

It is worth mentioning that of the species that Mayr (1944: 130) listed as new for Timor at least three had been previously obtained by Müller; they are the Short-toed Eagle *Circaetus gallicus* (♂, February 1829, cf. Mees 1975), the Grey Plover *Pluvialis squatarola* (♀, March 1829, cf. Schlegel 1865: 55, s.n. *Pluvialis varius*) and the Red-necked Stint *Calidris ruficollis* ('three specimens, cf. Schlegel 1864: 46, s.n. *Tringa minuta*); the last-mentioned species is probably the one described by Müller (1842: 153) as: 'eene kleine *Tringa*, veel gelijkenis hebbende met *T. Temminckii*'.

Peculiar is the case of *Rogibyx tricolor* (Horsfield) = *Vanellus cucullatus* Temminck, of which Temminck (1830) wrote: 'elle habite en g[r]andes troupes la plage de Timor'. The locality Timor was also listed by Seebohm (1887: 188), Sharpe (1896: 148) and Peters (1934: 238) but not mentioned by either Hellmayr or Mayr. A mounted specimen from Timor is still in our collection; it is a syntype of *Vanellus cucullatus* Temminck.

The preceding notes will make clear that anybody who is interested in winter visitors and is prepared to go through the possibly tedious work of sifting earlier literature is likely to be rewarded by the rediscovery of a few overlooked records. Other records may require a reappraisal in the light of the discoveries made by McKean *et al.*: for example, the two mounted specimens of the Pallid Cuckoo *Cuculus pallidus* in Paris, labelled as originating from Timor (cf. Hellmayr 1916: 110).

#### REFERENCES

- HARTERT, E. 1898. On the birds of Lomblen, Pantar, and Alor. *Novit. zool.* 5: 455-465.
- HELLMAYR, C. E. 1914. Die Avifauna von Timor. In Haniel, Zoologie von Timor 1 (1): i-vi, 1-112.
- G. F. MEES, *Rijksmuseum van Natuurlijke Historie, Raamsteeg 2, Leiden, Nederlanden*. 19 November 1975.
- , 1916. Weiteres zur Avifauna von Timor. *Novit. zool.* 23: 96-111.
- JUNGE, G. C. A. 1948. Notes on some Sumatran birds. *Zool. Meded.* 29: 311-326.
- MAYR, E. 1944. The birds of Timor and Sumba. *Bull. Am. Mus. Nat. Hist.* 83: 123-194.
- McKEAN, J. L., I. J. MASON and J. W. O'CONNOR. 1975. Birds not previously recorded from Timor. *Emu* 75: 62-64.
- MEES, G. F. 1975. A list of the birds known from Roti and adjacent islets (Lesser Sunda Islands). *Zool. Meded.* 49: 115-140.
- MÜLLER, S. 1840-1847. *Verhandelingen over de natuurlijke geschiedenis der Nederlandsche overzeesche bezittingen. Land- en volkenkunde*. Leiden: Luchtmans en van der Hoek.
- OORT, E. D. VAN. 1907. *Catalogue ostéologique des oiseaux*. *Mus. Hist. nat. Pays-Bas* 10 (1): i-viii, 1-384.
- PAYNTER, R. A. 1963. Birds from Flores, Lesser Sunda Islands. *Breviora* 182: 1-5.
- PETERS, J. L. 1934. *Check-List of Birds of the World* 2. Cambridge, Mass.: Harvard Univ. Press.
- RENSCH, B. 1931. Die Vogelwelt von Lombok, Sumbawa und Flores. *Mitt. zool. Mus. Berl.* 17: 451-637.
- SCHLEGEL, H. 1863. *Sternae*. *Mus. Hist. nat. Pays-Bas* 6 (mon. 24): 1-44.
- , 1864. *Scolopaces*. *Mus. Hist. nat. Pays-Bas* 5 (mon. 27): 1-112.
- , 1865. *Cursores*. *Mus. Hist. nat. Pays-Bas* 4 (mon. 29): 1-80.
- SEEBOHM, H. 1887. The Geographical Distribution of the Family Charadriidae, or the Plovers, Sandpipers, Snipes and their Allies. London: Sotheman.
- SHARPE, R. B. 1884. On an apparently undescribed genus of wrens from Timor. *Notes Leyden Mus.* 6: 179-180.
- , 1896. *Catalogue of the Birds in the British Museum* 24. London: Br Mus. nat. Hist.
- TEMMINCK, C. J. 1830. *Nouveau Recueil de Planches Coloriées d'Oiseaux* 5 (livr. 85): pl. 505.
- , 1840. *Manuel d'Ornithologie*, 2e éd., 4. Paris: Cousin.
- VERHEIJEN, J. A. J. 1964. Breeding season on the island of Flores, Indonesia. *Ardea* 52: 194-201.

## FURTHER OBSERVATIONS ON THE TAKING OF PEBBLES BY BLACK-FACED CORMORANTS

Following an initial observation of a Black-faced Cormorant *Phalacrocorax fuscescens* picking up and swallowing four pebbles at Wright's Island, Tasmania (van Tets 1968a), the taking of pebbles by adults of the same species was observed many times from 25 October to 5 November 1970 at Dangerous Reef, South Australia.

Pebbles are regularly found in stomach samples and regurgitated pellets of cormorants that have been foraging in seawater but rarely in those that have been foraging in fresh water. The observations at Dangerous Reef permit a more detailed description of how at least one species obtains these pebbles.

#### STUDY-AREA

Marlow (1968) described Dangerous Reef and illustrated it with photographs. It is a low flat rocky island with a maximum height of less than four metres. Thousands of Black-faced Cormorants use the island for roosting and nesting and the Australian Sea-lion *Neophoca cinerea* uses it for hauling out and breeding.

Because the Sea-lions would push over and destroy conventional hides, dug-outs were made for observing the Cormorants. A dugout consisted of a pit with a short trench leading into it, covered by a flat roof of driftwood strong enough to support the weight of a Sea-lion. The roof was supported by boulders about a third of a

metre above the ground. Observations were made with the aid of binoculars and telescope through gaps between the boulders.

### RESULTS

Cormorants were observed at eye-level from a distance of two to ten metres. They usually picked up pebbles as they walked to and from their nests. One bird was seen picking up and swallowing two pebbles while incubating. The numbers of pebbles swallowed in succession by a bird are given in Table 1. These numbers are minima because additional pebbles may have been swallowed while the Cormorant was out of sight.

The faeces of large numbers of Cormorants and Sea-lions gave a white-washed appearance to the surface of the island. From this white surface the Cormorants picked up small white round or ovoid objects that were pebbles washed with guano, each about as wide as the depth of the bill. The average depth of bills of seven adults was eleven millimetres (range 9–12 mm). The largest pebble that was swallowed was estimated to be 10 x 25 millimetres. Another, estimated to be 15 x 20 millimetres, was picked up and then rejected, presumably because it was too wide. One Cormorant after swallowing five pebbles tried in vain to take pieces from a solid conglomeratic rock.

The Cormorants mandibulated the items they picked up. Occasionally they picked up a soft piece of dirt, which they threw away with a sideways flick of the bill. If

the item was a pebble. I heard a clicking sound, 'tick-tick-tick', as it was mandibulated before ingestion with visible swallowing movements of the throat.

### DISCUSSION

The purposeful way in which the pebbles were taken suggests that they serve a function. Cormorants forage about once a day and regurgitate as pellets the residual contents of their stomachs also about once a day (van Dobben 1952). Hence if the pebbles serve a function, there is a continuing need to replace them. I have suggested (van Tets 1968a, 1968b) that the pebbles may serve to help overcome the greater buoyancy of salt water. That cormorants do not need stones to aid digestion has been shown by Cott (1961) and van Dobben (1952).

The average weight of seven adult Black-faced Cormorants was 1.5 kilograms (range 1.2–1.7 kg). Depending on salinity and temperature, the density of salt water is about 1.025. A Black-faced Cormorant would therefore need an additional 37.5 grams to compensate for a 25-mg/cc difference between the density of salt and fresh water.

If as an approximation the volume of a pebble is taken as the cube of its width (= 11 mm) and its density as 2.5 g/cc (cf. van Tets 1968a), then a Black-faced Cormorant can gain per pebble an additional  $(2.5 - 1.025) \times 1.1^3$  grams or 1.96 grams. The largest number of pebbles taken was sixteen and may represent a gain of 25.6 grams. This is about seventy per cent of what is required to compensate for a 25-mg/cc difference between the density of sea and fresh water. Near the mouths of rivers the density of sea water is considerably less and fewer pebbles would be needed.

TABLE I

Frequency with which Black-faced Cormorant swallowed various numbers of pebbles in succession.

No. pebbles	No. observations
1	15
2	12
3	9
4	3
5	4
6	4
7	1
8	1
10	2
12	1
16	2

### REFERENCES

- COTT, H. B. 1961. Scientific results of an inquiry into the ecology and economic status of the Nile Crocodile (*Crocodilus niloticus*) in Uganda and Northern Rhodesia. Trans. zool. Soc. London 29: 211–356.
- MARLOW, B. J. 1968. The Sea-lions of Dangerous Reef. Aust. nat. Hist. 16: 39–44.
- VAN DOBBEN, W. H. 1952. The food of the Cormorant in the Netherlands. Ardea 40: 1–63.
- VAN TETS, G. F. 1968a. White-breasted Cormorant swallows pebbles on land. Emu 67: 224.
- 1968b. Familie Kormorane. Grzimeks Tierleben 7: 162–172.

DR G. F. VAN TETS, *Division of Wildlife Research, CSIRO, PO Box 84, Lyneham, ACT 2602.*  
8 September 1975.

### SOME REMARKS ON THE TAXONOMIC POSITION OF THE TREE SPARROW INTRODUCE INTO AUSTRALIA

The Tree Sparrow *Passer montanus* was first introduced into Victoria from Suffolk in 1862 (Sage 1956; Hobbs 1956; Le Souéf 1958). The first attempt was unsuccessful but shortly afterwards more birds safely arrived and in 1863 the Sparrows were set free. The first

comments on the usefulness of the Sparrows against caterpillars date from 1867 but in the next year complaints arose about their harmfulness in orchards. Thus was the European Tree Sparrow acclimatized in Victoria.