Redescription and Generic Redesignation of the Ladakhian Gecko *Gymnodactylus stoliczkai* Steindachner, 1969

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Abstract.- *Gymnodactylus stoliczkai* is redescribed on the basis of recently collected topotypes, and is redesignated to the genus the *Cyrtodactylus*. It is found to be morphologically distinct from *C. walli* and *C. yarkandensis* with which species it has long been synonymized. Reproduction, ecology and distribution of this highland gecko is discussed.

Key words.- *Cyrtodactylus stoliczkai*, taxonomy, reproduction, ecology, zoogeography.

Introduction

In 1866 Dr. Ferdinand Stoliczka deposited a collection of animals, collected from different parts of the Indo-Pak subcontinent, in Naturhistoristorisches Museum Wien, Austria (NMW). The collection contained a gecko from Karoo, north of Dras, Kashmir, apparently collected during geological survey of western Himalayas, which was described by Steindachner in 1867 as a new taxon, *Gymnodactylus stoliczkai*, honoring its collector. The specimen is still available in the museum under registry number NMW 16756 (Tiedemann et al., 1994). Ever since the description of this taxon, it has become a habit with herpetologists working on collections from northern Pakistan, to try to place almost every angular-toed gecko encountered, in the synonymy of *G. stoliczkai* without going into details of morphological comparisons: Smith, 1935 (*Gymnodactylus walli* Ingoldby, 1922); Minton, 1966 (*Cyrtodactylus mintoni* Golubev and Szczerbak, 1981) and Mertens, 1969 (*Cyrtodactylus dattanensis* Khan, 1980), creating taxonomic chaos. Recent collections from circum-Himalayan region has shown that *G. stoliczakai* does not belong to the fauna of Pakistan, moreover, all the geckos placed in its synonymy are themselves valid independent taxa (Khan, 1992, 1993, 1994; Khan and Baig, 1992).

A long, detailed morphological redescription of *Gymnodactylus stoliczkai* is urgently due, to make intertaxal comparisons possible and to come out of "*stoliczkai* myth". Due to lack of working material the present project has considerably been delayed. The type specimen (NMW 16756) and syntype in the Museum of Comparative Zoology, Cambridge (MCZ 7132) are not allowed to be loaned for study. Therefore the data for present study is drawn from several sources: one of us (HR) has studied series of 14 topotypes of this species in Zoologische Staatssammlung Munchen (ZSM; Table 1; collected by Gruber, 1981), while Dr. G. R. Zug (National Museum of Natural History, Washington) has kindly taken data on topotype MCZ 7132 for us. Moreover, present redescription is further supplemented with the data available in literature (Steindachner, 1867:15; Boulenger, 1890:63; Smith, 1935:57; Constable, 1949:84; Szczerbak and Golubev, 1986:205). Photographs of topotypes (Fig. 1; ZSM 124.77) and (Fig. 2; ZSM 45.77), and type NMW 16756 (Khan, 1994; Fig. 2) have helped us immensely to understand morphology of this important taxon.

Taxonomic Notes

Sprix's (1825:17) genus *Gymnodactylus* included all the then known non dilated angular-digited geckos (Boulenger, 1885:22, 1890:59; Annandale, 1913:309; Smith, 1935:37). Until Underwood (1954) restricted this genus to South American angular-digited geckos, placing all south Asian geckos in the genus *Cyrtodactylus* Gray 1827. Most of the subsequent workers on the herpetology of Pakistan have followed Underwood's view point (Minton, 1966; Khan, 1980; Khan and Mirza, 1977). However, Mertens (1969) is orthodox and a bit cautious by retaining *Gymnodactylus* as a genus and placing Pakistani geckos in the subgenus *Cyrtodactylus*.

A recent break through towards a solution comes from Szczerbak and Golubev (1984, 1986): the genus *Tenuidactylus* is erected to include Palearctic angular-digited geckos. It is divided in three subgenera to accommodate the rest of the southeast Asian gekkota: subgenus *Tenuidactylus* includes two Pakistani species *T. montiumsalsorum* and *T. kohsulaimanai*, and the group of Tibeto-Himalayan species: *T. tibetanus*,

Table 1. Range of scale counts and measurements of topotype series of *Tenuidactylus stoliczkai* in Zoologische Staatssammlung Munchen (ZSM) collection (data from juvenile ZSM 119/77 not taken into account).

Character	Range
Supralabials	9-11
Infralabials	7-9
Nasals	3-3
Internasals	1-3
Postmentals	2-2
Loreals	10-15
Scales between eye-ear	15-20
Interorbitals	17-19
Tubercle rows across body middorsum	8-12
Sale rows across midbelly	25-30
Midventrals	110-133
Lamellae under first toe	11-14
Lamellae under fourth toe	22-27
Cloacal spines	2-3
Granular scale rosette around dorsal tubercle	7-9
SVL	27-49.4 mm
TL	25-49.7 mm
Head length	8-11.5 mm
Head width	5-10.7 mm
Head height	3-6.1 mm
Nostril-eye distance	2-4.4 m
Eye-ear distance	2-4.1 mm
Body length	10-23.6 mm
Eye diameter	2-2.8 mm
Ear diameter	0.4-0.9 mm
Head length/head width	0.99-1.43 mm
SVL/body length	2.09-2.64 mm
Head length/head width	0.99-1.43 mm
Distance nostril-eye/eye-ear	0.98-1.29 mm
Eye/ear diameter	2.33-5 mm

Figure 1. *Cyrtodactylus stoliczkai* (ZSM 124.77), adult female, with unregenerated tail.

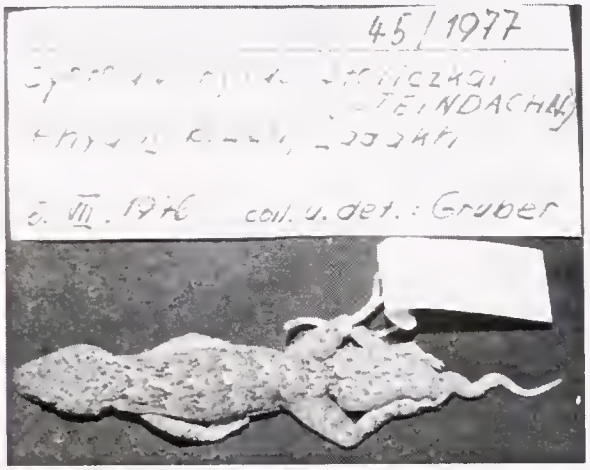

Figure 2. *Cyrtodactylus stoliczkai* (ZSM 45.77), adult female, with regenerated tail.

T. mintoni, T. chitralensis, T. stoliczkai and *T.kirmanensis;* the genus *Cyrtopodion* Fitzinger, 1843 is resurrected as a second subgenus to include four Pakistani forms: *agamuroides, scaber, watsoni* and *kachhensis.* A third subgenus *Mediodactylus* is left floating (Golubev, pers. comm., 1996).

Undoubtedly southeast Asian cyrtodactylid geckos are morphologically distinct from Palearctic tenuidactylids (Leviton and Anderson, 1970; Khan, 1988, 1989, 1991; Khan and Tasnim, 1990). Khan (1993) maintains the genus *Cyrtodactylus* Gray, 1827, to include Tibeto-Himalayan species group and all the southeast Asian species (Smith, 1935). The southeast Asian cyrtodactylids are a very heterogeneous assemblage of closely allied species. Their shared characters are: smooth tubercular granular scales with scattered round-oval smooth or slightly keeled tubercles on head and body dorsum; more than 25 heterogeneous interorbitals; subcylindrical and subequal body and tail; dorsal vivid pattern; subdigital lamellae about twice as broad as high with a pair of lateral row of granular scales, lamellae not swollen at the digital angles; 2-10 preanal pores in male, rare femoral pores; small blunt caudal tubercles, subcaudals small rarely broad. In the past there have been several attempts to arrange them in a logical array (Annandale, 1913; Smith, 1935; Khan, 1993). Considering morpho-ecogeography of these geckos, we distinguish two lineages:

Circum-oceanic group: tropical, scattered along sub continental coastal strip and oceanic islands, confined between lat. 7-32° N, long 75-105° E; dorsal pattern of vivid cross bars or spots, dorsal granular scales mixed with larger rounded, smooth or slightly keeled tubercles, tail and body cylindrical, tail often longer than body: *Cyrtodactylus pulchellus, intermedius, consobrinoides, angularis, khasiensis, rubidus, triedrus, nebulosus, collegalensis, dekkanensis, albofasciatus* and *jayporensis.*

Circum-Himalayan group: subtropical, highland forms, mainly extending between lat. 34-4° N, long 75° 50-50'E, tubercular, beady, scarcely imbricate granular dorsal scales, interspersed by 2-3 times larger oval keeled or keelless tubercles arranged in more or less in 12-13 longitudinal rows; body and tail subequal and subcylindrical, subcaudals small in several rows. inconspicuous dorsal pattern of transverse bands, spots or reticulation.

Further distinguished in three subgroups:

***stoliczkai* subgroup:** body and tail rather flat in cross section, caudal tubercles flat, smooth; anterior half of tail segmented, segments laterally lobulated in older animals, regenerated tail flattened and abnormally swollen, no preanal and femoral pores. Includes highland species: *Cyrtodactylus lawderanus, C. stoliczkai, C. yarkendensis* and *C. baturensis.*

***tibetinus* subgroup:** Body and tail round in cross section, tail segments not distinct, 4-10 preanal pores, feebly keeled caudal tubercles, regenerated tail not flattened. Dorsal pattern of vivid cross bars, spots or reticulation. Includes Tibeto- Himalayan low altitude submountain geckos: *Cyrtodactylus tibetinus, C. himalayanus, C. mintoni, C. dattanensis* and *C. battalensis.*

***walli* subgroup:** Body flatter, tail quadrangular in cross section, distinctly segmented, caudal tubercles large slightly keeled, median row of subcaudals transversely enlarged; 4-6 preanal pores. Species included are: *Cyrtodactylus kirmanensis* and *C. walli.*

Table 2. Comparison of morphology of 1= *Tenuidactylus yarkandensis* (J. Anderson, 1872) with its closest congeners: 2= *T. stoliczkai* (Steindachner, 1867), 3= *T. walli* (Ingoldby, 1922) and 4= *T. baturensis* Khan and Baig, 1992; vl=vertical, (measurements in mm).

Character	1	2	3	4
Snout vent length	47.15	46-48	46-54	44-53
Tail length	? (lost)	49	78	55-57
Supralabials	11/10	10-13	9-11	9-11
Infralabials	8/8	7-8	8-10	7-9
Subdigital lamellae under 4th finger	18	22	19-20	20-21
4th toe	25	25	23-25	24-27
Interorbitals	15-16	17-20	20-21	17-20
Scale rows across midbelly	29-30	26-27	38-40	26-30
Midventral scales	138-140	142-149	160-172	158-171
Preanal pores	?	?	4	?
Head length	11.5	10.8	11-14	13.3
height	5.3	5.2	5-5.75	5.9
breadth	9.3	9.6	9-10.5	10.1
Ear diameter	0.8 (vi)	1.1	1-2	1.5
Eye diameter	2.4	2.9	2-3	3.3
Number of cross bands on body dorsum	7	8	8-9	8

Redescription

***Cyrtodactylus stoliczkai* (Steindachner, 1867)**

***Gymnodactylus stoliczkai* Steindachner, 1867, Reise Novara, Zool., 1:15 Rept. 1, Plate 2, Fig. 2, 2a.**

***Cyrtodactylus stoliczkai* Underwood, 1954, Proc. Zool. Soc. London, 124:475.**

Type locality: near Karoo, north of Dras, Kashmir.

Holotype: NMW 16756 (Fig. 1), female, near Karoo, north of Dras, 3200 m, Kashmir (34° 28' N, 75° 46' E), donated by Stoliczka in 1866.

Paratypes: MCZ 7132, female, pholidosic counts and measurements by Dr. Zug, (per comm., 1989) Ladak, 3100 m, Stoliczka, 1908.

Topotypes (14, examined): ZSM 45.77 (1, 2, 3, 4, 5) and 149.77 (1, 2, 3, 4, 5), 2 males, 5 females, three juveniles, Phyang Ghompa, Ladakh, 3600 m, 5.7.77 and 19.8.77; ZSM 46.77, and 124.77, 2 females, Hemis, Ladakh, 3700 m, 6.7.77 and 17.8.77; ZSM 119.77, juvenile, Kargiul, Ladakh, 2750 m, 12.8.77; ZSM 121.77, female, Saspool, Ladakh, 3100 m, 16.8.77, all collected by Ulrich Gruber (1981).

Diagnosis: Body and tail moderately depressed, tail a little longer than body, caudal segments of unregenerated tail deeply sected on lateral sides to anterior half of the tail, three tubercles, and several series of small subcaudals arranged in four transverse rows; body dorsum with flat, mostly juxtaposed granular scales, distinctly arranged in transverse rows, interspersed with large flat smooth oval tubercles, about three times larger than granular scales, more or less arranged in 9-10 transverse rows across middorsum and 19-20 along paravertebral line; 16-20 interorbital tubercular scales; 27-32 scales across midabdomen, 117-150 midventrals; both preanal and femoral pores not indicated; dorsal pattern of M-shaped transverse

dark bands with heavier posterior margin, broader than interspaces.

Description of holotype NMW 16756, Fig. 1, (statements in parenthesis are from paratype and topotypes adding up to the original description of holotype NMW 16756 by Steindachner, 1867:15): (habitus depressed); rostral scale big (7-angular, broader than deep), slightly convex at the upper edge, and forked in the middle reaching the anterior end of the snout (median dorsal rostral longitudinal furrow narrowly misses anterior border of the rostral scale); nasal opening (small, dorsolateral) bordered in front by rostral plate, (ventrally by) second upper lip shield (first supralabial. Note rostral shield is regarded as first supralabial in original description), posteriorly by three small nasal shields, of which upper most is the largest (separated from that of other side by a pair of granular scales, rostral area with heterogeneous tubercular scales mostly arranged in longitudinal rows, 11-12 tubercular loreal scales between posterior nasals and anterior rim of orbit; head with heterogeneous granular tubercular scales, 19-20 between orbits arranged in longitudinal rows, smaller on eye bulgings; a series of sharp supraciliary scales jutting out from posterior half of the upper eyelid border followed by a row of large tubercular round scales running along the eyelid; temporals and neck with small tubercular granular scales; ear opening round, much larger than largest dorsal tubercle).

19-21 upper lip shields (10-11 supralabials, first three of the same size; suture between first supralabial and rostral scale almost equals former's length along oral orifice); 13 lower labial shields (7-9 infralabials, second narrowest while fourth the longest; 2-3 rows of sublabials). The anterior most lower lip shield (mental scale) is very large, triangular (about twice deep as broad, extends deep between first pair of postmentals), three pairs of chin shields (first pair, largest, narrowly in contact with each other behind posterior tip of mental scale, second pair smaller, less than half the size of first not in contact with each other), third pair (smallest) almost fully separated from lower labials (on right while in contact on left).

Body dorsum clearly granulated (with flat, juxtaposed, rarely slightly imbricate granular scales, arranged in transverse rows) with numerous, only little bigger fully rounded tubercles (interspersed with 2-3 times large, flat, smooth, round or oval tubercles, scattered evenly on body dorsum, more or less arranged in longitudinal rows, separated from each other by 3-4 granular scales, a rosette of 7-9 granules around a tubercle; tubercles on sides slightly conical).

(Gular scales flat, juxtaposed or slightly imbricate, mostly arranged in transverse rows interspersed with larger scattered tubercles, becoming flatter and pentagonal on chest, at abdomen flat, hexagonal, broader than long, slightly imbricate rarely juxtaposed, arranged in transverse rows, 30-32 scales across midabdomen; slightly marked lateral abdominal folds, 5-6 rows of lateral abdominal scales differ little from dorsals, however clearly marked from abdominals; femoral and preanal pores absent (even their site not marked by distinct scales; 142-149 midventral scales between first pair of submental and anterior anal lip. A pair of lateral cloacal tubercles, no postanal bulge).

(Limbs medium sized, covered with imbricate smooth scales arranged in transverse and longitudinal rows, without tubercles; subfemorals in 5-6 transverse rows, as large as abdominals; median-subtibial scales largest, imbricate, arranged in trans verse rows; granular postfemorals extend on to the sides of preanals, with no tubercles; tips of finger-claws extend to anterior of eye, when forelimbs are adpressed forward, those of toes a little anterior of axilla; subdigital lamellae 23-24 under fourth toe, equally broad throughout, not enlarged under basal and angular parts of digits).

Tail, as it appears in the specimen examined by us, is regenerated in the anterior, somewhat longer than the body. Lined on each (dorso-lateral) side by three rows of large, spike shaped raised tubercles, of which those of lower most row are the biggest and conical. No large transverse plates under side of the tail (regenerated?, this parenthesis is by Steindachner), posterior half of the tail is with uniform scales (morphologically tail of the holotype reminds original tail of older specimens of *Hemidactylus flaviviridis*. Doubtless the type specimen has original tail which is normal for older animals of the species as in ZSM 124.77. The tail is moderately depressed, its stump is less than half the width of body and the segmented part almost equals body's width, a median dorsal and ventral longitudinal slight furrow runs along its length. Its anterior half is divided in 10 distinct laterally lobulated segments, while posterior unsegmented half gradually narrows to sharp terminal tip; dorsolaterally caudal tubercles are given from the middle of the segments, four on 1st to 5th segment, three on 6th to 10th. The dorsal tubercles are small roundish about 2-3 times smaller than laterals which are elongated conical blunt, in contact with each other, are gradually reduced in size, until almost indistinct in posterior half of the tail. Dorsally 6-7 transverse rows of heterogeneous, slightly imbricate, smooth, tubercular scales cover anterior caudal segments while 4 transverse

rows of small imbricate subcaudals are present on ventral side of segment. In the posterior quarter dorsal and ventral caudal scales become indistinct from each other, get longer, flatter, pointed at tips and are strongly imbricate).

Color: Body dorsum light blue grey, with pink edged transverse bands with denser wavy posterior edges, broader than interspaces, three on nape, six on body and 13 on tail (in preserved specimens bands are dark and does not extend on subcaudals). (Head), labials and tail plates with fine grey dots, limbs and digits barred, ventrum light.

Measurements (in mm): Snout vent length 48, tail length 52, trunk length 24, head length 11.5, head width 10, head height 7, eye diameter, not including bony orbit 2.5; snout length 5; oculo-orbital space 5,

Variation: Table 1 presents the measurements and pholidosic counts in ZSM series which fall within the range of the type specimen NMW 16756 and paratype MCZ 7132, differing in minor details of pholidosic morphology: rostral scale is protrubrant in most of the specimens, however, in some it is flat, the median rostral groove in some specimens extend to middle, while in other it narrowly misses the anterior end of the scale; the supraciliary pointed scales vary in their pointedness; dorsal tubercles uniformly scattered on dorsum, 2-3 times larger than dorsal granular scales, separated from each other by 2-4 granular scales, surrounded by a rosset of 6-9 granular scales; lateral abdominal folds strongly or poorly indicated.

Study of tail morphology of MCZ 7132 and specimens in ZSM series indicates that the tail of the holotype NMW 16756 is undoubtedly original. Steindachner (1867) himself was doubtful about its being "(regenerated?)". In young specimens with unregenerated tail, the tail is uniformly broad from basal stump till mid-tail, where it gradually tapers to its tip (ZSM 45.77:5, 119.77, 124.77, 149.77: 1, 2, 4, 5). As animals get older (NMW 16756 and ZSM 124.77), the anterior half of the original tail becomes broader, flatter and deeply sected on sides so much so it appears laterally lobulated at segments. From lateral lobes caudal tubercles strongly jet out. While in regenerated tail, MCZ 7132 and ZSM 49.77,the tail swells up almost round at the base, with no indication of segmentation, lobulations and tubercles, while posteriorly it abruptly tapers. Moreover, instead of transverse bands of original tail, the regenerated tail is spotted with longitudinal spots, scattered all over it. Tail in ZSM 45.77, 49.77:3, 45.77, 121.77 and ZSM 49.77 represent different stages of tail regeneration in *Tenuidactylus stoliczkai.*

Dorsal pattern of bands is vividly distinct in juveniles (ZSM 119.77), but is gradually lost as the animal grows older.

Sex: Though dissection is the sure way of sex determination of geckos, however, presence of preanal and femoral pores in males and their absence in females are almost universal sex indicators in these animals. In the type specimen of *Tenuidactylus stoliczkai* NMW 16756, paratype MCZ 7132 and ZSM series the preanal and femoral are absent, moreover their position is not indicated by distinctiveness of scales in the area. On the other hand, swollen postanal sacs are usually distinct in male less so in female geckos (Smith, 1933, 1935; Khan and Baig, 1992). There is no indication of postanal sacs in type nor in paratype, however, are well indicated in two specimens in ZSM series which are males. Constable (1949:84) designated MCZ 7132 as a male specimen, which on dissection is proven to be an adult female with well developed vitellogen follicles (Zug, personal communications, 1989).

Ecology: Ladakh lies around 3000 m, above timberline. It is completely dry snow desert, with sparse vegetation of herbs, shrubs and grasses. The area is highly arid with sub-tropical continental highlands cold climate.Heavily snowy winters, getting rain in winter and spring. Maximum summer July temperature is 24.7° C, minimum 10.2°, while maximum winter temperature in January is -1.4° C, dropping to minimum -13.3°. Maximum rain fall, 15.0 mm, is received during August, minimum, 1.0 mm during November (Ahmad, 1951).

Gruber (1981) collected *T. Stoliczkai* from rocky habitat, where this gecko prefers desert, bare, dry situations in the non-irrigated areas without or with very sparse vegetation, apparently avoiding direct neighborhood of human settlements. Other reptiles collected from the area are *Phrynocephalus theobaldi, Laudakia himalayana,* and *Scincella ladacensis,* while *Bufo latastii* is the only amphibian recorded from waters of the area.

Comparison with congeners: Absence of trihedral tubercles, preanal and femoral pores, broader subdigital lamellae and peculiar tail morphology differentiate *Tenuidactylus stoliczkai* from Palearctic group of Pakistani tenuidactylid *Cyrtopodion* geckos: *C. scaber* (Heyden, 1827), *C. watsoni* (Murray, 1892), *C. kachhensis* (Stoliczka, 1872), *C. montiumsalsorum* (Annandale, 1913) and *C. kohsulaimanai* (Khan, 1991). While Pakistani members of Tibeto-Himalayan group of cyrtodactylid geckos: *C. mintoni* (Golubev and Szczerbak, 1981), *C. dattanensis* (Khan, 1980) *C. battalensis* Khan, 1993 are similar to *T. stoliczkai* in the morphology of subdigital lamellae, body configu-

ration, larger number of interorbitals, subabdominals, however, they differ markedly from it because of their plump rounded body and tail, tail morphology, dorsal tuberculation and pattern which extends on the tail ventrum, presence of preanal pores in male.

The tenuidactylid group of Pakistani geckos: *T. indusoani* (Khan, 1988), *T. rohtasfortai* Khan and Tasnim, 1990 and *T. fortmunroi* Khan, 1993 are distinguished from the nominated species by their different body configuration, smaller number of interorbitals, subabdominal pholidosic counts, dorsal scalation and pattern, caudal morphology with keeled large tubercles, single row of subcaudals, presence of both preanal and femoral pores.

Following Annandale (1913:316), Smith (1935:39) grouped *T. stoliczkai* with low altitude *T. lawderanus* (Stoliczka, 1972), despite very obvious differences from the former: more flattened body and tail, few and feebly developed dorsal tubercles, inconspicuous dorsal pattern, single pair of nasal scales, presence of preanal pores in male, tail morphology (compare Fig. 18, Smith, 1935).

C. yarkandensis (J. Anderson, 1872) and *C. walli* (Ingoldby 1922), have long been synonymized with *C. stoliczkai* and *C. chitralensis* (Smith, 1935), mostly due to their similar dorsal pattern, body configuration, dorsal tuberculation and absence of pores (Boulenger, 1885; Blanford, 1878; Annandale, 1913; Smith, 1935; Minton, 1966; Mertens, 1969; Szczerbak and Golubev, 1986). *C. chitralensis* has been found to be conspecific with *C. walli* (Khan, 1992).

Cyrtodactylus stoliczkai is defined by the following combination of characters: dorsal granular scales smooth, round, beady, juxtaposed, interspersed with oblong, smooth beady tubercles, arranged roughly in longitudinal rows; normal tail in juveniles uniformly broad from basal stump till mid-tail, where gradually tapering to tip, as animal gets old, the anterior half of the original tail becomes broader, flatter and deeply sected on sides in lateral lobules at segments, regenerated tail much swollen and rounded; subcaudals small, in several rows; caudal tubercles thick and blunt.

Geographical Distribution

All evidence goes in favor of the idea that the family Gekkonidae evolved in southeast Asia and dispersed westward through southwestern Asia into Indo-Pakistan and Africa (Kluge, 1967). Ranges of several circum-Indian oceanic cyrtodactylids overlap, however circum-himalayan highland geckos are widely distributed and the ranges of none of them are known to overlap: the northern most extralimital, *Cyrtodactylus. yarkandensis,* is known from lat. 38° 40'N, long 77° 50'E, along the western border of China's Xinjiang Province (Khan, 1994) and *Cyrtodactylus stoliczkai* is confined to Ladak, between lat. 34°-35° 45' N, long 75° 50-76° 70'E (Annandale, 1913; Schmidt, 1922; Gruber, 1981). A highland Pakistani gecko, *C. baturensis*, is reported from Gilgit Agency at lat. 36° 20'N, long 74° 50' E (Khan and Baig, 1992). The western most Pakistani form, *C. walli*, occurs between lat. 35-36° N, long 71-72° E, while the western extralimital Iranian gecko, *C. kirmanensis*, is reported from lat. 30° N, long 58° E (Szczerbak and Golubev, 1986).

Worldwide distribution of some geckos is largely known to be due to human transportation (Darlington, 1957). The circum-oceanic coastal forms are characteristically carried by sailors from coast to coast, however, some of the species penetrated deep inland. Similarly, westward dispersal of *Cyrtodactylus* in the lower Himalayas appears largely due to westward migrations of Buddhist peoples and seasonal nomadic high-low-high altitude migrations which played important role in the distribution of cyrtodactylid geckos of the area. Massive pagoda buildings and temples are still the frequent haunts of these geckos. In the valley-complex of the sub Himalayan system they evolved into closely allied forms: *C. mintoni, C. dattanensis* and *C. battalensis*. A parallel example of human transportation of a gecko is presented by the recent record of Palearctic geckos, *Hemidactylus persicus,* from Rohtas Fort, Jhelum valley, Punjab, Pakistan (Khan and Tasnim, 1990). The fort was built from 1542 to 1550 with rock-blocks transported from Balochistan. *H. persicus* is the dominant house-gecko in Balochistan and has never been reported from Punjab (Khan 1987; Khan and Ahmed, 1987). The present disjunct population most probably descended from few individuals so transported. Presently the few observed individuals are in severe competition with the common indigenous house gecko, *H. flaviviridis,* which is dominant throughout the building. The few individuals of *H. persicus* are still holding on in remote recesses of the fort.

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Appendix 1. Abbreviations used

BMNH= British Museum, Natural History, London; CAS= California Academy of Sciences, California, USA; MSK= Herp laboratory, 15/6 Darul Saddar North, Rabwah 35460, Pakistan (author's personal collection); NMW= Naturhistorisches Museum Wien, Austria; SR= Institute of Zoology, Academy of Sciences, Kiev-30, Ukraine; UF= Florida State Museum, Gainesville, USA; USNM= National Museum of Natural History, Washington,D.C.

Appendix 2. Additional material examined

Cyrtodactylus battalensis BMNH 1990.2; *C. collegalensis* BMNH 82.4.14.28-29; *C. fasciolatus* BMNH 1913.11.11.2; *C. nebulosus* BMNH 82.4.14.32-33; *C. oldhami* BMNH 1916.6.22.4; *C. pulchellus* BMNH 1916.3.27.1-2; *C.triedrus* BMNH 68.3.17.11-12; *C. dattanensis* MSK 0056.78; *C. yarkandensis* BMNH 72.3.22.4; *C. tibetinus* CAS 196850, CAS 196854; *Gymnodactylus walli* BMNH 1910.7.12.1; *G. chitralensis* BMNH 1946.8.23.19; *Tenuidactylus baturensis* BMNH 1990.3; *T. longipes* CAS 115944, SR 307:3267-68; *T. longipes voraginosus* CAS 130323; *T. montiumsalsorum* BMNH 1904.11.19.1 and MSK 014.86; *T. indusoani* MSK 0467.86; *T. rohtasfortai* USNM 284133; *Gymnodactylus stoliczkai* (photograph) NMW 16756; *Tenuidactylus fedtschenkoi* SR 1078:8837-8; *T. caspius* SR 2546:16713-14; *T. turcmenicus* SR 961:8016-17.