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PAPERS FROM THE HOPKINS STANFORD GALAPAGOS EXPEDITION, 1898-1899.

XIV.

REPTILES.

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INTRODUCTION.

Itinerary.— In the fall of 1898 the department of zoölogy of Stanford University, under the patronage of Mr. Timothy Hopkins, of Menlo Park, California, sent to the Galapagos Islands a party composed of two collectors, Mr. Robt. E. Snodgrass and the author, on the sealing schooner *Julia E. Whalen* which was bound on a cruise among those islands. The party was primarily interested in collecting vertebrates, but collections more or less complete were also made in nearly every class of animals and plants. The party had special privileges for collecting and was given an opportunity to collect on every island of the group.

Under the command of Captain Wm. P. Noyes the schooner sailed from San Francisco October 30, 1898. The first island touched at was Guadalupe which was reached November 5 and a single day devoted to exploring its southern extremity. Clipperton Island, a coral atoll, situated in latitude 11° N. and remarkable from being the only coral island in the Eastern Pacific, was visited November 22 and two days spent upon it.

On December 10 the Galapagos Archipelago was reached. On this date Culpepper Island was sighted and a landing effected the same day on its northeast side at the base of a talus slope to which all the collecting was limited, most of the island being inaccessible. Only one day was given to its exploration. The next day, December 11, we arrived at Wenman Island and remained in its immediate vicinity till December 20, making occasional landings whenever the weather permitted. The greater part of our collecting was confined to a low, flat topped island situated north of the main island. Albemarle Island was reached December 28, 1898, and the time from the 28th to the 31st was spent in exploring the region about Iguana Cove. From Iguana Cove we sailed northward to Narboro stopping one day en route at Webb Cove, near Point Christopher, Albemarle Island. The north coast of Narboro was explored on January 5 and 6, 1899, and the central volcano climbed to the summit of the crater's northern rim. The next stop was at Tagus Cove, Albemarle Island, where we anchored January 8 and remained a month at our anchorage. Explorations were made of the region about the cove, the western slopes of the adjacent volcano from sea level to summit of crater, and the eastern coast of Narboro. Leaving our anchorage at Tagus Cove on February 9 for Elizabeth Bay we arrived and anchored there on the 12th and remained till the 26th. Both coasts of the bay and the lower slopes of the two central volcanoes were explored. March 4 found us again at Iguana Cove where two days were spent in further exploration of the same region. On March 10 we again dropped anchor at Tagus Cove after circumnavigating Narboro and revisited much of the territory previously explored. Leaving this anchorage March 27 we anchored again, next day, at Mangrove Point, Narboro Island.

Here we explored the immediate coast and ascended the southeast slope of the volcano to a height of 3,000 feet. On April 8 we left our anchorage and sailed for James Island which we reached April 20 and anchored in James Bay. Here three days were spent in exploring about the bay and inland for a considerable distance. The Seymour Islands were reached on April 27 and an anchorage made near the southern island. Both the Seymour Islands and the northern coast of *Indefatigable* were explored. Leaving our anchorage May 4 we went to Duncan Island where we arrived the following day. Here three days were spent, on the northern part of the island, and we then proceeded southward to Charles, anchored off Black Beach on the 9th and explored the adjacent coast and interior of the island to the site of the old settlement. On May 11 we set sail for Hood where we arrived on the 14th and anchored in Gardner Bay; we remained here till the 20th. The coast southeast of the bay, and the central part of the island and Gardner Island were explored. From Hood we proceeded northward to Chatham anchoring in Wreck Bay on the 20th. The bay and interior part of the island near the hacienda of Señor Cobos were explored. On May 28 we sailed for Barrington Island where we arrived the same day and remained two days exploring and collecting about the northeast coast where several landings were made. A portion of the interior was also explored. After leaving Barrington we headed for Iguana Cove, Albemarle, where we remained from June 1 to June 10, making landings whenever the weather permitted. Our next anchorage was at Turtle Point just north of Tagus Cove, where we remained from June 13 to 16. After doubling Point Albemarle we proceeded to James Island where one day, the 19th, was spent on its northwest coast. Leaving James we headed for Bindloe Island whither we arrived on June 20 and spent two days exploring its southwest coast and interior. Tower was the next island visited, two days being given to its exploration. Leaving Tower June 23 we proceeded westward to Abingdon. The following day we landed on the west coast of that island and spent two days collecting along the coast and on the west slope of the central peak from sea level to summit.

On June 26, 1899, we took final leave of the Galapagos and headed for Cocos Island, where we arrived three days later and anchored in Chatham Bay. Here we stayed four days. On account of the dense vegetation only the coast and water courses could be explored. From Cocos we set sail, July 2, for San Francisco and after a short stop of one day, August 3, at Clarion Island, Revillagigedo Archipelago, we reached San Francisco on August 30, 1899, having been gone 304 days.

Material. — The material on which the present paper is based consists of nearly 1,200 specimens, being perhaps the largest collection of reptiles yet secured from the Galapagos Archipelago. With this collection as a basis, the attempt is here made to describe all species collected, with descriptions of their variations and habits, and to give the ranges and the synonymy of all the forms known to inhabit the Galapagos Archipelago and Cocos and Clipperton Islands.

Geologic Formation. — The Galapagos Archipelago is chiefly composed of basaltic lava and tufa, the latter, wherever it occurs, underlying the lava and forming the older portions of the islands. The fluidity and low melting point of the basaltic lava has given to the islands their characteristic topography, that is, comparatively low volcanoes with gently sloping sides and immense craters several miles in diameter. This formation is best exhibited on Narboro, Albemarle, Indefatigable and Bindloe, which are the only islands with large central craters. The craters on Charles, Chatham, James, Duncan, Jervis, Barrington and Abingdon are much smaller, being mere potholes in comparison with those of Albemarle. Definite craters are lacking on Hood, Tower, Wenman and Culpepper.

Subsidence Theory. — All the islands are obviously of volcanic origin, yet Dr. Baur¹ invokes a continental origin or connection to explain their faunal characteristics. To account for the presence of representative species on each island he assumes that all the islands in the group were formerly connected, forming one island, and that the species were generally distributed over this connected area before submergence; isolation and changed conditions after submergence are deemed by Dr.

¹ Baur, Biol. Lect. Woods Hole, pp. 67-78, 1894.

Baur to be the causes of the present differentiation. Such a joining together into one island of all the islands of the archipelago, including the northern islands of Wenman and Culpeper, would necessitate an elevation of more than 7,000 feet. Furthermore, a connection with the American continent is thought necessary by the same authority to explain the origin of the fauna and flora of the archipelago. Such connection with the continent would require an elevation of more than 10,000 feet, the present altitude of the islands having been attained through a corresponding submergence, a possible though improbable submergence, from the steep character of the adjacent South American coast which has been rising through a long period of geologic time.

Doubtless the assumed submergence is amply sufficient to account for the faunal characteristics of the archipelago but it is unnecessary and at variance with geological and biological evidence as illustrated in the derivation of the life of other similar groups of islands. Nearly all groups of volcanic islands exhibit similar though perhaps less striking differentiation of the species inhabiting separate islands. Since nearly all have been populated by strays from the present continental masses or from other islands we do not see the necessity of making the Galapagos an exception. Almost all authors from Darwin to Rothschild and Hartert, have regarded the Galapagos as a group of oceanic islands, Dr. Baur alone adopting the subsidence theory.

As a group the Galapagos Archipelago is probably today of greater extent than at any earlier geologic period though much erosion and perhaps some subsidence has taken place. The larger volcanoes are extinct, volcanic activity at present being confined to small lateral vents which in recent years have added only slightly to the size of the islands on which they occur. The northern portion of Abingdon, much of Narboro and Bindloe, some of the western portions of Albemarle and the southwestern part of James appear to be due to rather recent lava flows. Evidences of elevation appear at various localities. Near Iguana Cove, Albemarle there are several old sea cliffs now situated a considerable distance inland. At Tagus Cove on the same island a series of terraces, still containing the characteristic cavities

made by sea urchins, are now several hundred feet above the present sea level. Much erosion has taken place, especially about Wenman and Culpepper which formerly were considerably larger than they are now. Wenman appears to have once been the central crater of a larger island. Its steep semicircular northern face is not the result of erosion but at one time it formed the southern wall of the crater whose northern rim has been eroded away. It is only a short time, geologically speaking, since the northern and southern portions of Albemarle were united by the low Perry Isthmus which has the appearance of being built up from a recent lava flow from the southern crater. Had the central crater of Narboro continued active for some time longer it would have poured out lava enough to fill the narrow strait separating it from Albemarle, thus uniting those two islands.

Age of the Archipelago.—In the absence of any available geologic evidence as to the age of the archipelago the degree of differentiation attained by the fauna may be taken as indicative of considerable age. This kind of evidence is most noticeable among the reptiles. The greatest differentiation is shown by the genera *Amblyrhynchus*, *Conolophus* and *Testudo* while some of the others, perhaps later arrivals, as *Orophis*, *Tropidurus* and some of the *Phyllodactyli* show little or no differentiation from continental species. From the prominent West Indian element in the fauna and flora, which may have reached the islands during that part of the Tertiary when the Americas were separated, it would appear that the archipelago is at least of Tertiary age and the presence of *Testudo* would also support this view.

Previous Expeditions.—Previous to Darwin's visit to the Galapagos in 1835 a few reptiles, mostly *Testudo*, had been collected by navigators and presented to various museums. Darwin's collection formed the basis for the first systematic account¹ of the herpetology of the archipelago and consisted of specimens from Chatham, Charles and James.

Later, in 1852, Dr. Kinberg of the Swedish frigate *Eugenie* visited the archipelago and collected reptiles on Albemarle,

¹ Bell, Zool. Beagle, Reptiles, 1843.

Charles, Chatham, Indefatigable and James. These were partially reported on by Peters.¹

In 1868 Dr. Habel made a collection of reptiles on Abingdon, Bindloe, Hood and Indefatigable. These were reported on by Steindachner² who also received most of the reptiles taken by the Hassler expedition in 1872 on Albemarle, Charles, Indefatigable, James and Jervis.

Commander Cookson of the *Petrel*, in 1875, collected some reptiles, chiefly tortoises, at Abingdon, Albemarle and Charles; these have been reported on by Günther.³

The *Albatross*, in 1888, made quite extensive collections on Albemarle, Charles, Chatham, Duncan and Indefatigable. These were reported on by Cope.⁴

Dr. Baur, in 1891, made a very extensive collection of reptiles in the archipelago. His specimens are from Albemarle, Abingdon, Bindloe, Barrington, Charles, Chatham, Duncan, Hood, Indefatigable, James, Jervis and Tower. This collection has been reported on by Baur⁵ and Garman.⁶

Reptilian Derivation. — Eight genera of reptiles occur in the Galapagos Archipelago, two of which are peculiar and obviously of American derivation, being represented by allied genera on the adjacent continental coast. All the genera not peculiar to the archipelago, except *Testudo*, are found on the western slope of the Andes. The distribution of the eight genera of Galapagos reptiles is as follows:

<i>Chelone.</i>	Tropicopolitan.
<i>Gonatodes.</i>	Tropicopolitan.
<i>Phyllodactylus.</i>	Tropicopolitan.
<i>Tropidurus.</i>	Neotropical.
<i>Amblyrhynchus.</i>	Peculiar.
<i>Conolophus.</i>	Peculiar.
<i>Dromicus.</i>	West Indian and Neotropical.
<i>Testudo.</i>	Nearly cosmopolitan; lacking in South America west of the Andes.

¹Peters, Mon. Berl. Ac., 1869, 71.

²Steindachner, Festschr. Zool.-Bot. Ges., Wien, 1876.

³Günther, Proc. Zool. Soc., 1877, and Gig. Land Tort., Lond., 1877.

⁴Cope, Proc. U. S. Nat. Mus., xii, pp. 141-147, 1889.

⁵Baur, Festschr. Leuckart, 1892.

⁶Garman, Bull. Essex Inst., xxiv, 1892.

DISTRIBUTION OF REPTILES IN THE GALAPAGOS ARCHIPELAGO.

Name.	Narboro.	Albemarle.	Indefatigable.	South Seymour.	James.	Jervis.	Charles.	Hood.	Barrington.	Duncan.	Chatham.	Bindloe.	Abingdon.	Tower.	Wenman.	Culpepper.
<i>Chelone mydas</i>	x	x	s	s	x	...	...	s	s	s	...	s	s	s	s	s
<i>Testudo nigrita</i>	?	s	s	...	...	s	s	...	...	...
“ <i>galapagoensis</i>	x	...	...	...	...	...	...	...	...	...
“ <i>guntheri</i>	x?	...	...	...	...	...	...	...	...	...	...	...
“ <i>wallacei</i>	x?	...	...	...	...	...
“ <i>vicina</i>	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...
“ <i>microphyes</i>	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...
“ <i>becki</i>	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...
“ <i>ephippium</i>	x	...	...	...	...	...	...	...
“ <i>abingdoni</i>	x	...	...	...
<i>Gonatodes collaris</i>	x	...	...	...	...	...
<i>Phyllodactylus tuberculosus</i>	x	...	...	...	...	...
“ <i>gilberti</i>	x
“ <i>galapagoensis</i>	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...
“ <i>bauri</i>	x	x	...	...	...	...	...	...	...	...
“ <i>leei</i>	x	...	...	...	...	...
<i>Tropidurus grayi</i>	x	x	x	x	x	x	...	...	...	...	...	...	...	...	...
“ <i>magnus</i>	x	...	...	...	...	...	...	...	...	...	...	...	...	...	...
“ <i>barringtonensis</i>	x	...	...	...	...	...	...	...
“ <i>duncanensis</i>	x	...	...	...	...	...	...	...
“ <i>delanonis</i>	x	...	...	...	...	...	...	...	...
“ <i>bivittatus</i>	x	...	...	...	...	...
“ <i>habeli</i>	x	...	...	...	...
“ <i>pacificus</i>	x	...	...	...
<i>Conolophus subcristatus</i>	x	x	x	x	x	...	...	...	...	...	...	...	...	...	...	...
“ <i>pallidus</i>	x	...	...	...	...	...	...	...	...
<i>Amblyrhynchus cristatus</i>	x	x	x	x	x	...	x	x	s	x	x	x	x	x	x	x
<i>Dromicus biserialis</i>	x	x	x	...	x	s	x	...	...	...	...	...	...	...	...	...
“ <i>habeli</i>	x	...	...	...	...	...	...	...	...	...

x Collected or recorded by previous collectors.

s Seen.

Excluding *Chelone mydas*, which is a widely spread marine species, the Galapagos reptile fauna consists of twenty-six species and subspecies; of these twenty-five are peculiar and are represented on the adjacent coast of South America by closely allied species.

All species of *Testudo* in the Galapagos are peculiar, and are most closely related to those found in the Mascarenes, of the Indian Ocean, from which they are separated by only slight structural characters. Any land connection between these remote island groups in recent geologic times through a connection of the continents to which they are nearest, forming a con-

nection between South America and Africa, is not to be seriously considered. The similarity of the Mascarenes and Galapagos *Testudo* may be largely due to insular isolation, the two groups having sprung from a similar cosmopolitan type derived from the nearest continent, the absence of enemies and abundance of food on the islands being favorable to the development of gigantic races. These races have developed along nearly the same lines. Western South America at present lacks the genus, and paleontology is as yet silent as to its occurrence or the time of its disappearance there. Assuming that the Galapagos reptile fauna has been chiefly derived from material carried by ocean currents, the present direction of these currents would favor its derivation from South America south of the equator. So little of the fauna and flora is allied to West Indian and Central American forms, however, that it is improbable that during those geological epochs (Tertiary or older) when the Americas were separated by the submergence of part of the connecting isthmus an ocean current from the northeast washed the shores of the archipelago and brought with it such forms. The large Central American element in the Galapagos may be traced to the influence of the seasonal shifting of the present currents about the Panama region which not infrequently bring floating material to the islands from that coast.

The single peculiar species of *Gonatodes* is most closely allied to *G. ocellatus* of the West Indies (Tobago). This genus occurs along the coasts of Ecuador and Peru.

Of the five species of *Phyllodactylus*, four are peculiar and more or less closely related to *P. tuberculosus*, the non-peculiar species which is distributed along the west coast of Mexico, and Central and South America southward to Ecuador.

Tropidurus is distinctly a Neotropical genus with several Peruvian and Ecuadorian species. All the Galapagos species are peculiar and closely related forms, their nearest continental allies being perhaps some of the Peruvian species.

The genus *Conolophus* according to Garman¹ is nearest the Neotropical genus *Enyalioides* which is a common Ecuadorian inhabitant. This affinity is especially well marked in the young

¹Garman, Bull. Essex Inst., xxiv, 1892, p. 3.

which are said to be nearly indistinguishable. Boulenger¹ places it near Iguana.

The marine Iguana *Amblyrhynchus* is closely allied to *Conolophus*, of which it is perhaps a marine form evolved, as suggested by Garman, on barren islands where vegetation was lacking, thus compelling an alga diet or extermination.

The single species and subspecies of *Dromicus* are both closely allied to *D. chamissonus* of Peru and Chile from which species the Galapagos snakes are doubtfully distinct.

The author is under obligations to Dr. C. H. Gilbert, of Stanford University, in whose laboratory the work has been done, and to Mr. J. O. Snyder, curator of the Leland Stanford Junior University Museum, for many favors received in the handling of the collections.

SYSTEMATIC ACCOUNT.

Genus *Chelone* Brongniart.

Chelone BRONGN., Bull. Soc. Philom., II, p. 89, 1800.

Range. — Cosmopolitan in tropical and subtropical seas.

CHELONE MYDAS (Linnæus).

Testudo mydas LINN., Sys. Nat., ed. 10, I, p. 197, 1758.

Range. — Tropicopolitan.

Common among the islands of the Galapagos Archipelago. Most abundant in the shallow lagoons and on the sand beaches where the females come to deposit their eggs.

The crew secured many turtles for food and we observed many others on the beaches. The coloration of the upper parts varied from dark greenish to brownish-red, the reddish coloration greatly predominating in Galapagos specimens. Only one adult specimen was preserved.

The turtles have been driven from some of the islands, on which dogs and pigs have been introduced, by the ravages of these animals on their eggs and breeding grounds and also by Indians who hunt them for their oil. They are, however, still abundant about Albemarle and Narboro.

Genus *Testudo* Linnæus.

Testudo LINN., Syst. Nat., ed. 10, I, p. 197, 1758.

Range. — Ethiopian, Oriental, Mediterranean, Neotropical (east of the Andes) and South Temperate Nearctic.

¹ Boulenger, Cat., II, 1885, p. 186.

Galapagos Testudo (genus *Elephantopus* of Gray). — Nuchal plate absent; a pair of gular plates; frontal region of the skull flat; fourth cervical vertebra biconvex. In *T. galapagoensis* the third cervical vertebra is biconvex. Nine described species peculiar to the Galapagos Archipelago.

Allied most closely by the characters of the skulls and vertebræ to the tortoises of the Mascarenes (Mauritius and Rodriguez Islands) from which they are separated by the divided gular plate.

The following account of the habits of the Galapagos tortoises is based on observations made on the three species collected, viz., *T. microphyes*, *T. vicina* and *T. ephippium*.

Their food consists of various species of grasses and cactus (*Opuntia*). During the rainy season and in the moist portions of the islands the year round grass forms their chief food, especially a large, woody stemmed, perennial species. During the dry season in the arid portions of the islands, as at Tagus Cove, Albemarle, and on Duncan Island, the *Opuntia* becomes quite an important food plant. The green succulent leaf-like stems of this cactus and its fruit, the "prickly pear," are eagerly devoured by the tortoises regardless of the sharp spines with which they are armed. One specimen collected near Tagus Cove had the whole palate and pharynx bristling with cactus spines from which there was apparently no suffering. The juicy cactus stems supply the tortoises with the necessary water in the dry regions where springs are absent and thus make possible its existence in such localities. Cactus seems to be preferred, when it can be easily secured; all the tortoises we took on board the schooner would take no other kind of food except when compelled by hunger. The *Opuntia* are tree-like in habit, growing usually to a large size and it is only the young and smaller plants that are within reach of the tortoises. Grass can be secured much easier and it is perhaps due to this fact that it forms a larger proportion of their food.

The tortoises do a great deal of apparently unnecessary travelling and though slow are so persistent in their journeys that they cover several miles a day. Most of the travelling is done early in the morning and late in the afternoon, the hot hours of noon being spent in the shade of some bush wallowing in the damp soil. The wallowing probably cools them and incidentally relieves them of a few of the numerous wood ticks (*Amblyoma pilosum*) which infest them at the joints and wherever the skin is thin enough to allow them to pierce it. After heavy rains they delight to wallow in the mud. They are very determined travellers and when once started in a certain direction no

obstacles can stop them. Not unfrequently they ascend very steep, rocky hills. Sometimes their shells are broken and occasionally they are killed by rolling down these inclines, but if uninjured after these falls they will make repeated efforts to reascend until crowned by success. They retire early for the night, drawing in their limbs and neck and after sunset do not move from the place chosen for the night. Darwin, however, states that they travel both day and night when on their periodical visits to the springs.

All three of the species we observed make seasonal vertical migrations. Soon after the rainy season they descend the mountains to the grass covered flats at their bases to feed and deposit their eggs in the light soil. After the grass has withered they again ascend the mountains to the moist meadows produced by the trade winds at an elevation of 2,000 feet and above. These migrations are most marked in the dry regions, as at Tagus Cove, Albemarle, but even at Iguana Cove on the same island where there is an abundance of moisture at lower elevations a nearly complete migration takes place. On Duncan Island the tortoises scatter out so in the dry season that their movements can scarcely be called a vertical migration. In their seasonal pilgrimages they follow well established trails used perhaps for generations. These trails radiate from the higher plateaus as a center and usually follow the floors of the canyons to the flats below. Some of the trails are of considerable length, requiring several days of persistent effort on the part of the tortoise to cover them.

When surprised they draw in their limbs and necks with a deep hiss and suspend operations until they think the danger past. No amount of noise seems to frighten them and the Ecuadorians assert that they are deaf. A small one however taken at Iguana Cove, Albemarle, learned to recognize the voice of its keeper in a few months and would come to the gate of its pen when called though the keeper was hidden from its sight.

The males are sometimes quarrelsome, especially in the breeding season. In fighting the jaws are opened widely and the animals, raised by outstretched necks and limbs to their greatest height, attack one another. Superior height seems to be quite an advantage in a combat allowing the taller to bite down upon the head of his adversary. In these fights they seldom succeed in doing much damage. When turned over on their backs they right themselves by swinging their limbs all in the same direction, which causes the animal to rotate and clear the ground, so that by thrusting out their long necks to the ground and pushing with them the body falls over on the plastron.

During this operation they usually indulge in much grumbling and groaning as if it were a terrible tax on their anatomy. During the breeding season the males are said to "bellow like bulls." The "bellowing" which we heard consisted of a rather low prolonged note which could not have been heard more than a few yards away.

The type localities of most of the Galapagoan species of *Testudo* are shrouded in more or less uncertainty. Most of the early specimens were collected by whalers and other navigators who have left no records of the exact localities from which their specimens came, and it is only by guesses based on the islands touched at by these navigators that the type localities have been approximately fixed. Within recent years authentic specimens have been collected on Albemarle, near Tagus and Iguana Coves, Abingdon and Duncan Islands which comprise four species, the tortoises having become extinct on all the other islands of the archipelago. The identification of these specimens with those previously described has proved troublesome because of the immaturity of some of the types and the rather variable characters upon which some of the species are based. Some of the species may be simply varieties or subspecies but lack of series of specimens forces us to retain all as species.

From the accounts of early navigators who visited the archipelago we learn that gigantic land tortoises formerly inhabited, beside the islands enumerated above, Charles, Chatham, James, Indefatigable and Hood Islands. The form on Indefatigable has only recently become extinct. Some Ecuadorians we met asserted that some years ago they had seen an immense one near the plantation situated in the central crater. Albemarle Island is inhabited by two species whose ranges are separated by a low barren isthmus. Duncan and Indefatigable are supposed by Dr. Günther to be inhabited by the same species; all the other islands are considered to have been inhabited by distinct species. Charles, Chatham and James have each a species referred to them, leaving Hood and perhaps Indefatigable, the only ones not represented by described species. Of the larger islands and those possessing conditions of vegetation suitable for the existence of *Testudo* Narboro, Bindloe, Barrington, and Jarvis appear never to have been inhabited. This may in part be accounted for, on the three latter islands, by their inferior height which would greatly lessen the supply of moisture. Narboro, though high, is very rugged and its vegetation confined mostly to the rim of the crater, the coast being fringed by rough, barren lava fields which may account for the absence of tortoises.

The young do not take on their specific characters until nearly

adult; they remain very similar in shape, in all the species, for a considerable time. All the young observed possessed striated shells but adults seem to retain or lose this character indifferently in most of the species.

Growth takes place by additions to the outer border of each plate along the soft white seams and probably continues as long as life exists; the largest specimens possess the whitish seams which mark the growing edges of the plates. In youth the annual increase is probably much greater than later. A specimen from Iguana Cove, weighing 29 pounds when taken, doubled its original weight in twelve months accompanied by an increase to the margin of each plate of the carapace of about half an inch or an inch to the diameter of the plate. Its total gain during the year was in length of carapace four inches, in breadth three inches, and in height, one and one-fourth inches. During the colder winter months the consumption of food was greatly lessened and growth correspondingly retarded. The increase in weight during the summer months amounted to nearly three pounds monthly. This tortoise now weighs 130 pounds, having gained 100 pounds in three years. This rapid increase may be abnormal but it shows how rapid their growth may be under favorable conditions of food and warmth, which we believe are even more favorable in the Galapagos where no cool winter season retards their growth.

The extermination of the gigantic land tortoises in the Galapagos seems to have been due chiefly to inroads made upon them by the whalers, orchilla pickers and the "oilers." The tortoises were abundant in the early part of the nineteenth century and the whaling fleets frequenting these waters captured great numbers of them for food. It was the practice of these vessels to take several hundred away alive to be used as desired. In this way many hundreds were taken from the islands. What the whalers began the orchilla pickers and "oilers" completed. The orchilla pickers who visited the archipelago annually for several years to gather orchilla (*Roccella*) used the tortoises for food wherever they could be obtained. In their search for orchilla they visited the higher altitudes where the orchilla is most abundant and incidentally captured such tortoises as were safe from the whalers by nature of their habitat. These people brought with them their domestic animals, dogs, cats, pigs, etc., which upon their departure were left on the islands to complete or rather continue the extermination. Of these animals dogs and pigs have been most destructive in digging up the eggs and eating the young. The "oilers" have been perhaps the most destructive agents. It was the business of these

people to kill the tortoises for the oil which they contained. For this purpose they have been hunted systematically on many of the islands and practically exterminated.

Their natural enemies according to Darwin were *Conolophus*, which dug up the eggs and devoured them, and *Buteo*, the Galapagos hawk, which is said to eat the young when just issuing from the eggs.

TESTUDO NIGRITA Dumeril and Bibron.

Testudo indica GRAY, Syn. Rept., p. 9, 1831, and Cat. Tort., p. 5, 1844, and Sh. Rept., I, p. 6, 1855, and Suppl., p. 5, 1870 (part).—SOWERBY and LEAR, Tort., pl. VI, 1872.

Testudo nigrata Dum. and Bibr., II, p. 80, 1835.—GÜNTHER, Phil. Trans., CLXV, p. 267, 1875, and Gig. Land-Tort., p. 69, pls. XXX, XXXI, XLII, XLIV, 1875.—BOUL., Cat. Chel. Brit. Mus., p. 169, 1889.—BAUR, Am. Nat., XXIII, p. 1043, 1889.—ROTH, Novit. Zoöl., IX, No. 3, p. 618, 1902.

Testudo planiceps GRAY, Cat. Sh. Rept., I, p. 6, pl. XXXIV, 1855, and Suppl., p. 5, 1870.

Testudo elephantina STRAUCH, Chel. Stud., p. 83, 1862.

Testudo elephantopus GRAY, Proc. Zoöl. Soc., p. 708, 1870, and App. Cat. Sh. Rept., p. 3, 1872.

Elephantopus planiceps GRAY, Proc. Zoöl. Soc., p. 724, 1873.

Range.—Type locality unknown.

Two specimens referred to this species by Günther were taken in the Galapagos Islands by the Hassler expedition, but it is not known from which island they came.

TESTUDO GALAPAGOENSIS Baur.

Testudo elephantopus JACKSON, Bost. Soc. Nat. Hist., Journ., I, pp. 443-521, 1837.

Testudo galapagoensis BAUR, Am. Nat., XXIII, p. 1044, 1889.—GÜNTHER, Novit. Zoöl., IX, No. 2, pp. 184-192, pls. XVI-XXI, 1902.

Range.—Charles Island.

Two specimens taken by the U. S. S. *Potomac*, one representing the type, are undoubtedly referable to Charles Island. This species has probably been extinct since 1840, the penal colony established on Charles Island by the Ecuadorian Government in 1829 having accomplished their extermination.

TESTUDO ELEPHANTOPUS Harlan.

Testudo elephantopus HARLAN, Jour. Ac. Phil., v, p. 284, 1827.—GÜNTHER, Phil. Trans., CLXV, p. 261, 1875, and Gig. Land Tort., p. 63, pls. XXX, XLII-XLIV, LI-LIII, 1877.—ROTH., Novit. Zoöl., IX, No. 2, p. 448, 1902.

Testudo nigra BOUL., Cat. Chel. Brit. Mus., p. 170, 1889.

Testudo guntheri BAUR, Am. Nat., XXIII, p. 1044, 1889.

Range.—Unknown.

James Island has been suggested by Baur as the probable habitat of this species on the strength of the dome-shaped carapace. The measurements of the carapace, however, are duplicated by specimens from Iguana Cove, but we have seen no skulls from this locality with a deep recess before the occipital condyle and sharp edges to the pterygoids as in Günther's figure of this species.

TESTUDO WALLACEI Rothschild.

Testudo wallacei ROTH., Novit. Zoöl., IX, No. 3, p. 619, 1902.

Range.—(?) Chatham Island.

This species was described from a specimen of uncertain origin obtained by Wallace from the Bullock collection where it was catalogued as "Indian Tortoise." Chatham Island has been suggested as the habitat of the species by its describer on the clue given by Captain Porter's remark that the James Island tortoises were round. Most closely allied to *T. galapagoensis*.

TESTUDO VICINA Günther.

Testudo elephantopus BAUR, Am. Nat., XXIII, p. 1044, 1889.

Testudo vicina GÜNTHER., Phil. Trans., CLXV, p. 277, 1875, and Gig. Land Tort., p. 73, pls. XLVII and LIV, 1877.—BOUL., Cat. Chel. Brit. Mus., p. 170, 1889.—LUCAS, Smith. Rept., p. 643, pl. CIV, 1889.

Testudo nigrita COPE, Proc. U. S. Nat. Mus., XXII, p. 147, 1889.

Range.—Albemarle Island from Iguana Cove eastward along the southern slopes of the two southern volcanoes to Cape Woodford and Perry Isthmus, absent from the barren southern slopes of the volcanoes. Vertical range from sea level to 4,000 feet altitude. (*Petrel*, *Albatross*, 1888, Rothschild Expedition, Hopkins Stanford Expedition.)

This species was found rather common near Iguana Cove in June, 1899, but during our previous visit in December, 1898, only two were found, the tortoises being at that season of the year in the high plateaus. This species inhabits a moist region supporting a heavy growth of underbrush and small trees. Food is abundant throughout the year and the conditions are ideal for the great development of tortoises in size and numbers. The largest living tortoises are perhaps to be found here. We observed a few large males that we estimated would weigh about four or five hundred pounds.

The shells in this species are more symmetrical, the carapace being rounded in horizontal outline and more or less dome-shaped without much anterior flaring. The limbs are considerably shorter than in *T. microphyes*.

MEASUREMENTS OF *Testudo vicina*.

Sex.	Male.		Male.		Male.		Male.		Female.		Female.	
	Centim.	%	Centim.	%	Centim.	%	Centim.	%	Centim.	%	Centim.	%
Carapace, length.....	109	91	103	115	103	75	73	93	81	81	81	
“ width.....	71	76	77	73	76	79	82	87	81	81	81	
“ “ posteriorly at 8th marginal plate.....	70	73	75	71	75	79	78	81	79	79	79	
“ height at nuchal notch.....	33	41	36	39	37	41	41	43	41	41	43	
“ “ median.....	49	52	50	47	49	52	58	58	58	58	51	
Gular plate to nuchal notch.....	26	29	36	34	22	32	31	34	31	34	29	
Anal plate to last marginal.....	16	21	32	21	17	19	18	19	19	19	19	
Plastron, length.....	72	76	76	70	73	65	82	81	81	81	81	
“ “ bridge.....	39	46	47	42	43	46	50	49	46	46	46	
“ width.....	71	70	70	68	71	73	78	83	77	77	77	
“ depth of concavity.....	23	23	19	23	20	13	10	08	15	15	15	
Fore limb, length from elbow.....	30	...	31	29	33	31	33	32	32	32	32	
Hind limb, length from knee.....	28	...	32	24	31	31	31	36	34	34	34	

The above table is derived from measurements made from *adult* living specimens taken by the crew. The specimens are not in the zoological museum of Stanford University.
 The first row of the table shows the length of carapace, in centimeters, measured between the neck and tail notches. All other figures in this and the following tables of *Testudo* measurements, are percentages of length of carapace, *except* concavity of plastron. Concavity of plastron is expressed in percentages of length of plastron bridge.

The most distinctive feature of the skull in our specimens is found in the tympanic cavity, which is bordered posteriorly by a prominent process just above the notch made by the Eustachian tube, causing the notch to appear very deep. The pterygoid edges are moderately flattened. The occipital condyle is large and preceded by a wide open cavity.

The carapace is usually striated in the young, but in the adults this character is nearly or quite lost, only a few striations appearing, in some specimens, on the margins of the plates. A few large males were seen that had conspicuously striated plates, from which it is inferred that striation has no specific value but is merely due to individual variation.

TESTUDO MICROPHYES Günther.

Testudo microphyes GÜNTHER. Phil. Trans., CLXV, p. 275, 1875, and Gig. Land Tort., p. 78, pls. XXXII-XXXVIII and XLII-XLV, 1877. — BOUL., Cat. Chel. Brit. Mus., p. 170, 1889. — BAUR, Am. Nat., XXIII, p. 1044, 1889. (?) *Testudo nigrita* LUCAS, Smith. Rept., p. 643, pl. CIV, 1889 (figure resembles *T. vicina* rather than this species).

Range. — Albemarle Island; Tagus Cove and the slopes of the adjacent volcano (Petrel, Hopkins Stanford Expedition).

None are now to be found in the immediate vicinity of Tagus Cove where apparently they have been extinct for a considerable time. A few may still be found a short distance inland on the sides of the adjacent volcano. During several weeks' exploration on the western side of this volcano not more than seven or eight tortoises were met with and these were all adult males. They range vertically from near sea level to the rim of the volcano, 4,000 feet. The absence of young might be accounted for by the destruction of the eggs by wild dogs but why no females were found is unaccountable. The report by whalers that tortoises occur on the northern volcano of Albemarle makes it probable that this species ranges to Point Albemarle as the two volcanoes are not separated by any wide stretch of impassable lava. The Ecuadorians report a species of tortoise on Cowley volcano which if this form, as seems very probable, indicates a distribution as far south as Perry Isthmus.

In comparison with the Iguana Cove form, *T. vicina*, this species is more elongate with longer limbs and higher carapace which, in the male, has a flaring anterior border as in the Duncan Island form. This difference in shape may be due to difference in climatic conditions. Tagus Cove being dry and desert-like, with well marked wet and dry seasons, could support only an active long limbed species that could do much foraging during the long dry season.

In one specimen seen the coloration varied from the customary blackish in having the rostral, mandible, and angles of the jaw yellowish as in *T. ephippium*.

Our material consists of the shells and skulls of four large males taken east of Tagus Cove.

The skulls differ from those of *T. vicina* as follows:

1. Tympanic cavity not armed posteriorly by a prominent process, the Eustachian notch shallow.

2. Occipital condyle small with a more or less definite recess anteriorly (in one specimen the recess is as deep as in *T. nigrita*).

3. Pterygoid edges less flattened (in one specimen they are sharp).

The skulls differ from those of *T. ephippium* of Duncan Island in the characters of the pterygoid edges and the recess before the condyle much as *T. vicina* does but the Eustachian notch is similar. Comparison of these skulls seems to show that some of the characters upon which herpetologists have placed specific value are subject to considerable individual variation. Skull No. 4800 Stanford Museum in the characters of the occipital recess and the pterygoid edges is a perfect facsimile of the skull figured by Günther as *T. elephantopus*.

MEASUREMENTS OF *Testudo microphyes*. ADULT MALES.

Cat. No. Stan. Univ. Mus.	4799	4805	4800	4806
	Centim.	Centim.	Centim.	Centim.
Carapace, length	96	99.5	94	90
“ “ over curve.....	%	%	%	%
“ width	114	114	111	119
“ “ posteriorly at 8th marginal plate.....	69	67	71	77
“ height at nuchal notch.....	70	67	71	77
“ “ median	35	37	40	...
Gular plate to nuchal notch.....	46	43	47	...
Anal plate to last marginal.....	32	32	32	...
Plastron, length...	19	17	17	...
“ “ bridge.....	70	70	71	75
“ width	40	38	40	42
“ concavity	66	62	66	66
	15	15	15	15

TESTUDO EPHIPIUM Günther.

Testudo ephippium GÜNTHER, Phil. Trans., CLXV, p. 271, 1875; Gig. Land Tort., p. 81, pls. XXXIX, XLII-XLIV, 1877; Novit. Zoöl., III, p. 329, pls. XX-XXII, 1896.—BOUL., Cat. Chel. Brit. Mus., p. 171, 1889.
Testudo abingdonii BAUR, Am. Nat., XXIII, p. 1039, 1889 (part).

Range. — Duncan Island. (*Albatross*, 1888 and 1891; Rothschild Exped.; Hopkins Stanford Expedition).

Rather common on the higher parts of Duncan Island especially about the fertile basins of the old craters. The exact locality of the type is unknown. Günther has referred it, at different times, to both Charles and Indefatigable Islands for various reasons, none of which are very convincing. The Indefatigable form as described by Ecuadorians is a much larger and more symmetrically shaped species. The *Tropiduri* of the two islands are so different that we would be surprised to find the *Testudo* showing no differences.

Duncan Island is comparatively low and, being centrally situated, is robbed of a good deal of moisture by the weather islands. Though without living water and subject to drought for several consecutive seasons yet it has supported many tortoises. When we visited the island in May, 1899, in the height of the rainy season, we found the crater dry and the deep soil fissured in all directions by the heat, indicating little rainfall that season. The tortoises evidently find enough moisture in the *Opuntia*, or other vegetation, to supply their wants during these dry seasons.

The species has a longer carapace and limbs than *T. microphyes* which may be attributed to climatic conditions, still dryer than those which prevail at Tagus Cove. It is readily distinguishable from either of the Albemarle species by its peculiar flaring and elongate carapace and its slightly reddish coloration. Its size is considerably less, the largest males found weighing only about fifty pounds.

MEASUREMENTS OF *Testudo ephippium*. ALL ADULT.

Cat. No. Stan. Univ. Mus.	4802			4803		
	Male.	Male.	Male.	Female.	Female.	Female.
Sex.	Male.	Male.	Male.	Female.	Female.	Female.
	mm.	mm.	mm.	mm.	mm.	mm.
Carapace, length.....	750	640	720	600	512	530
“ “ over curve.....	%	%	%	%	%	%
“ width	114	80	73	117	75	81
“ “ posteriorly at 8th marginal.....	65	84	77	70	75	81
“ height at nuchal notch	66	53	54	72	52	51
“ median	42	55	57	46	54	53
Gular plate to nuchal notch	49	42	44	30	39	38
Anal plate to last marginal	37	20	21	15	19	13
Plastron, length	13	80	85	82	91	92
“ “ bridge.....	39	47	44	42	46	50
“ width	63	77	68	66	72	77
“ concavity	12	16	16	04	11	10
Fore limb from elbow, length.....	...	38	40	...	35	39
Hind limb from knee, length .....	...	41	40	...	39	38

Our material consists of the shells and skulls of a pair of adults and observations and measurements on five live specimens taken by the crew.

The skulls have the broad pterygoid edges and wide shallow recesses before the occipital condyles as in Günther's figure of the type, from the characters of which there is no important divergence. The notch formed by the Eustachian tube on the posterior border of the tympanic cavity is shallow.

The soil of Duncan Island is a dark red loam and the reptiles all partake more or less of a similar coloration. They have a slight tinge of dark brick red above and the skin of the limbs, neck, and head is similarly colored, with the exception in the latter of the anterior portion of the rostral, the mandible, and the angles of the jaws, which are pale yellowish. The upper portion of the throat in some specimens is also yellowish.

TESTUDO BEDSI Rothschild.

Testudo bedsi ROTH., Novit. Zoöl., VIII, No. 3, p. 372, 1901.

Range. — Cape Berkeley, northwestern point of Albemarle. Described as intermediate between *T. ephippium* and *T. abingdoni*.

TESTUDO ABINGDONI Günther.

Testudo abingdonii GÜNTHER, Gig. Land Tortoises, p. 85, pls. XL, XLI, XLV, XLVIII, L, 1877; Novit. Zoöl., III, p. 330, 1896. — BOULENGER, Cat. Chel. Brit. Mus., p. 171, 1889.

Testudo ephippium BAUR, Am. Nat., XXIII, p. 1039, 1889 (part).

Range. — Abingdon Island! (*Petrel*, 1875, *Albatross*, 1888).

Probably now nearly extinct. None seen by us in June 1899, on the northwest slope of Abingdon. The northern and northwestern slopes of the island were explored by us from sea level to summit of highest peak without finding even a trace of the present or past existence of *Testudo*. What tortoises now remain on the island are probably confined to the moister and greener southern slopes where the *Albatross* and *Petrel* secured their specimens.

In shape of carapace and in cranial characters this species closely approaches *T. ephippium*. The skull of the type of *T. abingdoni* possesses a much deeper recess before the occipital condyle but this difference might disappear in a series of skulls.

Genus *Gonatodes* Fitzinger.

Gonatodes FITZINGER, Syst. Rept., p. 91, 1843.

Range. — Malayan, Indian, Australian and Tropical American. Galapagos Archipelago (one peculiar species).

GONATODES COLLARIS Garman.

Gonatodes collaris GARM., Bull. Essex Inst., XXIV, p. 11, 1892.

Range. — Galapagos Archipelago; Chatham Island (Baur).

We did not meet with this species during our stay at Wreck Bay, Chatham Island where Baur secured his specimens.

Genus *Phyllodactylus* Gray.

Phyllodactylus GRAY, Spicil. Zoöl., p. 3, 1870.

Range. — Mediterranean, African, Australian and Tropical American. Galapagos Archipelago (four peculiar species and one of wide distribution).

PHYLLODACTYLUS TUBERCULOSUS Wiegmann.

Phyllodactylus tuberculosus WIEGM., Nova Acta Ac. Leop.-Carol., XVII, p. 241, pl. XVIII, fig. 2, 1835. — COPE, Proc. U. S. Nat. Mus., XII, p. 145, 1889. — GARMAN, Bull. Essex Inst., XXIV, p. 9, 1892.

Range. — Western South America from Ecuador northward through Central America and Mexico to Cape San Lucas, Lower California. Galapagos Archipelago; Chatham Island (*Albatross* 1888, Baur).

The *Albatross* secured two specimens on Chatham Island which Cope referred to this species. These we have examined and find they agree essentially with Boulenger's description of *P. tuberculosus*.

We did not meet with this species in the archipelago.

MEASUREMENTS OF *Phyllodactylus tuberculosus*.
CHATHAM ISLAND.

Cat. No. U. S. Nat. Mus.	14949.	14956.
	mm.	mm.
Head and body, length	45	48
Tail, length.....	34+	60
	%	%
Snout to ear.....	27 ¹	28 ¹
Snout.....	13	13
Diameter of eye	7	8
Width of head.....	20	21
Fore limb	34	33
Hind limb.....	46	42
Submentals.....	2	2
First infralabial compared to mental	½	⅓

¹The percentages in this table are based on length of head and body as the unit of comparison.

PHYLLODACTYLUS GILBERTI sp. nov.

Type.—Cat. No. 4549, adult male, Leland Stanford Junior University Museum; Wenman Island, Galapagos Archipelago, December, 1898.

Range.—Galapagos Archipelago: Wenman Island (Hopkins Stanford Expedition). Occurs abundantly under the loose lava blocks and scoria.

Specific Characters.—Dorsal tubercles small, keeled, in two to six continuous longitudinal series on dorsum; rump crossed by eight rows becoming ten anteriorly, the outer series on each side disappearing before reaching middle of back. Occiput covered by equal granules. Tail inferiorly with a median series of enlarged scales. Digital pallets wide, more than one half diameter of eye, trapezoid. Mental triangular, not much larger than the first infralabial.

Description of the Type.—Dorsal tubercles small, two or three times the size of the dorsal granules, rounded, juxtaposed and feebly keeled, in ten longitudinal series on sacral region; back and nape crossed by four rows, the three outer rows on each side disappearing before reaching middle of back. Rows of tubercles separated by two or three rows of granules; tubercles in the rows juxtaposed with few exceptions. Digital pallets wide, four times width of rest of digit, nearly two thirds diameter of eye, trapezoid. Fourth toe with fourteen transverse lamellæ inferiorly, the distal one divided. Head large, one half as long and two thirds as wide as the body. Ear opening elliptical, oblique, two thirds diameter of eye. Snout rounded at tip, the dorsal profile oblique; length slightly less than twice the diameter of eye. Interorbital more or less concave; occipital region flat. Limbs moderate, the appressed fore limb reaching anterior border of eye; hind limb reaching appressed elbow. Head covered above with equal granules, smallest on occiput, becoming gradually larger anteriorly. Nostril situated between rostral, first superior labial, internasal and two posterior nasals. Internasals contiguous. Rostral twice as broad as high, slightly pentagonal with a median cleft above, bordered dorsally by two internasals. Mental subtriangular, longer than wide with obtuse angle posteriorly, followed by two hexagonal submentals. Superior labials six before middle of pupil, twice as long as high; five inferior labials anterior to middle of pupil, as high as long, first largest and more than two thirds size of mental. Belly and lower surfaces covered with smooth, rounded, imbricate scales; forty-five transverse series between axilla and groins. Tail of type imperfect. In younger specimens the tail is cylindrical, tapering gradually, covered

above and on sides with imbricate, keeled scales about size of dorsal tubercles; covered inferiorly with a median series of enlarged scales.

Coloration in Life.—Above pinkish-gray with dusky blotches and spots; a median light pinkish stripe from nape to tail forking into several faint narrow cross bars on back. Head lighter grayish with irregular dusky blotches above, snout faintly dusky spotted, labials more heavily spotted, a dusky stripe beginning at tip of snout, passing through eye above ear opening and becoming obsolete on shoulder, widest and most distinct just posterior to eye; sides lighter, dusky, spotted. In perfect specimens the tail is light like the head, the dark cross-bands narrower than the light areas and anteriorly broken up into spots. Limbs above barred and blotched with dusky. Underparts cream or whitish, the scales with minute dark dots.

Variations.—Longitudinal series of dorsal tubercles varying from two to six, the tubercles in the outer rows often little larger than the granules and only partly juxtaposed. Rows of ventral scales between axilla and groins forty-four to forty-eight. Superior labials eight or nine, inferior usually seven. One specimen has the internasals separated by a median row of scales, in all the others they are contiguous. Transverse lamellæ under fourth toe twelve to fourteen.

Coloration above varying from thickly dusky blotched with distinct median light stripe to light grayish, faintly dusky shaded without evident light stripe and with dark stripe through eye almost obsolete.

Young with the median dorsal light stripe beginning sharply at base of head and extending to beginning of tail; widening out into six light cross-bars on back, the light areas narrower than the dark ones, the latter splitting on the sides into short forks. Tail light grayish with twelve wide dusky bars. Stripe through eye pronounced, extending to above shoulder. Top of head and snout dusky spotted. Limbs above with oblique dusky bars. Under surfaces whitish, the scales minutely dark spotted.

This species is unique among those possessing keeled tubercles in the possession of less than ten rows of dorsal tubercles on the dorsum. Its derivation from a form possessing ten or more rows is evident as shown by the ten rows on the sacrum. The shape and size of the digital pallets and the median series of enlarged scales on inferior surface of the tail ally it to *P. tuberculosus* from which it differs in the size and number of rows of dorsal tubercles, the smaller size and lighter coloration and in the absence of larger granules on the occiput and limbs.

Named for Dr. C. H. Gilbert, of Stanford University.

MEASUREMENTS OF *Phyllodactylus gilberti*.

Cat. No. Stan. Univ. Mus.	4549	4553	4552	4548	4557	4555	4550	4547	4554
Sex and Age.	Adult Male.	Adult Male.	Adult.	Adult Male.	Adult.	Adult.	Adult Male.	Young.	Young
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Head and body, length	52	50	52	44	44	39	46	41	35
Tail, length.....	...	...	...	48	40	43	...	...	35
	$\frac{0}{10}$	$\frac{0}{10}$	$\frac{0}{10}$	$\frac{0}{10}$	$\frac{0}{10}$	$\frac{0}{10}$	$\frac{0}{10}$	$\frac{0}{10}$	$\frac{0}{10}$
Snout to ear.....	27	28	27	29	29	29	27	29	27
Snout.....	13	12	13	14	15	14	13	15	14
Diameter of eye.....	6	6	7	7	7	7	7	7	7
Fore limb.....	33	35	34	37	39	34	35	34	37
Hind limb.....	43	41	44	43	43	43	41	43	46
Width of head.....	20	21	20	23	23	22	20	22	23

PHYLLODACTYLUS GALAPAGOENSIS Peters.

Phyllodactylus galapagoensis PETERS, Mon. Berl. Ac., p. 720, 1869. — STEINDACHNER, Festschr. Zoöl.-bot. Ges. Wien, p. 329, 1876. — GARMAN, Bull. Essex Inst., XXIV, p. 9, 1892.

Range. — Galapagos Archipelago; Albemarle Island at Tagus and Iguana Coves and on the southeast coast (Kinberg; Baur; Hopkins Stanford Expedition).

Specific Characters. — Digital pallets small, width less than one half diameter of eye, rounded or oblong. Dorsal tubercles in ten to twelve (usually twelve) very regular series, tubercles large, juxtaposed, trihedral, extending forward on nape. Occiput covered with unequal granules. Mental large, two to four times the size of the first infralabial. Submentals two to four, usually three.

Peters' description of the dorsal tubercles and the three submentals of the type fixes this species as the Albemarle form from which island his specimens must have come. Garman does not distinguish clearly between this form and *P. bauri*. The difference between the two species is not one of number of rows of tubercles for these are variable in each but it is rather a difference in the size and number of the tubercles, causing juxtaposition in the one and separation in the other. Submentals usually more than two. Proportions the same as in *P. bauri*. The present species approaches *P. tuberculosus* in the character of the dorsal tubercles but is smaller, differently colored, without enlarged tubercles on the limbs, with smaller and rounded digital pallets and with the enlarged scales on the inferior surface of the tail not arranged in a single row.

The species was found abundant at Iguana Cove under loose blocks of lava near the coast and along dry creek beds. The small spherical

eggs were found commonly in the same situations, many containing large embryos at this season (December). At Tagus Cove they were much less common. Found only at the head of the cove under loose blocks of tufa and in mangrove swamps near Turtle Point where a few were secured beneath the bark of *Avicennia*. Such individuals as inhabit mangrove swamps may occasionally be carried out to sea on logs or other drift material and thus floated to other islands. It seems quite probable that this may have been the manner of their distribution. The stomachs of these mangrove swamp specimens contained remains of the large crickets, *Liparoscelis*, which also live beneath the bark of the same trees.

Phyllodactylus galapagoensis.

Cat. No. Stan. Univ. Mus.	Locality, Albemarle Id.	Rows of Dorsal Tubercles.	Tubercles in the Two Median Rows.	Submentals.	Size of First Infralabial Compared to Mental.
4978	Iguana Cove.	12	42-38	3	one third.
4979	" "	12	52-54	3	one third.
4980	" "	12	42-40	2	one third.
4982	" "	10	40-35 +	3	one fourth.
4983	" "	12	45-44	4	one third.
4985	" "	12	45-45	4	one fourth.
4986	" "	12	40-40	2	one third.
4987	" "	12	42-44	3	one third.
5007	" "	12	40-38	3	one third.
5008	" "	12	36-38	3	one half.
5009	" "	12	44-44	3	one third.
5011	" "	12	38-43	3	one third.
5012	" "	12	43-41	3	one third.
5013	" "	12	47-45	3	one fourth.
5014	" "	10	38-40	3	one fourth.
5019	Tagus Cove.	12	45-45	4	one third.
5021	" "	11	38-36	5	one fourth.
5022	" "	12	40-36	3	one fourth.
5023	" "	12	40-42	3	one third.
5028	" "	11	40-41	5	one fourth.
5029	" "	12	35-36	2	one third.

PHYLLODACTYLUS BAURI Garman.

Phyllodactylus galapagoensis GÜNTHER, Proc. Zool. Soc., p. 67, 1877.—BOUL., Cat. Liz. Brit. Mus., I, p. 82, 1885.—COPE, Proc. U. S. Nat. Mus., XII, p. 145, 1889.

Phyllodactylus bauri GARMAN, Bull. Essex Inst., XXIV, p. 10, 1892.

Range.—Galapagos Archipelago: Charles Island (Petrel, Albatross, 1888 (?), Baur, Hopkins Stanford Expedition); Hood Island (Hopkins Stanford Exped.); Gardner Island (Hopkins Stanford Expedition).

Specific Characters.—Digital pallets small; width less than one half diameter of eye: rounded or oblong. Dorsal tubercles small,

rounded, separated by granules in the rows; in ten to twelve, usually ten longitudinal series. Mental large, two to four times the size of the first infralabial; submentals two.

This species is very close to *P. galapagoensis*, from which it differs chiefly in the fewer and smaller dorsal tubercles, which are not juxtaposed but separated by granules. The submentals are always two. These differences hold good in a series of twenty-one specimens from Charles, Hood and Gardner Islands. The specimens average lighter colored than the Albemarle form. More material may show this form to be only a subspecies of *P. galapagoensis*.

This species occurs commonly at Black Beach, Charles Island. Found beneath rocks near the coast. Much less common on Hood and Gardner.

Phyllodactylus bauri.

Cat. No. Stan. Univ. Mus.	Islands.	Rows of Dorsal Tubercles.	Tubercles in the Two Median Rows.	Size of First Infrac- labial Compared to Mental.
4989	Charles	11	35-36	one third.
4990	"	10	34-35	one third.
4991	"	12	37-35	one third.
4994	"	10	34-34	one third.
4995	"	10	33-35	one third.
4996	"	10	28-31	one third.
4997	"	10	33-33	one third.
4998	"	10	27-28	one third.
4999	"	10	40-41	one fourth.
5000	"	10	27-27	one third.
5001	"	10	37-35	one third.
5002	"	10	30-31	one third.
5003	"	11	28-27	one third.
5004	"	10	30-32	one fourth.
5005	"	10	34-34	one third.
5006	"	12	30-29	one third.
5030	Hood.	12	30-28	one third.
5031	"	10	35-34	one third.
5032	Gardner	12	31-34	one third.
5033	"	12	29-27	one third.
5034	"	10	28-29	one half.

PHYLLODACTYLUS LEEI Cope.

Phyllodactylus leei COPE, Proc. U. S. Nat. Mus., XII, p. 145, 1889. — GARMAN, Bull. Essex Inst., XXIV, p. 11, 1892.

Range. — Galapagos Archipelago; Chatham Island (Albatross, 1888; Baur; Hopkins Stanford Expedition).

Three specimens secured on Chatham Island. Cat. No. 5037, Stan. Univ. Mus., is quite different in coloration from the others being much lighter with no trace of the dark stripe through the eye and with the dark bands of the back only faintly indicated; the auricular meatus is nearly closed.

MEASUREMENTS OF *Phyllodactylus leei*.

(From Wreck Bay, Chatham Island.)

Cat. No. Stan. Univ. Mus.	5037	5035	5036
Sex and Age.	Adult Male.	Immature Female.	Adult Female.
	mm.	mm.	mm.
Head and body, length.....	37	29	35
Tail, length.....	...	31	34
	%	%	%
Snout to ear.....	26	29	28
Snout.....	11	13	12
Diameter of eye.....	7	8	7
Width of head.....	17	20	20
Fore limb.....	32	32	34
Hind limb.....	42	43	43
Submentals.....	3	2	2
Size of first infralabial compared to mental.....	$\frac{1}{3}$	$\frac{1}{4}$	$\frac{1}{3}$
Internasal plates.....	0	1	2

Genus *Tropidurus* Wied.

Tropidurus Abbild. WIED, Naturgesch. Bras., pl. 1824?; Beitrage Naturgesch. Bras., I, p. 137, 1825.

Range. — Neotropical. Galapagos Archipelago (six peculiar species).

Occurs abundantly on most of the islands and islets of the archipelago; lacking only on Culpepper, Wenman and Tower. Apparently nearly extinct on Charles. On all the other islands it is the commonest reptile. Most abundant along the coast and in the dryer parts of the islands, nearly or quite disappearing in the damp and heavily wooded portions and in the higher altitudes at 2,000 feet and above.

The Galapagos hawk, *Buteo*, is the chief native enemy of *Tropidurus*. The owls, *Strix* and *Asio*, may occasionally feed upon them. The range of *Buteo* coincides almost perfectly with that of *Tropidurus*, lacking only on Charles Island where *Tropidurus* is very rare.

May and June are the breeding months. The eggs are four to six in number, white and elliptical. Many of the females were seen at various islands in May and June digging short oblique tunnels in the sand presumably for the reception of the eggs.

KEY TO GALAPAGOS SPECIES AND SUBSPECIES OF *Tropidurus*.

A₁ Ninety scales or less in a transverse series around middle of body.

B₁ Sides of neck granular and much folded between ear opening and anterior oblique fold.

C₁ No red on tail; scales large, 58 to 73 in circumference of body.

- D₁ Female without dark transverse bars above.
 E₁ Below light; scales in circumference of body 58 to 68; female usually plain olivaceous above; length of head and body in male less than 100 mm. *grayi grayi*.
 E₂ Plumbeous below; length of head and body in male usually 100 mm. or greater; scales in circumference of body 58 to 60..... *grayi magnus*.
 D₂ Female with dark transverse bars above; scales in circumference of body 66 to 73; length of head and body in male 91 to 100 mm..... *grayi barringtonensis*.
 C₂ Coloration of tail extensively reddish; scales smaller, 70 or more in circumference of body.
 D₁ Tail and belly red; scales smaller, 80 to 90 in circumference of body; female dark spotted on throat and breast; size smaller, length of head and body, male 90 mm., female 75 mm..... *duncanensis*.
 D₂ Tail red laterally, inferiorly yellowish like belly; scales larger, 70 to 80 in circumference; female immaculate below; size larger, length of head and body, male 115 mm., female 90 mm..... *delanonis*.
 B₂ Sides of neck scaled; no folds between ear opening and anterior oblique fold of neck.
 C₁ Scales large, 55 to 65 in circumference of body; height of dorsal crest in male on nape $\frac{2}{3}$ internasal width; plates on top of head more divided and equal in size; male with two longitudinal light stripes on sides; small, length of head and body in male 80 mm., female 60 mm *bivittatus*.
 C₂ Scales small, 68 to 75 in circumference of body; height of dorsal crest in male on nape $1\frac{1}{2}$ internasal width; plates on top of head fewer and unequal; male light spotted above; larger, length of head and body in male 100 mm., female 70 mm..... *habeli*.
 A₂ More than 90 scales in transverse series around middle of body.
pacificus.

TROPIDUURS GRAYI GRAYI (Bell).

- Leiocephalus grayii* BELL, Zoöl. Beagle, Rept., p. 24, pl. XIII, fig. 1, 1843 (part). — GRAY, Cat., p. 218, 1845 (part). — GÜNTHER, Proc. Zoöl. Soc., p. 67, 1877 (part).
Holotrophis grayii A. DUM., Cat. Meth. Rept., p. 70, 1851 (part) and Arch. Mus., VIII, p. 538 (part).
Craniopeltis grayii PETERS, Mon. Berl. Ac., p. 645, 1871.
Tropidurus (Craniopeltis) grayii STEINDACHNER, Festschr. Zoöl.-bot. Ges. Wien, p. 310, pl. II, fig. 1, 1876 (part).

Tropidurus grayi BOUL., Cat., II, p. 172, 1885 (part). — COPE, Proc. U. S. Nat. Mus., XII, p. 145, 1889 (part). — BAUR, Biol. Centralbl., X, p. 475, 1890. — BOUL., Ann. N. H. (6), VII, p. 502, 1891 (part). — BAUR, Festschr. Leuckart, p. 265, 1892.

Tropidurus indefatigabilis BAUR, Biol. Centralbl., X, p. 476, 1890 and Festschr. Leuckart, p. 268, 1892.

Tropidurus albemarlensis BAUR Biol. Centralbl., X, p. 476, 1890, and Festschr. Leuckart, p. 269, 1892.

Tropidurus jacobii BAUR, Festschr. Leuckart, p. 268, 1892.

Range. — Galapagos Archipelago; Charles Island (Darwin, Kinberg, Baur); Indefatigable (Kinberg, Hassler, Albatross 1888, Baur, Hopkins Stanford Exped.); James (Hassler, Albatross 1888, Baur, Hopkins Stanford Exped.); Jervis (Hassler, Baur); Albemarle (Hassler, Cookson, Albatross 1888, Baur, Hopkins Stanford Exped.).

Specific Characters. — Sides of neck granular with numerous folds between ear opening and anterior oblique fold. Scales in circumference 58 to 68. Considerable variation in coloration but tail never red; underparts usually light; females plain olivaceous above. Males less than 100 mm. in length of head and body.

Head plates variable but never as divided as in *T. bivittatus*. Frontal usually small; prefrontals large, commonly four. Internasals not usually confluent with prenasals. Supraoculars five to seven, varying much in shape. Sides of neck granular and much folded, there being two oblique folds on side of neck and several irregular folds behind the ear opening.

There is much individual variation in size and coloration, especially in the specimens from Albemarle where the conditions of vegetation and moisture are so various. Individuals inhabiting the barren black lava fields and living only near the coast are usually larger and darker than those found in the brush-covered areas. On islands where there is little diversity of conditions, as on the Seymours, the individual variation is correspondingly less. The specimens from the different islands comprising the range of this species show a little local variation but individual variation is so great that it is almost impossible to define the former.

Charles Island. — Baur's description of his only specimen from the type locality, a female, agrees in coloration and scale counts with some females of *T. g. grayi* from James and Seymour from which form the Charles Island specimens are perhaps not separable. *Tropidurus* is apparently now almost extinct on this island where formerly it was not uncommon. Its extinction is probably due to the introduction of domestic animals, chiefly cats, which have spread over the whole island and feed on the lizards. Three days were spent, in May, 1899,

collecting on the western and central portions of the island but without finding any traces of *Tropidurus*.

Indefatigable Island.—An adult male, Cat. No. 4862 Stan. Univ. Mus., from Indefatigable shows the following coloration. Above olive-brown, head lighter brown; back marked anteriorly with transverse blackish bars; whole dorsal surface except the head spotted with grayish. A dark stripe on side of head beginning below eye and extending above ear to nape. Sides of head and neck posterior to eye reddish, black-spotted. A black antehumeral spot. Sides of body reddish, finely black-spotted. Breast and lower jaw rosy red, with large black blotches; throat black. Belly light greenish-gray; tail and hind limbs inferiorly light blue-gray. Fore limbs spotted below like breast.

Thirty-seven adult males are in the collection, nine from the northern coast of Indefatigable, twenty from South Seymour and eight from North Seymour Island. The coloration of the breast varies from red through orange to buff, the black blotches in some specimens obscuring the ground color; in some others the breast is only sparingly spotted. A few are light grayish above, like *T. g. barringtonensis*.

Length of head and body 72 to 80 mm.

An adult female, Cat. No. 4875 Stan. Univ. Mus., from Indefatigable, is olive-brown above, becoming lighter on head and tail. Sides of head and neck from snout to antehumeral fold brick-red. A black ante-humeral spot. Sides of body reddish, unspotted. Mandible and breast posteriorly yellowish; the chin reddish. Throat light slate, darker spotted; forebreast lighter grayish, dark-spotted. Belly, hind limbs and tail inferiorly grayish.

Twenty-seven adult females are in the collection from Indefatigable and the Seymour Islands. These show little variation in coloration. Several are marked on the sides by two dark longitudinal bands, the lower band extending from axilla to thigh, the upper from ear to above thigh.

Length of head and body 58 to 67 mm.

In the Indefatigable specimens the male approaches much nearer the size of the female. The females are scarcely distinguishable in coloration from some specimens from James Island, while the males approach closer in size and coloration to Albemarle specimens.

Generally distributed, most abundant coastwise. The specimens from the Seymour Islands show scarcely any variation from those taken on Indefatigable. They average slightly lighter colored and larger.

Stomachs of Indefatigable specimens contained insects and spiders; those from the Seymours insects, seed cases and berries.

James Island.—Coloration in life of an adult male, Cat. No. 3918, Stan. Univ. Mus. Above dark brown-spotted with blackish and light grayish spots, dorsal crest and the scales at its base light grayish, hind limbs and tail above lighter dusky brown, the former light-spotted; head above olive brown. Belly, thighs and tail inferiorly light grayish, breast buffy and pinkish, sparingly black spotted, throat black, mandible pinkish, black spotted posteriorly. Sides of head light brownish, preoculars light spotted, lower eyelid bluish; sides of neck bright red, black spotted; a black antehumeral spot, light bordered anteriorly; shoulders blotched with yellowish and brown. Sides of body lake red, spotted with black and whitish spots except about axilla and along sides of belly.

The fifteen adult males in the collection show the following variations in coloration: throat and belly darker, plumbeous-gray, dorsum without lighter spots, some light above with transverse black bars as in *T. g. barringtonensis*.

Coloration in life of an adult female, Cat. No. 3913 Stan. Univ. Mus. Above golden-brown, crest grayish-white, nape and tail lighter without golden coloration; limbs above like dorsum. A dark brown band, two scales wide, extending from ear to above thigh, a lighter or fainter one from axilla to thigh. Belly, hind limbs and tail inferiorly light grayish; breast, throat and mandible canary-yellow, black-spotted. Sides of head orange-red; sides of neck and body red, brightest anteriorly, lake red posteriorly, on body the scales light-edged, sparingly dark-spotted; a black antehumeral spot.

Of the seventeen females taken at James Island only two have the lateral stripes as described above. Some are much darker on throat and chest with only a median light streak.

The darker specimens are indistinguishable from the average Albemarle specimens but show less variation than the latter and the females as a whole are indistinguishable from Indefatigable specimens.

The stomachs examined contained spiders, insects and seeds.

Albemarle Island, Iguana Cove.—Coloration in life of an adult male, Cat. No. 4711, Stan. Univ. Mus. Above olive-brown, flecked with pale greenish-gray, dorsal crest like spots except on nape where it is dark-spotted; limbs above like the back. Head uniform brownish, sides of body same but dark-spotted. Sides of neck tinged with reddish; a black antehumeral spot. Belly pale greenish-gray, bordered with brick red on the sides; limbs and tail inferiorly like the

belly. Breast chrome-yellow spotted with black, the throat clay-yellow, much spotted with black, mandible grayish, labials greenish.

The males secured at Iguana Cove show much variation. Those inhabiting the light soil in brushy areas are lighter, in some the breast being yellowish with a few scattered spots and throat grayish. Others taken near the beach on black basaltic lavas have the breast, throat and mandible solid blackish and the belly plumbeous. Some of the light specimens are considerably lighter above than the one described, the dorsal crest being entirely light grayish and sides of belly dark-spotted with the dark markings of the back arranged in transverse bars.

Coloration in life of an adult female, Cat. No. 4709, Stan. Univ. Mus. Much darker brown above than the male, with light dorsal crest, black-spotted above; tail somewhat lighter with a greenish dorsal crest and light spots; fore limbs like the back; hind limbs like the tail, light-spotted. Belly pale greenish-gray, breast golden, black-spotted; throat and mandible brick red. Tail and hind limbs inferiorly like the belly; fore limbs like the breast, black-spotted. Sides of throat, mandible and body brick red; a black antehumeral spot.

Some of the females in the collection are as dark as the darkest males. Most of them lack red on the mandible, sides of the head and neck which separates them somewhat from specimens secured on James and Indefatigable.

Four specimens taken at Point Christopher on black lava are dark plumbeous below. Specimens secured at Elizabeth Bay on black lava are also dark and of only average size.

Albemarle Island, Tagus Cove.—Coloration in life of an adult female, Cat. No. 4694, Stan. Univ. Mus. Above brown, spotted with lighter brown, except on tail which is grayish-brown. Hind limbs like the tail, fore limbs colored like the back. Belly light grayish, hind limbs and tail inferiorly the same. Breast pale yellow, spotted with black; throat dark with yellow-edged scales; chin lighter, grayish, dusky-spotted; infralabials and mental pinkish. Sides dull brick, black-spotted; a dark stripe from ear to thigh, and another fainter one from axilla to thigh. Sides of head and neck brighter red with a dark antehumeral spot.

The males vary from light below, sparingly spotted on breast to black throat and breast with plumbeous belly. Those inhabiting the coast are larger and darker as a rule. The females vary in the same manner as the males but are smaller in comparison to the males in the dark forms.

Specimens secured near Black Bight are larger and darker, approaching *T. g. magnus* of Narboro in size and coloration.

Tropidurus grayi.

Cat. No. Stan. Univ. Mus.	Locality.	Sex.	Scales in Circumference.	Length of Head and Body.	Length of Tail.
4888	James.	Male.	62	mm. 87	mm. 134
4896	"	"	66	95	.....
4885	"	"	68	83	.....
4907	"	"	65	84	.....
4862	Indefatigable.	"	64	80	.....
4859	"	"	60	72	109
4869	"	"	64	72	103
4871	"	"	60	77	.....
4643	Albemarle.	"	60	86	102
4650	"	"	62	81	114
4700	"	"	60	88	135
4716	"	"	62	83	115
4887	James.	Female.	64	68	102
4889	"	"	65	60	92
4906	"	"	65	65	102
4900	"	"	63	65	91
4863	Indefatigable.	"	60	67	103
4860	"	"	66	58	101
4866	"	"	60	58	92
4857	"	"	66	60	.....
4613	Albemarle.	"	58	58	90
4595	"	"	62	65	.....
4716	"	"	58	66	92
4709	"	"	62	73	92

TROPIDURUS GRAYI MAGNUS subsp. nov.

Type. — Adult male, Cat. No. 3974, Stan. Univ. Mus., from Narboro Island.

Range. — Galapagos Archipelago; Narboro Island (Hopkins Stanford Expedition).

Subspecific Characters. — Males large, length of head and body 100 to 105 mm. Under parts dark, the breast and throat black and the belly plumbeous. Females much smaller than the males, length of head and body 63 to 71 mm. Scales large, 56 to 60 in circumference of body.

Description of the Type. — Coloration above dark olive, nape and dorsal crest greenish-gray, the entire dorsum excepting head, tail and hind limbs spotted with black; tail and hind limbs light blue-gray-spotted; tail greenish posteriorly. Sides of head olive; sides of neck and body dark slaty, spotted with black; a black antehumeral spot. Inferior surfaces of hind limbs, tail and mandible plumbeous, the lat-

ter spotted with black posteriorly; throat black; breast and fore limbs proximally dark slaty-spotted with black; belly grayish plumbeous.

Length of head and body 105 mm. Scales in circumference of body 60.

An adult female, Cat. No. 3985, Stan. Univ. Mus., which exhibits the typical coloration is uniform dark brownish-olive above, considerably darker than in the male; sides of head and body similar. Below dark plumbeous, darkest on throat where nearly black; breast and mandible spotted with black; the chin grayish-green.

Much variation occurs in the sixty specimens secured from various parts of Narboro. The typical form occurs all along the barren lava fields bordering the coast where they feed on the littoral crustacea. Farther inland where the lava is overgrown with vegetation they become smaller and lighter colored, resembling specimens secured on Albemarle in similar situations.

The food of the smaller inland form consists of insects, and the seed capsules and ovaries of various flowers.

Tropidurus grayi magnus.

Cat. No. Stan. Univ. Mus.	388r	3974	3989	4560	3965	3985	4575
Sex.	Male.	Male.	Male.	Male.	Female.	Female.	Female.
Scales in circumference of body.....	60	60	60	58	59	58	56
Head and body, length.....	mm. 104	mm. 105	mm. 100	mm. 105	mm. 63	mm. 71	mm. 62
Tail, length.....	155	114+	147	.....	105	106	...

TROPIDURUS GRAYI BARRINGTONENSIS (Baur).

Tropidurus barringtonensis BAUR, Festchr. Leuckart, p. 267, 1892.

Range. — Galapagos Archipelago; Barrington Island (Baur, Hopkins Stanford Expedition).

Subspecific Characters. — Scales in circumference of body, 65–73; female dark-barred above; male light grayish above with dark bars, the breast and lower jaw reddish; length of head and body in male 91–100 mm., in female 66–76 mm.

Coloration in life of an adult male, Cat. No. 3934, Stan. Univ. Mus. Above light grayish-brown, tail darker grayish; whole upper surface except head spotted with blue-gray; the dorsum anteriorly and fore limbs black barred and spotted; hind limbs and tail without dark bars. Head above olive green, grayish on sides and neck, black-spotted. A black antehumeral spot. Sides of body behind axilla

reddish, black-barred and spotted; belly yellowish, spotted with pinkish and dusky on sides; breast and lower jaw brick red, spotted with black; chin yellowish without darker spots; throat black; fore limbs inferiorly red, black-spotted proximally like the breast; tail and hind limbs below light grayish-green.

Sixteen adult and three immature males are in the collection. In these alcoholic specimens the coloration of the belly varies from grayish or whitish to light buff. Throat in a few specimens medially yellowish, black-spotted. Sides of neck red in two specimens.

Length of head and body 91 to 100 mm.

Coloration in life of an adult female, Cat. No. 3907, Stan. Univ. Mus. Above grayish-brown, the dorsum crossed by dusky transverse bars; whole dorsal surface except head spotted with blue-gray; limbs above dusky barred like back; head above olive brown, sides of snout grayish. Sides of head and neck from eye to antehumeral spot brick red; sides of body behind axilla pinkish, obsoletely spotted with dusky; a black antehumeral spot. Belly and inferior surfaces of hind limbs and tail light grayish; breast lemon-yellow, spotted with black; throat medially like the breast, spotted with dark brown; sides of body reddish; lower jaw pinkish, spotted with dusky; fore limbs inferiorly colored like breast, the forearm unspotted.

The collection contains twenty-four adult females. In the majority of these the belly is light blue-gray. The breast, throat and chin in some specimens are sparingly spotted with darker.

Length of head and body 66 to 76 mm.

Scales small, 65 to 73 in circumference of body.

Some of the darker males are not distinguishable in size and coloration from specimens of *T. g. grayi* from James Island. As a series these specimens are more uniform in size and coloration than those from other islands.

MEASUREMENTS OF *Tropidurus grayi barringtonensis*.

Cat. No. Stan. Univ. Mus.	3903	3906	3910	3920	3905	3911	3922	3933
Sex and Age.	Adult Male.	Adult Male.	Adult Male.	Adult Male.	Adult Female.	Adult Female.	Adult Female.	Adult Female.
Scales in circumference.....	67	73	70	67	71	70	69	66
Head and body, length	95	95	100	91	66	70	76	66
Tail, length.....	150	...	145	...	...	107	...	110

Distributed generally over the entire extent of Barrington Island but most abundant about the sand beaches.

Food insectivorous. All the stomachs examined contained insects, chiefly Orthoptera.

Many of the females secured during our visit (May 29-30) contained large eggs.

TROPIDURUS DUNCANENSIS Baur.

Tropidurus grayi COPE, Proc. U. S. Nat. Mus., XII, p. 145, 1889 (part). — BOUL., Ann. N. H. (6), VII, p. 502, 1891 (part).

Tropidurus duncanensis BAUR, Biol. Centralbl., X, p. 477, 1890, and Festschr. Leuckart, p. 270, 1892.

Range. — Galapagos Archipelago; Duncan Island (Albatross 1888, Baur, Hopkins Stanford Expedition).

Specific Characters. — Belly and tail inferiorly red; breast and mandible dark-spotted; throat black. Sides of neck granular, much folded behind ear-opening. Scales small, 80 to 90 in circumference of body. Length of head and body: of male 83 to 95 mm., of female 70 to 76 mm.

Plates on top of head variable as in *T. g. grayi*. A single small frontal plate; prefrontals usually four, large. Parietal large, bordered laterally by two temporals. Dorsal crest in male of medium height; highest on tail; height at nape one half internasal width.

Coloration of adult male, Cat. No. 4912, Stan. Univ. Mus. Above olive-brown, black-spotted except the head; tail more brownish with few dark spots; hind limbs and tail light blue-gray-spotted; forelimbs dark-spotted like back. Sides of head and body from snout to tip of tail brick red, finely black-spotted on sides and along the belly where the red is brightest; a black antehumeral spot. Throat black; breast, mandible and fore limbs reddish, black-spotted; chin, belly, and hind limbs and tail inferiorly red.

Twelve males are in the collection. In some the breast as well as the throat is black, in others it varies from red to orange, black-spotted. A few are spotted with blue-gray on back.

Length of head and body 83 to 95 mm.

Coloration of adult female, Cat. No. 4919, Stan. Univ. Mus. Above olive-brown. Sides of head and body from snout to tip of tail brick red, darkest dorsally where the red extends high up and encroaches on the dorsum, brightest along belly; a black antehumeral spot. Below red from mandible to tip of tail, darkest anteriorly on lower jaw, brightest on tail; breast and belly lighter, breast darkspotted.

Ten females are in the collection, all of them varying considerably from the above. Sides spotted in some, others with breast dusky. Red of sides not always running high up on dorsum. Tail usually dark at tip like dorsal surface.

Length of head and body 70 to 76 mm.

The coloration of this species is quite distinctive and separates it at once from reddish specimens of *T. g. grayi*.

Occurs abundantly in the central part of Duncan Island. Especially common in the old crater at the north end where their coloration harmonizes with the red soil forming the floor of the crater; much rarer near the coast. Their food consists exclusively of insects. The stomachs examined contained grasshoppers, caterpillars, grubs, beetles, etc.

MEASUREMENTS OF *Tropidurus duncanensis*. ALL ADULT.

Cat. No. Stan. Univ. Mus.	4908	4918	4928	4929	4919	4920	4925	4927
Sex.	Male.	Male.	Male.	Male.	Female.	Female.	Female.	Female.
Scales in circumference	88	90	84	82	87	85	80	80
Head and body, length	mm. 87	mm. 85	mm. 95	mm. 83	mm. 70	mm. 72	mm. 72	mm. 76
Tail, length.....	131	133	140	135	113	106	110	108

TROPIDURUS DELANONIS Baur.

Tropidurus grayi COPE, Proc. U. S. Nat. Mus., XII, p. 145, 1889 (part). —

BOUL., Ann. N. H. (6), VII, p. 502, 1891 (part).

Tropidurus delanonis BAUR, Biol. Centralbl., X, p. 476, 1890, and Festschr Leuckart, p. 269, 1892.

Tropidurus hoodensis BAUR, Festschr. Leuckart, 1892, p. 263.

Range. — Hood Island (Albatross 1888, Baur, Hopkins Stanford Expedition); Gardner Island (Hopkins Stanford Expedition).

Specific Characters. — Sides of tail red, belly and tail inferiorly yellowish, male spotted on breast, female usually immaculate below. Parietal plate small, width one and one fourth internasal width or less, bordered on each side by a single large temporal between which it is sunk. Scales in circumference of body 70 to 80. Large, length of head and body in male 111 to 125 mm., female 85 to 96 mm.

Head plates varying considerably, in some specimens nearly as divided as in *T. bivittatus*. The parietal however is smaller than in other species, its width varying from one to one and one fourth internasal width. Supraoculars usually narrow, six or seven. Height of dorsal crest in male at nape one half internasal distance.

Coloration in life of adult male, Cat. No. 3876, Stan. Univ. Mus., from Hood Island. Above olive-brown, spotted, except the head, with light yellowish; tail dark reddish, the crest light brown; hind limbs reddish, light-spotted distally; fore limbs like sides of body. Belly medially and hind limbs and tail inferiorly dusky-yellow; the belly anteriorly and laterally red. Mandible dark greenish-gray, throat black, chest black with large straw-yellow blotches. Fore limbs below proximally like breast. Sides of head and neck light brown with black blotches; sides of body reddish, spotted with light yellow; tail brick red on sides.

The collection contains eighteen adult males from Hood and Gardner Islands, those from Gardner having the reddish areas brighter. In some the dorsum is only sparingly light-spotted and without light spots on the sides. The immature males are unspotted above like the females.

Length of head and body 111 to 125 mm.

Coloration in life of adult female, Cat. No. 3874, Stan. Univ. Mus., from Hood Island. Body and tail above olive-brown; limbs similar in coloration. Sides of belly and tail reddish; a black antehumeral spot. Whole head, throat and chest brick red, becoming darker on nape and top of head, fading to dull orange on anterior belly; belly and tail and hind limbs inferiorly cream-yellow; fore limbs below proximally like breast.

There are nineteen adult females in the collection from Hood and Gardner Islands. A single specimen has the breast dark-spotted, all the others being immaculate below.

Length of head and body 85 to 96 mm.

This is the largest species of the archipelago. Some specimens from Narboro nearly equal it in size but differ much in coloration and size of scales. Some forms of *T. grayi* approach it somewhat in coloration but the red on the sides of tail and the unspotted lower parts of the female seem to be distinctive.

MEASUREMENTS OF *Tropidurus delanonis*. ALL ADULT.

Cat. No. Stan. Univ. Mus.	3871	3873	3882	3883	3861	3863	3867	3874
Sex.	Male.	Male.	Male.	Male.	Female.	Female.	Female.	Female.
Scales in circumference	72	74	76	72	75	70	80	72
Head and body, length	mm. 121	mm. 125	mm. 125	mm. 111	mm. 96	mm. 85	mm. 90	mm. 95
Tail, length.....	.....	.....	.....	.....	...	120	124	145

This species is generally distributed over Hood and Gardner, but as on the other islands of the archipelago they occur much more abundantly near the coast.

Food consists of insects, seed capsules and berries. Stomachs examined contained grasshoppers, beetles, caterpillars, seeds and berries.

TROPIDURUS BIVITTATUS (Peters).

Leiocephalus grayii BELL, Zoöl. Beagle Rept., p. 24, 1843 (part). — GRAY, Cat., p. 218, 1844 (part). — GÜNTHER, Proc. Zoöl. Soc., p. 67, 1877 (part).

Crainopeltis bivittata PETERS, Mon. Berl. Ac., p. 645, 1871.

Tropidurus (Crainopeltis) grayii STEINDACHNER, Festschr. Zoöl.-Bot. Ges., Wien, p. 310, 1876 (part).

Tropidurus grayii BOUL., Cat., II, p. 172, 1889 (part).

Tropidurus lemniscatus COPE, Proc. U. S. Nat. Mus., XII, p. 145, 1889. — BAUR, Biol., Centralbl., x, p. 475, 1890.

Tropidurus bivittatus BOUL., Ann. N. H. (6), VII, p. 501, 1891. — BAUR, Festschr. Leuckart, p. 272, 1892.

Range. — Galapagos Archipelago; Chatham Island (Darwin, Kingberg, Albatross 1888, Baur, Hopkins Stanford Expedition.).

Specific Characters. — Two oblique folds on side of neck; no folds between ear opening and anterior oblique fold; sides of neck scaled. Male with two longitudinal light stripes above. Scales in circumference of body 55 to 65. Small, length of head and body in male 66 to 85 mm., female 57 to 61 mm.

Plates on top of head small and numerous; about equal in size. The frontal and azygos plates between prefrontals and frontonasals equal in size to prefrontals. Prefrontals transversely divided forming eight; frontonasals four. Crest of male about one half internasal distance in height, highest on tail.

Coloration in life of adult male, Cat. No. 4951, Stan. Univ. Mus.; above olive-brown, top of head darker brown; a light stripe two and one half scales wide beginning behind eye, running slightly upward above ear and along sides to base of tail; a narrow stripe of the same color beginning at axilla and extending along sides to base of thigh. Belly yellowish, red-tinged; breast, tail and hind limbs below soiled whitish or grayish; throat and lower jaw same; sides of head grayish; sides of body below lateral stripe barred yellow and brick red; a black antehumeral spot. Limbs above spotted with brown and gray; tail posteriorly light brown.

The fourteen adult males in the collection are all dusky-spotted on breast, throat, mandible and limbs. The immature males are whitish below without dusky spots. One large male is wholly buff below.

Length of head and body 66 to 85 mm.

Coloration in life of adult female, Cat. No. 4950 Stan. Univ. Mus. Above golden brown, darker on top of head and along base of dorsal crest; limbs above like back. Sides of head brownish; sides of throat and body bright brick red; a slaty antehumeral spot with black center. Belly and inferior surfaces of limbs cream; tail yellowish below. Chin greenish; rest of lower jaw, throat and breast buffy. Eyelids dark blue-green.

The collection contains eleven adult females, all of which exhibit considerable variation. Mandible and throat in some spotted with dusky; tail dorsally black-barred and dorsum bronze-brown in a few specimens.

Length of head and body 57 to 61 mm.

This is the smallest and in some respects the best marked species in the archipelago.

Occurs abundantly near the coast at Wreck Bay. None were seen inland more than a mile from the coast, their absence being due probably to the saturated condition of the soil and great amount of surface water.

Food consists of insects, spiders, blossoms and seed capsules, the former predominating in the stomachs examined.

MEASUREMENTS OF *Tropidurus bivittatus*. ALL ADULT.

Cat. No. Stan. Univ. Mus.	4743	4756	4947	4951	4754	4755	4761	4950
Sex.	Male.	Male.	Male.	Male.	Female.	Female.	Female.	Female.
Scales in circumference.....	60	60	63	62	60	63	65	58
Head and body, length	mm. 66	mm. 76	mm. 85	mm. 75	mm. 58	mm. 61	mm. 57	mm. 60
Tail, length.....	119	131	...	127	95	92	...	90

TROPIDURUS HABELI (Steindachner).

Tropidurus pacificus (var. *habeli*) STEINDACHNER, Festschr. Zoöl.-bot. Ges. Wien, p. 314, pl. II, fig. 2, 1876.

Tropidurus pacificus BAUR, Biol. Centralbl., x, p. 479, 1890. — BOUL., Ann. N. H. (6), VII, p. 501, 1891 (part).

Tropidurus habelii BAUR, Festschr. Leuckart, p. 271, 1892.

Range.—Galapagos Archipelago; Bindloe Island (Habel, Baur, Hopkins Stanford Expedition).

Specific Characters.—Sides of neck scaled; no folds between ear-opening and anterior oblique fold of neck. Dorsal crest in male high, height on nape equal to one and one-half internasal distance. Male

above brownish without darker spots. Scales in circumference 68 to 75.

Sides of neck with two oblique folds; no folds between ear-opening and anterior oblique fold. Crest in male high; height at nape equal that on tail. Sides of neck covered with scales. Plates on top of head very irregular and unequal; internasals confluent with prenasals (one exception); prefrontals three to six. Dorsal crest in female low, equal one sixth internasal width.

Coloration in life of adult male, Cat. No. 4937, Stan. Univ. Mus. Above dark brown, spotted with light gray; crest grayish; tail and nape olive-brown; limbs above lighter, more spotted; top of head olive-brown. Belly grayish; breast red with dark blotches; throat and lower jaw also dark but with more red than breast. Sides of body and neck lake red; a black antehumeral spot.

Eleven adult males are in the collection. None of the alcoholic specimens show any light spots on dorsum. The coloration of the breast varies from dark red heavily dark-blotched to lighter reddish, obsoletely spotted with darker.

Length of head and body 99 to 108 mm.

Coloration in life of adult female, Cat. No. 4930, Stan. Univ. Mus. Above dusky greenish, spotted with black, becoming dusky on tail and brown on head; limbs above with much light olive. Sides of body dark lake red, chest lighter red; lower jaw and throat dark like sides. Belly and limbs below clay yellow; tail inferiorly dusky yellow. Sides of head light brown; sides of neck dark red like throat; a black antehumeral spot.

The five adult females in the collection show little or no variation.

Length of head and body 67 to 72 mm.

In size the males average a little larger than *T. pacificus*, but the females are considerably smaller than in that species. Tail shorter than in *T. pacificus*, less than one and one half head and body, varying from one and one tenth to one and one third head and body. This species is not very close to any other of the archipelago. Its distinctive features are its coloration and the possession in the male of a high dorsal crest. The absence of granules on the sides of the neck ally it to *T. bivittatus* from which in other respects it is very different.

Occurs abundantly throughout the brushy portions of Bindloe Island. Found sparingly along the coast on the barren lava fields.

Its food appears to be wholly vegetable. All the stomachs examined contained blossoms, seed capsules and berries.

MEASUREMENTS OF *Tropidurus habeli*. ALL ADULT.

Cat. No. Stan. Univ. Mus.	4933	4936	4937	4939	4930	4932	4935	4940
Sex.	Male.	Male.	Male.	Male.	Female.	Female.	Female.	Female.
Scales in circumference ..	74	72	72	76	70	68	68	70
Head and body, length ...	mm. 99	mm. 108	mm. 102	mm. 100	mm. 70	mm. 67	mm. 72	mm. 69
Tail, length .....	...	118	....	112	...	91	63	71

TROPIDURUS PACIFICUS Steindachner.

Tropidurus (Craniopeltis) pacificus STEINDACHNER, Festschr. Zoöl.-bot. Ges. Wien, p. 313, pl. II, fig. 3, 1876.
Leiocephalus pacificus GÜNTHER, Proc. Zoöl. Soc., p. 67, 1877.
Tropidurus pacificus BOUL., Cat., II, p. 173, 1885, and Ann. N. H. (6), VII, p. 501, 1891.—COPE, Proc. U. S. Nat. Mus., XII, p. 147, 1889.—BAUR, Festschr. Leuckart, p. 270, 1892.
Tropidurus abingdonii BAUR, Biol. Centralbl., x, p. 477, 1890.

Range. — Galapagos Archipelago. Abingdon Island (Habel, Petrel, Albatross 1888, Baur, Hopkins Stanford Expedition).

Specific Characters. — Scales small, 94 to 101 in circumference of the body; dorsal scales little larger than the ventrals. Whole head reddish in both sexes.

Plates on top of head variable, the frontal small; prefrontals usually large, three or four in number; frontonasals two, the azygos plate between them and prefrontals small or wanting; prenasals not confluent with internasals. Supra-oculars wide, five or six; parietal bordered by two large temporals. Scales on body small, those on dorsal surface little larger than the laterals, equalling ventrals in size. Scales in circumference of body 94 to 101. Dorsal crest in male highest on tail, height at nape one half internasal distance.

Coloration in life of adult male, Cat. No. 4741, Stan. Univ. Mus. Dorsum grayish-brown, the back crossed by several series of transverse black bars, most distinct anteriorly, interrupted medially and on sides. Dorsal crest and the scales at its base light greenish-gray; dorsum, tail and limbs spotted with same. Top of head reddish-brown, nape olive-brown. Fore limbs brownish, barred above like the back. Tail becoming dusky toward tip, without lighter spots. Chin and sides of mandible pinkish; throat deep brown; chest light brown, dark-spotted, the scales with light margins; fore limbs below like chest, slightly more buffy. Belly, and hind limbs and tail inferiorly light olive-gray. Sides of head from snout to ear-opening red shading into seal brown on neck. A black antehumeral spot. Sides of body reddish, black-spotted.

Eight adult males are in the collection. In one specimen the breast and lower jaw are yellowish and the dark area of the throat restricted to a narrow band. Several have the top of the head spotted with light yellow and dark brown spots. Width of light area along base of dorsal crest variable. Light spots of dorsal surface nearly obsolete in some specimens.

Length of head and body 88 to 95 mm.

Coloration in life of adult female, Cat. No. 4740, Stan. Univ. Mus. Whole head, nape, shoulders, back anteriorly and sides of body brick red; fore limbs reddish, becoming olive-gray distally. Dorsal crest and median line of back greenish-gray; dorsum from middle of back, tail and hind limbs above olive-brown, spotted with the color of the dorsal crest. Belly, tail and hind limbs inferiorly light olive-gray. Breast and sides of body light brick red; throat dark red; lower jaw light like breast. Fore limbs below brick red proximally, lighter grayish distally. Antehumeral spot black.

The ten adult females in the collection show scarcely any variation in coloration. Breast in some indistinctly dark-spotted. Alcoholic specimens show no trace of the red on the top of the head.

Length of head and body 72 to 82 mm. The female approaches nearer the size of the male than in any other Galapagos species except *T. bivittatus*, which it nearly equals in this respect.

Proportions practically the same as in the other species of the Archipelago. In coloration this species is very different from any other. In the small size of the scales it is approached only by *T. duncanensis*.

Distributed abundantly over the brushy portions of Abingdon. Absent from the barren lava fields, even along the coast. Occurs from the beaches to the summit of the island but most abundant in the lower belt along the coast.

MEASUREMENTS OF *Tropidurus pacificus*. ALL ADULT.

Cat. No. Stan. Univ. Mus.	4725	4731	4734	4735	4726	4730	4732	4739
Sex.	Male.	Male.	Male.	Male.	Female.	Female.	Female.	Female.
Scales in circumference	94	96	94	95	95	96	96	100
Head and body, length	mm. 191	mm. 88	mm. 94	mm. 95	mm. 80	mm. 82	mm. 82	mm. 72
Tail, length.....	126	...	151	...	...	123	110	107

Food chiefly vegetable, varied with insects, etc. Stomachs examined contained berries, hard seeds and blossoms with an occasional

grasshopper, beetle or other insect. The seed capsules and berries are eaten for the fleshy part surrounding the seeds, which is the only part digested, the seeds passing unchanged through the alimentary canal. The same is true of all species of *Tropidurus* which eat seed capsules and berries.

Genus *Conolophus* Fitzinger.

Conolophus FITZINGER, Syst. Rept., p. 55, 1843.

Range. — Galapagos Archipelago.

CONOLOPHUS SUBCRISTATUS (Gray).

Trachycephalus subcristatus GRAY, Cat., p. 188.

Amblyrhynchus subcristatus GRAY, Zoöl. Misc., p. 6, 1831 and Zoöl. Beechey's Voyage, Rept., p. 93. — DARWIN, Journ. Beagle, p. 469.

Amblyrhynchus demarllii DUM. & BIBR., IV, p. 197. — BELL, Zoöl. Beagle, Rept., p. 22, pl. XII.

Hypsilophus (Conolophus) demarllii FITZINGER Syst. Rept., p. 55, 1843.

Conolophus subcristatus STEINDACHNER, Festschr. Zoöl.-Bot. Ges. Wien, p. 322, pls. IV-VII, 1876. — GÜNTHER, Proc. Zoöl. Soc., p. 67, 1877. — BOUL., Cat., II, p. 187, 1885. — GARMAN, Bull. Essex Inst., XXIV, p. 5, 1892 (part).

Conolophus subcristatus pictus ROTH & HART, Novit. Zoöl., VI, p. 102, 1899.

Range. — Galapagos Archipelago; Albemarle Island (Darwin, Hassler, Petrel) James Island (Darwin); South Seymour Islands (Hopkins Stanford Expedition); Narboro Island (Rothschild Expedition, Hopkins Stanford Expedition).

Formerly abundant on Albemarle, James, Indefatigable, Seymour and Narboro but now extinct on all except Seymour and Narboro, where they are still fairly common. Extinction due chiefly to the introduction of dogs which have destroyed both eggs and adults.

This species inhabits the brushy and wooded portions of the islands from sea-level to the rims of the highest craters.

Conolopus is an omnivorous vegetable feeder devouring almost any kind of vegetation. Grass, the foliage, flowers and berries of various bushes, and cacti (*Opuntia* and the fruit of the giant *Cereus*) are eaten with little or no preference. The reptiles when feeding climb into the bushes and strip the foliage from the branches, deftly crawling to the tips of slender branches for that purpose.

They live in burrows dug obliquely into the soil in open country or on rocky hillsides often beneath or between the lava rocks. All the individuals we observed were somewhat shy and would scamper to their burrows as soon as alarmed. This is undoubtedly an acquired habit due to their persecution by dogs.

MEASUREMENTS OF *Conolophus subcristatus*. ALL ADULT.

Locality.	Narboro.										South Seymour.									
	Cat. No. Stan. Univ. Mus.					Sex.					4794			4795			4796			
	4798		4791		4787		4789		4794		4795		4796		4797		4798		4799	
	Female.	Male.	Male.	Female.	Male.	Female.	Female.	Male.	Female.	Female.	Male.	Female.	Female.	Female.	Female.	Female.	Female.	Female.	Female.	Female.
Head and body, length.....	mm. 390	mm. 400	mm. 405	mm. 380	mm. 405	mm. 380	mm. 405	mm. 475	mm. 475	mm. 480	mm. 475	mm. 480	mm. 455	mm. 415	mm. 425	mm. 415	mm. 440	mm. 455	mm. 480	mm. 465
Tail, length.....	480	475	495	325	475	470	470	520	520	465	450	450	515	480	480	480	450	515	480	465
	% 18	% 19	% 21	% 18.5	% 18.5	% 20	% 20	% 20	% 20	% 18.5	% 18.7	% 21.5	% 21.5	% 20	% 19	% 20	% 18.7	% 21.5	% 20	% 19
Snout to ear ¹	48	46	46	45	46	45	47	46	46	48	49	44	44	48	46	48	49	44	48	46
Snout ²	81	85	81	81	81	80	80	88	88	80	80	84	84	79	82	79	80	84	79	82
Width of head ²	40	41	45	43	41	45	39	40	39	39	36.5	36.5	46	41	46	41	37.5	46	41	37.5
Fore limb ¹	55	52	56	52	52	52	51	50	48	51	48	56	56	53	49	53	48	56	53	49
Hind limb ¹	20	25	21	19	21	19	21	17	17	17	18	21	21	20	18	20	18	21	20	15
Femoral pores.....	21	23	22	21	22	21	23	19	19	18	19	18	22	20	15	20	19	22	20	15

¹ Percentages of length of head and body.

² Percentages of length of head, snout to ear.

Our material consists of four adult specimens from Narboro and seven from South Seymour. The coloration of the two series shows scarcely any constant differences, but there is considerable individual variation.

Coloration in life of adult male, Cat. No. 4787, Stan. Univ. Mus., from Narboro, March, 1899. Superior and inferior labials, oculars and sides of snout to level of nostrils lemon; head above orange with spots and blotches of whitish; neck, lower jaw and throat dirty whitish; dorsum upper surface of limbs and tail brick red; lower parts, excepting tail posteriorly, chrome; tail posteriorly lighter brick red; dorsal crest on nape lemon, on dorsum brick; tympanum lemon with a bluish semicircle; iris ochraceous and silvery; claws light brownish-yellow.

An adult female, Cat. No. 4489, Stan. Univ. Mus., same locality and date, was similar in coloration to the male but dorsum much darker, maroon rather than brick, black-blotched; no white on head above; whitish of throat extending on breast to beginning of belly; drab blotches on rump, hind limbs and tip of tail; fore limbs chrome above, not like dorsum; legs and tail black-spotted like dorsum.

CONOLOPHUS PALLIDUS sp. nov.

Conolophus subcristatus GARMAN, Bull. Essex Inst., XXIV, p. 5. 1892 (part).

Type.—Adult female, Cat. No. 4749, Stan. Univ. Mus.; Barrington Island, Galapagos Archipelago, May, 1899.

Range.—Galapagos Archipelago; Barrington Island (Baur, Hopkins Stanford Expedition).

Specific Characters.—Coloration above, clay yellow, below, whitish; rostral plate broad, height more than twice the length, bordered above by eight scales; snout less than twice in length of head from ear-opening; height of mental twice in the width.

Description of the Type.—Head short, occipital region highest, depressed anteriorly at occipital plate; interorbital flat; profile of snout convex. Head widest between ear-opening and angle of jaws, width one and one third in the length. Ear-opening broadly oval, a little larger than the eye, bordered by small scales. Nostrils large, circular, perforating a single raised plate, nearer snout than eye; distance from snout to center of nostril equal length of rostral plate. Head covered above by keeled convex scales, those on occiput strongly conical; occipital plate not much enlarged; supraoculars small; scales anterior to nostrils without keels. Rostral plate large, broadly pentagonal, height more than twice in the length, bordered above by

eight scales. Superior labials 10-11, as wide as high. Mental plate broadly triangular, height twice in the length, as long as rostral, bordered posteriorly by four submentals, the two inner much larger; inferior labials 11-12, similar in shape to superior labials. Chin and throat covered with small scales, the chin with a median groove from angle of mental; throat and chin longitudinally plicate. Dorsal surface with small conical, sharply pointed scales, those on superior and anterior surfaces of limbs larger; toes above with enlarged median lamellæ distally. A dorsal crest of enlarged scales from nape to tail; highest on nape where represented by nine high conical scales; lower and more uniform on dorsum, where composed of slightly compressed conical, juxtaposed scales, highest anteriorly, becoming obsolete between hind limbs and reappearing again on tail. Lower surfaces covered with larger, squarish, smooth scales, those before anus smaller and rounded. Inferior and posterior surfaces of limbs covered with small scales, these beginning on hind limbs abruptly at femoral pores; toes inferiorly with a median series of enlarged tricarinate lamellæ, thirty-one under fourth toe. Tail rounded, tapering gradually, covered with large, square, obliquely keeled scales; crest obsolete on posterior part. Femoral pores 22-23.

Coloration in Life. — Above light clay yellow, a large light-brown blotch between hind limbs, another across middle of back; toes more brownish toward tips; below cream, axilla and groins pinkish; whole neck and eyelids bluish; labials and sides of head blotched with grayish and yellow.

Variations. — Height of dorsal crest and convexity of scales on top of head varies with age. In immature specimens they are much lower. Superior labials nine to eleven, usually ten; inferior labials nine to thirteen. Femoral pores 20-24. Brown blotches on dorsal surface vary much in extent, absent in some specimens; appear to be due to shedding. Coloration of underparts cream-yellow to pinkish-cream; bluish of neck and labials most marked in immature specimens. Young vermiculated with dark brown on an olive-yellow ground; below light yellowish.

Close to *C. subcristatus* from which it differs in its paler coloration, lacking the chrome-yellow head and limbs and dark red dorsum of that species. The mental and rostral plates are wider, also.

Six specimens collected. Rather sparingly distributed in small colonies throughout the islands. Many of the dried skins found near an old camp where the lizards had been used as food by the Ecuadorians. This would account for the scarcity of the reptiles on the island.

MEASUREMENTS OF *Conolophus pallidus*. ALL ADULT.

Cat. No. Stan. Univ. Mus.	4749	4770	4766	4768	4765
Sex.	Female.	Female.	Female.	Female.	Male.
	mm.	mm.	mm.	mm.	mm.
Head and body, length.....	375	355	330	325	325
Tail, length.....	515	450	455	445	445
	%	%	%	%	%
Snout to ear.....	20.5	21	20	21	21
Snout.....	49	48	49	48.5	51
Width of head.....	77	80	74	80	77
Fore limb.....	43	50	44	47	48
Hind limb.....	61	59.5	62	66	65

Percentages as in table of measurements of *C. subcristatus*.

Genus *Amblyrhynchus* Bell.

Amblyrhynchus BELL, Zoöl. Journ. II, p. 206, 1825.

Range. — Galapagos Archipelago.

AMBLYRHYNCHUS CRISTATUS Bell.

Amblyrhynchus cristatus BELL, Zoöl. Journ., II, p. 206, 1825, Suppl., pl. XII, and Zoöl. Beagle Rept., p. 23. — DUM. & BIBR., IV, p. 195, 1837. — DARWIN, Journ. Beagle, p. 466. — A. DUM., Cat. Meth., Rept., p. 62. — STEINDACHNER, Festschr. Zoöl.-bot. Ges. Wien. p. 316, pls. III, V, VI, VII, 1876. — GÜNTHER, Proc. Zoöl. Soc., p. 67, 1877. — BOUL., Cat., II, p. 185, 1885. — COPE, Proc. U. S. Nat. Mus., XII, p. 147, 1889. — GARMAN, Bull. Essex Inst., XXIV, p. 7, 1892 (part).

Oreocephalus cristatus GRAY, Cat., p. 189, 1845.

Iguana (*Amblyrhynchus cristatus*) GRAY, Griff. A. K., IX, Syn., p. 37.

Iguana (*Amblyrhynchus ater*) GRAY, Griff. A. K., IX, Syn., p. 37.

Amblyrhynchus ater DUM. & BIBR., p. 196.

Hypsilophus (*Amblyrhynchus cristatus*) FITZINGER, Syst. Rept., p. 55, 1843.

Hypsilophus (*Amblyrhynchus ater*) FITZINGER, Syst. Rept., p. 55, 1843.

Amblyrhynchus cristatus var. *ater* GARMAN, Bull. Essex Inst., XXIV, p. 8, 1892.

Amblyrhynchus cristatus var. *nanus* GARMAN, Bull. Essex Inst., XXIV, p. 8, 1892.

Range. — Galapagos Archipelago: Albemarle (Petrel, Baur, Hopkins Stanford Exped.); Charles (Petrel, Baur); Hood (Albatross 1888, Hopkins Stanford Exped.); Chatham (Albatross 1888); Indefatigable (Hopkins Stanford Exped.); James (Albatross 1888); Duncan (Albatross 1888, and Hopkins Stanford Exped.); Narboro (Hopkins Stanford Exped.); Tower (Baur, Hopkins Stanford Exped.); Bindloe (Baur); Abingdon (Petrel, Albatross 1888); Wenman (Hopkins Stanford Exped.); Culpepper (Hopkins Stanford Expedition).

We observed the species on all the islands and islets of the archipelago. They occur abundantly on every island, living upon the rocky

beaches, their dark colors harmonizing well with the black basaltic rocks. In some localities they occur so numerously as to more or less completely hide the rocks near the beach.

Their food consists chiefly of marine algæ, both Chlorophyceæ and Phæophyceæ, which is obtained by diving in quiet coves and lagoons. In such sheltered places they can usually be seen cropping the algæ from the rocks which pave the bottom. After partaking of a sufficient quantity they return to the beaches and crowd upon the bowlders near shore where they spend most of their time basking in the sunshine.

They seldom go far out to sea, usually remaining within a hundred yards of the beach. None were seen in the open channels between the islands and it is probable that they do not usually leave the island on which they were reared. When attacked they slip lazily into the water, but soon return to the land which they regard as the safest place. Their chief enemies are the sharks (*Carcharrhinus*) which patrol the shore line and act as checks to the migration of the species. The remains of *Amblyrhynchi* were not uncommon in the stomachs of the sharks we dissected. It is probable that the Galapagos hawk, *Buteo*, eats the young when first hatched as in the case of the young of *Testudo*.

The eggs are deposited at the end of the rainy season in the sand near the beach, usually in boulder-strewn places. A nest found at Iguana Cove, Albemarle, and from which the female was driven was situated in the sand which partially filled a fissure in the lava rocks bordering the beach. The eggs in this nest were six in number, soft-shelled, elliptical and measured approximately three inches in length by one and a half in diameter.

Much individual variation occurs, especially in size and coloration together with a slight amount of local variation. In coloration the variation extends, on nearly every island, from black specimens through brownish to greenish-mottled and to a combination of mottlings of all three colors. The young are uniform black above, the mottled coloration not being attained until they reach a length of a foot or more. The immense specimens at Iguana Cove have little black on them, the general coloration above being greenish and brownish blotches. The variation in size among adults is considerable but difficult to determine. The convexity of the head plates and the height of the dorsal crest varies from the smooth condition and low crest of the young to the sharply conical plates and high crest of the old adults.

MEASUREMENTS OF *Amblyrhynchus cristatus*.

Locality.	Narboro.		Albemarle.		Duncan.	Seymour.		Itood.		Tower.	Culpepper.		Wen- man.
	4782	4781	Iguana Cove.	Tagus Cove.		4783	4778	4775	4771		4779	4786		4776	4780
Cat. No. Stan. Univ. Mus.	Adult Male.	Adult Female.	Adult Male.	Adult Male.	Adult Female.	Adult Male.	Adult Male.	Young.	Young.	Young.	Adult Male.	Adult Male.	Adult Male.
Sex and Age.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Head and body, length.	310	253	475	345	290	330	350	190	222	105	287	310	248
Tail, length.	494	380	660	562	412	.....	485	315	.....	268	420	490	380
	%	%	%	%	%	%	%	%	%	%	%	%	%
Snout to ear ¹ .	17.5	17.3	18	19	16	16.5	16.5	18	17	17.3	17	17	17
Snout ² .	55	54	56	56	54	53	55	57	56	55	57	57	56
Width of head ² .	98	98	105	98	94	96	100	94	95	93	98	102	95
Height of crest ² on nape	44	25	41	41	32	45	37	29	27	17	33	25	35
Fore limb ¹ .	44	41	40	43	43	42	38	46	41	45	44	43	45
Hind limb ¹ .	58	63	55	63	57	55	55	63	62	61	60	59	65
Femoral pores.	24	26	24	27	.....	25	23	28	25	27	27	29	23
	25	25	21 +	24	.....	25	23	27	28	29	27	31	25

¹ Percentages of length of head and body.

² Percentages of length of head, snout to ear.

The local variation is slight and so mixed with individual variation that it is difficult to define. With only our scanty material for comparison — eighteen specimens representing eight islands — we have not been able to detect any insular varieties nor would our observations in the field lead us to infer that any well marked forms exist.

The proportions are practically the same in all the specimens. The largest specimens occur at Iguana Cove, where some attain a length of four feet. Nowhere else do they attain these dimensions. On Culpepper, Wenman and Tower they appear to average smaller than on any of the other islands.

The Duncan variety which has been described as uniform black above has received the name *ater*. Our only specimen from Duncan, an adult female, is no darker in coloration than specimens from other islands, being blotched with greenish on the dorsum and mottled with brownish on the sides. Those observed on the island were not noticeably darker than those seen on other islands.

A single young specimen of the variety called *nanus* from Tower Island is in the collection. The individuals observed at Tower appeared somewhat smaller and darker, on an average, than those from other islands but exceptions in size were not rare.

Hood Island possesses the lightest forms. Two specimens in the collection have the dorsum covered by a few large confluent light greenish blotches, the head blackish and the sides and limbs mottled with black and brown in about equal proportions. Nearly all the specimens seen were remarkably light-colored and this coloration is attained in this locality at an early age.

The specimens taken on Culpepper and Wenman, though separated in habitat from the others by a considerable expanse of ocean, are not appreciably different. They average smaller, with less convexity to the plates on the top of the head and snout and with smoother dorsal scales. The green blotches are entirely lacking on the dorsum the upper parts being black, spotted and mottled with brown. Some specimens, however, from the Seymour Islands duplicate these in coloration.

Occasional migration at rare intervals probably occurs between all the islands which keeps the stock apparently the same.

Genus *Dromicus* Bibron.

Dromicus BIBRON, in R. de la Sagra Hist. Cuba Erp., p. 221, 1843 (part).

Range.—West Indies and west coast of South America from Peru to Chile. Galapagos Archipelago (a single species and subspecies).

DROMICUS BISERIALIS BISERIALIS (Günther).

Herpetodryas biserialis GÜNTHER, Proc. Zool. Soc., p. 97, 1860.

Dromicus chamissonis PETERS, Mon. Berl. Ac., p. 719, 1869.—BOUL., Cat., II, p. 119, 1894 (part).

Dromicus chamissonis var. *biserialis* GÜNTHER, Zool. Rec., p. 115, 1869 (part).

Dromicus chamissonis var. *dorsalis* STEINDACHNER, Festschr. Zool.-bot. Ges. Wien, p. 306, pl. 1, fig. 1, 1876.

Opheomorphus chamissonis COPE, Proc. U. S. Nat. Mus., XII, p. 147, 1889 (part).

Orophis biserialis GARMAN, Bull. Essex Inst., XXIV, p. 85, 1892 (part).

Range.—Galapagos Archipelago; Charles (Darwin, Hassler); Indefatigable (Hassler); James (Hassler, Albatross 1888); Albe-marle (Hassler, Hopkins Stanford Exped.); Narboro (Hopkins Stanford Expedition).

Specific Characters.—Close to *D. chamissonis*, from which it is doubtfully distinct, differing chiefly in the greater number of gastros-teges, 209–252 (175–201 in *D. chamissonis*) and in the shorter pre-frontals which equal or but slightly exceed the internasals in length.

The coloration above is dark olive, either uniform or dark-blotched and spotted on nape, or with a pair of light brownish longitudinal dorsal stripes covering the third and fourth scale rows. These begin three or four inches posterior to the head and extend to the tail, the stripes anteriorly represented on the nape by a series of spots of the same color. Head and throat below thickly dark-spotted.

Oculars 1–2, rarely 1–3; temporals usually 1–2–3. Two specimens have a few of the dorsal scales marked with double scale-pits but none of the others shows this character.

One specimen, Cat. No. 4977, Stan. Univ. Mus., taken on Albe-marle, near Cape Berkeley, had the following coloration in life: above brown, the scales minutely dark-dotted; two longitudinal series of black spots on sides of body; neck above lighter brownish-yellow with a median black stripe and a single series of large black blotches; top of head spotted minutely with light yellowish; tail unspotted, becoming lighter toward the tip; sides of head about labials light with darker brownish spots; belly pink with a steel gray luster, darkly spotted on sides; throat and mandible more grayish, thickly dusky-spotted; tail light yellowish inferiorly.

Most of the Narboro specimens have the light dorsal stripes very distinct; one specimen, however, is uniform dark brown above and another resembles the Albe-marle specimen in coloration. A young specimen from this island has a color pattern quite different from any of the others. Its general coloration above is dark brown, the

sides and dorsum barred with light brownish bars forking on sides, anteriorly nearer together and nearly meeting over the nape, posteriorly breaking up on the sides of the tail into spots.

According to Steindachner *D. biserialis habeli* stands nearest the continental form in coloration. From descriptions of the coloration of *D. chamissonis* it appears that the species is very variable in coloration and is as often blotched or striped above on a dark ground. *D. biserialis* has the reverse condition as in the Hood Island forms.

MEASUREMENTS OF *Dromicus biserialis biserialis*.

Locality. Cat. No. Stan. Univ. Mus.	Narboro.			Albemarle.	
	4973	4974	4975	4976	4977
Oculars.....	1-2	1-2	1-2	1-2	1-2
Temporals.....	1-1-2	1-2-3	1-2-3	1-2-3	1-2-3
Lower labials touching pregenials.....	1-2-3	1-2-3	1-2-3	1-3-4	1-2-2
Gastrosteges.....	5-5	5-5	5-5	5-5	4-4
Urosteges.....	252	231	233	243	241
	91	116	112	105	87
Length, total.....	mm.	mm.	mm.	mm.	mm.
" tail.....	975	700	820	466	1090
	205	275	285	145	230

DROMICUS BISERIALIS HABELI (Steindachner).

Dromicus chamissonis var. *habeli* STEINDACHNER, Festschr. Zoöl.-bot. Ges. Wein, p. 309, pl. I, fig. 2, 1876.

Orophis biserialis GARMAN, Bull. Essex Inst., XXIV, p. 12, 1892 (part).

Range. — Galapagos Archipelago; Hood Island (Habel, Baur, Hopkins Stanford Expedition).

Subspecific Characters. — Coloration above light grayish-olive with a pair of whitish longitudinal stipes covering third and fourth scale rows, beginning behind eye and becoming obsolete a little posterior to middle of body. Head below light greenish-gray sparingly spotted with dusky. Oculars 1-3; temporals 2-2 (3)-3.

MEASUREMENTS OF *Dromicus biserialis habeli*.

Cat. No. Stan. Univ. Mus.	4970	4971
Oculars.....	1-3	1-3
Temporals.....	2-3-3	2-2-3
	2-2-3 ³	2-2-3
Lower labials touching pregenials.....	4-4	5-5
Gastrosteges.....	212	206
Urosteges.....	94	98
	mm.	mm.
Total length.....	965	745
Tail.....	230	205

Two specimens are in the collection from Hood Island. These differ conspicuously in coloration from those specimens secured on other islands and represent a well-marked color variety which is undoubtedly confined to Hood.

Genus *Anolis* Daudin.

Anolis DAUDIN, Rept., IV, p. 50, 1802.

Range. — Tropical and subtropical America.

ANOLIS TOWNSENDI Stejneger.

Anolis townsendi STEJNEGER, Bull. Mus. Comp. Zool., XXXVI, p. 163, 1900.

Range. — Cocos Island. Common on vegetation and rocks everywhere.

A typical specimen, an adult male, Cat. No. 4537, Stan. Univ. Mus., shows the following characters: head narrow; the snout sharp, rounded at tip, depressed, the profile concave before eyes; occipital region flat; interorbital concave; canthus rostratus distinct nearly to nostrils, covered by six scales; nostrils lateral, separated by seven rows of scales; eye one and one half in interorbital width; ear opening elliptical, vertical, smaller than occipital plate, bordered by rounded granules; snout covered with keeled scales; rostral broad and low, rectangular, height two and one half times in length; superior labials six before middle of pupil; six loreals in a vertical series before eye; fifteen enlarged, keeled supraoculars; two rows of scales between supraorbitals; four rows between occipital and supraorbitals; mental deeply cleft, elongate, extending on sides considerably past the rostral, bordered posteriorly by six rows of chin scales, the median ones keeled, outer larger, without keels; inferior labials six before pupil, similar in shape to superior labials; mandible covered with small oval keeled scales; gular-sac large, reaching from chin to end of sternum; teeth posteriorly trilobate, anteriorly becoming more slender and losing the lateral cusps; no pterygoid teeth.

Dorsum covered with juxtaposed keeled scales larger than the raised granules of the sides; vertebral series enlarged. Ventral scales keeled, larger than the dorsals, imbricate, those on the gular-sac larger with smaller keels; smaller on groins and inferior surfaces of limbs. Toes covered inferiorly with a median series of transverse lamellæ. Tail covered dorsally with keeled scales, larger than those on the back, the median series enlarged; inferior surface of tail covered with keeled scales similar in size to those on superior surface; no enlarged post-anal scales. Limbs armed on their dorsal and anterior surfaces with

imbricate, sharply keeled scales, larger than the dorsals and much larger than the granular scales of the posterior surfaces; phalanges superiorly with a median series of large multicarinate scales; third and fourth phalanges of fourth toe with seventeen lamellæ inferiorly; penultimate phalanx of each toe dilated. Extended fore limb reaching midway between nostril and eye; appressed hind limb reaching anterior border of eye. Tail long, cylindrical, length twice head and body.

Coloration in Life.—Above olive-brown with transverse mottlings of darker brown, limbs and tail barred with the same; sides with a bright green longitudinal stripe beginning below ear, running obliquely above shoulder to thigh, bordered above and below by dark brown stripes equal in width to light stripe; another narrower stripe similar in coloration commencing above ear and extending obliquely to above shoulders. Belly and chin whitish; limbs, groins and tail inferiorly light olive with faint dusky blotches; gular-sac orange, finely white-spotted. Iris black with a narrow golden ring bordering the pupil; eyelids edged with golden.

Variations.—Rows of scales between supraorbitals two or three, between occipital and supraorbitals three or four; loreals in five or six vertical rows before eye; supralabials six or seven before middle of pupil; transverse lamellæ on inferior surfaces of second and third phalanges of fourth toe seventeen to nineteen. Coloration on upper parts varying from light to dark olive, the lateral stripes varying considerably in extent and intensity; whole lower surface of some specimens olivaceous, only the mandible whitish.

MEASUREMENTS OF *Anolis townsendi*. ALL ADULT.

Cat. No. Stan. Univ. Mus.	4537	4536	4545	4542	4543	4544	553 ⁸	544 ¹
Sex.	Male.	Male.	Male.	Male.	Male.	Female.	Female.	Female.
Head and body,	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
length	49	42	46	44	46	40	41	42
Tail, length.....	..	84	96	...	..	73	...	...
	%	%	%	%	%	%	%	%
Snout to ear ¹	28	32	29	31	30	31	29	29
Snout ²	53	55	55	55	55	58	58	55
Width of head ²	56	55	55	55	55	58	60	58
Tibia ²	92	96	91	95	95	100	95	91
Fore limb ¹	39	47	45	47	43	45	44	43
Hind limb ¹	75	87	82	85	82	95	88	80

¹ Percentages of length of head and body.

² Percentages of length of head, snout to ear.

Females with a trace of the gular-sac of the male; no enlarged vertebral scales and tail usually without the median dorsal series enlarged. Coloration similar to that of the male but somewhat duller, lacking the orange coloration of the gular-sac.

Eleven specimens are in the collection from Cocos Island.

Genus *Lygosoma* Gray.

Lygosoma GRAY, Zoöl. Journ., III, p. 228, 1828.

Range.—Tropicopolitan. Clipperton Island (one peculiar species).

LYGOSOMA ARUNDELI Garman.

Lygosoma arundelii GARMAN, Proc. N. Eng. Zoöl. Club, 1, p. 61, 1899.

Range.—Clipperton Island. Occurs abundantly on Clipperton Rock, which forms a small projection near the center of the coral atoll.

Fifteen specimens are in the collection. These agree minutely in squamation with the descriptions of Polynesian specimens of *L. cyanurum* (Lesson) but differ somewhat in coloration. The light stripes of this latter species are represented by a single median light stripe. In the suppression of the lateral light stripes the species approaches some specimens of *L. cyanurum* from the Hawaiian Islands described by Stejneger.¹ The species is of doubtful validity but in the absence

MEASUREMENTS OF *Lygosoma arundeli*.

Cat. No. Stan. Univ. Mus.	4969	4961	4960	4962	4959	4968	4955	4964
	mm.	mm.	mm.	mm.	mm.	mm.	mm.	mm.
Head and body, length...	50	48	50	45	50	48	45	47
Tail, length.....	74	74	80	69		72	63	66
	%	%	%	%	%	%	%	%
Snout to ear ²	24	25	24	23	23	25	24	22
Snout ²	12	11	12	11	12	11	12	11
Width of head ²	16	17	17	16	16	17	15	15
Fore limb ²	31	28	28	28	30	32	29	28
Hind limb ²	44	43	42	40	43	44	43	40
Scales in circumference of body.....	28	30	26	28	28	32	28	30
Subdigital lamellæ.....	63	60	60	52	63	60	56	53

- No. 4969. Right prefrontal coalesced with frontal.
- Nos. 4955, 4959, 4961. Frontal touching fronto-nasal.
- No. 4962. Frontal coalesced with prefrontals.
- Nos. 4960, 4964, 4968. Frontal not touching fronto-nasal.

¹ Stejneger (L.), Hawaiian Land Reptiles. Proc. U. S. Nat. Mus., vol. XXI, p. 807, 1899.

² Percentages of length of head and body.
Proc. Wash. Acad. Sci., July, 1903.

of series of specimens from other localities for comparison its status cannot be determined.

Variations.—Coloration dark lustrous brown above with a whitish median stripe from snout to rump, beginning definitely in middle of frontal, but usually traceable to frontonasal (scarcely any variation from young to adult in intensity of this stripe). Median stripe bordered on each side by a band of dark brown as wide as the light stripe. Below light grayish or whitish with olive tinge, darkest on sides of belly; lower jaw with dusky blotches medially; tail blue-gray below, brownish like back above. One adult specimen is uniform dark bronze-brown above, lacking the median light stripe but with the darker bordering stripes fairly indicated. In some specimens the lower parts are brownish without whitish anywhere, the mandible and throat being quite dark and the tail more bluish below.