

a colony of wild Herons (*Ardea cinerea*) had lately established itself, and now numbered 24 pairs.

In Amsterdam Mr. Sclater was much interested to find an adult male and a young female of the fine Antelope *Tragelaphus gratus*, described by him in the Society's 'Proceedings' for 1883 (see P. Z. S. 1883, p. 34, pl. viii.), remarkable for its long extended hoofs. These animals were named in Amsterdam *Tragelaphus decula*, but were certainly not, in Mr. Sclater's opinion, *Antelope decula* of Rüppell (Neue Wirb. i. p. 11, t. iv.). They had been received from a correspondent on the Lower Congo. Other fine species represented in the Amsterdam Gardens were *Canis jubatus* of Brazil, *Pedetes caffer* of South Africa, *Felis servalina*, Ogilby (cf. Sclater, P. Z. S. 1874, p. 495, pl. lxiii.), from the Congo, and *Corythaix livingstoni*, G. R. Gray.

Mr. Sclater had also paid a visit to the private garden of Heer Blauuw, at Westervald, near Hildersum, and inspected with great pleasure the herd of Gnus (*Catoblepas gnu*) recently spoken of by that gentleman in a communication to this Society (*suprà* p. 2), and the other beautiful specimens in that collection.

Mr. E. T. Newton, F.Z.S., exhibited a tibio-tarsus of the large extinct bird *Gastornis klaasseni* from the Woolwich Beds of Croydon. The specimen had parts preserved in it which were wanting in the type (described, Trans. vol. xii. p. 143), and consequently the length of the bone was now made certain.

The following papers were read:—

1. Remarks on the Zoo-geographical Relationships of the Island of Palawan and some adjacent Islands. By A. H. EVERETT, C.M.Z.S.

[Received March 15, 1889.]

(Plate XXIII.)

It has been customary heretofore to regard the Island of Palawan, together with Balabac and the numerous smaller islands which lie between South Balabac and the Mindoro Straits, as forming a kind of debatable land, of which the fauna was not sufficiently well known to allow of its being allocated definitely to the Philippines or to Borneo and the more typical sub-area of the Indo-Malayan Sub-Region. But in actual practice these islands have been treated as a part of the Philippine sub-area by the authors who have written on the zoology of the latter, though until lately this practice was followed simply for reasons of convenience, and not as expressing the opinion that their natural zoo-geographical relationship lay with that group rather than with Borneo.

Quite recently, however, Professor J. B. Steere, to whom we are



Scale of English Miles

A vertical scale with a central horizontal line. The scale is marked with numbers 0, 10, 20, 30, 40, and 50. The numbers 0, 10, 20, 30, and 40 are placed to the left of the line, while the number 50 is placed to the right. Horizontal lines extend from each of these numbers across the width of the page. Between each major number, there are four smaller tick marks, dividing each 10-unit interval into five 2-unit intervals.





Standard's Geogr. Study

Longitude East 118° of Greenwich

116°



indebted for our first acquaintance with the fauna of the islands in question, has given formal expression, in a prominent scientific journal¹, to the view that Palawan and Balabac should be considered as constituting, zoologically, a part of the Philippine Archipelago. Prof. Steere, having proceeded to divide the Philippine "Province" of the Indo-Malayan Sub-Region into six "Sub-Provinces," of which the sixth or Western Sub-Province "includes Balabac, Palawan, and perhaps the Calamianes," goes on to state that "this Sub-Province has evidently received a large portion of its fauna from North Borneo, through Balabac, at a comparatively recent date, and since its separation on the north from the rest of the Philippines, so that these genera have not flowed over into Mindoro and Luzon. In addition to these apparently late arrivals from Borneo, the Sub-Province possesses a large number of peculiarly Philippine birds and mammals, which show it to be an integral part of the province." So that it would seem from the above extract that, in Prof. Steere's opinion, the fundamental characteristics of the fauna of the Palawan group of islands are Philippine rather than Bornean, although there has been a comparatively more recent and very considerable invasion of Bornean forms; and the group is thus for the first time pronounced to be zoo-geographically, as it is politically, an integral portion of the Philippine sub-area.

With this view I do not find myself able to concur, and it seems to me that such evidence as is available on the subject indicates rather that Palawan and the other islands mentioned by Prof. Steere have never been directly connected with any part of the Philippines since the former received their existing population, but that they have been almost certainly so connected with Borneo, or, more correctly perhaps, with a south-eastern extension of continental Asia, of which Borneo formed a part. It appears to me that it was from the Bornean side that these islands received their original fauna, and that the Philippine element is the foreign element and the one of comparatively recent advent. As it is very desirable that the natural relationship of the Palawan group should be placed on an established footing as soon as possible, I propose to offer briefly for consideration the grounds which seem to me to justify the definite inclusion of these islands in the western sub-area of the Indo-Malayan Sub-Region.

A glance at the accompanying map of the Palawan group (Plate XXIII.) demonstrates at once that these islands, together with Cagayan-Sulu and Sibutu (which have been also looked upon as zoologically Philippine until recently), are all intimately connected with Northern Borneo by a very shallow submarine bank, the depth of the sea on which is generally less than 50 fathoms, and nowhere exceeds 100 fathoms continuously through the straits intervening between the China and Sulu seas. At the 100-fathom limit the bed of the ocean abruptly plunges down to depths ascending, in the Mindoro and Sibutu straits, 500 fathoms, and in the Sulu sea 1900 fathoms, thereby forming a profound gulf, which completely severs all the islands above mentioned from any connexion with the Philip-

¹ 'Nature,' Nov. 1888, pp. 37, 38.

piners. The significance of such a condition of things in the submarine geography of the area between Borneo and the Philippines is too well understood to render it necessary to enlarge upon it here; and if the settlement of the point at issue depended upon considerations of physical geography alone, it would probably be at once conceded by all that to include the Palawan group as an integral part of the Philippine sub-area is to draw a purely arbitrary line of delimitation somewhere through the Balabac straits and to the westward of Cagayan-Sulu and Sibutu, instead of adopting the natural boundary which soundings demonstrate to exist already in the Mindoro and Sibutu straits.

But the geographical evidence for the connexion here advocated, though valuable in so far as it shows that a very slight elevation of the sea-bed would suffice now, and may have sufficed in the past, to join the Palawan group to Borneo, while one of considerable magnitude would be required to effect a junction with the Philippines, is not of convincing weight unless it can be shown that it is confirmed by the characteristic features of the Palawan fauna. For if we were to rely on the argument of physical geography alone, we should be confronted with the fact that Celebes might just as well be regarded as having been directly connected in recent geological time with Borneo, since that island also is apparently linked to the latter by a broad band of submarine bank, on which the soundings are everywhere, so far as is ascertained, less than 100 fathoms. And as this argument might be advanced, and this bank in the Straits of Macassar is a real difficulty, in view of the extreme dissimilarity of the faunas on either side of that strait, I may be permitted to digress for a moment before proceeding to examine the Palawan fauna, and to point out that in consequence of local circumstances, which are absent in the case of Palawan, this apparent evidence of a recent land-connexion between Borneo and Celebes is susceptible of being otherwise interpreted. The interpretation has been suggested by Mr. Wallace, who remarks¹: "The southern portion of the Straits of Macassar is full of coral reefs, and a shallow sea of less than 100 fathoms extends from Borneo to within about 40 miles of the western promontory of Celebes; but farther north there is deep water close to the shore, and it seems probable that a deep channel extends quite through the straits, which have no doubt been much shallowed by the deposits from the great Bornean rivers as well as by those of Celebes itself. Southward, again, the chain of volcanic islands from Baly to Timor rise out of a deep ocean, the few soundings we possess showing depths of from 670 to 1300 fathoms almost close to their northern shores. We seem justified therefore in concluding that Celebes is entirely surrounded by a deep sea, which has, however, become partially filled up by river-deposits, by volcanic upheaval, or by coral reefs. Such shallow seas, where they exist, may therefore be due to antiquity and isolation, instead of being indications of a former union with any of the surrounding islands." The rainfall in Borneo is enormous, and the country is largely made

¹ 'Island Life,' p. 423.

up of soft decomposable rocks which are readily degraded by denudational agencies; and no one who has watched the larger rivers of the island incessantly discharging their yellow mud-laden floods seawards will be disposed to doubt that they must have done much towards shallowing of the Macassar strait. But this agency cannot be called in to explain the existence of the shallow bank connecting Borneo with the Palawan group; for all the rivers discharging on to this bank are of quite insignificant size, and therefore it may be regarded as having formed for some time past a permanent feature in the local geography, whereas the Macassar bank is a recent feature still in process of construction. The Palawan bank may have been, and almost certainly has been, submerged far below its present level; but the probability is equal that it has also been elevated into dry land and a temporary junction formed—perhaps more than once—with Borneo.

Proceeding now to inquire what light is thrown upon the connexion of Palawan with Borneo on the one side or the Philippines on the other by the characteristics of the fauna of the Palawan group, we are met with the difficulty that the only classes of animals from these islands which are fairly well known are the mammals and the birds. On the other hand evidence derived from the distributional relationships of these two classes has admittedly a high value for the purpose in view. The mammals which are known to exist in the Palawan group are the following :—

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| 1. <i>Macacus cynomolgus</i> ... | Common to Philippines and Indo-Malaya proper. |
| 2. <i>Felis minuta</i> | Indo-Malaya Proper and I. of Negros. |
| 3. <i>Paradoxurus philippensis</i> | Common to Philippines and N. Borneo. |
| 4. <i>Arctictis binturong</i> | Nepal to Borneo. |
| 5. <i>Herpestes brachyurus</i> ... | Malay Peninsula and Borneo. |
| 6. <i>Mydaus</i> , sp. (?) ¹ | Sumatra, Java, and N. and E. Borneo. |
| 7. <i>Lutra</i> , sp. | Genus abundant in N. Borneo. |
| 8. <i>Tragulus javanicus</i> | Indo-Malaya Proper and I. of Balabac. |
| 9. <i>Sus</i> , sp. | Genus common to Philippines and Borneo. |
| 10. <i>Sciuropterus alboniger</i> ... | Nepal to Cambodja. |
| 11. <i>Sciurus steerii</i> | Allied to <i>S. ferrugineus</i> of Assam, Burmah, and Siam. |
| 12. <i>Mus</i> , sp. | Genus common to Philippines and Borneo. |
| 13. <i>Hystrix pumila</i> | Genus abundant in N. Borneo. |
| 14. <i>Tupaia javanica</i> | Indo-Malaya Proper. Abundant in Borneo. |
| 15. — <i>ferruginea</i> | Indo-Malaya Proper. Abundant in Borneo. |
| 16. <i>Pteropus hypomelanus</i> ... | Philippines, Borneo, Celebes, and N. Guinea. |
| 17. <i>Kerivoula hardwickii</i> ... | India, Java, Borneo. |
| 18. <i>Manis</i> , sp. ... | Genus very abundant in N. Borneo. |

The above enumeration shows that the Palawan group possesses a mammalian fauna (exclusive of Bats) comparable in variety of species and genera with that of the entire Philippine Archipelago. Of the species composing this fauna only one, the *Paradoxure*, namely, can be regarded as a distinctively Philippine species, and even that one occurs also in Northern Borneo. The remaining mammals, after putting on one side those which are common to the Philippines and

¹ This animal has never been actually obtained, I believe, by any collector, but it has frequently been described to me by Europeans as well as by natives.

Borneo, are all identical with or allied to species inhabiting the latter island or other parts of Indo-Malaya proper. Not one of the few mammals which are peculiar to the Philippines is known to occur in the Palawan group. On the other hand the genera *Hystrix*, *Manis*, and *Mydaus*, which are such as require a continuous land-connexion to enable them to migrate from one area into another, and which are all very abundantly represented in Northern Borneo, do occur in Palawan, while none of them have been recorded as existing in the Philippines. So that a study of the relationships of the mammals of the Palawan group seems to show that this portion of the fauna was derived from Borneo and western Indo-Malaya and not from the Philippines; and not only so, but that continuous connexion by land with Borneo must have existed so as to enable some of the genera which we find in Palawan to have reached that island. It may be argued that had such continuity of land-surface existed within the lifetime of the present fauna, the mammals of Palawan could not fail to be far more numerous than is known to be the case. But the actual junction may have been of too brief duration to allow of the migration of a large number of species; or, as is far more probable, the mammals were at one time sufficiently numerous, and they have since been almost extinguished by a general submergence of the Palawan group. There is reason to believe that the Island of Borneo has undergone in comparatively recent times a submergence to a depth of probably not less than 1000 feet, from which it is now recovering; and since Palawan appears to be partaking in the present elevatory movement, it is reasonable to conjecture that it partook also in a less or greater degree of the preceding subsidence, in which case the group must have been reduced to a chain of steep islets affording no scope for the continued existence of a varied mammalian fauna.

Passing now to the birds, we find that the total number of species authentically recorded from the Palawan group amounts to 161¹, which may be tabulated as follows.

TABLE I.—Showing the Palawan Species which are common to Borneo or other parts of western Indo-Malaya and to the Philippines, together with the Species which are of wide general distribution or are migrants from Continental Asia.

1. <i>Phylloscopus borealis</i>	11. <i>Musicapa griseisticta</i> .
2. <i>Acrocephalus orientalis</i> .	12. <i>Hypothymis occipitalis</i> .
3. <i>Monticola solitaria</i> .	13. <i>Culicicapa ceylonensis</i> .
4. <i>Cisticola cisticola</i> .	14. <i>Hirundo gutturalis</i> .
5. <i>Motacilla flava</i> .	15. — <i>javanica</i> .
6. <i>Anthus maculatus</i> .	16. <i>Sturnia violacea</i> .
7. — <i>gustavi</i> .	17. <i>Artamus leucorhynchus</i> .
8. <i>Pericrocotus cinereus</i> .	18. <i>Chætura gigantea</i> .
9. <i>Lalage terat</i> .	19. <i>Collocalia fuciphaga</i> .
10. <i>Hemichelidon sibirica</i> .	20. <i>Eurystomus orientalis</i> .

¹ I exclude *Parus elegans*, because the accuracy of the Palawan locality is very doubtful, and *Turnix raynaldi*, which Mr. Ogilvie-Grant assures me is identical with *T. nigrescens*.



Everett, Alfred Hart. 1889. "Remarks on the Zoo-geographical Relationships of the Island of Palawan and some adjacent Islands." *Proceedings of the Zoological Society of London* 1889, 220–228.

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