so that

the trends observed at an important site like the Coorong can be understood in the context of the Flyway. Some of these parameters are discussed in Gosbell and Clemens 2006.

- **Count accuracy**.

If a species cannot be counted accurately the change in estimated numbers may simply reflect the inaccuracy of individual counts rather than a genuine change. For example, if counts for a species were only accurate to within 20% of the true number, then apparent population changes of up to 40% can be expected when the population is actually unchanged. In practice this problem means that counts are unable to reliably detect relatively small changes unless special methodologies are adopted. See below for comment on trial of new methodology.

Counts of species that are easily seen and identified and do not occur in large flocks are likely to be the most accurate, for example Common Greenshank, Masked Lapwing and Black-winged Stilt. Banded Stilt are difficult to count accurately because they often occur as very large (>5000) dense flocks. Species that are hard to see are likely to be undercounted in some circumstances. For example, at long distances Curlew Sandpiper can be easily overlooked amongst the more numerous Red-necked Stint, and Sharp-tailed Sandpiper can be difficult to see if they are using vegetated habitats such as saltmarsh.

Changes in counting methods and counting bias.

Counting waders, especially large flocks, is difficult and count results like those considered here are actually estimates of unknown accuracy. Some people may consistently under or over estimate numbers. If counts are conducted by the same people using the same method then the size of any errors and bias are likely to be constant. Where these are not the case particular caution needs to be taken in interpreting trends. The AWSG counts from 2000 to 2008 have used the same methodology and the same key people (team leaders). The coverage however has progressively improved over the last 7 years with reduced opportunity for any major omissions.

Counting the length of the Coorong over a 2 day period raises the question of duplicate counts. Previous studies (Wilson, 2001[a]) have indicated that provided good coverage is achieved and account is taken of flying birds this has a minimal effect. Other studies (Paton, 2005) have shown that most waders have a relatively small home range (average 300ha) and while they utilise both the eastern and western shorelines, they stayed within the same 5-8 km section of the Coorong for up to two weeks and possibly longer.

Importance of the Coorong in Monitoring Changes in the Flyway Population

The Coorong is one of ten sites in Australia identified for monitoring the changes in numbers of migrating waders that utilise the Yellow Sea during northward or southward migration. The AWSG has an agreement with the Australian Government (Department of the Environment, Water, Heritage and the Arts) to undertake a program of monitoring migratory shorebirds in the East Asian-Australasian Flyway which has the objective of detecting population changes over a 5 year period. The emphasis is on the species most likely to be impacted by the major recent and potential changes to the Yellow Sea which is the single most important staging region in the EA-A Flyway. While clearly the most significant sites for monitoring are in Northwest Australia, there are other sites identified in SE Queensland, southeast Victoria and the Coorong in SA. A summary of the first 2 years of this program is outlined in Rogers et al 2006.

Commentary on the 2012 results

Wader Numbers

The total number of waders counted in February 2012 was 50533, When the ephemeral species of Banded Stilt and Red-necked Avocet are taken out of this total, the number is 47082. This is the highest number counted since 2006, and suggests that the habitat quality in some sections of the Coorong have improved in terms of food resources they offer waders.
Curlew Sandpiper continue to crash with another extremely low count recorded being again this year. This continuing and increasing trend is evident in other parts of southern Australia although high numbers are still observed in North-west Australia (Gosbell and Clemens 2006).

During the 2012 Coorong count it was noted that Sanderling were almost non existent in the vicinity of the Mouth. It is possible that the dredging operations, including the movement of sand are affecting the habitat quality in and around the Murray Mouth. Empirical data indicates that the area receiving dredged sand now appears to support few waders, whereas previously several hundred of several species were present. The Ocean beach to the south of the Mouth has also been altered as a result of dredging. This highlights a need to monitor the impact of dredging on species that utilize the habitat near the Mouth to assess any degrading impacts.

- **Distribution**

The distribution of wader species is graphically shown in Figure 2. Over the eight previous years of records the number of migratory waders using the area to the north of the Needles has been in the range of 45% to 65%. In 2006 this increased to 75% with consequent reduction in the use of the southern areas. This was maintained in 2007 with 73% using the northern areas. In 2012 it was evident that fresher water had moved further south in the Coorong and this had positively facilitated the recruitment of benthic organisms in the mudflats. This observation had also been supported by research from Flinders University (Dittman, pers comm.) to show improved abundance and diversity of benthos in much of the northern lagoon of the Coorong

The ecological character of the southern lagoon, generally, remains quite poor, and few birds choose to use these environs.

- **Water Levels**

The water level at the Parnka Point gauge on Saturday Feb 4 was -0.017m. Under these conditions, there are vast areas of exposed mud and sand in the southern lagoon. On Saturday 25th February when the northern lagoon was surveyed the water level at Parnka Point was 0.026m.. Water levels are dictated by the tidal flow through the Murray Mouth, which is moderated to some degree by water released through the barrages.

- **Coverage and accuracy of counts**.

In 2012 the coverage was considered to be of a high standard. Both land based teams and boats were used as previously outlined to cover all the sectors shown in Figure 2. Two boats were used for the Northern Channels area allowing one team to undertake more detailed counts of several of the less accessible bays. The use of boats and the local knowledge input by the Park Rangers and the fishers who operated the boats was invaluable to the success of the survey.

The size of the Coorong, movements of birds, heat haze and winds makes counting difficult. Variance and skill between observers will also affect count results, but this was thought to be

minimal compared to discrepancies caused by the short term movements of birds. All counts were done with telescopes, and where available from higher view points (especially in the Magrath Flat/Hells Gate area). Flocks were, where possible, checked for movements and the time and direction of such movements recorded.

It is interesting to compare the AWSG counts in 2000 (Wilson 2000), 2001 (Wilson 2001[a]), 2002 (Gosbell, *et al* 2002), 2003 (Gosbell, *et al* 2003), 2004 (Gosbell, *et al* 2004-2007 with independent counts by Paton (Paton, 2001, 2002, 2003 and pers. com.). It is noted that while there are some differences in the numbers and distribution of some species, similar trends are evident. The comparison between the AWSG count and the count by Paton this year (pers com) has not been made.

Key issues in regard to count methodology.

The Coorong is one of the top ten sites for non-breeding waders in Australia. However, unlike all the other top sites (Eighty-mile Beach, Roebuck Bay, Gulf of Carpentaria, Corner Inlet etc) which are highly predictable and stable tidal marine systems, the Coorong is a variable system which contains a diverse habitats ranging from estuarine to hyper-marine. It is arguably the only top site in Australia where the hydrology, and ultimately suitability for waders, is fundamentally affected by human activities (in particular the management of the Murray catchment). The conservation and wise management of the Coorong requires a full understanding of the habitat requirements and food resources that sustain viable wader populations. Existing research suggests that the declining ecological character of the site is the principal cause of declines in wader abundance. However, There are various other possible causes of change which cannot be determined from the existing data. Additional data are required on the following:

- Co-ordinated monitoring of the availability and use of alternative sites in South Australia (say within 500 km) and further north on flyway route. The counts of the SE Lakes which forms part of the current study is relevant to this.
- Monitoring conditions in the Coorong. In view of the significant changes in the south lagoon in particular over the last five years, it is essential to monitor water quality and biological activity to assess changes for input to management strategies. Such monitoring should be aimed at documenting the relationship between salinity regimes and environmental water flows and how these influence the aquatic food sources. The multidisciplinary research program (CLLAMMEcology) undertook some of this research. See Paton and Rogers 2006.
- Quantifying and understanding the movements and site fidelity of the different species using the Coorong.
- Quantifying settlement mechanism of juveniles; do few juveniles settle (and adopt the Coorong as their non-breeding site) when the Coorong is in poor condition.
- Better understand count accuracy. Processes were put in place in 2005 and continued through to 2012 which are expected to lead to an improved measure of the confidence limits of estimates. See Rogers et al 2006.

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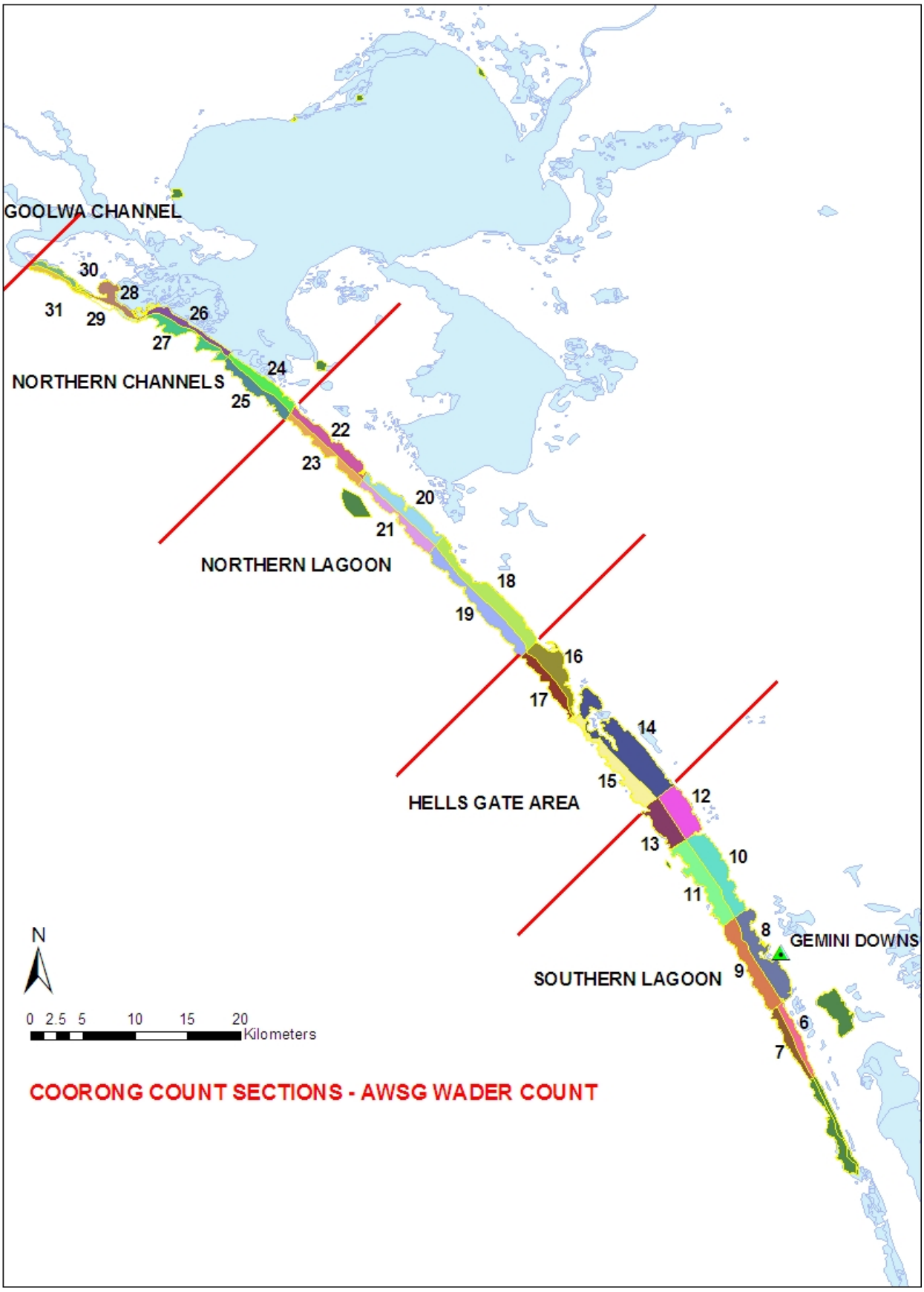
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