

Description of the first Tibetan species of *Neocalathus* Ball & Nègre, 1972 (Insecta: Coleoptera: Carabidae: Sphodrini, *Calathus* Bonelli, 1810)

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Summary

A new species of the *Calathus* subgenus *Neocalathus* is described from the surroundings of Lhodrak in the Inner Himalaya of South Tibet, the Peoples Republic of China. *Calathus relictus* sp. n. is the first representative of that subgenus known to occur on the Tibetan Plateau. It is considered a member of the *C. melanocephalus* species group (= *Neocalathus* sensu novo). The new species is brachypter and thus unable to fly, and is presumably endemic to the high valley of Lhodrak where it occurs on subalpine Yak pastures with shrubs and grassland.

Zusammenfassung

Beschreibung einer ersten tibetischen Art der Untergattung *Neocalathus* Ball & Nègre, 1972 (Insecta: Coleoptera: Carabidae: Sphodrini, *Calathus* Bonelli, 1810).

In der *Calathus*-Untergattung *Neocalathus* wird eine neue Art aus der Umgebung von Lhodrak im Inneren Himalaya Südtibets (Volksrepublik China) beschrieben. *Calathus relictus* sp. n. ist der erste Vertreter dieser Untergattung, der vom Tibetischen Plateau bekannt ist. Er wird als Element der Artengruppe des *C. melanocephalus* (= *Neocalathus* sensu novo) diagnostiziert. Die neue Art ist brachypter und damit flugunfähig. Sie ist vermutlich im Lhodrak Tal endemisch, wo sie im alpinen Gras- und Buschland vorkommt.

Key words: China, Himalaya, Tibet, taxonomy, new species, Carabidae, Sphodrini, *Calathus*, *Neocalathus*

Introduction

The species and species group diversity of the genus *Calathus* Bonelli, 1810, is centred in the Western Palaearctic (LINDROTH 1956, NÈGRE 1969, LÖBL & SMETANA 2003). Based on a molecular genetic analysis of

the subtribe Calathina RUIZ et al. (2010) hypothesized the origin of *Calathus* sensu lato in the Mediterranean Basin. However, the conclusions of RUIZ et al. (2010) remain provisional because all the species groups of *Calathus* endemic to the Himalaya and the closely related taxa from East Asia [species of *Acalathus* Semenov, 1889, and *Procalathus* Jedlička, 1953, with exception of the single North American species *P. advena* (LeConte 1848)] were excluded from their study.

Three *Calathus* species groups are endemic to the Himalayan-Tibetan orogen (SCHMIDT 1999): the monotypic *C. kirschenhoferi* species group from the Indus Himalaya, the *C. himalayae* species group with six species distributed in the Central and Western Himalaya, and the *C. heinertzi* species group with six species distributed in the Central Himalaya. In the modern catalogues these species groups are provisionally placed within the subgenera *Calathus* sensu stricto, *Neocalathus* Ball & Nègre, 1972, and *Calathus* incertae sedis, respectively (LÖBL & SMETANA 2003, LORENZ 2005). *Neocalathus* as defined by BALL & NÈGRE (1972) is the most species diverse subgenus of *Calathus*; however, it was recently identified to be polyphyletic and comprises at least two natural groups which evolved independently within *Calathus* sensu lato (RUIZ et al. 2010): the *melanocephalus* species group (= *Neocalathus* sensu novo), and the *ambiguus* species group. Consequently, in the present paper the subgenus *Neocalathus* (type species: *Carabus melanocephalus* Linné, 1758) will be used solely for the *melanocephalus* species group. An unpublished preliminary morphological and molecular genetic analysis of the senior author of this study suggests that the Himalayan species groups mentioned above neither branch within *Calathus* sensu stricto nor *Neocalathus* sensu novo nor the *ambiguus* species group but they all represent separate lineages within *Calathus* sensu lato. All the species of the endemic Himalayan *Calathus* lineages are brachypter, thus unable to fly. Their distributional areas are restricted to small parts of the mountain chain in Northern India, Pakistan and Nepal. Only a single species of the subgenus *Neocalathus* sensu

novo known to occur in this region is fully winged and widely distributed along the southern margin of the Himalayan-Tibetan orogen: *C. (Neocalathus) kollari* Putzeys, 1873. This species occurs from the Hindukush in the northwest along the High Himalaya eastwards to the Darjeeling District of Northeast India (LÖBL & SMETANA 2003, and unpublished data of the senior author). Whereas members of the other Himalayan *Calathus* species groups are adapted to different types of forests, *C. kollari* can only be found in steppe-like habitats (different types of open pastures) and occurs in a greater altitudinal range than any other Himalayan representative of that genus. Its habitat preferences are remarkable similar to other members of *Neocalathus* sensu novo [e.g., *melanocephalus* (L.), *micropterus* (Duftschmid)].

Although suitable habitats also exist in the southernmost portions of Tibet where the High Himalaya is strongly incised by deep gorges of the transverse valleys, no occurrences of *C. kollari* are known from that region. Because all the other Himalayan *Calathus* species groups also are lacking in the Tibetan parts of the Himalaya, the genus *Calathus* was unknown from the fauna of Tibet so far (this statement is only true if we follow the classical taxonomy where *Acalathus* and *Procalathus* are separate genera). From the biogeographical point of view it is very remarkable that a brachypterous *Calathus* species which is morphologically similar to *C. kollari* could be discovered in the Inner Himalaya by the junior author during his travel through the eastern and central parts of South Tibet in 2010. In the present paper the new species is described and its systematic position discussed.

Material and methods

Material: This study was based on 11 specimens of the newly described *Neocalathus* species, in addition to comprehensive comparative material from the Himalaya comprising all *Calathus* species hitherto known from this region and from adjacent mountains of Asia. The specimens are preserved in the collections of the South China Agricultural University, Guangzhou (SCAU), and of Joachim Schmidt, Admannshagen (CSCHM).

Examination: Specimens were examined with a stereomicroscope Leica M205-C. The photographs were taken with a Leica DFC450 digital camera using a

motorised focussing drive, light base Leica TL5000 Ergo, diffused light with Leica hood LED5000 HDI, subsequently processed with Leica LAS application software, and enhanced with CorelDRAW Graphics Suite X5.

Measurements: Body size was measured from the apex of the longer mandible in closed position to the apex of the longer elytron. The width of the head (HW) was measured across the widest portion including the compound eyes. The widths of the pronotum (PW) and of the elytra (EW) were measured at their widest points. The length of the pronotum (PL) was measured from the anterior to the posterior margin along the midline; the length of the elytra (EL) was measured from base of the scutellum to the apex of the longer elytron.

Genitalic preparations: Genitalia were prepared after soaking specimens in water with vinegar and mild detergent for one day, followed by dissection. The aedeagus was cleared in lactic acid for up to five days. After examination, genitalic preparations were stored in Euparal on acetate labels or cards, and pinned beneath the specimen.

Calathus (Neocalathus) relictus sp. n.

Figs. 1, 2.

Holotype. Male, with label data: „S TIBET 18.VI.2010 / Lhodak, W of city / 4220 m, leg. Tian Mingyi / 28°22'N 90°41'E“ (SCAU).

Paratypes. 3 males, 4 females, with same label data as holotype (CSCHM, SCAU) (1 male in CSCHM with the additional label “hs1147”); 2 males, 1 female with same data but: 28°22'N 90°38'E, 19.VI.2010 (CSCHM).

Etymology. Latin “relictus”: left behind (adjective, masculine). The name was given in the belief that the new species represents a relic from a former invasion of *Neocalathus* into Tibet (see chapter Distributional history).

Description. Body length: 8.9–9.8 mm.

Colour: Black, with dorsal side moderately shiny in males, rather dull in females; without metallic reflections; palpi, antennae, legs, lateral margins of pronotum, base and epipleura of elytra brown.

Micro-sculpture: Surface of head with deeply engraved

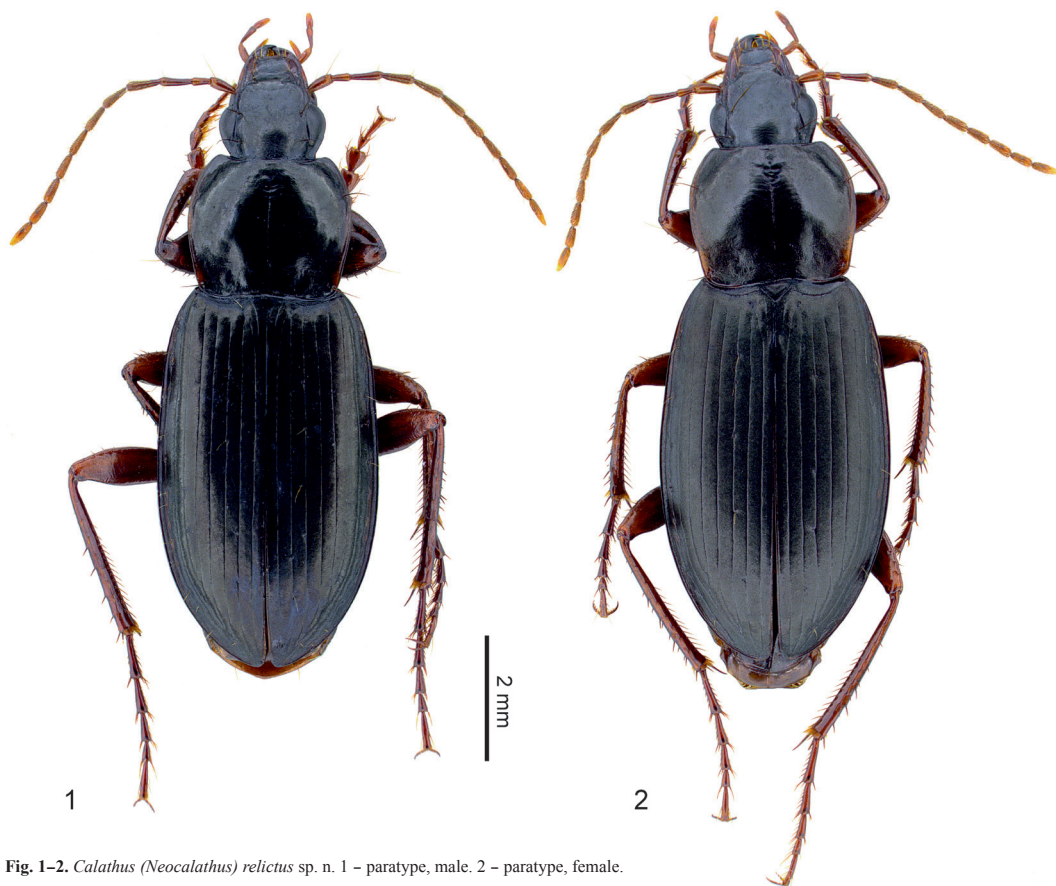


Fig. 1–2. *Calathus (Neocalathus) relictus* sp. n. 1 – paratype, male. 2 – paratype, female.

isodiametric sculpticells and additional distinct micro-puncture (magnification 50x); surface of pronotum with moderately engraved, slightly transverse sculpticells and with indistinct micro-puncture; elytra with deeply engraved, scale-like sculpticells, whereas surfaces of sculpticells distinctly more convex in females than in males; micro-puncture on elytra indistinct.

Head: Mandibles of normal length. Eyes of normal size, moderately convex, temples of approximately half of eye diameter. Antennae moderately slender, with eighth joint extended to pronotal base; scapus with 2–4 very small setae in addition to the regular large seta near apex; pedicel with a ring of small apical setae. Menthum with a large bidentate tooth and a single pair of setae below the tooth; submentum with two pairs of setae.

Prothorax: Pronotum with discus very slightly convex and with basal portion widely depressed, in dorsal view

somewhat transverse ($PW/PL = 1.19\text{--}1.25$, $\bar{O} 1.22$, $n = 6$), much wider than head ($PW/HW = 1.54\text{--}1.62$, $\bar{O} 1.58$, $n = 6$), broadest in or slightly before middle, moderately constricted anteriorly, more slightly constricted posteriorly, basal margin distinctly broader than apical margin. Sides evenly rounded in anterior 2/3 and rectilinearly narrowed towards base. Anterior margin concave. Posterior margin straight in the middle, feebly curved posteriorly and then distinctly curved anteriorly towards side margin, with hind angles widely rounded. Median longitudinal impression moderately deep in the middle, indistinct near apex and base. Anterior and posterior transverse impressions indistinct or absent, laterobasal grooves broad and very shallow. Anterior and posterior margins finely beaded laterally. Lateral margin finely beaded in anterior third and indistinctly beaded towards base; lateral gutter very shallow, very

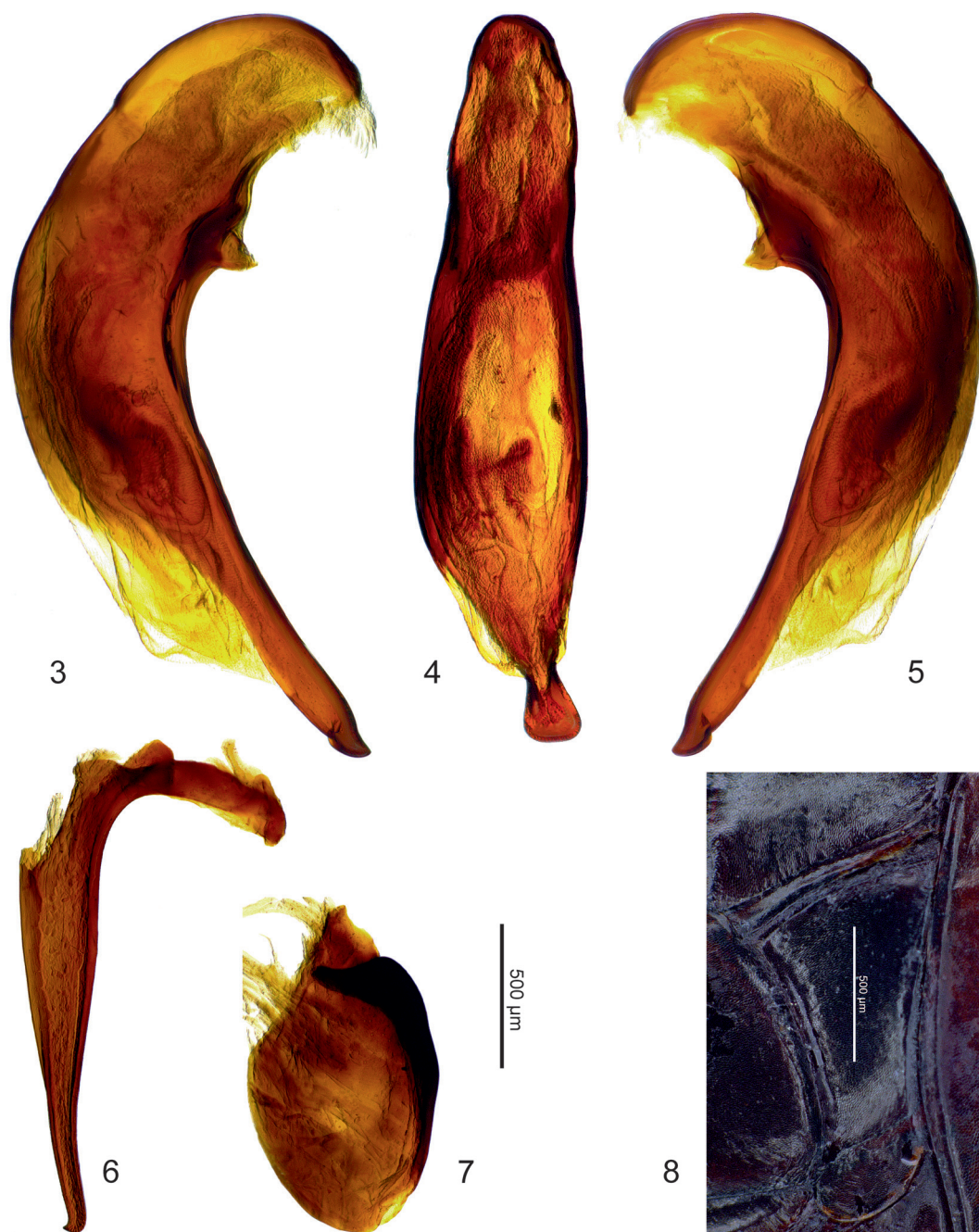


Fig. 3–8. *Calathus (Neocalathus) relictus* sp. n., paratype, male. 3 – Aedeagal median lobe in right lateral view. 4 – Median lobe in dorsal view. 5 – Median lobe in left lateral view. 6 – Right paramere. 7 – Left paramere. 8 – Left metepisternum.

narrow in anterior third, distinctly widened before base. Anterolateral seta inserted at the end of the first third of pronotal length, somewhat removed from lateral margin (approx. by the width of the pore); posterolateral seta inserted somewhat before hind angle and very slightly removed from the lateral margin (approx. by half of the width of the pore). Pronotal surface, including posterolateral areas, impunctate. Prosternal process completely beaded at apex.

Pterothorax: Metepisternum with outer margin slightly longer than anterior margin (Fig. 8). Elytra flattened on dorsal surface, long oval in dorsal view (EL/EW = 1.63–1.70, \bar{O} 1.68, $n = 6$), 1.30–1.36 times broader than pronotum (\bar{O} 1.35), maximum width in the middle. Basal margin markedly concave, humeral angle rectangular or slightly acute, without a distinct humeral tooth. Striae shallow, intervals flat, parascutellar stria developed, parascutellar seta present; third interval with three to four (exceptionally five) discal setae adjoining second and third striae; additional discal setae lacking; umbilicate series consists of 16–17 (exceptionally 15) setae adjoining eighth stria; seventh stria with two apical seta. Wings reduced to small stubs.

Legs: Moderately long and slender (Figs. 1, 2). Pro-, meso- and metafemur each with two setigerous punctures in ventral row on anterior surface. Tarsi relatively robust, first to third tarsomeres of middle and hind legs each with a longitudinal groove on outer surface.

Aedeagus: Median lobe (Figs. 3–5) relatively stout with apex short, latter markedly narrowed in dorsal view, straight in lateral view; apical disc well developed. Internal sac without spines, but with median portion covered with very small scale-like sclerites (Figs. 3–5). Terminal apophysis of right paramere long and slender, with apex hooked (Fig. 6). Left paramere with a small membranous lobe (Fig. 7).

Relationships. *Calathus relictus* sp. n. is considered a member of the *C. melanocephalus* species group sensu BALL & NÈGRE (1972) (= *Neocalathus* sensu novo) based on the combination of the following characters: Pronotum with posterolateral areas impunctate and with lateral setae slightly removed from lateral margin, prosternal process beaded, elytra without a distinct humeral tooth and with 3–4 discal setae in third interval, femora with two setae in ventral row on anterior surface, aedeagal median lobe with apical disc, internal sac with-

out spines, right paramere long and slender with apex hooked; left paramere with a small membranous lobe.

Differential diagnosis. *Calathus relictus* sp. n. is the only representative of *Neocalathus* sensu novo in Central and Middle Asia that is primary wingless, and it can thus easily be recognized by the body shape with flattened elytra and by the shortened metepisternae. Due to the shape of the pronotum which is more markedly constricted towards base within the Asian fauna, *C. relictus* sp. n. is most similar to *C. kollari*. In addition to the diagnostic characters mentioned above, the new species can be distinguished from *C. kollari* as follows: Appendages darker (not yellowish brown), pronotum with discus less convex and basal portion markedly and widely depressed, elytra distinctly longer, apex of aedeagal median lobe shorter and more robust with broader disc.

Distribution and habitat. This species was found in the Kuru Chu river valley west of Lhodrak Town (= Lhodak, Lhozgag, or Dowa Dzong) in the eastern part of the Inner Himalaya, approx. 25 km south west of the lake Puma Tso (Phuma Yumco) in the Lhodrak county of Tibet (the Peoples Republic of China). *Calathus relictus* sp. n. is certainly endemic to this part of the Himalayan mountain system. The species was collected on subalpine meadows beside the road at an altitude of approx. 4220 m.

Distributional history. The position of the distributional area of the new species within a small portion of the eastern Inner Himalaya north of the High Himalayan mountain belt and just in front of the Tibetan Plateau, well separated from the distributional areas of other members of *Neocalathus* sensu novo, is certainly of particular biogeographical interests. From the current state of knowledge it appears unlikely that *C. relictus* sp. n. evolved from a High Himalayan ancestor as there is no evidence that *Neocalathus* is a primary element of the Himalayan fauna. The only Himalayan representative of that subgenus is the fully winged species *C. kollari*, which is widely distributed along the south western margin of High Asia (see chapter Introduction). This species is very probably an element of the mountainous fauna of southern Middle Asia that has subsequently spread eastwards along the southern

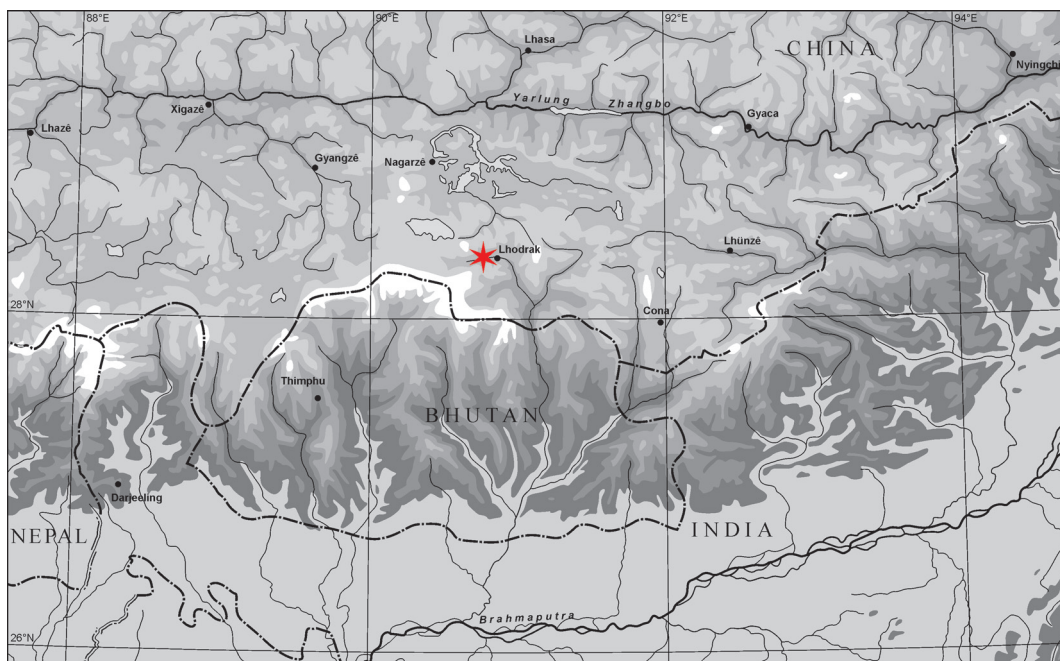


Fig. 9. Relief map of southern central Tibet and the eastern Himalaya showing distribution of *Calathus (Neocalathus) relictus* sp. n. (red star).

slopes of the High Himalayan massifs. As all the lineages of *Neocalathus* sensu novo are represented in the Western Palaearctic (see RUIZ et al. 2010) it seems most likely that *C. relictus* sp. n. has its origin in this biogeographical region, too. A possible explanation for the markedly separated distribution of *C. relictus* sp. n. in the eastern Inner Himalaya is that the species derived from a fully winged ancestor that reached South Tibet during an early phase of mountain uplift when the High Himalaya was distinctly lower than today, thus not functioning as an distributional barrier to the inner portions of the mountain system. SCHMIDT (2006) and SCHMIDT et al. (2012) assume that South Tibet was an independent evolutionary centre of the high montane fauna during the Miocene-Pliocene that lost its importance due to the continuously drying of the inner portions of High Asia in the course of the subsequent uplift of the High Himalayan mountain belt. This mountain belt acts as an effective barrier to humid air masses of the Indian summer monsoon. *Calathus relictus* sp. n. could thus represent a relic species of the Late Cenozoic fauna of South Tibet and the last remnant of a for-

merly wider distribution of *Neocalathus* in South Tibet during geological epochs when the Himalaya had an elevation distinctly lower than today.

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