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TAXONOMIC STATUS OF HIPPOSIDEROS LARVATUS ALONGENSIS BOURRET, 1942 AND OCCURRENCE OF H. TURPIS BANGS, 1901 IN VIETNAM (MAMMALIA, CHIROPTERA)

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The taxonomic status of *Hipposideros larvatus alongensis* BOURRET, 1942 is discussed in connection with its recent findings in northern Vietnam. The Vietnamese samples are compared morphologically and statistically to samples of *Hipposideros turpis* BANGS, 1901 from Japan and Thailand. The Vietnamese animal is found to be conspecific with *Hipposideros turpis* and subspecifically intermediate between *H. turpis turpis* and *H. t. pendleburyi* (CHASEN, 1936), and should be referred to as *Hipposideros turpis alongensis* (BOURRET, 1942). With 9 figures.

Introduction. – After the description of *Hipposideros turpis* BANGS, 1901 from Ishigaki Island in the Ryukyu group (Japan), the species has been also found on Iriomote and Yonakuni Islands in the southern part of the same group of islands (YOSHIYUKI 1989) and then far away to the south-west in Thailand in the 1930s (Fig. 1). The latter form was described as *Hipposideros pendleburyi* by CHASEN in 1936. A few years later CHASEN (1940) still regarded the Thai form as a separate species. According to LEKAGUL et al. (1977) it has been known since, in that country only from two localities in the Krabi province and at Khao Ram, Nakhom si Thammarat province. TATE (1941) listed the diverse related forms previously described, as well as *H. turpis,* in the *H. armiger* group. ELLERMAN et al. (1951) dealt with it as a supposed subspecies of *Hipposideros armiger* HODGSON, 1835. HILL (1963) pointed out that it was a separate species, moreover, *H. pendleburyi* was actually a subspecies of *H. turpis*. The species thus seemed quite a rare one with a clearly disjunct distribution. YOSHIYUKI (1991) clarified the taxonomic status of *Hipposideros terasensis* KISHIDA, 1924 and the position of *H. t. turpis* within the *armiger* group.

During the present author's rather intensive bat collectings in North Vietnam in 1966, 1971 and 1987, a moderately large hipposiderid bat was also obtained in a good number. First it was thought to be *Hipposideros larvatus alongensis* BOURRET, 1942 as externally it clearly agreed with that

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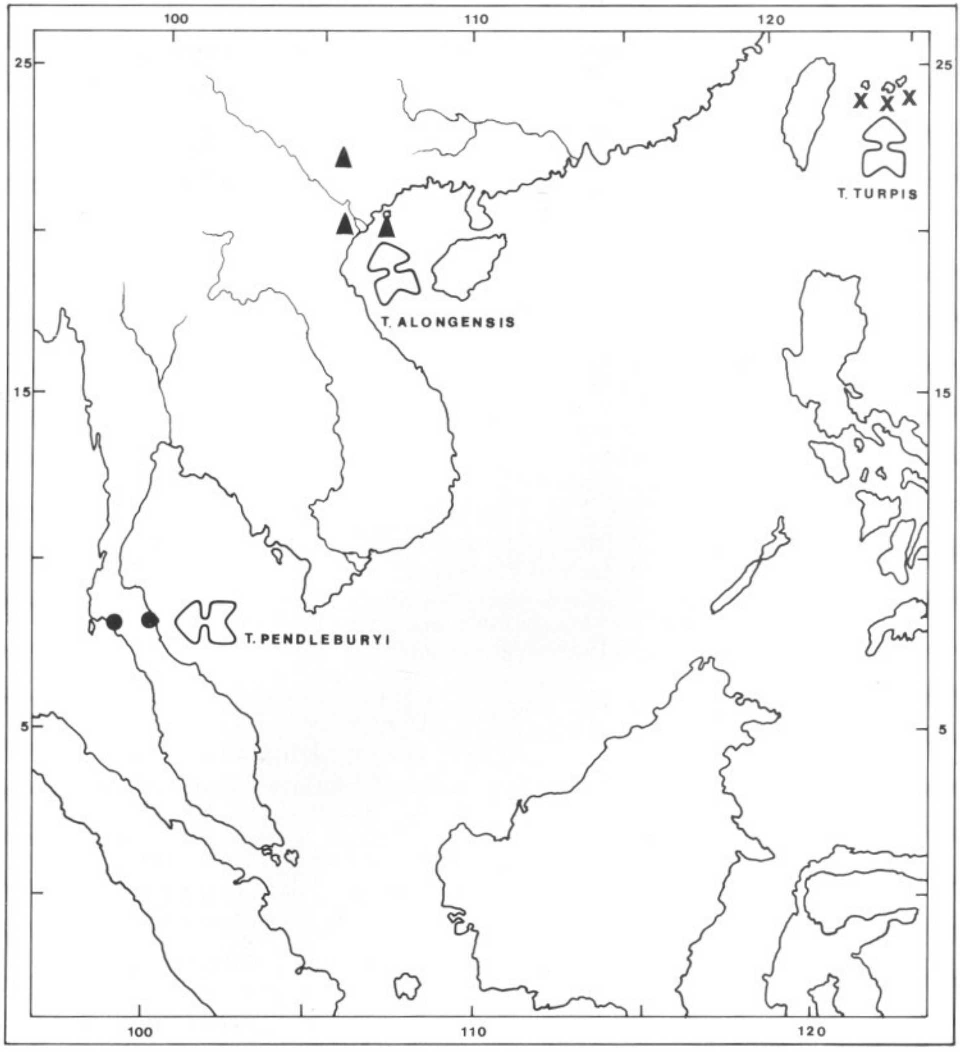

Fig. 1. Map of the distribution of *Hipposideros turpis* with the known collecting sites of the various subspecies

description in every respect. HILL (op.cit.) in his revision of the genus *Hipposideros* accepted BOURRET's animal as a subspecies of *H. larvatus*. TOPÁL (1975), however, regarded it as a separate species *(H. alongensis)* because it was found sympatrically with *H. larvatus* and because of the strong differences in their bacula. This view was further substantiated when, in 1987, on Cat Ba Island near Haiphong, in the Tonkin Bay, Vietnam in the very same cave both *H. larvatus,* and *H. "larvatus" alongensis* occurred (along with populations of *H. armiger*, of *H. bicolor* and a specimen of *Aselliscus stoliczkanus*). It is worth noting that until very recently there was no new consideration of the Vietnamese "subspecies" of *H. larvatus* even by Mr. J. E. Hill (Hill, in litt. and pers. com.).

MATERIAL AND METHODS

The following list of the studied specimens grouped under the name of the subspecies includes: deposition of the specimen (BMNH = The Natural History Museum, London; HNHM = Hungarian Natural History Museum, Budapest; NCSRV = National Center for Scientific Research of Vietnam, Hanoi); register number (or collector's number); sex (m = male, f = female, ? = undetermined sex); collecting locality; collector's name.

Hipposideros turpis turpis – BMNH 5.11.3.16., m ad., S. Loo-choa, Ishigaki Isl., Japan, A. Owston; BMNH 5.11.3.17., m ad., S. Loo-choa, Ishigaki Isl., Japan. A. Owston; BMNH 5.11.3.18., m ad., S. Loo-choa, Ishigaki Isl., Japan, A. Owston; BMNH 5.11.3.19., m ad., S. Loo-choa, Ishigaki Isl., Japan, A. Owston; BMNH 25.9.3.7., m., Yonakuni Isl., Japan, N. Kuroda; BMNH 25.9.3.8., f, Yonakuni Isl., Japan, N. Kuroda; BMNH 25.9.3.9., m, Sonai, Iriomote Isl., Japan, N. Kuroda; BMNH 25.9.3.10., f. Kasila, Ishigaki Isl., Japan, N. Kuroda.

Hipposideros turpis pendleburyi – BMNH 78.2338., ?, Ban Thap Plick, Krabi Muang, Thailand, A. Thonglongya K.; BMNH 78.233.9., ?, Ban Thap Plick, Krabi Muang, Thailand, A. Thonglongya K.

Hipposideros turpis alongensis – HNHM 88.39.1., f, netted in forest, Cuc Phuong National Park, 20° 20′ N, 105° 35′ E, prov. Ninh Binh, Vietnam, Gy. Topál et Cao Van Sung; HNHM 88.40.1., m; HNHM 88.40.2., m; HNHM 88.40.3., m; HNHM 88.40.4., f; HNHM 88.40.5., m; HNHM 88.40.6., m; HNHM 88.40.7., m; HNHM 88.40.8., f; HNHM 88.40.9., f; HNHM 88.40.10., f; HNHM 88.40.11., m; HNHM 88.40.12., m; HNHM 88.41.1., m; HNHM 88.42.1., m; NCSRV 280, m; NCSRV 287, f; NCSRV 289, m; NCSRV 290, m; NCSRV 298, m; NCSRV 300, f; NCSRV 302, m; NCSRV 304, m; NCSRV 306, m; NCSRV 307, m; NCSRV 320, m; NCSRV 338, m; NCSRV 339, m, all from the Bat Cave, Cuc Phuong Nat. Park, Vietnam, by Gy. Topál et Cao Van Sung; HNHM 11294, ? and HNHM 11295, ? as subrecent fragments from Bat Cave, Cuc Phuong Nat. Park, Vietnam, Gy. Topál; HNHM 11296, ? subrecent from Moon Cave, Cuc Phuong Nat. Park., Vietnam, Gy. Topál; HNHM 11288, ?; HNHM 11289, ?; HNHM 11290, ?; HNHM 11291, ?; HNHM 11292, ?, all subrecent remains from a cave at Yu Do, Prov. Yen Bai, Vietnam, by Gy. Topál et I. Matskási; HNHM 11297, f; HNHM 11298, m; HNHM 11299, f; HNHM 11300, f, all from Cave No. 1 at village Khé Sau, 20° 46′ N, 107° 01′ E, Cat Ba Island, Vietnam, I. Matskási et Gy. Topál.

External measurements of the Vietnamese specimens were taken in the field by the author. A total of 38 cranial and dental characters were measured with help of a "Digimatic" caliper to an accuracy of 0.01 mm, except when the skull was fragmentary. A series of measurements, especially those of short distances and of the teeth, were taken with the caliper under a stereo-microscope. List of the cranial and mandibular characters, abbreviations of the measurements used in the paper along with explanations are as follows:

CCONDYLL	condylar length of skull (from front of canines to back of condyles)
TOTALLEN	total length of skull (from front of canines to occiput)
BASILLEN	basilar length of skull (from frontal edge of palate [without praemaxillae] to the foremost part of the ventral incision between condyles)
ZYGWIDTH	width of skull between zygomata
MASTWIDT	mastoid width of the skull (between mastoid knobs)
UCCWIDTH	width of rostrum between outer margins of crown of canines
M3M3WIDT	width of rostrum between outer crowns of M^3s
UCM3LENG	crown length of upper $C–M^3$
PALBRIDG	length of palatal bridge (without the postpalatal spike)
COCHDIST	distance between cochleae
BRCASEWI	width of braincase (just above mastoid knob)
BRCASEHE	height of braincase (from base to top with sagittal crest)
LACRWIDT	width of rostrum between lachrymal foramina
UCP4LENG	crown length of upper $C–P^4$
UM1M3LEN	crown length of upper $M^1–M^3$ (from the anteriormost portion of parastyle of M^1 to the posteriormost edge of protocone of M^3)
UCBLENGT	basal cross-sectional length of upper C
UPCWIDTH	basal cross-sectional width of upper C
UM1LENGT	antero-posterior length of upper M^1 (between parastyle and metastyle)
UM1WIDTH	width of upper M^1 (between lingual base of protocone and labialmost edge of mesostyle)
UP2LENGT	antero-posterior crown length of upper P^2
UP2WIDTH	crown width of upper P^2
BULLALEN	greatest length of bulla tympani
MANDIBLE	length of mandible (between hindermost portion of articular process and anteriormost edge of I_1 alveolus)
LCM2LENG	crown length of lower $C–M_3$
LCP4LENG	crown length of lower $C–P_4$ row
LM1M3LEN	crown length of lower $M_1–M_3$ (between anterior edge of paraconid of M_1 and posterior margin of hypoconulid of M_3)
PROCCORH	height of coronoid process (between its top and the sinus on the mandibular body's ventral profile)
LP4LENGT	length of lower P_4 (between its paraconid and hypoconulid)
LP4WIDTH	greatest basal width of lower P_4
LP2LENGT	greatest basal length of lower P_2
LP2WIDTH	greatest basal width of lower P_2
LM1LENGT	length of lower M_1 (between its paraconid and hypoconulid)
LM1TALWI	talonid width of lower M_1
LM3LENGT	length of lower M_3 (between its apraconid and hypoconulid)
LM3TRIWI	trigonid width of lower M_3
INTEROWI	width of interorbital constriction

Statistical analyses of the available variables were carried out with help of the SYSTAT statistical computer programme (Wilkinson 1990).

RESULTS

Some of the specimens from Vietnam (Fig. 2) have been compared directly with the material in the Natural History Museum (London) probably from the type locality (purchased by the same collector as for the type

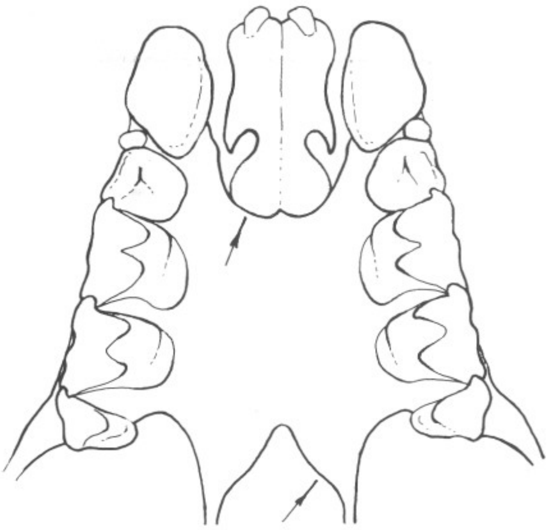

Fig. 2. Occlusal view of the rostral part of the skull in *Hipposideros t. alongensis* (HNHM 88.40.2.)

series, see also BANGS 1901), from some other Japanese localities, and from Thailand.

Conventional comparison of the Japanese and Vietnamese specimens

Comparison of the HNHM 88.41.1. Vietnamese *turpis* and the BMNH 5.11.3.19. Ishigaki *t. turpis* showed that the skull of the Japanese animal is decidedly smaller, with shorter and narrower nasofrontal region, and thinner and more elongated anteorbital bar, and greater anteorbital foramen. The anterior incision of the palate is very deep and reaches at least the level of the hypocone of M^1. The postdental palate behind the toothrows is much narrower than that in the Vietnamese specimen, with evenly arched and pointed incision, not as in the Vietnamese skull where the palation is arched with two faint lobes (Fig. 2). The upper toothrows are very similar, however, C and P^4 in contact as P^2 fully extrudes out of the toothrow in the Japanese animal. In both specimens the basal surface of upper C has an impression of P^2 postero-labially. The lower P_2 of the northern specimen is somewhat greater, though both have the same length/width ratio in basal cross-section. On the contrary, the length/width ratio of the lower P_4 is quite different in the two compared animals, that of the Japanese specimen being decidedly shorter and wider. The lower molars of the northern animal were found to be somewhat greater. Another *t. turpis* specimen (BMNH 5.11.3.16., Ishigaki Island) was found to be different from the above Vietnamese animal in a similar way, in the size of the anteorbital foramen and bar, in the shape of the anterior palatal incision and in the postdental palate, as well as in the lower dentition. The Ishigaki specimen (BMNH 25.9.3.10.) has generally smaller nasofrontal region in dorsal view than that of the Vietnamese one. The upper C and P^4 are closer to each other than in the southern animal. The difference in the palation and postdental palate is as in the other Japanese specimens. The size of the bulla is equal, the lower C, P_2 and P_4 are smaller and shorter than in the Vietnamese specimen. Its molars are, however, slightly greater. The BMNH 25.9.3.9. specimen from the Iriomote Island has the same anteorbital bar and foramen as the other *H. t. turpis* specimens and a generally somewhat smaller skull with very similar, yet smaller nasofrontal region. The differences in the anterior palatal incision, and that of the postdental palate are the same as in other Japanese animals. The measurements of bulla tympani are equal in the present Japanese and in the above Vietnamese animal. It has C and P^4 in touch, upper dentition otherwise identical to that of the Vietnamese specimen. In the lower dentition P_4 is shorter and wider, the molars are somewhat greater than in the southern population, though C and P_2 are identical in both.

Comparison of the Thai and Vietnamese animals

Specimen HNHM 88.41.1. from Cuc Phuong, Vietnam, has been compared to a specimen of *H. t. pendleburyi* (BMNH 78.2329. from Ban Thap Plick, Korbi Muang, Thailand). In dorsal view their skulls are strikingly similar mostly because of equal size in general. At the same time the nasofrontal region of the Vietnamese specimen is longer and wider, thus with a greater dorsal surface. The anterior palatal incision in the Thai specimen reaches the level of the anteriormost part of the parastyle of M^1 and its interpterygoid fossa is narrower and the palation has rounded incision, not as in the Vietnamese animal where the interpterygoid fossa is wider and the posterior palate is sharply and pointedly incised (Fig. 2). The Vietnamese specimen has a more inflated bulla tympani with greater opening than the Thai one. The coronoid process of the mandible is somewhat higher in the Vietnamese specimen, while the projection of the dorsal crest on angular process is lower in the Thai animal. The upper and lower teeth of the Thai animal are wider than those of the Vietnamese one, although their antero-posterior lengths are more or less equal or just slightly longer in the southern specimen. The P_2 of the Thai specimen seems shorter anteroposteriorly. The second Thai specimen of *H. turpis pendleburyi* (BMNH 78.2338.) has the same measurements and rostrum as the Vietnamese HNHM 88.41.1. The anterior palatal incision proved to be deeper

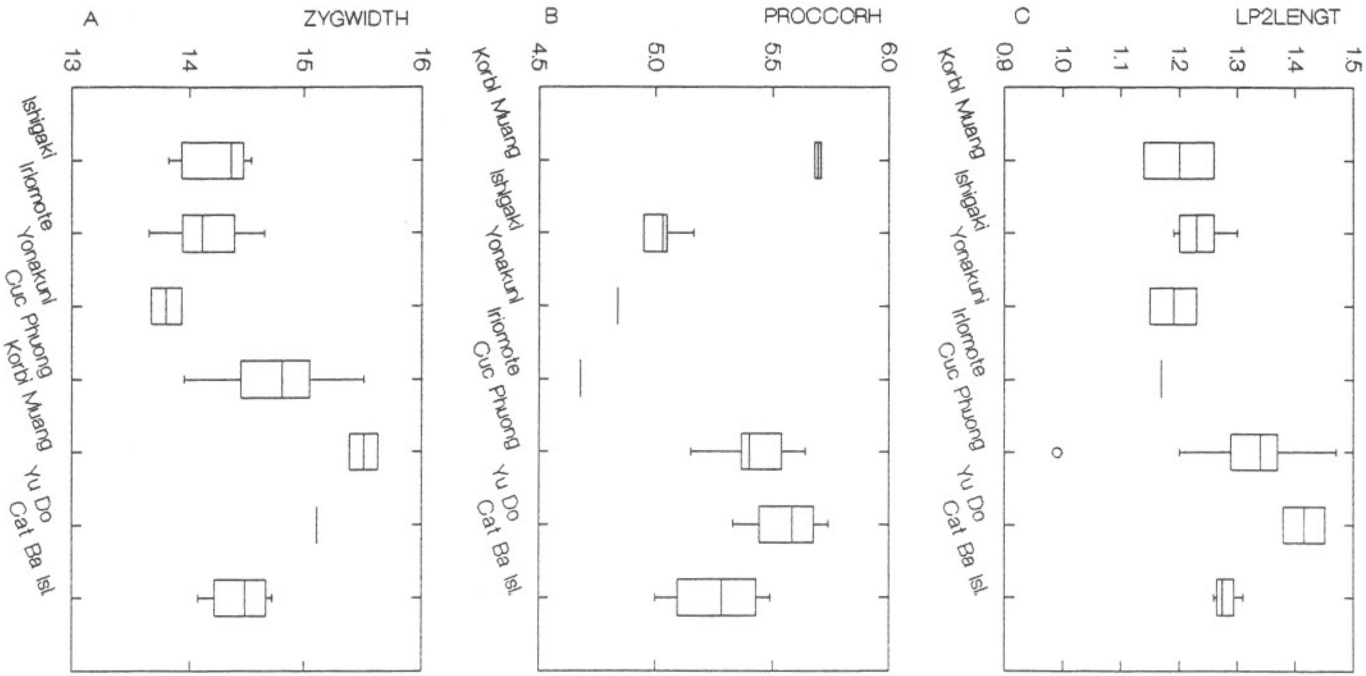

Fig. 3A, B, C. Boxplots of three variables. The horizontal lines represent the range of the sample, vertical mark in the box is the median, the right and left margins (hinges) of the boxes represent the interquartile range or midrange. Values outside the inner fences are plotted automatically with asterisks by the computer programme for some specimens slightly falling out of the sample, outside the outer fences with empty circles for strongly outstanding specimens. Grouped according to the collecting localities (see the list of study material) and the posterior palate narrower with evenly rounded incision, not as in the Vietnamese animal. It has smaller bulla tympani with smaller opening. The upper C is basally shorter, but wider than in the northern specimen. Its upper molars are slightly, as well as the lower teeth are generally more robust, P_2 is longer and wider in cross-section, P_4 is relatively wider.

Cranial and dental characters

The dental and cranial measurements of Japanese specimens (taken from YOSHIYUKI 1989, with the exception of Nos NSMT-M 11446 and NSMT-M 11449), the few specimens in London, the Vietnamese populations, and the two Thai specimens have been analysed.

In general the Vietnamese population has slightly smaller cranial and dental measurements for the females in 22 characters measured. Among these the females are markedly smaller in LACRWIDT, BRACSEHE, PROCCORH, LP2LENGT, and LP2WIDTH. The males are smaller but in five characters: UCM3LENG, UCBLENGT, LM1LENGT, LM1TALWI and especially in INTEROWI. The two sexes had apparently equal measurements in the following eight characters: UCM3LENG, UCP4LEGN, UM1-WIDTH, UM1LENGT, UP2LENGT, LP4LENGT and BULLALEN.

The boxplots present rather different results, thus a truly mosaic picture.

The values of the small sample of *Hipposideros t. pendleburyi* are the highest in many cases, and outstandingly so in ZYGWIDTH, UCCWIDTH, M3M3WIDT, BRCASEHE, UPCWIDTH, MANDIBLE, LCM3LENG, LP2WIDTH and LM1TALWI (see Fig. 3A–B, Fig 4A). They are small, however, in UP2WIDTH and the smallest in BULLALEN. *H. t. pendleburyi* more or less equals the Japanese nominate form and is thus markedly greater in COCHDIST, UM1M3LEN, UM1LENGT, LP4WIDTH, LM1LENGT, LM3LENGT, and LM3TRIWI, (see Fig. 4A, B, C), or smaller than the Vietnamese population in CCONDYLL, LP2LENGT, PAL-BRIDG and PROCCORH, respectively, (see Fig. 3A, B, C). The Thai form and the Vietnamese material overlapped in TOTALLEN, BASILLEN, UCP4LENG and in UCM3LENG.

The Vietnamese and Japanese samples are generally equal in UCC-WIDTH, UCM3LENG, PALBRIDG and LCM3LENG. Although it was difficult to compare the cranial and dental characters of the Japanese *H. t. turpis* due to the fragmentary state of the London specimens and the numerous missing characters in the material presented in YOSHIYUKI's book, they were markedly small e.g. in PROCCORH and LP2LENGT (Fig. 3A, C), however, large in UM1M3LEN, LP4WIDTH, LM3LENGT and LM3TRIWI (Fig. 4A, B, C).

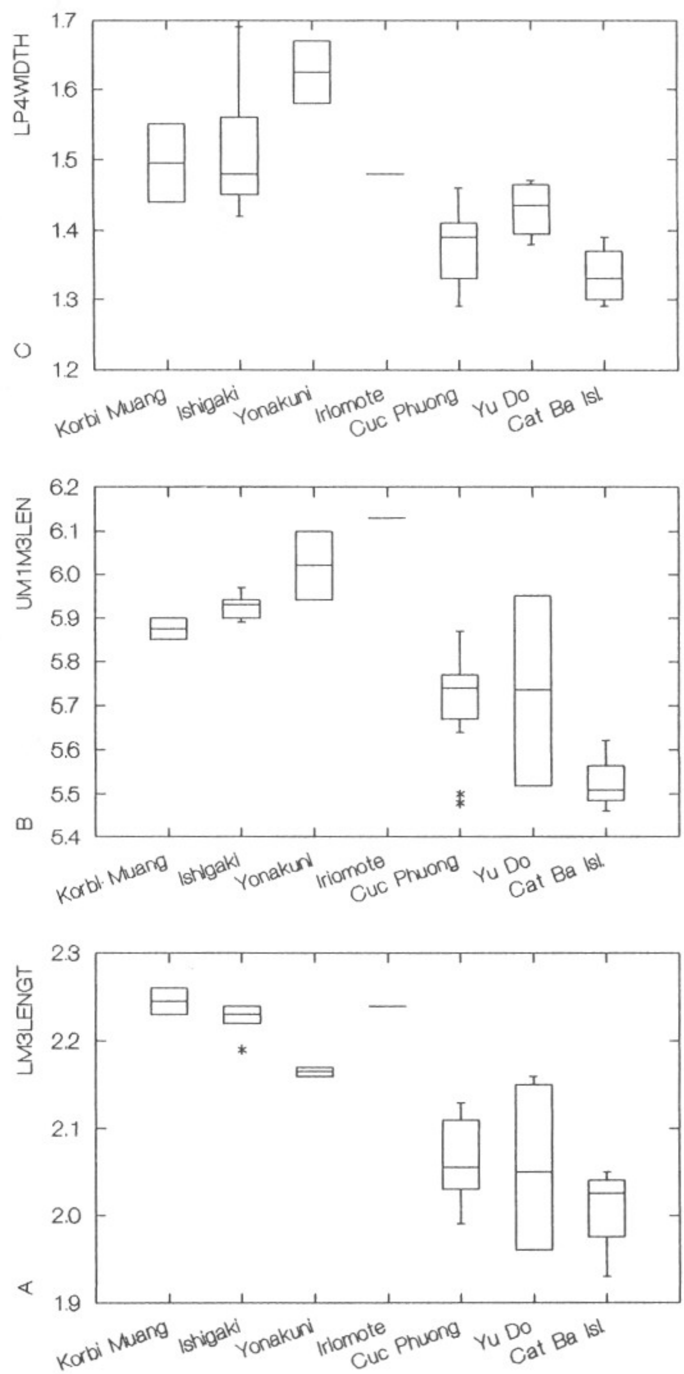

Fig. 4A, B, C. Boxplots of three variables. Legend as for Fig. 3

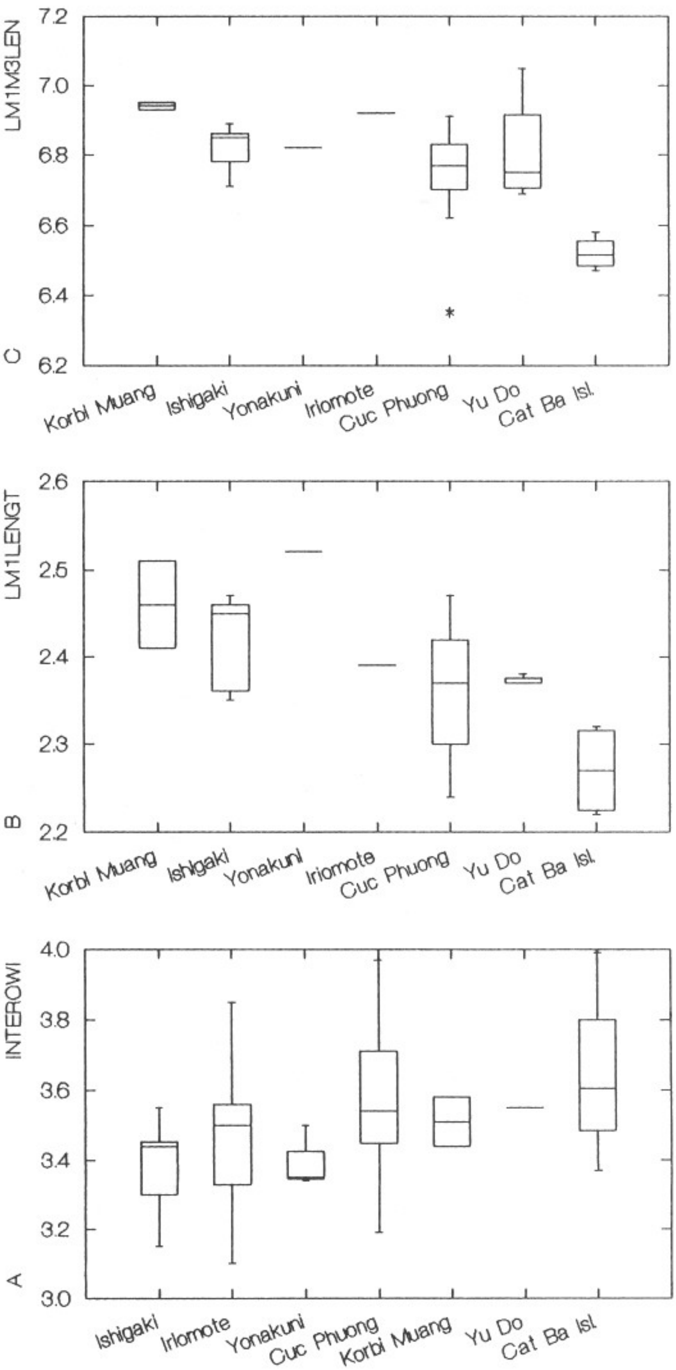

Fig. 5A, B, C. Boxplots of three variables. Legend as for Fig. 3

Within the Vietnamese material the unfortunately small series from the Cat Ba Island has smaller measurements than the other specimens in 21 cranial and dental characters. Among these they were certainly smaller in MASTWIDT, BRCASEWI, UM1M3LEN, LM1M3LEN, (see Fig. 5C) and especially in LACRWIDT, thus they were close and intermediate to the Japanese material in many cases. MANDIBLE and BRCASEHE in the Cat Ba specimens are practically equal to those of the Cuc Phuong sample, while INTEROWI of the Cat Ba specimens is greater (see Fig. 5A). The few fragments from Yu Do generally have greater values than the animals from Cuc Phuong, except in 12 characters where they are equal or smaller.

Otherwise, based on the present material, there were found no differences between the various populations in UCBLENGT, UPCWIDTH, UM1-LENGT, UP2LENGT, UP2WIDTH, and LCP4LENG.

Some of the dental and cranial measurements have been analysed with help of scatterplots (with regression lines and ellipses marking 50% probabilities of the density of the bivariate cloud of points). The scatterplots in which one of the variables was BRCASEHE had to be omitted for the Japanese material (published in YOSHIYUKI's book) because they were much lower and thus probably had been measured without sagittal crest (?).

Where there were data available in YOSHIYUKI's book, these and measurements of the specimens in the London collection, moreover the Cat Ba material agreed well in UCCWIDTH vs. ZYGWIDTH and BRCASEWI vs. CCONDYLL. However, the Cat Ba specimens more or less differed in having greater ZYGWIDTH vs. CCONDYLL, greater INTEROWI vs. CCONDYLL, smaller UCM3LENG vs. CCONDYLL, (see Fig. 6A), smaller BRCASEWI vs. ZYGWIDTH, and shorter UCM3LENG vs. ZYGWIDTH (see Fig. 7A). The Cat Ba material was practically mostly within the range of the Japanese sample in UCCWIDTH vs. CCONDYLL, UCCWIDTH vs. UCM3LENG, INTEROWI vs. ZYGWIDTH (see Fig. 7B), UCCWIDTH vs. ZYGWIDTH. The London deposited specimens of *H. t. turpis* were more or less outside the cloud of points of the original Japanese data (besides BRCASEHE mentioned above) in ZYGWIDTH vs. MANDIBLE, MANDIBLE vs. CCONDYLL (see Fig. 6B) and UCCWIDTH vs. BRCASEWI.

In scatterplots where there were no data from YOSHIYUKI's book the London specimens of *H. t. turpis* and the Cat Ba sample agreed in MANDIBLE vs. TOTALLEN, PALBRIDG vs. CCONDYLL and CCONDYLL vs. TOTALLEN. The Cat Ba material was greater than the specimens from Japan in the London collection in: LCP4LENG vs. LM1M3LEN (in LM1M3LEN), UCP4LENG vs. UM1M3LEN (in UM1M3LEN), UCCWIDTH vs. M3M3WIDT (in M3M3WIDT), UCP4LENG vs. UCM3LENG (in UCM3LENG), LCP4LENG vs. LCM3LENG (in LCM3LENG), UCP4-LENG vs. MASTWIDT (in MASTWIDT). The Cat Ba sample has smaller MASTWIDT vs. ZYGWIDTH.

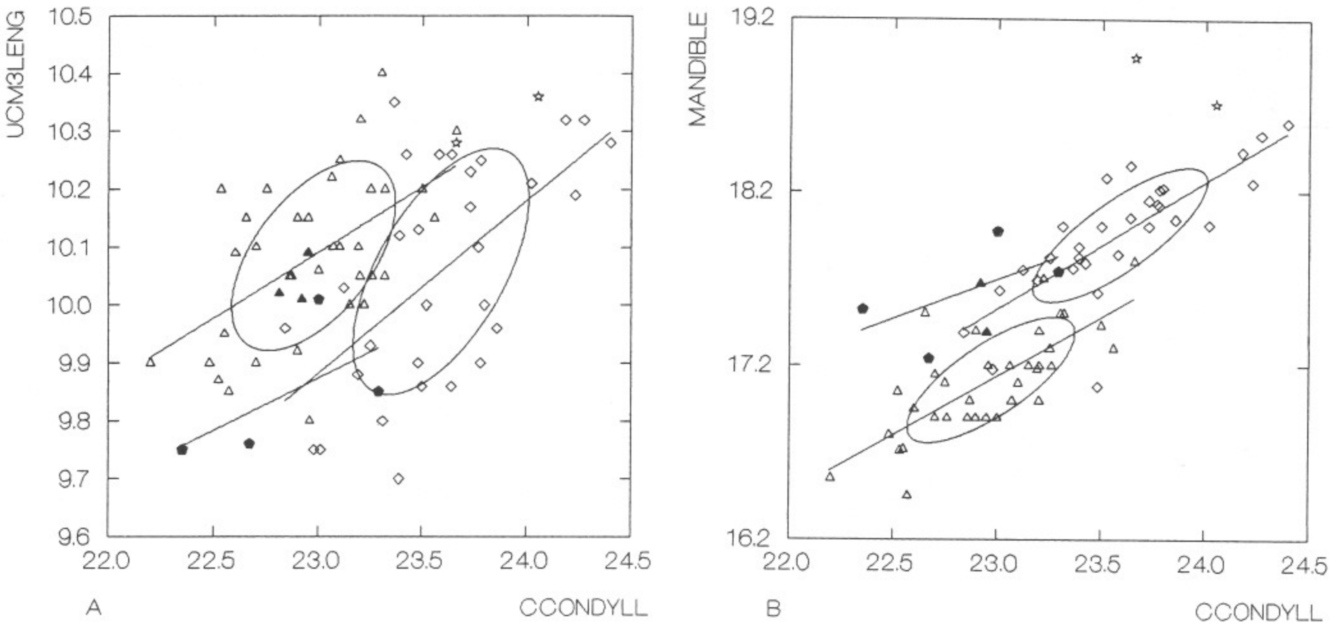

Fig. 6. Selected scatter diagrammes for three cranial and dental characters measured. Asterisks = *H. t. pendleburyi*; empty triangles = data of Japanese samples (Yoshiyuki 1989) of *H. t. turpis* (A: y = 0.228 X + 4.843; B: y = 0.670 X + 1.741); filled triangles = *H. t. turpis* measured in London; empty diamonds = data of the Cuc Phuong and Yu Do, Vietnam samples (A: y = 0.110 X + 8.423, B: y = 0.731 X + 0.701); filled pentagons = *H. t. alongensis* from Cat Ba Isl. (A: y = 0.180 X + 5.726, B: y = 0.450 X + 7.342) with the corresponding regression lines (equations in brackets). Ellipses mark 50% probabilities of the density of the bivariate cloud of points

External characters

External measurements of the two sexes in the study material are similar but the females have very slightly longer ears and forearms (at least as regards the medians). Tibia length is smaller in the Vietnamese sample, however, medians are similar in the Japanese (YOSHIYUKI 1989) material. Comparison of the three external characters of the Japanese specimens (data taken from YOSHIYUKI's book, those of specimens NSMT 11146 and NSMT 15143 omitted), and the Vietnamese populations gave differences in the scatterplots tibia vs. forearm and also ear vs. forearm, with similar differences in the slopes of the regression lines. In these plots, the four specimens from the Cat Ba Island are somewhat closer to the Japanese group. The cloud of points in the latter is always more scattered (due to various populations or to several different collectors?). However, the forearm is smaller with longer tibia or ear (see Fig. 8A). One of the 3 dimensional plots also depicts (Fig. 8B) the above differences.

Comparison of forearm lengths, as revealed by boxplots also gave some differences, namely, the highest values were found in the Cuc Phuong sample, in this respect somewhat smaller was the small series from Cat Ba. The latter one fitted well to the Japanese samples (Fig. 9A), among these, however, the samples from Nakano and Otomi on Iriomote Island had as great maxima as the value of the median of the Cuc Phuong population.

Tibia length was practically the same in the Japanese and Vietnamese samples (Fig. 9B), with equal medians for the Cuc Phuong and Cat Ba samples. Within the Japanese material again the Iriomote specimens had the highest values.

As regards ear length, the Japanese and Vietnamese samples also do not differ, and even the Cuc Phuong animals are somewhat smaller (Fig. 9C) than those from Cat Ba.

Baculum

It is interesting to note the differences between the baculum of the Japanese *H. t. turpis* (YOSHIYUKI 1989) and that of the Vietnamese population (TOPÁL 1975). It should be noted first of all that the figures in YOSHIYUKI's (1989) book are upside down (see the general explanation on p. 13 as well as the description of the baculum of *H. turpis* on p. 78) thus, the forked distal portion of the bone is heading downwards (see also descriptions and figures for all *Rhinolophus*, *Pipistrellus*, *Nyctalus* and *Murina silvatica*). YOSHIYUKI's book (op. cit.) erroneously describes the opposite situation, that is e.g. for *H. turpis:* the body a "reverse Y-letter shape, ampulla small" and "the ampulla is at the distal end". As regards the measurements of the baculum in *H. turpis* the figures both in YOSHIYUKI's book and TOPÁL's

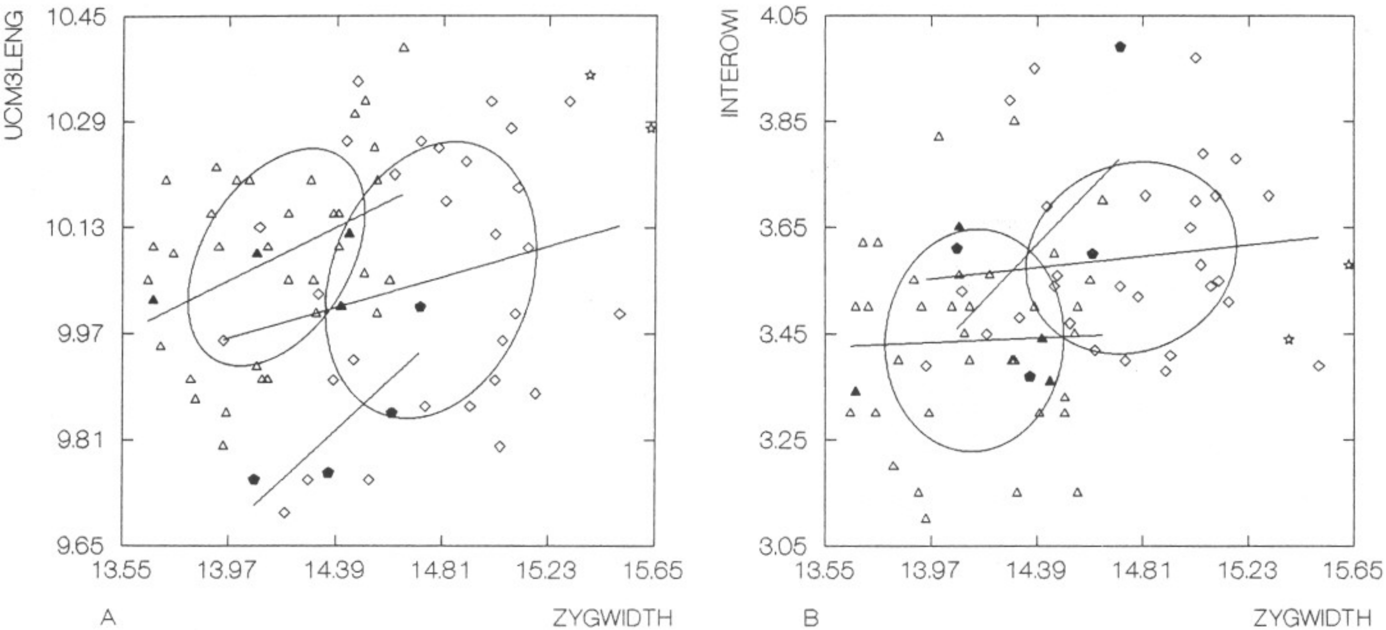

Fig. 7. Selected scatter diagrammes for three cranial and dental characters measured. Legend as for Fig. *H. t. turpis* (Yoshiyuki 1989) (A: y=0.191 X+7.386; B: y=0.021 X+3.146); *H. t. alongensis*, Cuc Phuong (A: y=0.110 X+8.423; B: y=0.051 X+2.846); *H. t. alongensis*, Cat Ba Isl. (A: y=0.355 X+4.174, B: y=0.494 X−3.497)

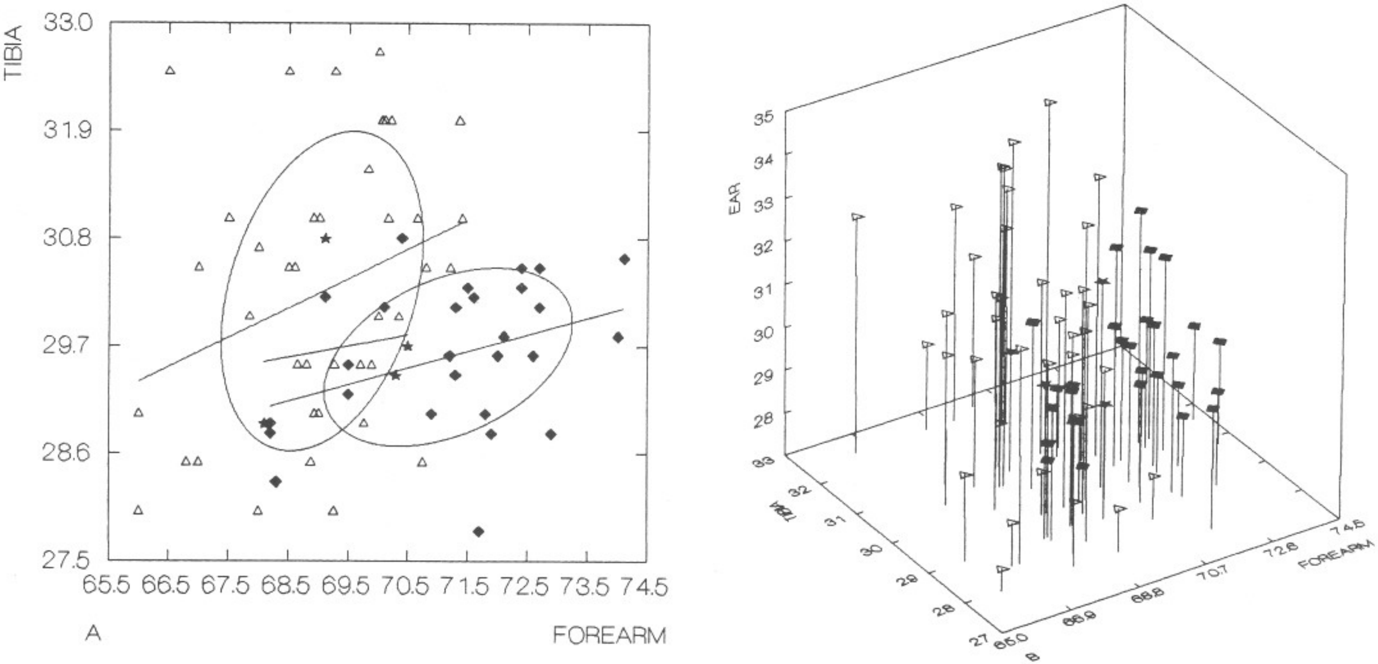

Fig. 8A. Scatter diagramme for tibia vs. forearm. Legend as for Fig. 6. except: filled asterisks = specimens *H. t. alongensis* from Cat Ba Island; filled diamonds = *H. t. alongensis* from Cuc Phuong; empty triangles = *H. t. turpis* (YOSHIYUKI 1989). – Fig. 8B. Three-dimensional plot of the external measurements of the study material. Legend as for Fig. 8A

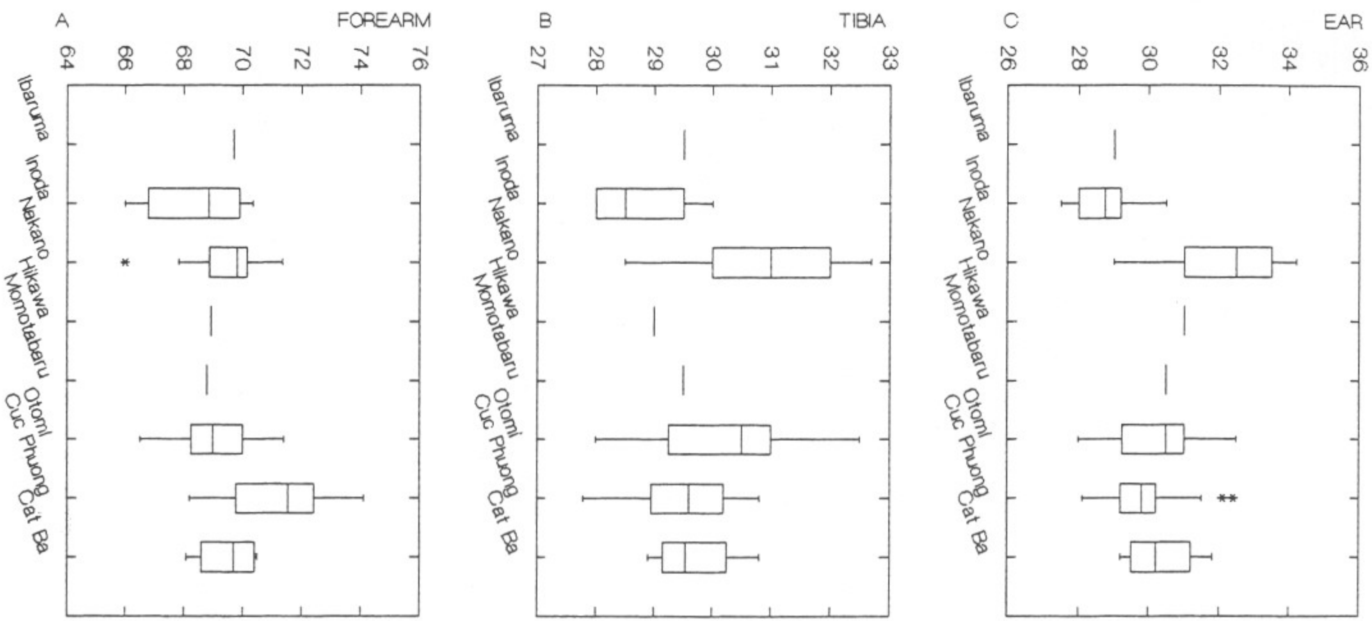

Fig. 9. Boxplots for the available external characters of *H. turpis* grouped according to collecting localities (Ibaruma and Inoda on Ishigaki Isl., Nakano and Otomi on Iriomote Isl., Hikawa and Momotabaru on Yonakuni Isl. see YOSHIYUKI 1989: 74.)

paper were made under the same magnification. Greatest length of the baculum in *H. t. turpis* is 1.40 ± 0.09 mm, in Vietnamese specimens 1.50–1.63 mm, greatest width is 0.689 ± 0.04 mm and 0.55–0.57 mm, respectively. Thus the Vietnamese form seems to have much more robust and somewhat longer bones with longer distal forks whose tips bend inwards, not as in the Japanese specimens where they clearly more diverge. The shaft of the bone between the basal cone and the terminal fork is broad and thick, and it seems more slender in the nominate form.

DISCUSSION

In light of the new findings it is evident that *Hipposideros larvatus alongensis* BOURRET, 1942 is a younger synonym of *Hipposideros turpis* BANGS, 1901.

The statistical investigations have proven in many respect that the Vietnamese population is an intermediate one between the northern *H. t. turpis* BANGS, 1901 and the southern *H. t. pendleburyi* (CHASEN, 1936), resembling the latter one.

The sporadic distribution of this still rarely collected species seems to be confined to easternmost continental Southeast-Asia and some close adjacent islands in the tropics and subtropics between 99° and 125° E and 8° and 25° N (see Fig. 1), with the northern and smallest nominate form, the southern and greatest *H. t. pendleburyi* and the transitional Vietnamese population whose name should stand as *Hipposideros turpis alongensis* (BOURRET, 1942) when one considers subspecific division. However, the complex picture of the various external, cranial and dental characters, although presenting a real mosaic, also indicates a northeast-southwest cline in the characters of this interesting bat, and insular effects cannot be excluded as well.

* * *

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Table 1

Hipposideros turpis alongensis from Vietnam (except Cat Ba Isl.); basic statistical data, total observations: 37

	CCONDYLL	TOTALLEN	BASILLEN	ZYGWIDTH	MASTWIDT
N. OF CASES	30	30	29	29	30
MEAN	23.588	26.434	17.111	14.764	13.090
STD DEV.	0.388	0.423	0.380	0.392	0.226
MINIMUM	22.840	25.620	16.320	13.950	12.470
MAXIMUM	24.400	27.260	17.820	15.510	13.420

UCCWIDTH	M3M3WIDT	UCM3LENG	PALBRIDG	COCHDIST	BRCASEWI
29	29	32	29	17	17
6.651	9.586	10.063	4.896	2.470	10.059
0.198	0.240	0.219	0.214	0.098	0.186
6.220	9.000	9.700	4.500	2.310	9.730
6.950	10.000	10.570	5.370	2.690	10.510

UCP4LENG	UM1M3LEN	UCBLENGT	UPCWIDTH	BRCASEHE	LACRWIDT
18	19	19	19	17	16
4.693	5.719	2.695	1.726	7.720	8.109
0.129	0.122	0.201	0.127	0.212	0.211
4.460	5.480	2.010	1.280	7.220	7.630
4.880	5.950	2.900	1.890	8.040	8.540

UM1LENGT	UM1WIDTH	UP2LENGT	UP2WIDTH	BULLALEN	MANDIBLE
19	19	18	18	15	33
2.288	2.596	0.648	0.616	3.651	17.962
0.077	0.092	0.063	0.051	0.080	0.356
2.140	2.450	0.530	0.550	3.430	17.080
2.450	2.750	0.770	0.720	3.750	18.600

LCM3LENG	LCP4LENG	LM1M3LEN	PROCCORH	LP4LENGT	LP4WIDTH
34	21	22	20	22	22
11.032	4.254	6.762	5.455	1.555	1.385
0.201	0.142	0.131	0.141	0.054	0.052
10.580	4.000	6.350	5.150	1.440	1.290
11.320	4.570	7.050	5.740	1.670	1.470

LP2LENGT	LP2WIDTH	LM1LENGT	LM1TALWI	LM3LENGT	LM3TRIWI
19	19	22	22	24	24
1.328	1.241	2.362	1.580	2.063	1.491
0.102	0.058	0.063	0.091	0.056	0.087
0.990	1.110	2.240	1.420	1.960	1.370
1.470	1.330	2.470	1.720	2.160	1.720

INTEROWI
30
3.580
0.182
3.190
3.970

Table 2

Hipposideros turpis alongensis from Cat Ba Island, Vietnam; basic statistical data, total observations: 4

	CCONDYLL	TOTALLEN	BASILLEN	ZYGWIDTH	MASTWIDT
N. OF CASES	4	4	4	4	4
MEAN	22.828	25.658	16.385	14.440	12.793
STD DEV.	0.407	0.240	0.427	0.289	0.111
MINIMUM	22.350	25.350	16.030	14.070	12.630
MAXIMUM	23.290	25.890	16.930	14.720	12.880

UCCWIDTH	M3M3WIDT	UCM3LENG	PALBRIDG	COCHDIST	BRCASEWI
4	4	4	4	4	4
6.540	9.373	9.843	4.573	2.315	9.755
0.112	0.169	0.120	0.149	0.054	0.203
6.420	9.210	9.750	4.400	2.250	9.500
6.650	9.600	10.010	4.720	2.360	9.980

BRCASEHE	LACRWIDT	UCP4LENG	UM1M3LEN	UCBLENGT	UPCWIDTH
4	4	4	4	4	4
7.688	7.723	4.588	5.525	2.743	1.665
0.107	0.203	0.113	0.068	0.076	0.040
7.570	7.560	4.490	5.460	2.640	1.630
7.830	8.010	4.750	5.620	2.820	1.720

UM1LENGT	UM1WIDTH	UP2LENGT	UP2WIDTH	BULLALEN	MANDIBLE
4	4	4	4	4	4
2.253	2.435	0.553	0.595	3.620	17.618
0.059	0.064	0.068	0.064	0.083	0.312
2.210	2.380	0.450	0.510	3.530	17.240
2.340	2.500	0.590	0.660	3.720	17.970

LCM3LENG	LCP4LENG	LM1M3LEN	PROCCORH	LP4LENGT	LP4WIDTH
4	4	4	4	4	4
10.785	4.153	6.520	5.263	1.473	1.335
0.110	0.070	0.047	0.214	0.042	0.044
10.680	4.060	6.470	5.000	1.430	1.290
10.940	4.220	6.580	5.490	1.530	1.390

LP2LENGT	LP2WIDTH	LM1LENGT	LM1TALWI	LM3LENGT	LM3TRIWI
4	4	4	4	4	4
1.280	1.228	2.270	1.530	2.008	1.405
0.022	0.028	0.052	0.042	0.053	0.024
1.260	1.200	2.220	1.500	1.930	1.380
1.310	1.260	2.320	1.590	2.050	1.430

INTEROWI
4
3.643
0.257
3.370
3.990

Table 3

Hipposideros turpis turpis alongensis from Japan (combined measurement data of BNHM and NSMT specimens) basic statistical data, total observations: 46

	CCONDYLL	TOTALLEN	BASILLEN	ZYGWIDTH	MASTWIDT
N. OF CASES	41	3	3	42	3
MEAN	22.963	25.713	16.523	14.136	12.970
STD DEV.	0.322	0.129	0.595	0.298	0.087
MINIMUM	22.200	25.570	15.840	13.650	12.870
MAXIMUM	23.660	25.820	16.930	14.650	13.020
UCCWIDTH	M3M3WIDT	UCM3LENG	PALBRIDG	COCHDIST	BRCASEWI
42	7	43	6	3	43
6.410	9.934	10.074	4.422	2.920	9.950
0.313	0.124	0.134	0.286	0.320	0.261
5.570	9.710	9.800	4.140	2.600	9.420
6.850	10.080	10.400	4.930	3.240	10.550
BRCASEHE	LACRWIDT	UCP4LENG	UM1M3LEN	UCBLENGT	UPCWIDTH
37	8	8	8	8	8
6.739	7.560	4.564	5.975	2.771	1.765
0.280	0.104	0.122	0.090	0.135	0.071
6.300	7.420	4.390	5.890	2.600	1.670
7.680	7.710	4.710	6.130	2.980	1.870
UM1LENGT	UM1WIDTH	UP2LENGT	UP2WIDTH	BULLALEN	MANDIBLE
8	8	8	8	4	45
2.435	2.535	0.596	0.601	3.705	17.198
0.108	0.208	0.040	0.066	0.042	0.340
2.350	2.300	0.550	0.490	3.650	16.450
2.680	2.800	0.660	0.690	3.750	17.850
LCM3LENG	LCP4LENG	LM1M3LEN	PROCCORH	LP4LENGT	LP4WIDTH
7	8	7	8	8	8
10.956	4.135	6.833	4.938	1.471	1.541
0.143	0.108	0.071	0.149	0.089	0.101
10.750	4.010	6.710	4.680	1.340	1.420
11.150	4.320	6.920	5.160	1.580	1.690
LP2LENGT	LP2WIDTH	LM1LENGT	LM1TALWI	LM3LENGT	LM3TRIWI
8	8	7	7	8	8
1.216	1.249	2.429	1.601	2.211	1.591
0.049	0.017	0.063	0.062	0.033	0.025
1.150	1.230	2.350	1.530	2.160	1.550
1.300	1.280	2.520	1.690	2.240	1.620
INTEROWI					
43					
3.438					
0.168					
3.100					
3.850					

Table 4

Hipposideros turpis pendleburyi from Thailand; basic statistical data, total observations: 2

	CCONDYLL	TOTALLEN	BASILLEN	ZYGWIDTH	MASTWIDT
N. OF CASES	2	2	2	2	2
MINIMUM	23.660	27.010	17.090	15.390	12.700
MAXIMUM	24.050	27.280	17.380	15.630	13.160

UCCWIDTH	M3M3WIDT	UCM3LENG	PALBRIDG	COCHDIST	BRCASEWI
2	2	2	2	2	2
7.030	10.280	10.280	4.490	2.870	9.980
7.370	10.380	10.360	4.500	3.170	10.200

BRCASEHE	LACRWIDT	UCP4LENG	UM1M3LEN	UCBLENGT	UPCWIDTH
2	2	2	2	2	2
8.050	7.660	4.780	5.850	2.680	1.900
8.290	7.670	4.820	5.900	2.770	2.000

UM1LENGT	UM1WIDTH	UP2LENGT	UP2WIDTH	BULLALEN	MANDIBLE
2	2	2	2	2	2
2.410	2.590	0.540	0.530	3.330	18.710
2.470	2.740	0.600	0.540	3.440	18.980

LCM3LENG	LCP4LENG	LM1M3LEN	PROCCORH	LP4LENGT	LP4WIDTH
2	2	2	2	2	2
11.320	4.340	6.930	5.680	1.520	1.440
11.390	4.340	6.950	5.710	1.560	1.550

LP2LENGT	LP2WIDTH	LM1LENGT	LM1TALWI	LM3LENGT	LM3TRIWI
2	2	2	2	2	2
1.140	1.320	2.410	1.720	2.230	1.560
1.260	1.330	2.510	1.820	2.260	1.690

INTEROWI
2
3.440
3.580