

SPECIATION IN THE FIJIAN AND TONGAN IGUANA *BRACHYLOPHUS* (SAURIA, IGUANIDAE) WITH THE DESCRIPTION OF A NEW SPECIES

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The monotypic genus *Brachylophus* is one of the most geographically isolated Iguanidae known. Because its range is restricted to the Pacific Island groups of Fiji and Tonga, the genus has been neglected and specimens in museum collections and zoos are uncommon.

The genus was originally described by Brongniart in 1780 as *Iguana fasciata*. As pointed out by Savage (1952) the name *Brachylophus* first appears in the literature in Cuvier's "Le Règne Animal" (1829). Since then the generic name has mistakenly been credited to Guérin-Méneville (1829) and Wagler (1830). The species has also been described by Daudin (1803) who considered it to be an agamid and by Dumeril and Bibron (1837) who correctly placed it in the family Iguanidae.

The type locality of *Brachylophus fasciatus* is in doubt. The original description of Brongniart lists the specimens as coming from "The Indies" and having been collected in the Fiji Islands as it was not until 1899 that Waite published a range extension for the genus to the Tongan Islands. Unknown to Waite, Dumeril and Bibron (1837) indicated that they had utilized specimens from Tongatabu in their re-description of the species.

It is also our opinion that the type locality lies somewhere in the Fiji Islands. An examination of Brongniart's plate vi, figure 1 shows a *B. fasciatus* with light spots and streaks on the neck and with a light colored head. This color pattern has been observed in Fiji Island specimens seen by us and we, therefore, believe that such a pattern is endemic to the Fiji group. Light neck streaks and light colored heads have not been observed in Tongan specimens.

In 1965 we contacted Mr. Bert Nixon, who was then teaching at Nukalofa, Tongatabu Island, and through him, secured a small series of *Brachylophus* from Tonga. The skulls of two Tongan specimens were used to augment the skeletal material available for this genus at Harvard and the American Museum.

Our original study, to be published elsewhere, includes a comparative osteological and myological study of those genera belonging to the iguanine line of the family Iguanidae. However, a comparison of the skulls from the Tongan specimens with those from Fiji demonstrated several significant differences of specific level.

A comparison with material from other collections has enabled us to redefine the species *Brachylophus fasciatus* and to name as a

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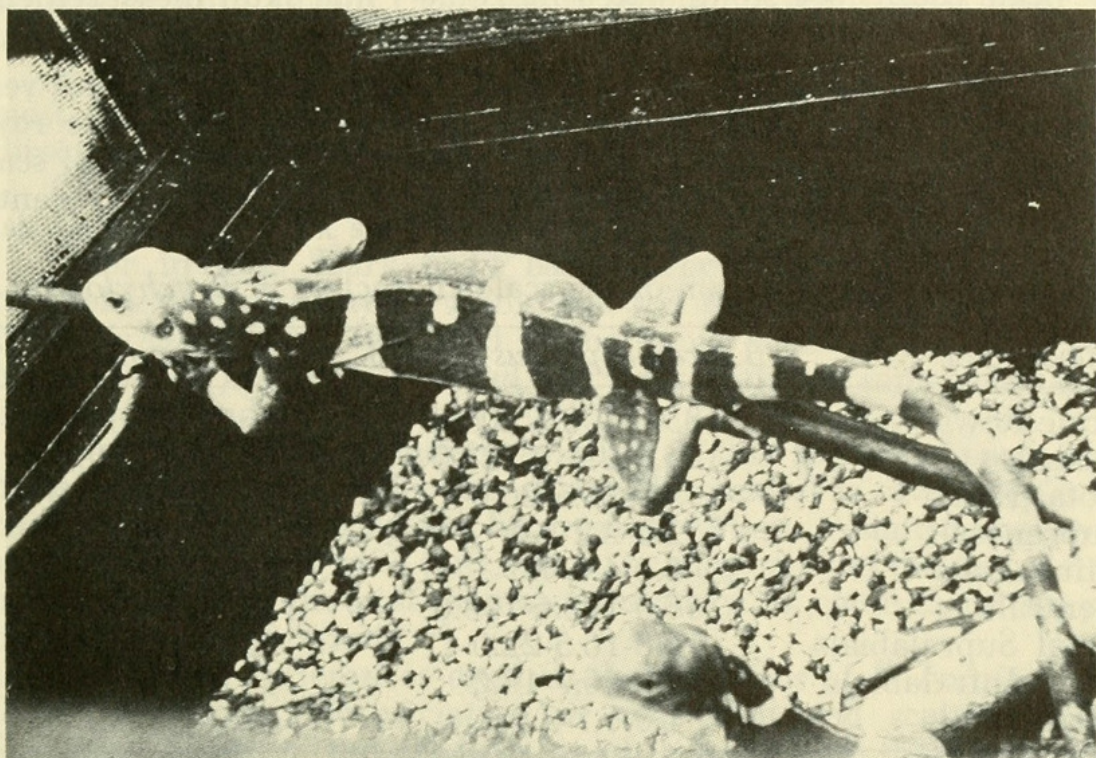


Fig. 1. A male *Brachylophus fasciatus* from Fiji. Specimen is at the San Diego Zoo, Balboa Park. (Photo by W. W. Tanner by courtesy of Charles E. Shaw.)

new species the population of Tonga. The new species we choose to call

*Brachylophus brevicephalus*³ sp. nov.
Tongan Iguana

HOLOTYPE: An adult male, BYU 32662, taken at Nukalofa, Tongatabu Island, Friendly Islands by Mr. Bert Nixon, during March, 1966.

PARATYPES: All specimens are from the collections of Brigham Young University (BYU), University of Utah (UU) and the California Academy of Science (CAS). Topotypes, BYU 32661, 32663, 31955, 23743, 31094, 31095, 31096, 31102; UU 11014 and CAS 50135, Maufanga, Tongatabu.

DIAGNOSIS: A moderately large lizard resembling an iguana in body form and distinguished from *B. fasciatus* by a higher number of dorsal scales 100.0-128.0 (average 111.0) as contrasted to 68.0-98.0 (average 84.2 in *fasciatus*; a lower number of total femoral pores 9.0-26.0 (average 21.5) as opposed to 17.0-38.0 (average 26.7) in *fasciatus*; a higher number of scale rows 183.0-205.0 (average 190.7) as opposed to 146.0-201.0 (average 177.0) in *fasciatus*; a higher number of supranasals 2.0-3.0 (average 2.2) as opposed to 1.0-2.0 (average 1.2) in *fasciatus*; skull with a greater length-width ratio .655-.735 (average .712) as opposed to .535-.657 (average .615) in *fasciatus*.

³The term *brevicephalus* refers to the short head characteristic of the Tongan *Brachylophus*.

Scale counts are summarized in Table 1 and skull measurements of the two species are summarized in Table 2.

DESCRIPTION OF THE TYPE: Total length 640 mm., snout-vent length 166 mm., dorsal scales 128, ventral scales 158, scale rows around body 191, femoral pores 12-11, infralabials 8-8, rostral scale single, supranasals 2, infranasals 3, mental split with post mental

Table 1. A comparison of the scale characters in *Brachylophus*

Character	<i>B. brevicephalus</i> N=10	<i>B. fasciatus</i> N=21
Scale Rows	183.0-190.7-205.0	146.0-177.0-201.0
Dorsals	100.0-111.0-128.0	68.0-84.2-98.0
Total Pores	9.0-21.5-26.0	17.0-26.7-38.0
Supranasals	2.0-2.2-3.0	1.0-1.2-2.0
Infranasals	3.0-4.0-5.0	4.0-4.1-5.0
Ventrals	158.0-168.6-178.0	138.0-159.0-190.0
Total Supralabials	14.0-16.5-22.0	12.0-19.0-21.0
Total Infralabials	14.0-16.7-18.0	12.0-16.2-19.0
Mentals	1.0-1.7-2.0	1.0-1.8-2.0

Table 2. Skull Characters¹ in *Brachylophus*

Character	<i>B. fasciatus</i> *	<i>B. brevicephalus</i> **
Skull L X W	.535-.615-.657	.655-.712-.735
Basisphenoid	.591-.592-.594	.526-.640-.655
Basioccipital	.700-.740-.781	.494-.571-.648
Supraoccipital	.852-.917-.982	.792-.838-.885
Pterygoid	.406-.484-.535	.309-.344-.380
Ectopterygoid	.333-.349-.372	.390-.415-.440
Palatine	.562-.605-.658	.500-.551-.602
Premaxilla	.442-.535-.613	.629-.650-.671
Nasal	.541-.554-.564	.422-.424-.427
Prefrontal	.535-.571-.619	.460-.517-.574
Jugal	.160-.180-.201	.190-.205-.220
Parietal Wings	.734-.759-.778	.776-.780-.785
Postorbital	.745-.757-.769	.800-.841-.883
Quadrates	.569-.605-.642	.489-.518-.537
Narial Orifice	.804-.885-.951	.725-.779-.833
Dentary	.202-.206-.210	.216-.225-.235
Articular	.240-.264-.288	.364-.382-.400
Angular Process	.130-.144-.158	.164-.174-.185
Splenial	.263-.280-.298	.328-.420-.513
Angular	.152-.181-.211	.206-.207-.208
Articular Condyle	.805-.819-.833	.833-.849-.866

¹All skull ratios are width divided by length, length being the greatest distance along the median axis. Width is the greatest distance at right angles to the length.

*Based on the following skulls: MCZ 15009, 5222, 15008; AMNH 17701.

**Based on the following skulls: BYU 23743, 31955, 32663; UU 11014

separating chin shields, body short and stout with dorsal crest, tail long and compressed laterally at base.

Body with 4 dark, transverse bands and 3 light, transverse bands, most anterior dark body band interrupted by a single light spot directly over scapula, tail also banded.

Color in alcohol: Basic color a dark bluish green with light greenish blue bands; neck spot same color as light colored bands.

Color in life: Dark body bands very dark green, light bands turquoise or bluish green, limbs and tail bands leaf green, eye red. In *B. brevicephalus* the head is the same color as the dark body bands. In *B. fasciatus* the head and neck spots are same color as the light body bands.

VARIATION: The greatest variation in this species appears to be in the scale pattern under the chin. The mental is always split but chin shields may or may not be present. When present they may be separated anteriorly by a post mental or may meet at the mid ventral line and displace the post mental posteriorly. In some cases two post mentals may be present.

Besides the differences cited in the diagnosis of *B. brevicephalus* there is considerable variation in coloration and scalation of *B. fasciatus*. Scales of the chin are much less variable than in *breviccephalus* with the mental always being split and chin shields almost always touching. This results in the post mental being displaced posteriorly or being lost entirely. Scales of the head are always platelike and polygonal or hexagonal in shape.

Color differences are apparent in the two species. *B. fasciatus* males have spots and/or streaks on the necks and light colored heads. In some forms the necks are of a solid color. The banding of the body and tail appear to be about the same as in *B. brevicephalus*. Body bands are absent in females of both species. Females of *breviccephalus* have small light spots sparsely scattered over the body.

Sexual dimorphism is evident in the Fiji populations, with females having less well developed dorsal crests and more femoral pores than males. Females also lack the light body bands so prominent in males. For a summary of scale characters in males and females of *fasciatus* and *breviccephalus* see Table 3.

The two species also vary in the size and arrangement of some head scales. In *breviccephalus* the two postrostral scales touch at top of rostral, whereas these scales do not touch in some *fasciatus*. Head scales of *breviccephalus* are smaller and more granular than those of *fasciatus*. In the latter they are large and have a regular polygonal to hexagonal shape.

REMARKS: We consider the new species to be more primitive than *fasciatus*, by virtue of its having less specialized head scales, more dorsals, more scale rows and in general a series of scale patterns which are seemingly more primitive. Its range is also to the east of *fasciatus* and if one assumes a South or Central American origin for the group, it would probably represent the earliest population to raft to the Southern Pacific area. The Fiji populations were probably derived from this ancestral stock.

Table 3. Scallation of males and females of
 B. fasciatus and *B. brevicephalus*
 B. fasciatus

Character	Females N=9	Males N=12
Scale Rows	161.0-184.4-201.0	146.0-163.8-.97-0
Dorsals	28.0-88.2-98.0	68.0-83.7-100.0
Ventrals	146.0-167.0-174.0	138.5-161.6-190.0
Total Pores	23.0-27.6-38.0	17.0-26.1-33.0
Total Supralabials	13.0-17.0-21.0	12.0-15.7-19.0
Total Infralabials	13.0-16.5-18.0	12.0-16.0-19.0
Supranasals	1.0-1.1-2.0	1.0-1.3-2.0
Infranasals	4.0-4.2-5.0	3.0-4.0-5.0
Mentals	1.0-1.8-2.0	1.0-1.9-2.0
<i>B. brevicephalus</i>		
	Females N=2	Males N=8
Scale Rows	183.0-190.0-197.0	184.0-191.0-205.0
Dorsals	100.0-103.5-107.0	100.0-114.0-128.0
Ventrals	160.0-161.5-163.0	160.0-171.0-178.0
Total Pores	20.0-23.0-26.0	9.0-21.1-26.0
Total Supralabials	16.0-16.0-16.0	14.0-19.0-22.0
Total Infralabials	17.0-17.0-17.0	14.0-16.6-18.0
Supranasals	2.0-2.0-2.0	2.0-2.1-3.0
Infranasals	4.0-4.5-5.0	3.0-3.8-5.0
Mentals	2.0-2.0-2.0	1.0-1.7-2.0

Burt (1932) indicates that these island groups were populated from invasions coming from the west or that some species may have been endemic. Although this may be the case for the great majority of species now extant in these islands, we do not believe this to be true for the iguanids. In a major study to appear soon these considerations will be dealt with in more detail.

A statistical analysis of two populations was made utilizing scale counts found in Table 1. The approximate F value of the U statistic, testing the null hypothesis that two populations were the same, was 38.91414, with degrees of freedom 2, 22. $F(.9999, 2, 22) = 11.4$. Therefore, the null hypothesis is rejected indicating that the two populations are different.

A canonical correlation (Program BMD07M, Dixon 1968: 214a-214t) was utilized to form a two dimensional representation of the specimens relationships to each other for the P dimensional hyper-space (P=19). This relationship is represented in Figure 2.

MATERIALS: Besides the specimens of *B. brevicephalus* from Tonga, a series of *B. fasciatus* was examined from the Fiji Islands. Included in this series are the following: AMNH 29009 - Vatu Vara, 29013 - Oneata, 29016 - Fiji Islands, 29034-35 - Avia, 40474 - Kandavu; CAS 54664 - Fiji Islands; MCZ 5800 - Viti, 6457-8 - Luva,

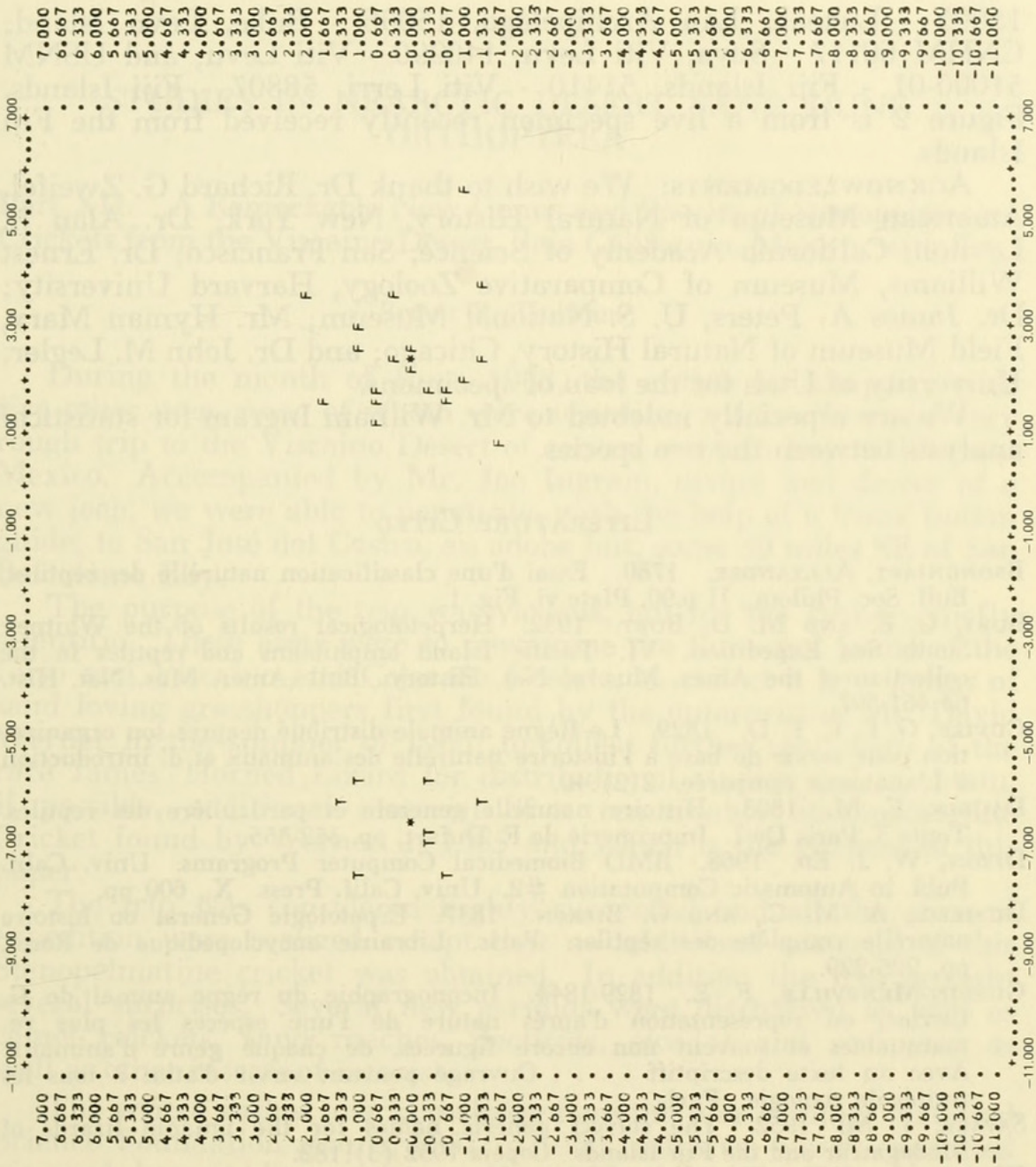


Fig. 2. The distribution of Tongan and Fijian specimens as determined by a canonical correlation. T=Tongan specimen, F=Fijian specimen, *=means of each population.

15005 - Lukeah, Lau Archipelago, 15006 - Buke, Levu Island; CNHM 60117 - Suva, Viti Levu, 140290 - Viti Levu; and USNM 51000-01 - Fiji Islands, 51410 - Viti Lerri, 58807 - Fiji Islands. Figure 2 is from a live specimen recently received from the Fiji Islands.

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