

AN EXTINCT GOOSE FROM THE ISLAND OF HAWAII

By ALEXANDER WETMORE

In the course of engineering operations connected with the domestic water supply of Pahala on the Island of Hawaii, in 1926, fragmentary bones of a good-sized bird were obtained by W. O. Clark. Through the United States Geological Survey these were forwarded to the United States National Museum. The specimens were taken from a tunnel at a depth of about 100 feet from the surface at a point approximately 1000 feet to the eastward of the shoulder of the mountain peak called Kaumaikēohu, which is shown in the northeastern corner of the Honuapo quadrangle of the Geological Survey topographic map of this area.

Mr. Clark has kindly supplied the following data regarding the find: "The formation in which the bones were found was almost certainly Pahala, buried beneath 75 or 80 feet of lava flows. The bones were located on top of the ash bed or practically so, though there may have been a few (2-4) inches of ash above them. I was not present at the time that they were encountered, but when I arrived the tunnel foreman showed me the place, which as I remember it was a depression in the ash; the lava did not fit down into this small depression. Thus, the bones lay in a small cavity perhaps one foot in length and five or six inches in height."

The bones are very fragile, are stained brown in places and are considerably cracked and warped. Although the change in them may have come in part from their long contact with the ash, they present the appearance of having been subjected to a considerable degree of heat from the lava that overflowed the area.

When the specimens were first examined in the National Museum, it was obvious that they came from a good-sized goose, considerably larger than the Nene or Hawaiian Goose (*Nesochen sandvicensis*) native on the island, but beyond that there was little that could be learned from them. Comparative material in modern goose skeletons at the time was scanty and the bones from the tunnel were highly fragmentary. As years have passed, this part of the skeleton collections in the National Museum has increased steadily through addition of the Nene and of various other species until now it is possible to complete the studies of the Pahala bones that have been made from time to time through the intervening years. It develops that the goose is an extinct species of the subfamily Cereopsinae, a peculiar form that is described below as an interesting addition to the Hawaiian fauna.

***Geochen rhuax* new genus and species**

Characters.—Tibiotarsus (fig. 39) similar to that of living *Cereopsis novaehollandiae* Latham (Index Orn. Suppl., 1801:67; Victoria, Australia), but with tendinal bridge broader and heavier; support for groove for tendon of peroneus profundus heavier, and extending farther distally; inner side of anterior face of shaft deeply grooved above tendinal bridge, with an extensive undercut.

Description.—Type, a fragmentary right tibiotarsus, U. S. Nat. Mus. no. 16740, from the water supply tunnel 1000 feet east of the shoulder of Kaumaikēohu, above Pahala, Island of Hawaii, forwarded by W. O. Clark in 1926. Shaft fairly strong, with condyles relatively heavy; front of shaft at lower end deeply grooved, with a strong undercut on the inner side immediately above tendinal bridge; inner margin of shaft rounded, outer side flattened, so that margin is sharply angular; tendinal bridge strong and heavy, and flattened, so that its longitudinal axis meets that of shaft at a low angle; a broad level space external to bridge bounded at its outer margin by a sharply raised line; support for tendon of peroneus profundus relatively broad and strong; intercondylar fossa broad, open and only slightly excavated; anterior portions of condyles largely broken away so that their form is uncertain; intercondylar sulcus broad and shallow; posterior surface of lower end of shaft broadly rounded; angles of the condyles low and rather rounded; central portion of shaft rather slender, with peroneal ridge heavy; a foramen on inner portion of anterior face a short distance below peroneal bridge, with a well impressed groove leading into it; head of bone too fragmentary to show char-

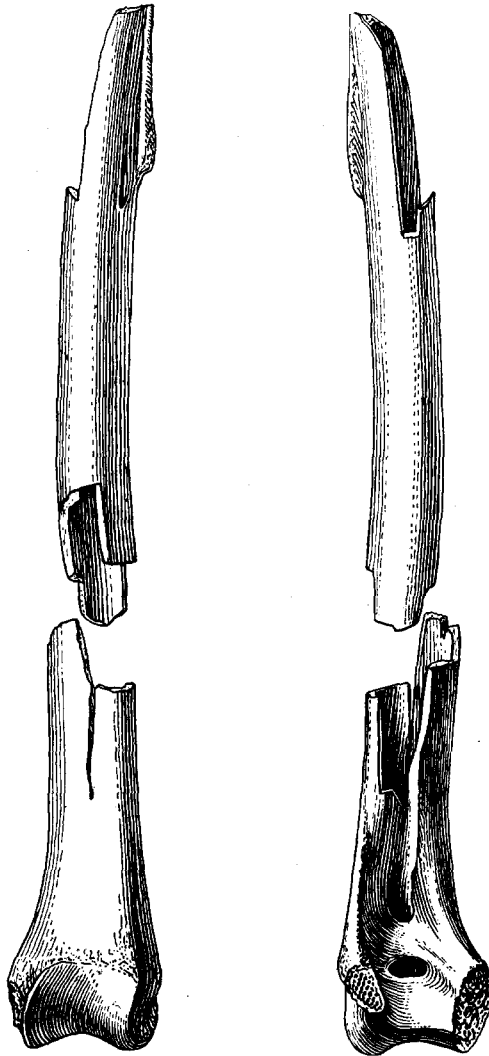


Fig. 39. Fragmentary tibiotarsus, type of *Geochen rhuax* from Pahala, Hawaii; $\times 1$.

acters of value. Bone whitish in color, friable and considerably cracked and warped, with spots of discoloration (from ash in which it was embedded and possibly from heat).

Measurements.—Transverse breadth of shaft near center, 8.9 mm.; greatest breadth across condyles (approximate), 20.3; length of tendinal bridge, 5.8.

Other material.—In addition to the bones of the tibiotarsus just described, there are present remains of two femora, indicating a robust bone with the head broad and strong. The pelvis is represented by broken sections of the fused vertebrae and by a small section of the ischium from the lower posterior margin. There are also fragments from the head of a coracoid and some other miscellaneous fragments not certainly identified. These can all be distinguished as from a goose, but the diagnostic characters on which the new genus and species here described are based are found in the tibiotarsus.

Following receipt of the bones, Mr. Clark forwarded a detailed account of their finding with the information that the ash bed to the point where the bones were found

had varied from five or six to ten or twelve feet in thickness. The ash was originally interpreted as belonging to the Ninole series which is represented in the hills of Pahala, but later observations did not substantiate this. Under date of February 22, 1943, Mr. Clark has written me that the tunnel in which the bones were found "was being driven to develop water and as work in it interfered with the domestic supply it stopped a little short of an absolute decision as to whether the ash went into a 'Ninole' hill, or whether it lapped against it." However, the conclusion that it lapped against the hill and did not pass into it was almost certain. The formation therefore in which the bones were found was probably Pahala. Mr. Clark informs me that the actual age of the Pahala formation is not known. The overlying lava is all prehistoric and is covered by dense forest. It would appear that the bones may belong to the Recent period, though it seems that they may have an age dating back thousands of years.

The relationships of *Geothen rhuax* are highly interesting. From the skeletal evidence available, this bird appears to have been about as large as the living Cape Barren Goose (*Cereopsis novaehollandiae*) of southern Australia and to have been more similar to that bird than to any other now known. Like that species, *Geothen* shows a considerable development of the external tubercle of the oblique ligament, although not to the degree that this is found in *Cereopsis*. In the latter species the tubercle forms a pronounced knob of bone 4 millimeters in length, placed external to the margin of the tendinal bridge. In *Geothen* it is perhaps one-half as large and has a slightly lower position. This tubercle is also greatly developed in the great extinct goose of New Zealand, *Cnemiornis calcitrans*, a species that, from the leg elements, is close to *Cereopsis*.

Geothen shows no close alliance with the living Nene (*Nesochen sandvicensis*), except that both belong to the family Anatidae. Its description introduces a distinctly new element in the ancient avifauna of Hawaii, a species that evidently was mainly terrestrial in habit, and that, as stated above, is to be placed in the subfamily Cereopsinae.

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