THE DECLINE OF THE EASTERN CURLEW IN SOUTH-EASTERN AUSTRALIA

This paper presents and comments on evidence of a decline in numbers of the Eastern Curlew *Numenius madagascariensis* in South Australia and Tasmania. We do not know of evidence of long-term status in other parts of Australia.

SOUTH AUSTRALIA

In all places in South Australia for which such evidence is available there has been a drastic decline in numbers. One example is the northern Coorong, which consists of limestone reefs, sandbars and mudflats in waters which are at different times tidal, estuarine or hyper-saline. Here the species was reported as common from the 1930's until at least as late as the (southern) summer of 1967-68, when 150 were seen on the especially-favoured site of Tauwitchere Reef (Glover 1969; Randell 1930, 1935; Sutton 1930a). Comprehensive surveys in February 1981 and February 1982 revealed totals of 15 and 22 respectively (Anon 1981; unpubl.). On the swamps and shores of the adjacent Lakes Alexandrina and Albert, which were mainly fresh before the completion in 1940 of the barrages separating them from the Coorong and entirely fresh thereafter, the species was apparently wide spread in small numbers between the 1920's and 1940's, but has rarely been since the 1960's (Randell 1929; Sutton 1930b, 1931; H.J. Eckert, pers. comm. to DHC), and a comprehensive survey in 1982 recorded one bird.

At Outer Harbour, which lies at the mouth of the Port River in Gulf St Vincent, the feeding habitat consists of marine and estuarine mudflats, sandbars and samphire swamps. From 900 to 1000 birds were seen in 1930 and again in 1938 (Pearce 1931; Clements 1938). Large numbers in the 1930's were also reported on the marine mudflats 12 km further north (Condon 1935a, b). There may have been some decline at Outer Harbor by 1953, when Glover (1954) wrote that 'several hundred' birds frequented it each summer, mentioning some counts of 200 and one of above 300 in the previous five summers. In 1968, however, he wrote that 'only small numbers' had been recorded in recent years, mentioning a recent maximum of 16. Reclamation of former feeding and roosting grounds in the Port River may account for much of this decline, but does not explain why few birds are now seen further north. During repeated surveys of all high-tide roosts along 22 km of coast from Outer Harbour northwards between September 1980 and March 1981, the maximum possible population for the area was 55.

On the coastal reefs of Yorke Peninsula the species was widespread in the 1930's (Bonnin 1933; Jarman 1940), and clearly in larger numbers than during the surveys of February 1981 and February 1982. These February surveys, which covered the western coast of the peninsula and the eastern coast south of Price, found a total of 13 birds. A decline on coastal reefs has also been noted in the south-east of South Australia. Twenty to thirty were regularly seen in the early 1960's on the reefs between Cape Northumberland and Stony Point, 9 km further east, but they could no longer be found in the 1970's, by which time the species had become scarce along the whole coast from the Victorian border north to Cape Jaffa (P. Penney and I.A. May, pers. comm. to DHC). On the mangrove-bordered mudflats of Franklin Harbor, on eastern Eyre Peninsula, the species was 'plentiful' in February 1923 (Weidenbach 1924) but during repeated counts in January and February 1982 only one bird was seen (G.C. Garrett and J. Ramsey, pers. comm. to DHC).

TASMANIA

In Tasmania there has been well-documented systematic decline over 30 years in the south-east, a poorly documented possible decline in the north-west and on Flinders Island, and comparative stability over the last 13 years in central north-coast areas. In the Hobart area *ca* 450 birds were present between 1948 and 1950 (Wall 1953). By 1965-9 numbers had fallen to an average of 265 (Thomas 1968, 1970). Annual counts between 1974 and 1982 have shown a continued gradual decline (Newman & Fletcher 1981), the 1981-82 total of 140 representing the lowest summer population yet recorded. Data from after 1965 shows a linear rate of decline of *ca* seven birds a year (correlation coefficient $r = 0.95$ for 11 d.f. $p < 0.01$). The birds predominantly frequent tidal mudflats which are highly landlocked, but Orielton Lagoon, which is mainly freshwater, is an important roost. There has been no substantial loss of habitat in the area and other, smaller, wader species have increased in the same period. However, there has been a major change in the distribution of Eastern Curlews within the Hobart area. For instance, numbers in Ralphs Bay have declined from two hundred and eighty-three in 1948 to thirteen in 1982, while in the Sorell/Orielton Lagoon area numbers have shown a much smaller decline. The population in the Sorell/Orielton area, as a percentage of the whole population in the Hobart area, has increased from 64 per cent in 1949-51 to 93 per cent in 1974-82. Blackmans Bay, an almost completely landlocked tidal mudflat in south-eastern Tasmania, held flocks of *ca* 100 and 75 in 1948 and 1955 respectively (L.E. Wall, pers. comm. to OMGN). The present population is less

than twenty.

At George Town on the Tamar Estuary there is no evidence of any systematic decline since 1969 when 100 were present (L.E. Wall, pers. comm. to OMGN). Between 1973 and 1982, summer surveys by R. Cooper and D. Henderson indicated a population range of 90 to 180, the maximum size recorded in 1975-76 being anomalously high compared with the mean of 115 (s.d. = 31; n = 8). The situation at Port Sorell is similar, with surveys by G. Bromfield indicating a typical population of 100, and a maximum of 120 in 1980-81.

In the north-west of mainland Tasmania, including the Robbins Passage, and on Flinders Island off north-eastern Tasmania, flocks of *ca* 200 have been recorded (e.g. *ca* 200 recorded by L.E. Wall in the East Inlet near Stanley in 1954, and above 200 by D. Milledge at Long Point near Whitemark, Flinders Island, in 1969). Although these areas were far less comprehensively surveyed than the areas discussed previously, present indications are that they support less than 100 and 60 birds respectively, suggesting that declines have occurred. These areas consist of massive tidal mudflats, including some landlocked bays.

DISCUSSION

There are two possible causes of the species' decline in south-eastern Australia: an alteration of wintering/non-breeding range or a fall in total population. On present indications the first seems more important, although the reasons for it are uncertain. In most or all places where decline has been noted, the species seems to have been vulnerable to human activity. Disturbance to feeding or roosting birds has undoubtedly increased in many areas, especially on coastal reefs. Shot birds have been found in Gulf St Vincent and the Hobart area (pers. obs.) and in Westernport Bay, Victoria (P. Dann, pers. comm. to DHC). Pollution in Gulf St Vincent and the Derwent Estuary may have reduced viable food supplies and caused the present preference, in the latter case, of the Sorell/Orielton Lagoon area as opposed to Ralphs Bay. However, it does not explain the continued decline at Sorell/Orielton Lagoon or at Blackmans Bay. In South Australia the feeding habitat has been destroyed by land reclamation in the Port River and by the stabilisation of water levels as a result of the construction of barrages in the lakes.

Factors affecting the total population may be the extensive destruction of habitat by pollution, land reclamation and clearance of mangroves in China, where the species is a passage migrant (Hsu wei-shu, Dept. of Zoology, Peking Natural History Museum, pers. comm. to DHC). On the other hand no marked decline, or likely cause of one, has been noted by Russian ornithologists in the species' breeding areas in eastern Siberia. Shooting, agricultural development, and other forms of disturbance are considered to be too localised to threaten the species significantly (P.S. Tomkovich, Dept. of Ornithology, Zoological Museum, Moscow, pers. comm. to DHC).

The population of the species in South Australia and Tasmania is only a small proportion of the Australian total. In the national count of February 1982, these States contained only 8% of the 5788 birds counted, although they were probably better covered by observers than most other parts of the species' range in Australia. Having contributed to a survey of most of the species' habitat in these two States in 1981-82, we estimate the average population each (southern) summer to be currently 300 to 400 in South Australia and *ca* 500 in Tasmania. Therefore, before the significance of the decline noted above can be understood, the species' status in the rest of Australia needs to be assessed. This process should include an estimate of (juvenile) recruitment rates, to which banding studies and counts of (southern) wintering birds may contribute. However, the evidence presented here suggests that the species is highly susceptible to disturbance by man.

We are grateful to those that have answered our enquiries and given us their unpublished information. They are referred to above and also include S.A. Parker and J. Strudwick.

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A NON-DESTRUCTIVE METHOD TO DETERMINE THE DIET OF SEED-EATING BIRDS

We report a novel but harmless method to sample the crop contents of seed-eating birds. During a study of the ecology of Zebra Finches *Poephila guttata* a non-destructive method was required for sampling the contents of the crop. At first an emetic of antimony potassium tartrate was tried at half the dosage rates recommended by Prys-Jones *et al.* (*Ibis* 116: 90-94) but of the three subjects tested two died within 20 minutes and only a few seeds were regurgitated. A method devised by Payne (*Ibis* 122: 43-56) for sampling the crop contents of the Red-Billed Fire Finch *Lagonosticta senegala* consists of inserting a tube into the crop and sucking up the contents with a large syringe. When this method was tried water and digestive juices were obtained but no seeds; they remained in a compacted mass in the crop. We then devised our tube insertion method.

TUBE INSERTION METHOD (TIM)

To extract seeds from the crops of Zebra Finches we used a 60 mm length of plastic tubing of 2.7 mm external and 1.8 mm internal diameter. Size 02 bands from the Australian Bird Banding Scheme come on such tubing. To reduce abrasion on the walls of the crop and oesphagus the tube should not be too stiff or inflexible and the end should be carefully smoothed. On the other hand, if the tube is too flexible it is difficult to insert and to push into the seeds.

The crops were examined first by blowing away feathers at the back of the neck in order to see the contents. Grassfinches have two sections to their crop, one on the right side that receives food first and one on the left that passes food into the gizzard. The crop walls are transparent and individual seeds can be clearly seen. If a crop section was less than one quarter full it was difficult to sample its contents.

The bird was held as for banding but the head held firmly; the tube was inserted into the beak and gently pushed down into the crop where it could be clearly seen. To collect seeds the end of the tube was pushed towards the wall of the crop and at the same time the wall was pushed down with a finger, forcing any seed in between up into the tube. The process was repeated and up to ten seeds could be pushed in before the tube was withdrawn. Both sides of the crop were sampled this way. Particular seeds can be selected for removal or the tube can be used without any visual guidance so that selection of seeds may be random. The seeds were expelled into a seed envelope by blowing the other end. The method was more easily executed when there was a small amount of fluid in the crop. The crops of nestlings over ten days of age could easily be sampled. All seeds had their husks and seed coats removed by the birds. The seeds were later identified by the Seed Purity Laboratory at the Burnley Horticultural College, Victoria.

Difficulties.

It may be hard to prise open the beak. We used the side of the tube to push up the tip of the upper mandible, then twisted the end of the tube inwards. The tongue must be avoided. The diameter of the tube also limits the size and shape of the seeds that can enter. Small round seeds entered more easily than long narrow ones.

Sampling reliability

To test whether we obtained a representative sample of the contents of the crop by the TIM we compared the sample obtained on dead specimens (that had died from other causes) with the contents of the crop when it was dissected out. In four of the five specimens studied there was no significant difference in the proportion of seed types found by the two methods (Table I). In Subject 3, item b was not found in the TIM sample, however, these were not seeds but aphids.

Effects on mortality

No direct effects on the mortality of adults and nestlings have been detected in the course of our 18 month long study. Once the tube was removed all the adult birds flew away immediately (N = 545). The TIM also did not affect rates of recapture at a baited walk-in trap. The recapture rates (52%) of birds that had their crops sampled did not differ significantly from those (60%)