NOTES ON THE VERTEBRATE FAUNA OF THE KRAKATAU ISLANDS,

with special reference to the birds

by

A. HOOGERWERF

(Kebun Raya Indonesia, Bogor)

Owing to the want of good drinking-water, the expedition to the Prinsen Island or Pulau Panaitan (HOOGERWERF, 8) had to be cut short by two weeks. It was decided to turn this time to good account by visiting some adjacent area, and the choice fell on the Krakatau Islands, which had indeed been subjected to a series of scientific investigations since the great volcanic eruption of 1883, but which were nevertheless sure to offer some new aspects, owing to the still unstable condition of the flora and fauna, no inventory of which had been made since 1933.

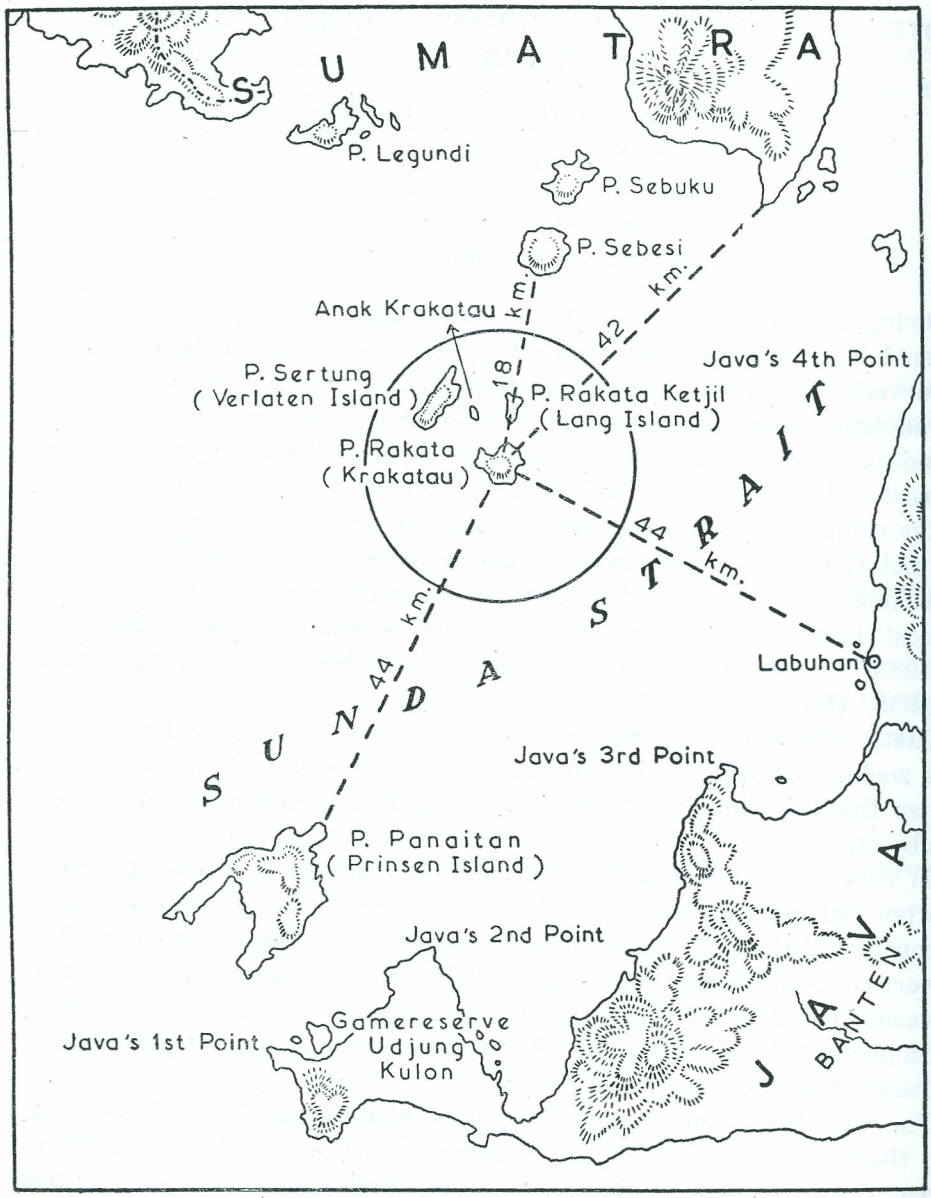
Among the extensive literature dealing with this group of islands, the most important contributions are the botanical work "Krakatau, 1883-1933" (DOCTERS VAN LEEUWEN, 5), and "The Fauna of Krakatau, 1883-1933" (DAMMERMAN, 4).

DAMMERMAN's book gives a very comprehensive survey of the results of the zoological investigations made within this group of islands up till 1933, so that this important work is the primary book of reference on the subject.

In view of the fact that the observations made by the present writer are often put side by side with those made by former investigators, it was considered the best plan to have these personal observations preceded by a very concise summary of the results obtained by others, partly also for the reason that it is very time-consuming to pick out from the abundance of data presented in DAMMERMAN's book those of particular interest within the frame of the present paper. [1])

The expedition here reported on took place from 5 till 15 October 1951; the bivouac was on the main island of Krakatau (Pulau Rakata), whereas the trips made to the other three islands of the group (Verlaten Island, Lang Island and Anak Krakatau) were only short ones, so that the data here given almost exclusively refer to the main island.

[1]) Thanks are due to Mr M. W. F. TWEEDIE, Director of the Raffles Museum and Library at Singapore, for reading the manuscript and for his valuable suggestions.



PRESENT SITUATION OF THE KRAKATAU ISLANDS

SCALE 1 : 700.000

There was no opportunity for the preserving of zoological material, so that, apart from a few rats, no animals were collected. As a result the present article deals only with species which were seen or heard, or whose presence could in some other way be established.

Zoological particulars recorded in literature

General

Although the Krakatau Islands were visited by several scientists in the years immediately following the eruption of 1883, only the Belgian naturalist ED. COTTEAU is known in May 1884 seriously to have attempted to find traces of animal life. All he found was one small spider. The first extensive zoological reconnaissance was not made until 1908 by the well-known naturalist EDW. JACOBSON. Although JACOBSON's investigations are, of course, of very great significance, it is to be regretted that 25 years had to pass before serious attention was paid to the fauna of this region after the catastrophe of 1883, and that even JACOBSON did not devote more than three days to it. J. C. KONINGSBERGER's visit to Rakata in 1913 was also a very short one and practically nothing is known about it.

It was not until 1919 that investigations were again made, which became the first of a long series, extending, off and on, over a period of fifteen years. Inventories were made first of all by DAMMERMAN, who in all spent 30 days on Rakata and 28 on the other islands of the Krakatau group. A. SUNIER, at the time Head of the Laboratory for Marine Research at Djakarta, the well-known ornithologists M. BARTELS Sr. and H. C. SIEBERS, and many other scientists, made one or more trips to the islands, whereas also DOCTERS VAN LEEUWEN made zoological investigations.

It is of no use at all to try to find out why investigations which at present would seem to be of paramount importance, were neglected for so long and did not start immediately after the eruption. The main causes have probably been the difficult accessibility of the islands and the want of biologists, willing and able to occupy themselves with such investigations. The shortage of biologists has always made itself felt in Indonesia, particularly so in the Botanic Gardens, so that the fact that any data were collected and published at all concerning the new flora and fauna of this group of islands, is something to be duly appreciated. The following notes, up to p. 326, are mainly derived from DAMMERMAN's book.

Reptiles

The number of reptiles was very small initially, as JACOBSON established the presence of only two species, viz., the common monitor

(*Varanus salvator* LAUR.) and a house lizard ("tjitjak", *Hemidactylus frenatus* DUM. & BIBR.). He did not observe any snakes, but BRUN, who shortly afterwards visited Rakata, reported the presence of a "Boa constrictor", by which undoubtedly a python was meant. About 1921 a second species of "tjitjak" was observed (*Lepidodactylus lugubris* DUM. & BIBR.) and (on Verlaten Island) a scink, (*Lygosoma atrocostatum* LESS.). He also collected a python (*Python reticulatus* SCHN.). In 1924 near a small lake on Verlaten Island the first crocodile was observed (*Crocodilus porosus* SCHN.) and on Rakata suddenly a great number of other small lizards, belonging to the species *Mabuia multifasciata* KUHL, which is very common and widely distributed in Indonesia. In 1928 a third "tjitjak" was found (*Hemidactylus platyurus* SCHN.). The presence of amphibians and freshwater fishes was not established.

Mammals

During JACOBSON's visit in 1908 no mammals were seen, not even bats, but two species of these were observed in 1919, the fruit-eaters *Cynopterus brachyotis angulatus* MILL. and *Cynopterus horsfieldi minor* LYON. In 1928 a third species was added to this group, viz., the insectivorous *Hipposideros diadema* E. GEOFFR., and a fourth one was obtained in 1933 (*Rousettus amplexicaudatus* E. GEOFFR.). Rats were not observed either by JACOBSON; they were probably not imported until long afterwards by the german pumice-licensee HÄNDL, who lived on Rakata from 1917 till 1922. This was the domestic rat (*Rattus r. diardii* JENT.); the same species was later on also found along the north-western coast of Rakata near the "Zwarte Hoek". They may have been imported here more recently by fishermen and their prahus.

These rats are still present in large numbers — at least near the south-eastern corner of the island —, and bats are almost common in many parts of Rakata, but as yet there are no other mammals, at least none have been observed so far. On Lang Island rats also occur and have probably done so for a long period of time, but these are the so-called field-rats (*Rattus rattus jalorensis* BONH.).

Birds

In 1908 JACOBSON established the presence of 16 species of birds, 13 of which were looked upon by DAMMERMAN as "permanent dwellers". The investigations of 1919-1921 raised this number to 47; this substantial increase is no doubt primarily to be attributed to the work of BARTELS and SIEBERS, two ornithologists of considerable field experience, who

devoted their attention exclusively to birds, in contradistinction to JACOBSON, who in 1908 tried to obtain a bird's-eye view of the fauna in the widest sense of the word. This number moreover included many migratory birds from northern Asia, which could not have been observed by JACOBSON, whose visit took place in May. There undoubtedly were also real newcomers, however, birds which in those years had come to settle permanently on these islands. Birds as *Haliaeëtus leucogaster, Haliastur indus intermedius, Ducula b. bicolor, Hirundo tahitica javanica, Aplonis panayensis strigatus,* etc. would decidedly not have escaped JACOBSON's attention, if they had been there during his visit. The same applies to the thrush *Copsychus saularis musicus* and the sunbirds *Nectarinia jugularis microleuca* and *Anthreptes m. malacensis.* Not observed, on the other hand, were the kingfisher *Alcedo caerulescens* and the common bulbul *Pycnonotus cafer aurigaster,* which were both seen in 1908 by JACOBSON.

Between 1930 and 1934 the number of birds proved to have gone up once more, viz., from 47 to 59 species, among which were the conspicuous Sunda Island Cuckoo-Dove *Macropygia phasianella emiliana,* which was, however, observed on Verlaten Island only. Flycatchers were collected for the first time in those years, no less than four species of them; the resident birds *Muscicapa rufigaster rhizophorae* and *Gerygone s. sulphurea,* and the migrants *Muscicapa l. latirostris* and *Muscicapa narcissina xanthopygia.* The last two additions are, like all other migratory birds, of little significance to the new fauna of Krakatau. The large number of specimens of *Muscicapa rufigaster* was termed remarkable and the species was found to have settled permanently on all three islands, after having been established for the first time in May 1929.

Once again a species which was observed in 1908 by JACOBSON, proved absent, viz., the shrike *Lanius schach bentet,* a bird even observed breeding there in 1919. The Barred Ground-dove *Geopelia s. striata,* collected in that year by BARTELS, was not seen any more either.

In his discussion of the birds of the beach DAMMERMAN in addition to *Esacus magnirostris scommophorus* and *Sterna* spp. also mentioned the "Marsh Tern", *Hydrochelidon* (= *Chlidonias*) as breeding there, but in this he must have been mistaken, since the species of the genus *Chlidonias* found in Java are migrants. He further mentioned the nightjar *Caprimulgus a. affinis* as a bird which could be met with practically all the time and which was also found to breed there. The bird of prey, *Haliastur indus intermedius,* in the Barringtonia-formation was also reported to be common ("we always find here"), and so were the pigeons *Ducula b. bicolor, Treron vernans griseicapilla* and *Chalcophaps i. indica.*

The last two species were even said to be "extremely abundant", which fact DAMMERMAN attributed to the absence of the common "monjet" (*Macaca irus*), a notorious robber of nests.

Why DAMMERMAN mentioned the "monjet" in connection with these pigeons only is not clear, since these robbers do not despise other eggs either! In Udjung-Kulon (most western peninsula of Java), where this species of monkey is common, *Treron vernans* is more numerous than in any other region known to the present author, whereas the fact that *Treron vernans* decidedly cannot be called common at present in the Krakatau group any longer, although these monkeys still do not occur there, contradicts DAMMERMAN's statement.

The absence of *Zosterops*, pointed out by DAMMERMAN, is not so strange as it seems to be since not a single white-eye is known from the extensive area of Udjung-Kulon or Prinsen Island (Pulau Panaitan)!

DAMMERMAN, in discussing the fauna of the grassy plains, points to *Geopelia s. striata*, which is typical of this habitat, but which was observed only once (in 1919) on Rakata. The Lesser Crow-Pheasant *Centropus bengalensis javanensis* was found there ever since 1908 and was not called uncommon in 1930. Later on also the bigger *Centropus sinensis bubutus* was observed. Also representatives of *Pycnonotus goiavier personatus* and *Pycnonotus cafer aurigaster* were met with as early as 1908, as well as the shrike *Lanius schach bentet*, all of them birds which are considered by DAMMERMAN typical of this type of landscape, but the two last-mentioned species were not seen again after 1908 and 1919, respectively. It is not clear why *Pycnonotus cafer aurigaster* disappeared completely, whereas the other bulbul, *Pycnonotus goiavier personatus* spread across all three islands, the two species occurring side by side elsewhere. In my experience, however, this case does not stand by itself.

The White-breasted Waterhen, *Amaurornis phoenicurus javanicus*, was observed for the first time on Rakata as late as 1919. The bird was also found breeding there.

None of the *Lonchura* species, or other birds elsewhere living in grass-wildernesses, such as *Prinia inornata*, *Turnix suscitator*, and *Excalfactoria sinensis*, were ever seen on Rakata or the other islands.

The still young forest with as yet a limited number of trees would seem little attractive to many kinds of birds, and to this circumstance DAMMERMAN attributed the absence of gallinaceous birds and owls, parakeets, hornbills, barbets, pittas, drongos and timelids.

In view of the fact that the Koel, *Eudynamis scolopacea malayana*, is parasitic on the crow *Corvus m. macrorhynchus*, this scientist came

to the conclusion that the former could not arrive on Rakata prior to the latter. He saw a confirmation of this theory in the fact that the crow (1908) was indeed observed earlier than the Koel (1919). DAMMERMAN called this cuckoo "conspicuous" on account of its dimorphous plumage and its peculiar call, and further states that the species preferably lives (he writes "nest"', which must be a printing error for "rest", since this parasitic cuckoo does not build a nest) in "bushes and low shrubs"! These curious statements will be discussed in more detail on p. 333.

Macropygia phasianella remained known from one specimen shot on Verlaten Island. The presence of the two Nectariniidae, *Nectarinia jugularis microleuca* and *Anthreptes m. malacensis* was not established until 1920, that of the flowerpecker *Dicaeum trigonostigma flaviclune* in 1919, although no species of Loranthus or Viscum (parasitic plants) which are sometimes considered indispensable to these birds, were or are to be found on Rakata.

DAMMERMAN wondered at the fact that no fly-catchers (which he called birds of the forest) were observed before 1929, and that two of them, *Muscicapa rufigaster rhizophorae* and *Gerygone s. sulphurea* were found only in the light forest along the coast and in the mangrove and not in the deep forest (see also p. 334-335).

DAMMERMAN considered it evident that the "omnivorous" and fruit-eating birds arrived on Krakatau earlier, stayed there for a longer period of time, at any rate, than did the insectivorous ones, although the habitat had long been available for the latter category (forest). The same phenomenon was noticed with respect to bats.

When making comparisons with the island of Durian, south of Singapore, which is of about the same size as Rakata, DAMMERMAN concluded that the avifauna of the latter island would ultimatedly become twice that of 1934, and that the island had recovered 60 per cent of its normal fauna after a period of less than 40 years.

In making comparisons with Pulau Berhala, east of Medan, he pointed to a number of bird species not (yet) present on Rakata, giving as examples the owl *Ninox scutulata,* the kingfisher *Halcyon coromanda,* the cuckoos *Cuculus fugax* and *Surniculus lugubris* and the pigeons *Ptilinopus jambu* and *Caloenas nicobarica.*

None of the species mentioned here by DAMMERMAN are, however, common either in western Java or southern Sumatra, with the exception of the Drongo-Cuckoo *Surniculus lugubris,* so that it would not be surprising if these birds were not observed on the Krakatau Islands even in the next hundred years. The absence of *Surniculus* is probably due to

the want of "host-families", on which the bird usually parasitizes. Of the species at present known to act as "host" only *Copsychus saularis*, which only rarely functions as such, was observed on Krakatau (HOOGERWERF, 7, p. 92).

In drawing a parallel between the avifauna of Christmas Island, 350 km. south of Java, and that of Rakata, DAMMERMAN gives a list of 12 species of birds, of which the presence was established on both islands. Of these birds 7 have, however, to be reckoned among the northern migrants, whereas 3 are coastal birds with a wide distribution throughout the entire Indo-Malayan region.

In discussing the problem of distribution DAMMERMAN suggested the possibility of "local migration" of so-called resident birds, on the analogy of what was established in India with respect to *Eudynamis scolopacea, Merops viridis, Merops superciliosus, Nycticorax nycticorax* and *Terpsiphone paradisi*. He considered it very well possible that such local migrations might also occur in Indonesia, though no instances of it were known to him. He was, however, of the opinion that in western Java and Sumatra, where seasons do as a rule not differ to any considerable extent, there would seem little occasion for such migration.

I am of opinion that it is possible to point to "local migration" of many birds living here. Examples are: *Nycticorax nycticorax, Eudynamis scolopacea* and *Merops viridis* among the birds mentioned by DAMMERMAN and many others besides these, as certain Laridae, Ardeidae, Ciconiidae, Ploceidae, etc. DAMMERMAN should not have included *Merops superciliosus* here, as this bee-eater is a migrant from regions outside Indonesia.

In the following some references are made to literature published prior to DAMMERMAN's book, on the fauna of Krakatau and more in particular about its birds.

JACOBSON (9) commented on the exceedingly large number of orioles (*Oriolus chinensis maculatus*) present on Rakata. His idea was that the absence of most of the enemies of this birds (beasts of prey, tree-snakes, etc.) and the abundance of certain species of trees (e.g. Ficus fistulosa) and insects, might have created highly favorable living conditions for them. He further stated that no connections with the mainland are necessary to explain the presence of land-molluscs, as they were found on Krakatau 25 years after the eruption of 1883.

The list, published by E. D. VAN OORT in 1910 (10) of a collection made by JACOBSON from Java and Krakatau needs not be discussed, as it mentions very few Krakatau birds and gives no particulars which are of interest here.

The list published in 1919 by BARTELS Sr. (1) of the 32 species observed by him during an excursion to Krakatau and Verlaten Island from 24 till 29 April 1919, supplies few particulars as to the material observed and/or collected.

Haliastur indus intermedius, repeatedly observed on Rakata was, according to BARTELS, probably one and the same individual all along. *Eudynamis scolopacea malayana* was termed rather common on Rakata and Verlaten Island. *Caprimulgus a. affinis* was found in considerable numbers on Verlaten Island in a few glades. *Pachycephala cinerea vandepolli* was called rare and was seen only a few times on Rakata and once on Verlaten Island. Of *Lanius schach bentet* an adult and a young specimen were collected on Rakata, but "a number" of them was seen on Verlaten Island somewhere near the place where *Caprimulgus* was found. *Oriolus chinensis maculatus* was said to be abundant on both islands. About *Corvus m. macrorhynchus* BARTELS wrote: "Of this nest-robber fortunately only a few individuals live on Krakatau and Verlaten Island". Small groups of *Aplonis panayensis strigatus* were found scattered throughout both islands. *Treron vernans griseicapilla* was observed fairly frequently on either island, whereas the Emerald Dove, *Chalcophaps i. indica* was nowhere seen by BARTELS in Java in such great numbers as on Krakatau and Verlaten Island.

The data presented by DAMMERMAN in 1923 (3) on the birds are of little importance compared with those given in his work of 1948. To this article is appended a list, compiled by the ornithologists BARTELS Sr. and SIEBERS, of the birds known up till 1923 from Krakatau and Sebesi. From this list the following is derived.

SIEBERS also called *Pachycephala cinerea* rare within this region, whereas *Oriolus chinensis* was reported by BARTELS to be "abundant" on Rakata and Verlaten Island. According to SIEBERS *Corvus macrorhynchus* was not common on these islands.

The tern *Sterna fuscata* mentioned by SIEBERS is probably *Sterna anaetheta.*

The most meritorious article on the birds of the Krakatau Islands published so far is, in the opinion of the present author, that by CHASEN, which appeared in 1938 (2). This article clearly states which species of birds are and which are not of interest with regard to the new avifauna of this region, and which must be taken as having come from Java and which from Sumatra.

CHASEN's list, based on material sent to him by the Zoological Museum at Bogor and on data supplied by former authors, mentions 27 resident

birds, including *Geopelia s. striata, Alcedo caerulescens* and *Pycnonotus cafer aurigaster,* which were all of them observed only once, and *Lanius schach bentet,* which was not seen again either in subsequent years. Among these species 11 are reported to be breeding there.

Of this list twenty species (in my opinion also including *Centropus sinensis*) occurred on Krakatau in the same subspecies as are living in Java and Sumatra, four agreed subspecifically with birds from Java and three with material from Sumatra.

CHASEN pointed to the fact that on the near-by Sebesi there are still found several birds which were as yet not observed on the Krakatau Islands, e.g. *Arachnothera longirostris, Geokichla interpres, Orthotomus sepium, Lonchura punctulata* and *Copsychus malabaricus,* whereas also from Meeuwen Island he knew several typical Javan birds which so far were not found on Krakatau.

CHASEN called the number of birds on these islands 44 years after the eruption abundant, but found the population of the resident birds not constant, as is apparent from the differences observed in 1908, 1922 and 1933. He suggested that the re-population by birds may take place in the normal manner, i.e. through forms common in the surrounding lowlands. Different subspecies of the same species, of which one originated from Java and another from Sumatra, were not observed. Neither were found indications pointing to the formation of local subspecies or other deviations among the material investigated by CHASEN up to that date.

Findings of the present author

Since the present author and his party stayed almost exclusively on Pulau Rakata, the findings here reported on refer practically without exception to this island, a fact the reader is asked to bear in mind whenever it is not made sufficiently clear in the text.

A. Reptiles and lower animals

The number of Java monitors (*Varanus salvator*) observed on Rakata may safely be called large, at any rate in the south-eastern corner of this island and slightly north of this region. Some of these animals were, just as on Pulau Panaitan, very bold and frequently to be found near our kitchen.

Tracks of monitors were also found often associated with those of big marine turtles (*Chelonia mydas*) which had come on land to lay their eggs. This was seen, for example, in the bay of the "Zwarte Hoek", which shows that monitors occur in this area too. Turtles are not mentioned in DAMMERMAN'S book so that their presence is recorded

for the first time here. In my opinion this is not of any particular significance, as these animals may be observed in many places along Strait Sunda as well as on the surface of the seas surrounding these coasts. The only surprising thing is that the species was not mentioned already a long time ago.

Our notes record only one snake, viz., the python (*Python reticulatus*), which we met on descending a steep gritty slope towards the "Zwarte Hoek". Lizards (*Mabuia multifasciata*) were extremely numerous, particularly so in the neighbourhood of our bivouac and elsewhere in the south-eastern part of the island, whereas they were also observed in many other places. The species seems to occur throughout the island. House lizards (*Hemidactylus* sp.) were heard regularly.

The number of ants was tremendous and these troublesome animals were practically ubiquitous. In and around the bivouac were many flies and cockroaches, and many crickets were heard, but when perusing the long list made by DAMMERMAN of all the animals crawling and flying around on Krakatau, the author feels ashamed of having noticed so few.

B. Mammals

We are not conscious of having seen any new mammals on Rakata or the other islands, although this statement is to be taken with some reserve as far as bats are concerned, since none were collected.

In the traps set near our bivouac and in the cultivated areas close by, 14 rats were caught, all of them belonging to *Rattus rattus diardii*, the species whose presence had already been ascertained by former investigators. It is of interest that this "domestic rat" has managed to maintain itself so well, in spite of the fact that since 1922 (the year when HÄNDL left) there has been no human habitation on the island, although a kind of shelter had been built there, probably by people from Sebesi, who practice shifting cultivation on Rakata.

DAMMERMAN pointed to the interesting aspects created by this adjustment and considered it worth while to trace the modifications this species of rat may undergo after a certain period of time. The fact, however, that this population of rats will not remain pure, owing to the shifting cultivation practised on the island and the new import due to regular traffic with this agricultural area, would seem to rob this investigation of much of its attractiveness.

C. Birds

In view of the ornithological observations made by the present author, it appears probable that the data as recorded by DAMMERMAN have under-

gone some changes. If, to begin with, the list of birds and the notes about them [1]), found on pp. 328-345 of DAMMERMAN's book, are compared with our own observations, it is obvious that the situation is not the same. Here follows part of that list with the particulars of each species which to the present writer seem the most important ones, side by side with his own findings [2]). Below we only mention the species, which were also observed by me.

COLUMBIDAE

J. S. *Treron vernans griseicapilla* SCHLEG. The numerous observations made by former investigators show that this pigeon was fairly common between 1920 and 1934, also on Rakata. On this island the species could not be established by the author, but it was heard a few times and seen once on Verlaten Island on 26 August 1952.

J. S. *Macropygia phasianella emiliana* BP. The Sunda Island Cuckoo-Dove was not previously observed on Rakata, but on Verlaten Island it was seen, although here too only rarely (1 specimen in 1933). During our visit to Rakata the species was common, it was observed or seen daily and also a nest, containing one egg, was found. The author assumes that it occurs scattered throughout the island.

J. S. *Geopelia s. striata* LINN. Known from only one single specimen, obtained in 1919 by BARTELS Sr. on Rakata. The species has not been observed since, but the author repeatedly heard the "perkutut" on Verlaten Island when he spent only a few hours there on 26 August 1952.

J. S. *Chalcophaps i. indica* LINN. Formerly this species must have been very common on Rakata, since BARTELS, who was there in 1919 thought that he had seen this bird nowhere so frequently as on this island. The present author indeed heard the species probably every day and saw it several times, but would decidedly not call it common during his stay on Rakata. It appears to be scattered throughout the island.

RALLIDAE

J. S. *Amaurornis phoenicurus javanicus* (HORSF.). From observations made in the past the conclusion may be drawn that formerly this species

---

1) As much as possible, the species are here given in the same order as done by DAMMERMAN, but the names are here as well as elsewhere in this report, confirmed to the new nomenclature.

2) S. = agrees with the subspecies living in Sumatra.
J. = agrees with the subspecies living in Java.
J. S. = one and the same subspecies is living in Java and Sumatra. The names *not marked* J., S., or J. S. are those of birds which visit these regions during the winter months of the temperate zones only, or of birds whose identity is not certain.

was not at all rare on Rakata. It was observed breeding there. As to Rakata I myself have no definite observations, but may have heard the birds once (on 11 October 1951). On Verlaten Island, however, I saw a specimen in Ipomoea vegetation along the northern peninsula on 26 August 1952. This need not be an indication, however, of a decline in the numbers of this bird as many months may pass when the species is not or only rarely heard, which, in the view of the present writer, is the main indication of its presence. DAMMERMAN's view that the bird is conspicuous, apart from its call, is decidedly not corroborated by our experiences.

BURHINIDAE

J. S. *Esacus magnirostris scommophorus* (VIEILL.). So far the Stone-Plover was reported to occur on Verlaten Island and Anak Krakatau, but not on Rakata. We however, regularly noticed the bird there, occasionally even four specimens together, which we only rarely did elsewhere. On 26 August 1952 a newly-laid egg of this species was found on Verlaten Island.

CHARADRIIDAE

Pluvialis dominica fulva (GMELIN). DAMMERMAN reports having found a specimen on Verlaten Island. I observed the Golden Plover only on Anak Krakatau, but the species is a migrant from the north, as are the three species mentioned below, and consequently of little or no interest to the new ornis of Rakata and the other islands.

Numenius phaeopus variegatus (SCOPOLI). Observed only once by former investigators on Rakata. The author only observed the species on Anak Krakatau on 16 November 1952.

Actitis hypoleucos (LINNAEUS) was in the past observed regularly and also seen by us a few times along the coast of Rakata as well as on Verlaten Island.

LARIDAE

J. S. *Sterna s. sumatrana* RAFFLES. Known from Verlaten Island (1908, 1920, 1933). We observed this species near the south-western corner of Rakata, probably mated birds.

Sterna sp. The species of tern observed in September 1920 near Verlaten Island was in all probability *Sterna anaetheta,* a species regularly seen in the Sunda Strait. The other dark-winged species, *S. fuscata,* is extremely rare everywhere near Java. The author did not see either of

these terns near Rakata, but on 26 August 1952 a few specimens of *Sterna anaetheta* were observed along the coast of Verlaten Island.

ACCIPITRIDAE

Accipiter sp. During two visits a small bird of prey was noticed on Rakata and Verlaten Island (1920, 1933). DAMMERMAN took it to be *Accipiter virgatus gularis* (TEMM. & SCHLEG.), a migrating small sparrow-hawk. In view of the fact, however, that he reports having observed the bird "hovering", it seems unlikely that it belonged to the species *virgatus*. The bird in question must have been the bigger *Accipiter t. trivirgatus* (TEMM.) which may indeed be seen hovering in circles, a thing the smaller species has never been seen doing, as far as is known to the present writer. On Verlaten Island (on 12 October 1951) we observed a small *Accipiter*, probably *Accipiter v. virgatus* (TEMM.).

J. S. *Haliaëetus leucogaster* (GMEL.). The White-bellied Sea-Eagle is known from all islands of the group. The present author saw the species nearly every day, both an adult and a young specimen. A big nest was found in one of the tallest Casuarinas of the south-eastern corner of Rakata, probably built by this species.

J. S. *Haliastur indus intermedius* GURNEY. Repeatedly observed by former investigators, both on Rakata and on Verlaten Island (1919, 1920, 1932, 1933). The statements made by DAMMERMAN (see above p. 323) create the impression that this bird of prey is common near Krakatau, but BARTELS in 1919 had the idea that there was only one specimen. Not a single specimen was observed by the present author on Rakata, but on 26 August 1952 two birds of this species were seen along the coast of Verlaten Island. The statement that this bird is "such a remarkably common sight along the coasts everywhere", is not correct, as the species is rare along the coasts of Sunda Strait.

ALCEDINIDAE

J. S. *Halcyon chloris palmeri* (OBERH.). Frequently observed on Verlaten Island, Lang Island and Rakata, from 1908 onwards. We also saw this bird daily on Rakata. On this island a nest containing young was found.

CAPRIMULGIDAE

J. S. *Caprimulgus a. affinis* HORSF. Observed by nearly all visitors (1908, 1919, 1920, 1928, 1929, 1933) on Rakata and Verlaten Island and

also found breeding there. On this island neither seen nor heard by us, but on 26 August 1952 towards the evening a specimen was heard along the beach of Anak Krakatau. It seems certain that the species has decreased numerically within the Krakatau region.

APODIDAE

Collocalia sp. 1. Observed by JACOBSON as well as by later visitors (1908, 1919, 1920, 1928, 1934), but the species could not be classified. The present writer also on various occasions observed swiftlets with a dark underside, without being able to identify them. In his opinion they belonged to *Collocalia inexpectata.*

Collocalia sp. 2. In April 1934 a swiftlet with a light underside was seen, which we assume to have been *Collocalia esculenta linchi* HORSF. & MOORE. We, at any rate, gave that name to the birds we occasionally observed at close range on Rakata.

CUCULIDAE

J. S. *Eudynamis scolopacea malayana* CAB. & HEINE. Once again (see also p. 325) DAMMERMAN calls this cuckoo "conspicuous" on account of the strong contrast in feathers between the male and the female bird and owing to its very loud call. In the past the species was heard or seen many times and was in 1919 by BARTELS considered fairly numerous on Rakata and Verlaten Island. DAMMERMAN had the idea that the species became less numerous in later years. He further was of the opinion that the Koel could not arrive prior to the Largebilled Crow (*Corvus m. macrorhynchus* WAGL.) on which it parasitizes. This view is not shared by the present author, as the Koel, when not in the mating season, probably covers great distances and often lives in areas where no crows are to be found (the species does not parasitize exclusively on the crow just referred to, as D. seems to think, but also on the smaller *Corvus e. enca* (HORSF.) (HOOGERWERF, 7, p. 93).

DAMMERMAN is moreover mistaken in stating that *Eudynamis* preferably lives "in bushes and low shrubs". In our experience it is just in this environment that it is seen very rarely. Neither does the present writer think *Eudynamis* conspicuous: the species is rarely seen and its peculiar call is not heard for months on end, so that the birds may for a long time remain unobserved. Hence the fact that we cannot with certainty state that we observed the bird on Rakata or the other islands of the group — we possibly heard the species once (on 6 October) near

the south-eastern corner of Rakata — does not warrant the conclusion that it has disappeared or became very rare.

J. S. *Centropus bengalensis javanensis* (DUM.). The Lesser Coucal was observed regularly since 1908, also on Rakata. It was called common by DAMMERMAN. It is decidedly not so at present, as we saw it only once on this island, viz., on 7 October 1951, along the steep, grass and low shrub-covered northern slopes of Rakata. As the grass-wildernesses disappear this bird also is bound to go, but its chances will improve if the practice of shifting cultivation is maintained, since these areas, once abandoned, will again develop into plains, covered with grass, herbs, low shrubs etc. *Centropus bengalensis* requires a sunny environment without too heavy a vegetation, whereas the bigger *C. sinensis* favours dense shrubs and borders of heavy forest.

PICIDAE

J. S. *Dendrocopos m. moluccencis* (GMEL.). This small woodpecker was observed on several occasions, also on Rakata, the first being in 1920. We also established the presence of this bird a few times. In the opinion of the present writer it is fairly inconspicuous and thus easily escapes the attention.

HIRUNDINIDAE

Hirundo rustica gutturalis SCOP. BARTELS observed this swallow for the first time on Rakata in 1919; after that the species was seen regularly. It is a migratory bird from the north and hence of little significance. We observed these birds both on Rakata (repeatedly and on 7 October in a group of no less than 10 specimen) and on Verlaten Island.

MUSCICAPIDAE

J. *Muscicapa rufigaster rhizophorae* (STRES.). The species was established for the first time within the Krakatau group in 1929 and regularly after that. DAMMERMAN called this fly-catcher a typical inhabitant of mangrove and coastal forest, as indeed it is, but for Rakata this does not hold good, since it may there be seen throughout the interior of the island, nearly up to its very top. On p. 156 DAMMERMAN said that he thought it remarkable that this flycatcher had not been observed on Krakatau before, and that it had been seen only in the thin forest along the coast and in the mangrove, but never in the "primary" forest ("never in the deep jungle"). The last remark is not true, and what is remarkable about the bird is that it is least of all to be found in the coastal areas,

but does populate the whole of the interior! On Pulau Panaitan things are just the other way round as regards *Muscicapa banyumas*, a bird everywhere known from inland regions, but here also occupying the habitat of *M. rufigaster*.

J. S. *Gerygone s. sulphurea* WALL. In 1928 the Fly-eater was for the first time observed in the group of islands, viz., on Verlaten- and Lang Island. On Rakata it was mentioned for the first time in 1932 and regularly afterwards. We, too, frequently heard or saw this small flycatcher on Rakata in its most typical habitat: the coastal zone. Elsewhere this species is also known to inhabit the interior: it was found by the present author in the Pinus merkusii-forest of central Atjeh (North Sumatra). On Rakata the birds were not seen by him except in the coastal region.

S. *Copsychus saularis musicus* (RAFFL.). The Magpie Robin was observed for the first time in 1919. DAMMERMAN reported it to be fairly common on all the Krakatau Islands. At present it is decidedly not so any more on Rakata; the present author would be inclined to call it rare rather than common there. The bird was found only at two places near the coast, not far from the south-eastern corner of Rakata.

J. S. *Pachycephala cinerea vandepolli* FINSCH. The presence of this bird on Rakata was established for the first time in 1919, after which year it was observed regularly, although it was never common. It proved more numerous about 1933. *Pachycephala* was also observed regularly by the author and heard many times, especially in the early morning. The species is here far less common, however, than it is on Pulau Panaitan, but seems to be distributed throughout the island of Rakata, in about the same way as *Muscicapa rufigaster*.

CAMPEPHAGIDAE

J. S. *Lalage n. nigra* (FORST.) DAMMERMAN reports this cuckoo-shrike to be fairly numerous on Verlaten Island and Rakata. The species has been seen regularly since 1919, but we observed it only a few times, in fairly open coastal forest, at a short distance from the bivouac. From this we must conclude that the bird has greatly declined in numbers, since it usually does not lose much time in making its presence known to the observer.

PYCNONOTIDAE

S. *Pycnonotus goiavier personatus* (HUME) Regularly observed on Rakata since 1908. The author also found the "djogdjog" quite common more so near coast but not rare in the interior either.

ARTAMIDAE

J. S. *Artamus leucorhynchus amydrus* OBERH. After having been observed for the first time in 1908 the Swallow-Shrike was mentioned in nearly all subsequent reports. DAMMERMAN called the species "a familiar bird" on the Krakatau Islands. This does not at present apply to Rakata, although a few specimens were seen regularly at a certain place. It would seem to the present author that DAMMERMAN too often called a species "familiar", "frequently seen", "common", etc., without having investigated how far it was distributed throughout the island.

DICAEIDAE

J. *Dicaeum trigonostigma flaviclune* HART. Established for the first time in 1919 and regularly on subsequent occasions. DAMMERMAN termed it "a rather common bird", both on Rakata and on Verlaten Island. He pointed out that the parasitic Loranthus spp. which are dispersed by the Dicaeidae, do not occur on Rakata, so that these birds obviously also thrive without these plants. We, too, regularly observed this *Dicaeum* on Rakata, more often hearing than seeing it. They appear to be found throughout the island.

NECTARINIIDAE

S. *Nectarinia jugularis microleuca* (OBERH.). DAMMERMAN called the ordinary Yellow-breasted Sunbird one of the most common birds of Krakatau. The species was observed regularly from 1919 onwards. The author also saw the birds several times, but would not call them common, not on Rakata at any rate.

J. S. *Anthreptes m. malacensis* (SCOP.). Observed regularly on Rakata from 1919 onwards. The present writer would be inclined to call them rare on Rakata as he saw them only twice.

STURNIDAE

J. S. *Aplonis panayensis strigatus* (HORSF.). After its being observed for the first time in 1919 the species has, according to DAMMERMAN, rapidly increased in number. The author also saw the Tree-Starling regularly, but only at two places along the coast. His idea is that the species did not spread across the whole of Rakata and that as a result it is not to be termed common for the entire island. This seems also to have been the opinion of BARTELS in 1919, as is clear from p. 327.

ORIOLIDAE

J. S. *Oriolus chinensis maculatus* VIEILL. This oriole was called by DAMMERMAN one of the "first colonizers" of Krakatau. In 1908 the bird was already present on all three islands and found fairly abundant by DAMMERMAN in 1933. This decidedly no longer applies to Rakata, where the present author heard or saw them more or less regularly, but only at two different places near the south-eastern part of the island. The species is at present by no means to be termed common.

CORVIDAE

J. S. *Corvus m. macrorhynchus* WAGL. Ever since 1908 the Large-billed Crow was observed regularly on all of the three islands. We also observed the birds, but not on Rakata, where not a single specimen was seen. Several of them were observed, however, on Verlaten Island, during the few hours we spent there.

The following 23 species known from the Krakatau Islands were not observed by the present author:

Migrants	Stragglers and Residents
Charadrius leschenaultii, Charadrius dubius, Tringa nebularia, Chlidonias leucoptera, Alcedo atthis, Apus sp., *Muscicapa latirostris, Muscicapa narcissina, Acrocephalus arundinaceus, Lanius cristatus, Motacilla flava.*	*Ducula bicolor, Sterna bergii, Sterna dougallii, Oceanodroma leucorhoa, Egretta sacra, Butorides striatus, Fregata* sp., *Alcedo caerulescens, Centropus sinensis, Hirundo tahitica, Pycnonotus cafer, Lanius schach.*

To this list some notes may be added.

Migrants

Charadrius l. leschenaultii LESS. was recorded only for Verlaten Island and Anak Krakatau. *Charadrius dubius(?) curonicus* GMEL. is known from Verlaten Island only. *Tringa nebularia* (GUNN.) is also known from Verlaten Island (1932). The three species last mentioned were formerly observed near a small lake on Verlaten Island, which has ceased to exist.

Chlidonias leucoptera grisea (HORSF.) was in former days observed on or along Rakata as well as near Verlaten Island. DAMMERMAN's statement that this tern is easily recognizable by its black feathers, is not quite correct, since the feathers are only partly dark in the early spring or in the beginning of autumn. During most of the time the birds spend here, the greater part of their plumage is almost white, like that of the majority of the other terns. The two species of *Chlidonias* may usually be distinguished from the other terns living here by being smaller, and

by having a short bill and a short tail. DAMMERMAN reports that the bird breeds here (4, p. 78), but here too he is mistaken: the species has never been found nesting in Indonesia.

Alcedo atthis bengalensis GMEL. is known from one specimen from Verlaten Island (1933).

SIEBERS in 1920 saw a few swiftlets belonging to *Apus* sp. flying over Verlaten Island. He took them to be specimens of the migrant *Apus pacificus* (LATH).

Muscicapa l. latirostris RAFFLES was observed only once, in November 1932. In view of the fact that this unobtrusively coloured flycatcher is rather hard to discover, no conclusions can be drawn from this single observation as to the frequency with which the bird occurs on Rakata, or as regards the date of its arrival. *Muscicapa narcissina xanthopygia* (HAY) is also known from only one specimen, which was collected in 1932 on Rakata. Although this flycatcher would seem to be easy to spot owing to the conspicuous feathers of the male bird, it appears not to be so in reality, unless the number of specimens visiting Java be too small for the species to be seen except on very rare occasions.

Of *Acrocephalus arundinaceus orientalis* (TEMM. & SCHL.) one specimen was found on Rakata in 1934.

Of *Lanius cristatus superciliosus* LATH. an adult and a young specimen were collected on Rakata in September 1920. This has remained — as far as is known to me — the only time they were observed. The peculiar thing about this bird is that in a majority of cases young specimens — at any rate birds which do not yet have the adult plumage — are seen or collected, as is also shown by the various collections seen by the author.

Motacilla flava simillima HART. [1]) was observed once on Rakata and twice on Verlaten Island. The view that this wagtail is easily distinguishable in its natural surroundings from *Motacilla cinerea* by the yellow underparts of the former, is not shared by the present writer. Not rarely the underparts differ so slightly in colour as to be hardly, if at all, distinguishable. We probably observed *Motacilla cinerea* subsp. on Rakata. Both species are migrants from the northern hemisphere and consequently of little account here.

Stragglers and Residents

Ducula b. bicolor (SCOP.) was observed on Rakata in April, September and December and during different visits. They are known to be present in great numbers to-day and absent altogether to-morrow.

1) According to K. H. VOOUS (Treubia, 20, 1950, p. 647-656) the subspecies *taivana* was also collected within the Krakatau complex.

Sterna bergii cristata STEPH. is known from Verlaten Island (1920, 1933), which is also the case with *Sterna dougallii bangsi* MATH. (1908, 1920).

Oceanodroma leucorhoa monorhis (SWINH.) flew aboard the ship in October 1921 near Verlaten Island.

The terns mentioned above and the stormy petrel are of little interest to the study of the new fauna of Krakatau, since they are all of them sea-birds and decidedly stragglers.

Egretta s. sacra (GMEL.) is known from both Rakata and Verlaten Island and was observed on various occasions. *Butorides striatus* subsp. is known from the lake on Verlaten Island mentioned above (1920, 1933).

A *Fregata* was occasionally seen over Krakatau, probably belonging to the species *ariel,* which is often met with in this part of Indonesia. We did not see any *Fregata* near the Krakatau Islands, but these birds wander from place to place, covering enormous distances, so that what was said in connection with *Oceanodroma* and the terns also holds good here.

Alcedo caerulescens VIEILL. was observed only once on Gn. Rakata but not collected (JACOBSON, 1908).

BARTELS reports having heard *Centropus sinensis bubutus* HORSF. once (1919) on Verlaten Island. CHASEN (2), grouped the bird with the subspecies *eurycercus* known from Sumatra, but more recent investigations (HOOGERWERF, 6) have shown that no distinction can be made between the populations on Java and Sumatra.

Hirundo tahitica javanica SPARRM. was observed frequently on Rakata (1919, 1920, 1933). DAMMERMAN mentioned, as features by which the bird is easily recognized, its smaller dimensions (as compared with *Hirundo rustica*) and its square tail, overlooking the characteristic which, according to the present writer, is the most decisive one, viz., its darker underparts, which are noticeable even when the bird is flying.

JACOBSON reported that he saw *Pycnonotus cafer aurigaster* (VIEILL.) in 1908. The truth of this statement need not be doubted, since the "kutilang" is so common a bird as to be familiar to practically everybody. The species was not seen on the islands afterwards.

As early as 1908 *Lanius schach bentet* HORSF., which is well-known in many parts of Java, was found on Rakata and after that year observed regularly. It was even found to be nesting there. In 1919-1922 the species seems to have been fairly numerous. After about 1933, however, it was not seen any more. It appears likely that the bird left when the habitat it favours disappeared (grass jungles with low shrubs, shifting cultivation, etc.) as DAMMERMAN suggested. Apart from the northern slopes of Rakata,

which are covered with low shrubs, etc., there seems no suitable habitat left for this bird. But also in Udjung-Kulon, where an excellent environment for the species would seem to be present, it has been observed only very rarely.

In the author's opinion, the fact that these 23 species were not observed by him does not justify any serious discussion, since it would be jumping to conclusions to state that they no longer occur within the group of islands, solely because in the course of the nine days spent there and during the short visits in August and November 1952, we neither heard nor saw them. A considerable part of Rakata was not covered by foot, whereas only about ten hours were spent on Verlaten Island, eight hours on Anak Krakatau and twenty minutes on Lang Island.

Of greater value than the negative results stated above are the positive ones, i.e. the observation of species which were observed by the present author for the first time on the Krakatau group, and of those which in the last few years may have extended their territories within these islands. These are the following 16 species observed on:

Rakata	Verlaten Island	Anak Krakatau
J. S. *Spilornis cheela* subsp. *Falco* sp.	J. S. *Falco s. severus* HORSF.	J. S. *Esacus magnirostris scommophorus* (VIEILL.)
J. S. *Esacus magnirostris scommophorus* (VIEILL.)	J. S. *Esacus magnirostris scommophorus* (VIEILL.)	*Charadrius mongolus* subsp.
? *Arenaria i. interpres* L.	J. S. *Geopelia s. striata* L.)	*Calidris tenuirostris* (HORSF.)
J. S. *Sterna s. sumatrana* (RAFFLES)	*Merops superciliosus philippinus* L.	*Motacilla cinerea* subsp.
J. *Ptilinopus melanospila melanauchen* (SALV.)	J. S. *Pycnonotus plumosus* subsp. *Aethopyga* sp.	
J. S. *Macropygia phasianella emiliana* BP.		
J. S. *Chaetura leucopygialis* (BLYTH)		
Motacilla cinerea subsp.		
J. S. *Pycnonotus plumosus* subsp. *Aethopyga* sp.		

Of these sixteen different species eleven are new to the entire group i.e. they have not been observed on the islands of the Krakatau group previously, which means an increase in the number of species known from this area of almost twenty per cent (without the migrants about twelve per cent). The remaining species were known from one of the Krakatau Islands, but not yet from the island where they were observed by the present author. Of these the most important is *Macropygia phasianella*, which at present may be called almost common on the main island and which was also found to breed there.

Here follow some particulars about the eleven new species mentioned above, among which are four migrants.

ACCIPITRIDAE

Spilornis cheela subsp. We heard the species repeatedly and saw it once (on 6 and 11 October), in all cases south-west of our Rakata bivouac. *Spilornis* is known from both Java and Sumatra, and the differences between the various subspecies cannot be observed in the field, so that nothing can as yet be said concerning the origin of the birds.

FALCONIDAE

Falco s. severus HORSF. Slightly over a month after the big eruption of the young volcano Anak Krakatau, in the beginning of October 1952, which severely damaged the vegetation of Verlaten Island, and as a result of which nearly all birds seemed to have disappeared, one single specimen of this small falcon was observed in the heavily damaged tjemaras (Casuarina equisetifolia). This was on 16 November 1952.

? *Falco* sp. From the top of Rakata, in the afternoon of 7 October were seen two falcon-like birds, of the size of Peregrine Falcons and more or less evenly dark coloured. They were chasing each other along the northern steep slope of Rakata, fairly continuously uttering a shrill call. The author does not venture to say to which species these birds belonged, since he did not get a full view of them and they were at rather a long distance from the observation post.

CHARADRIIDAE

Charadrius mongolus subsp. On 16 November 1952 a few specimens of this migratory plover were observed on Anak Krakatau, shortly after an eruption had taken place which in the lower regions had deposited a two metres' thick layer of ashes.

Arenaria i. interpres L. The Turnstone was probably observed by the author in a small group along the southern coast of Rakata.

Calidris tenuirostris (HORSF.). On the same afternoon when the presence of *Charadrius mongolus* was established on Anak Krakatau some six Great Knots were observed, which, together with the Whimbrel (*Numenius phaeopus variegatus*) were searching for food along the flood-mark of this young volcano. The birds (migrants) could be closely watched by means of a telescope, so that there is no doubt as to their identity.

COLUMBIDAE

Ptilinopus melanospila melanauchen (SALV.). This small fruit-dove usually reveals its presence by its monotonous, but peculiar call, which it utters during the greater part of the year. This species is undoubtedly new to Rakata, since otherwise our predecessors were sure to have observed it. We heard the birds on several occasions, and saw them in the afternoon of 11 October in a Ficus near the "Stone Plover Bay", where a number of specimens of both sexes, together with *Macropygia phasianella* and other birds, were feeding on the ripening fruits of the Ficus. The species is known only from Java and from areas further east, but not from Sumatra, so that in this case it seems clear where the bird came from. *Ptilinopus melanospila* was also observed on Pulau Panaitan.

APODIDAE

Chaetura leucopygialis (BLYTH). Observed from the top of Rakata on 7 October, when several specimens were seen flying along the steep northern wall. At the same place were seen *Collocalia* and several specimens of *Hirundo rustica*. The swiftly-flying, fairly, small, dark birds with an almost white back, whose presence was also established by the author in Udjung-Kulon, can in his view only belong to this species.

MEROPIDAE

Merops superciliosus philippinus L. A few specimens of this migrating bee-eater were observed along Verlaten Island during our visit to this island on 26 August 1952.

MOTACILLIDAE

Motacilla cinerea subsp. Although the present author does not venture the definite statement that the birds he saw a few times on the beach of the south-eastern corner of Rakata and on Anak Krakatau

belonged to this species, he is fairly sure of it, in view of the grey upper- and nearly white underparts of the birds.

PYCNONOTIDAE

Pycnonotus plumosus subsp. Observed in the forest northwest of our bivouac on the afternoon of 6 October; at first they were heard only, but later on one was seen as well. There were probably a few of them together. On 26 August 1952 another few individuals were seen on Verlaten Island. The species has been observed both in Java and in Sumatra and the subspecific differences are not noticeable in the field. The birds are not rare on Pulau Panaitan.

NECTARINIIDAE

Aethopyga sp. In the south-eastern part of Rakata (6 and 7 October) as well as on Verlaten Island (12 October) *Aethopyga* was observed. The only specimens seen, however, were female and male birds not in mating plumage, so that it was unfortunately impossible to determine the species. Both *Aethopyga siparaja* and *mystacalis* are known from Java and Sumatra so that in this case too it is impossible to say where the birds originally came from. On Pulau Panaitan a few specimens of *Aethopyga siparaja* were collected.

The five species now established for islands of this group other than those from which they were known previously, do not require any comment, with the exception of *Macropygia phasianella,* a resident bird which may be assumed to have extended its territory in the course of the last few years, as otherwise it would have been noticed by former observers on Rakata. To his regret the author is unable to make any statement as to the number present on the other islands, since in the short time he spent there, he did not see any.

The total number of species of birds seen per day as a rule amounted to 20, with a maximum of 25 species in the course of six hours' watching. Observations were made almost exclusively in areas along or near the coast, not higher than about 50 metres, but some trips were made to higher zones, one to the summit of Gn. Rakata (± 800 m).

Anak Krakatau

Finally follows a list of the eleven birds observed on Anak Krakatau during the short time spent there on 12 October 1951 and in August and November 1952.

Haliaëetus leucogaster; Esacus magnirostris scommophorus; Pluvialis dominica fulva; Charadrius mongolus subsp.; *Numenius phaeopus variegatus; Calidris tenuirostris; Actitis hypoleucos; Caprimulgus a. affinis; Hirundo rustica gutturalis; Motacilla cinerea* subsp.; *Pycnonotus goiavier personatus.*

Too much value is not to be attached to this list of birds, as the author assumes that of these species, seven of which are migrants, none are permanent inhabitants of this small island. The very short distance separating Anak Krakatau from the other islands of the group, makes it moreover hardly worth while to study the ornis of this young volcano.

These data show that the avifauna within this complex, at any rate that of the main island Gn. Rakata, is still subject to substantial changes. These changes are probably correlated with those in the vegetation, which still does not seem to have reached its ultimate stage, but about which the author does not venture a definitive opinion.

It appears from the foregoing that at present 70 different species of birds are known for certain from the Krakatau group. If this number is compared with that known from Pulau Panaitan (95, excluding the dubious ones), the number of species of this so much smaller group of islands may decidedly be called satisfactory, although it should be borne in mind that the attention given to the birds of Krakatau may have been more thorough than that devoted to the ornis of Pulau Panaitan (8), and in any case covered quite a number of years and different seasons, which is highly important.

The list appended makes the difference in composition of the avifauna of these two islands abundantly clear. It is easy to explain the absence from Krakatau of forest birds observed on Pulau Panaitan, as, e.g. hornbills and the two woodpeckers, by the lack of heavy forest on Krakatau, to which also the absence of *Gracula religiosa*, the lover of tall trees, is to be attributed. The fact that most of the stork- and heron-like birds found on Pulau Panaitan are not to be found on Krakatau is probably to be accounted for by the absence of such an excellent feeding area as is afforded by the "lagoon of the dead mangrove" of the former island. In the same way is on Krakatau lacking the habitat best favoured by a few *Alcedinidae.*

But as regards species as *Gallus gallus, Caprimulgus macrurus, Pelargopsis capensis, Pericrocotus cinnamomeus, Pycnonotus atriceps, Copsychus malabaricus, Orthotomus sepium, Muscicapa banyumas Hypothymis*

azurea, Dicrurus hottentottus, etc. the habitat does seem present within the Krakatau group, so that it seems probable that it will only be a question of time before the latter islands are populated by these species from the hardly 40 km. distant Pulau Panaitan.

On Krakatau were observed neither Timelids, nor *Aegithina tiphia* subsp., a bird so common along many parts of the coast of Bantam, whereas the remarkable fact appeared that *Muscicapa banyumas,* which is abundant on Pulau Panaitan, is entirely lacking on Krakatau, and *Muscicapa rufigaster,* so numerous on Krakatau, is wanting altogether on Pulau Panaitan!

The other species whose presence was established on Krakatau, but which are not known from Pulau Panaitan, do not require any comment here.

Although it is obviously uncertain whether the ornithological changes as observed by the present writer will be permanent, they seem of sufficient importance to be recorded, and it would seem advisable to trace future developments.

Postscript

In the beginning of October 1952 the Krakatau complex underwent considerable changes, as a series of eruptions of the young volcano Anak Krakatau not only completely destroyed the vegetation of that island, but also practically defoliated the vegetation of Verlaten Island and of Lang Island and covered the earth with a layer of ashes of from 15 to 25 cm. thick.

Consequently hardly any living animals were found on our visit of 16 November 1952. It may safely be assumed that practically all birds, if they were not killed by the catastrophe, left the islands. On the desolate Verlaten Island were nevertheless already found again two Stone-Plovers (*Esacus magnirostris*) as well as a bird, completely new to the entire group, viz., the Oriental Hobby (*Falco severus*). On the beach of the heavily-stricken Anak Krakatau were seen a group of *Charadrius mongolus,* together with a *Pluvialis dominica, Numenius phaeopus* and a few *Calidris tenuirostris,* of which neither the last-mentioned nor *Charadrius mongolus* had been observed on this group of islands before. The visit consequently yielded three "new" species.

Although the main island, Gn. Rakata, was not visited, we had the impression from the sea that it had not suffered at all, so that its fauna may be assumed to have remained fully intact.

LIST OF THE BIRDS KNOWN FROM THE KRAKATAU ISLANDS (K.I.) AND PULAU PANAITAN OR PRINSEN ISLAND (P.P.) [1]

	K. I.	P. P.
PROCELLARIIDAE		
Occanodroma leucorhoa monorhis	×	
Oceanites oceanicus		×
SULIDAE		
Sula leucogaster plotus		×
Sula sula rubripes		×
FREGATIDAE		
Fregata sp.	×	
ANHINGIDAE		
Anhinga anhinga melanogaster		×
ARDEIDAE		
Ardea sumatrana sumatrana		×
Ardea cinerea rectirostris		×
Ardea purpurea manilensis		×
Egretta alba modesta		×
Egretta intermedia intermedia		×
Egretta sacra sacra	×	×
Ardeola speciosa		×
Butorides striatus subsp.	×	×
CICONIIDAE		
Ciconia episcopus episcopus		×
Leptoptilos javanicus		×
ACCIPITRIDAE		
Haliastur indus intermedius	×	×
Accipiter trivirgatus trivirgatus	×?	
Accipiter virgatus virgatus	×	
Haliaeëtus leucogaster	×	×
Ichthyophaga ichthyaetus ichthyaetus		×
Spilornis cheela subsp.	×	×
FALCONIDAE		
Falco peregrinus calidus		×
Falco severus severus	×	
Falco sp.	×	
PANDIONIDAE		
Pandion haliaetus subsp.		×
PHASIANIDAE		
Gallus gallus bankiva		×
TURNICIDAE		
Turnix suscitator suscitator		×
RALLIDAE		
Porzana fusca rubiginosa		×
Amaurornis phoenicurus javanicus	×	×
CHARADRIIDAE		
Squatarola squatarola australis	×	×
Pluvialis dominica fulva	×	×
Charadrius dubius curonicus	×	
Charadrius mongolus subsp.	×	×?
Charadrius leschenaultii leschenaultii	×	×?
Numenius phaeopus variegatus	×	×
Numenius madagascariensis		×
Tringa totanus eurhinus		×
Tringa nebularia	×	×
Actitis hypoleucos	×	×
Arenaria interpres interpres	×	×
Calidris tenuirostris	×	
Ereunetes minutillus subminutus		×
BURHINIDAE		
Esacus magnirostris scommophorus	×	×
LARIDAE		
Chlidonias leucoptera grisea	×	
Sterna dougallii bangsi	×	×
Sterna sumatrana sumatrana	×	×
Sterna anaetheta anaetheta	×	×
Sterna bergii cristata	×	×
Anous stolidus pileatus		×
COLUMBIDAE		
Treron griseicauda pulverulenta		×?
Treron vernans griseicapilla	×	×
Ptilinopus melanospila melanauchen	×	×
Ducula aenea polia		×
Ducula bicolor bicolor	×	

[1] For the birds known from the Nature-reserve Udjung Kulon and the Bantam coast, east of that most western peninsula of Java, the reader is referred to Treubia, 19, 1948, pp. 83-137.

	K. I.	P. P.
Macropygia phasianella emiliana	×	×
Geopelia striata striata	×	×
Streptopelia bitorquata bitorquata		×
Chalcophaps indica indica	×	×
CUCULIDAE		
Eudynamis scolopacea malayana	×	×
Centropus sinensis bubutus	×	×
Centropus bengalensis javanensis	×	
STRIGIDAE		
Otus bakkamoena lempiji		×
CAPRIMULGIDAE		
Caprimulgus macrurus macrurus		×
Caprimulgus affinis affinis	×	
APODIDAE		
Collocalia fuciphaga fuciphaga		×?
Collocalia inexpectata bartelsi	×	×?
Collocalia esculenta linchi	×	
Chaetura leucopygialis	×	
Apus pacificus pacificus	×?	
Apus affinis subfurcatus		×
Cypsiurus parvus infumatus		×
Hemiprocne longipennis longipennis		×
ALCEDINIDAE		
Halcyon chloris palmeri	×	×
Halcyon coromanda minor		×
Halcyon cyanoventris		×
Pelargopsis capensis capensis		×
Alcedo atthis bengalensis	×	
Alcedo meninting meninting		×
Alcedo caerulescens	×	
Ceyx rufidorsus		×
MEROPIDAE		
Merops superciliosus philippinus	×	×
BUCEROTIDAE		
Aceros undulatus undulatus		×
Anthracoceros malabaricus convexus		×

	K. I.	P. P.
CAPITONIDAE		
Megalaema australis australis		×?
PICIDAE		
Dendrocopos moluccensis moluccensis	×	×
Dryocopus javensis javensis		×
Mülleripicus pulverulentus pulverulentus		×
HIRUNDINIDAE		
Hirundo tahitica javanica	×	
Hirundo rustica gutturalis	×	×
MOTACILLIDAE		
Motacilla cinerea subsp.	×	
Motacilla flava simillima [1]	×	×
CAMPEPHAGIDAE		
Coracina novaehollandiae javensis		×
Lalage nigra nigra	×	×
Pericrocotus cinnamomeus saturatus		×
LANIIDAE		
Lanius schach bentet	×	
Lanius cristatus superciliosus	×	
ARTAMIDAE		
Artamus leucorhynchus amydrus	×	×
PYCNONOTIDAE		
Pycnonotus atriceps atriceps		×
Pycnonotus cafer aurigaster	×	
Pycnonotus goiavier subsp.	×	×
Pycnonotus plumosus subsp.	×	×
MUSCICAPIDAE		
Copsychus saularis subsp.	×	×
Copsychus malabaricus subsp.		×
Gerygone sulphurea sulphurea	×	×
Cisticola exilis lineocapilla		×
Acrocephalus arundinaceus orientalis	×	
Orthotomus sepium sepium		×
Rhipidura javanica javanica		×
Muscicapa latirostris latirostris	×	
Muscicapa rufigaster rhizophorae	×	
Muscicapa banyumas subsp.		×

[1] See note on p. 338.

	K. I.	P. P.
Muscicapa narcissina xanthopygia	×	
Hypothymis azurea javana		×
Pachycephala cinerea subsp.	×	×
DICAEIDAE		
Dicaeum trochileum trochileum		×
Dicaeum trigonostigma flaviclune	×	×
NECTARINIIDAE		
Anthreptes malacensis malacensis	×	×
Nectarinia jugularis subsp.	×	×
Aethopyga siparaja subsp.		×
Aethopyga sp.	×	
Arachnothera longirostris prillwitzi		×
STURNIDAE		
Aplonis panayensis strigatus	×	×
Gracula religiosa religiosa		×
PLOCEIDAE		
Erythrura prasina prasina		×
DICRURIDAE		
Dicrurus hottentottus subsp.		×
ORIOLIDAE		
Oriolus chinensis maculatus	×	×
CORVIDAE		
Corvus macrorhynchus macrorhynchus	×	
Corvus enca enca		×
Total (without the queries) :	70	95

LITERATURE

1. BARTELS, Sr. M.—Lijst van vogels en zoogdieren, waargenomen van 24-29 April 1919 op de eilanden Krakatau en Verlaten Eiland. Handelingen 1ste Ned. Ind. Natuurw. Congres (1919) : 76.
2. CHASEN, F. N.—On a collection of birds from the Krakatau group of Islands. Treubia, 16 (1937) : 245.
3. DAMMERMAN, K. W.—The fauna of Krakatau, Verlaten Island and Sebesy. Treubia, 3 (1922) : 61.
4. DAMMERMAN, K. W.—The Fauna of Krakatau 1883-1933. Verhandelingen der Kon. Ned. Akademie van Wetenschappen, Afd. Natuurkunde, Tweede Sectie, Deel 44 (1948) : 594 pp.
5. DOCTERS VAN LEEUWEN, W. M.—Krakatau, 1833-1933, A. Botany. Annales Jard. Bot. Buitenzorg 46/47 (1936) : 506 pp.
6. HOOGERWERF, A.—Is *Centropus sinensis curycercus* Hay van Sumatra, Borneo en omliggende eilanden inderdaad verschillend van de op Java levende *Centropus sinensis bubutus* Horsf.? Limosa, 19 (1946) : 40-44.
7. ———— Bijdrage tot de Oologie van Java. Limosa, 22 (1949) : 279 pp.
8. ———— Some notes about the Nature Reserve Pulau Panaitan (Prinseneiland) in Strait Sunda. Treubia, 21 (1953) : 481-505.
9. JACOBSON, E. R.—De nieuwe fauna van Krakatau. Jaarverslag Top. Dienst Ned. Indië (1908) : 192.
10. OORT, E. D. VAN—List of a collection of birds from Western Java and Krakatau. Notes Leyden Museum, 32 (1910) : 105.

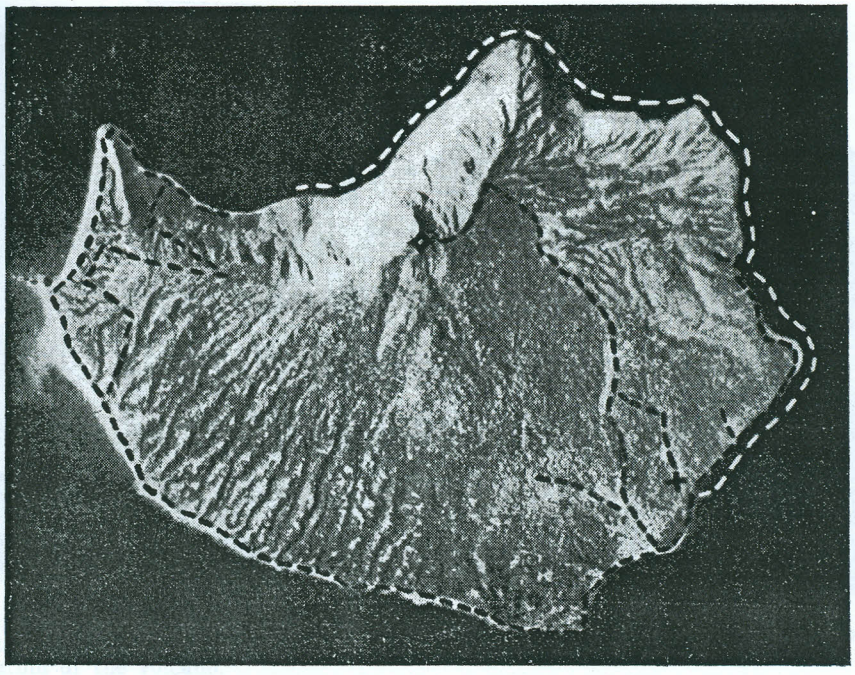


Fig. 1. Pulau Rakata as seen from the air.
◇ = summit (about 800 m above sea-level).
\+ = place of our bivouac.
- - - - - = covered on foot or by boat.

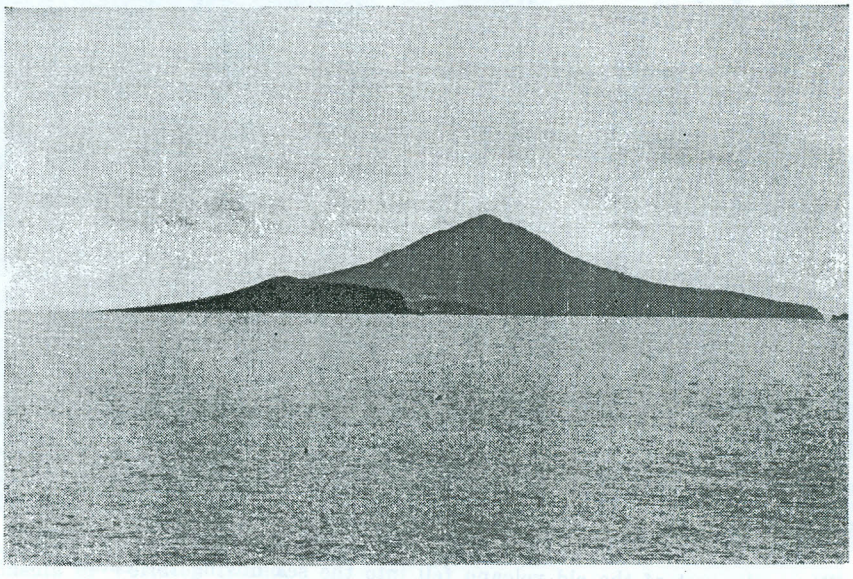


Fig. 2. Pulau Rakata with Anak Krakatau in the foreground, seen from Verlaten Island after the eruptions of October 1952.

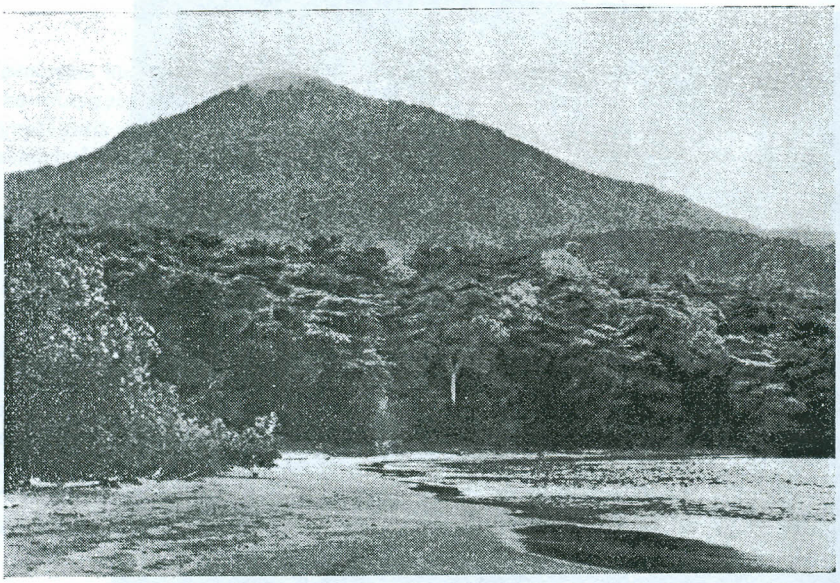


Fig. 3. Forest along Rakata's east coast; in the background the top of Rakata.

Fig. 4. Where the rest of the old volcano fell into the sea during the catastrophe of 1883. In the foreground *Casuarina equisetifolia*.

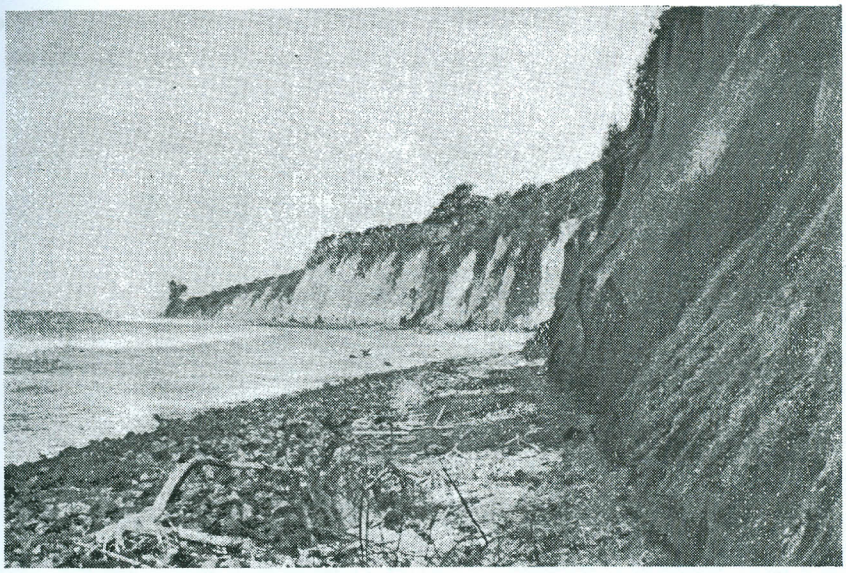


Fig. 5. Rakata's southcoast; the layers of ashes — at many places 30-40 metres thick — originating from the eruptions of 1883, cover the old substratum of the volcano.

Fig. 6. *Casuarina equisetifolia*, heavily damaged by the surf on the northern peninsula of Verlaten Island.

Fig. 7. *Casuarina equisetifolia* was a very important element in the vegetation of Anak Krakatau before the eruptions of October 1952.

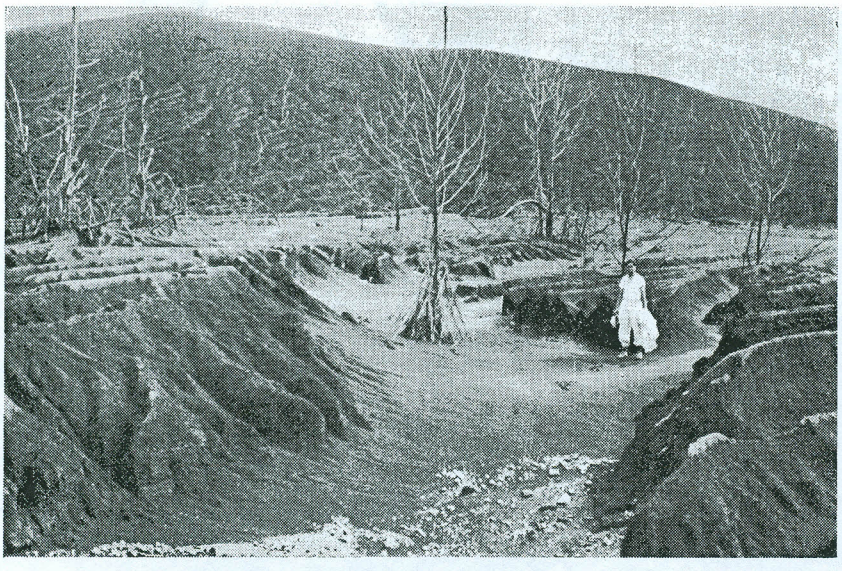


Fig. 8. A picture from about the same place as fig. 7, but taken a f t e r the eruptions of October 1952.

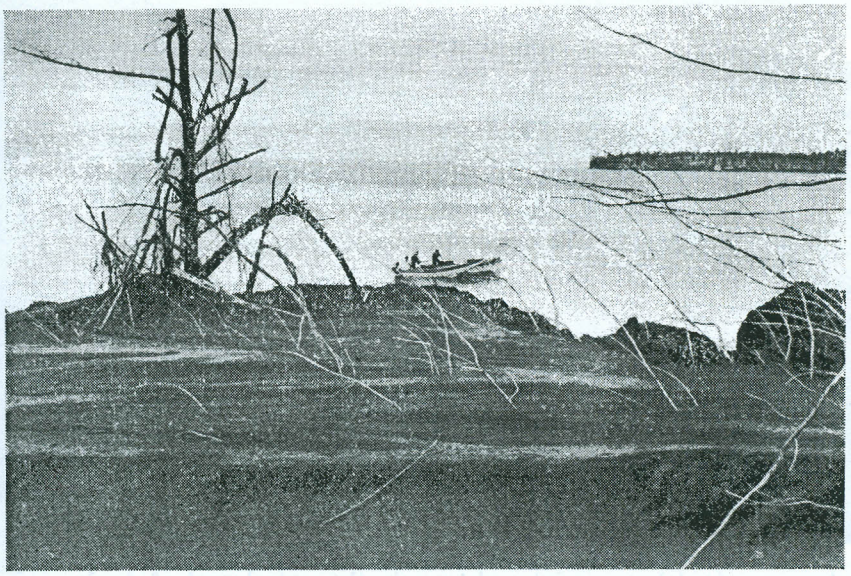


Fig. 9. Anak Krakatau seemed to be deprived of any trace of life when we were there in November 1952.

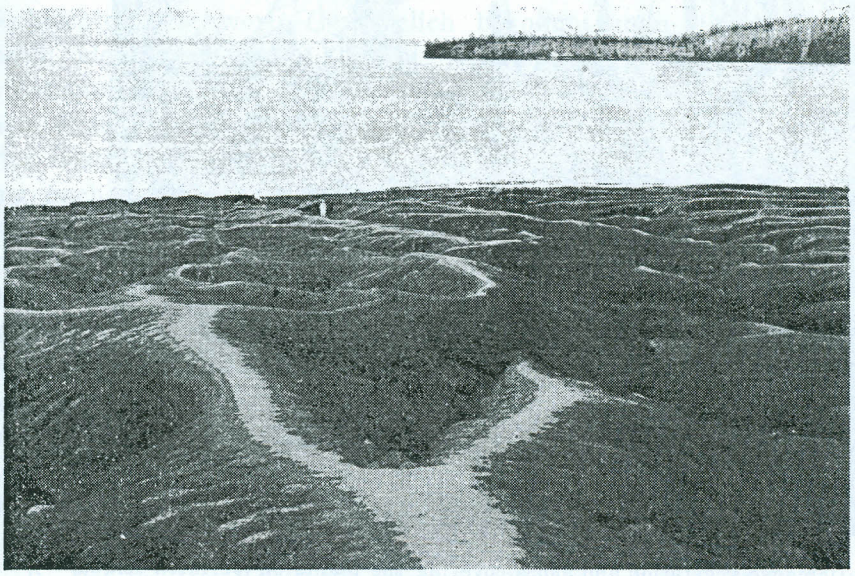


Fig. 10. Not later than a month after the October eruptions it was difficult to reach the top of Anak Krakatau owing to the many erosion gullies. In het background the damaged vegetation of Lang Island.

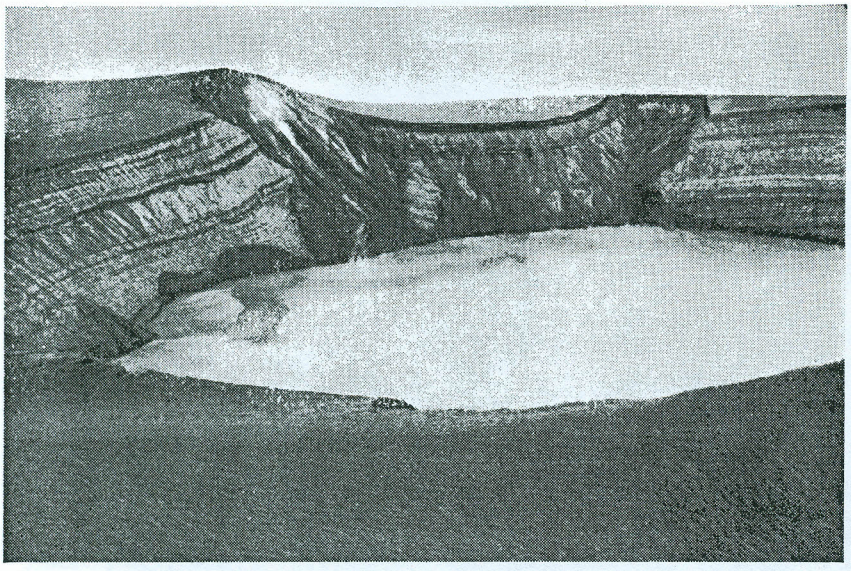


Fig. 11. A new crater-lake came into existence in the central part of Anak Krakatau.

Fig. 12. Damaged vegetation and ashes covering the plants on Verlaten Island after the eruptions of Anak Krakatau in October 1952.