

# A new species of *Gangara* Moore (Lepidoptera: Hesperiiidae), with a note on the genus

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A new species, *Gangara tumpa*, is described from N. Sulawesi. The monophyly, phylogeny and biogeography of the genus are discussed, also in relation to related genera.

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## Introduction

The genus *Gangara* Moore, 1881, as currently understood (Evans, 1949) comprises three species only: *G. thyrsis* Fabricius, 1775 (type species), *G. sanguinocculus* Martin, 1895, and *lebadea* Hewitson, 1868. The distribution of the genus is entirely Oriental, from Sri Lanka and India to Java, Sulawesi and the Philippines. In Sulawesi only one species has been found so far, viz. *G. thyrsis* (but without exact locality data). In this paper a second species from Sulawesi is described. It is most similar to *G. lebadea*. It was collected during Project Wallace, the international expedition to northern Sulawesi to commemorate the 150 years jubilee of the Royal Entomological Society of London in 1985. The collector of the specimen, Mr John Tennent, trusted me with the description, for which I am most grateful.

The position of the new species in the genus makes it worthwhile to discuss the monophyly, phylogeny and biogeography of the entire genus.

## *Gangara tumpa* spec. nov.

Material.— Holotype, ♂, Indonesia, Sulawesi Utara, Dumoga Bone National Park, Upper Sungai Tumpah, 14.vii.1985, John Tennent. Deposited in collection of the Natural History Museum, London.

Description.— Male. Antenna, club with apiculus obtuse, nudum covering 16 segments, all on apiculus. Hind tibia dorsally with yellow fringes. Tip of abdomen yellow. Eyes red. Length of forewing 33 mm. Termen of forewing slightly convex. Venation, vein 5 (M2) of forewing slightly decurving in basal half so that at its origin it is closer to vein 4 (M3) than to vein 6 (M1); hindwing cell short, much less than half wing, veins 2 and 3 (CuA2 and CuA1) running parallel in basal half, diverging in distal half. Upperside of wings unicolourous black, no spots. Tornal fringes of hindwing yellow; the yellow penetrates onto the wing, but the tornal areas of both hindwings are broken and the extent of yellow on the wings cannot be determined. On upperside of forewing inconspicuous long hairs in spaces 1c and 2. On upperside of hindwing conspicuous glandular streaks along basal half of veins 2 and 3.

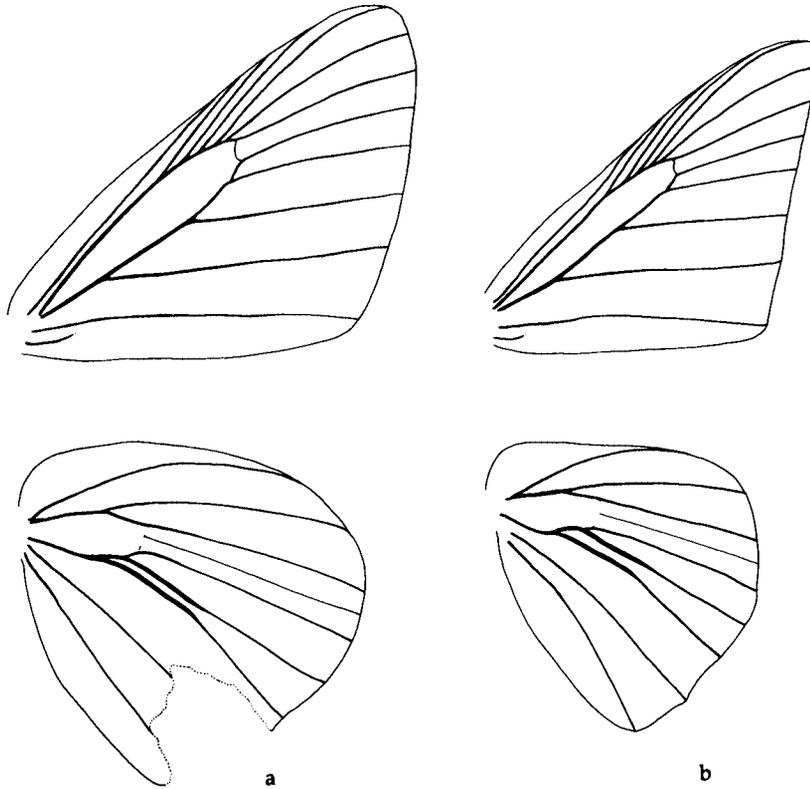


Fig. 1. Wing venation of *Gangara tumpa* (a) and *G. lebadea* (b).

Underside of forewing black in cell and basal half of costa; end cell, and from vein 11 to (and slightly over) vein 3 with bluish white scaling, but darkening along termen; from dorsum to vein 2 largely pale ochreous, long recumbent ochreous hairs on both sides of vein 1 from base to 2/3 of length to termen. Underside of hindwing black with a broad bluish white band from dorsum to distal third of vein 8, interrupted in space 1c, more or less sharply defined towards base but gradually passing into black towards termen; fringes yellow at tornus (the yellow possibly penetrating onto the wing, see upperside of hindwing).

Genitalia.— Uncus bilobed apically. Valva with cucullus ending in two toothed prongs, outer prong as long as inner prong but much wider, with many teeth along its edge as well as small spines on the outer side.

Etymology.— The species is named after the river Tumpah, a beautiful jungle river not far from the Project Wallace base camp and famous with the lepidopterists of the expedition because of the large number of butterflies found along its banks.

Remarks.— The new species fits well in the genus *Gangara* because of the following characters: antennal apiculus, short hindwing cell, glandular streaks on hindwing, patch of recumbent hairs along vein 1 on the underside of the forewing. Further, the genitalia are similar to those found in the three species that so far made

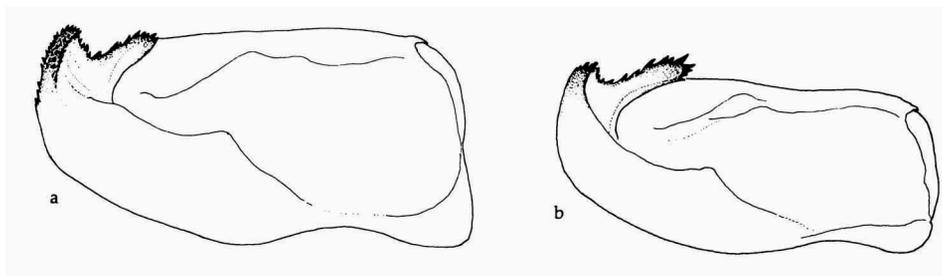


Fig. 2. Inside of left valva of *Gangara tumpa* (a) and *G. lebadea* (b).

up the genus. It most closely resembles *G. lebadea*. Characters of the male shared with this species are the absence of spots on the forewing and the presence of glandular streaks over the basal half of veins 2 and 3, running closely parallel so that they almost touch. In *G. thyrsis* and *G. sanguinoculus* the male has large spots on the forewing (as in the female), the swelling of veins 2 and 3 of the hindwing is inconspicuous and the veins are well separated, and there are swollen veins in the forewing as well. The new species differs from *G. lebadea* in size (being larger, forewing *G. lebadea* up to 29 mm), red eyes (reddish brown when fresh but soon turning to brown in *G. lebadea*), wing shape (in *G. lebadea* the termen of the forewing is straight giving the wing a quite different, more pointed appearance), absence of the rounded velvety patch of hairs found in the middle of the forewing in *G. lebadea*, ochreous recumbent hairs on the underside of the forewing on both sides of vein 1 (in *G. lebadea* only in space 1b), yellow fringes of hindtibia and yellow tip of abdomen (both brown in *G. lebadea*) and yellow tornal area of hindwing (in *G. lebadea* only fringes pale yellow), slightly decurved vein 5 of the forewing (in *G. lebadea* straight), and outer prong of cucullus larger and more heavily spined (in *G. lebadea* outer prong smaller than inner prong and with smooth outer side). Although *G. ebadea* and *G. tumpa* are very closely related (see below) and their distribution areas do not overlap, it seems justified to consider *G. tumpa* a separate species. In its wide distribution area (Sri Lanka, NE India to the Philippines and Java) *G. lebadea* varies only slightly (mainly in the markings of the female), and the characters of *G. tumpa* fall far outside the variation in *G. lebadea*.

### Monophyly phylogeny and biogeography of the genus *Gangara*

The genus *Gangara* is characterized by 1) an antennal club that has all (16) nudum segments on the obtuse apiculus; 2) a hindwing cell that is shorter than half of the wing; 3) bluish or purplish white scaling on the underside of the wings; and in the male, 4) swollen veins in forewing and/or hindwing associated with glandular streaks; 5) a patch or tuft of ochreous hairs along vein 1 on the underside of the forewing.

The genus is generally placed in the *Plastingia* group (Eliot, 1978; Evans, 1949), a rather diverse group of 26 genera the monophyly of which is still uncertain. It is, however, the best arrangement available at the moment. Within this group the *Gangara* characters 3 and 4 seem to be unique and therefore they are considered

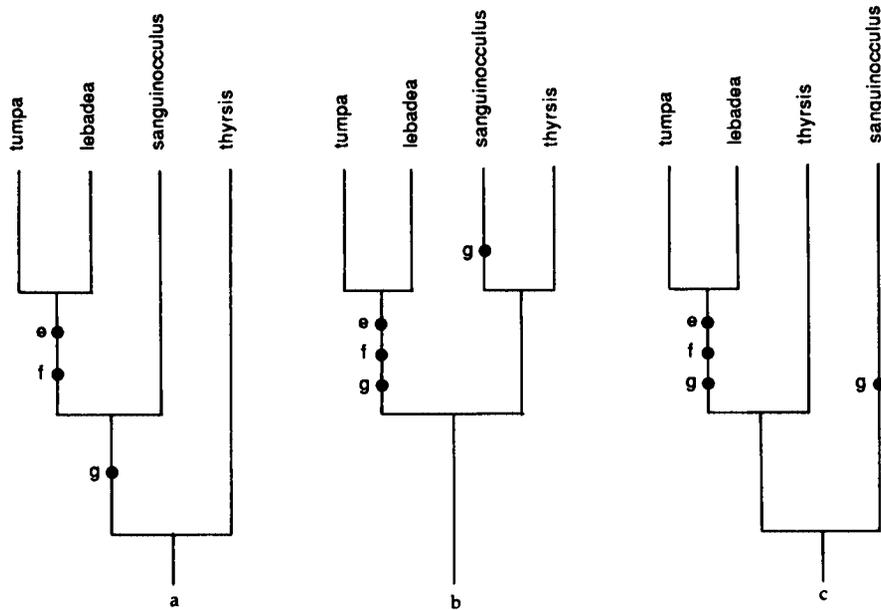


Fig. 3. Three possible cladograms for the genus *Gangara*. The letters e, f and g refer to the discussion of the characters in the text.

autapomorphies of the genus, and the genus is considered monophyletic. However, the sister group cannot be identified at the moment. Nevertheless the following observations can be made on characters that are potentially useful for phylogenetic considerations.

a. Colour of eyes.— Red eyes occur in a number of genera (in the *Plastingia* group as well as outside). They are apparently associated with crepuscular habits (de Jong, 1983). Because of its red eyes and the yellow at the tornus of the hindwing *G. tumpa* looks like a very large species of *Zela* de Nicéville, 1895. However, both characters occur in other genera as well and they cannot be taken to link *G. tumpa* to the genus *Zela*. The eyes of other *Gangara* species are also reddish though not as bright as in *tumpa*, and the colour tends to turn into brown with age.

b. Forewing vein 5.— According to Evans (1949) one of the characters differentiating *Gangara* and *Zela* is vein 5 of the forewing, decurved at its origin in *Zela*, straight in *Gangara*. In *G. tumpa* it is also slightly decurved, whereas it is straight (or at least it remains halfway between veins 4 and 6 over its whole length) in the other *Gangara* species. The character is, however, a little variable in the *Plastingia* group and the differences are rather subtle so it seems better not to place much weight on it.

c. Length of cell in hindwing.— The short hindwing cell in *Gangara* seems to link this genus to *Zela*. However, a short hindwing cell is also found in *Lotongus* Distant, 1886, another genus of the *Plastingia* group. Moreover, in *G. sanguinocculus* it almost reaches to the middle of the wing, not very different from the situation found in *Erionota* Mabilie, 1878, and some other genera. Again, we cannot place much weight on this character.

d. Patch of long hairs on underside of forewing parallel to vein 1.— This is apparently an autapomorphy of *Gangara*. The hairs are either implanted in space 1b (*G. lebadea*) or in spaces 1a and 1b (*G. tumpa*, *G. thyrsis*, *G. sanguinocculus*). It is not clear which of the two conditions must be considered apomorphic, but for reasons of parsimony the condition in *G. lebadea* is taken as such (see below).

e. Swollen veins and glandular streaks.— Above it was remarked that the presence of these characters is apparently an autapomorphy of the genus. In *G. tumpa* and *G. lebadea*, where they are restricted to veins 2 and 3 of the hindwing (in the other species also in the forewing), they are not only more pronounced but also accompanied by a distortion of the veins so that veins 2 and 3 almost touch over their whole basal half. This is considered a further specialisation, i.e. an apomorphy of *G. tumpa* and *G. lebadea*.

f. Male without spots.— Spots have been lost many times in the evolution of the HesperIIDae (see also below, under g). In the *Plastingia* group, they are, e.g., absent in both sexes in the genera *Matapa* Moore, 1881, and *Pirdana* Distant, 1886. However, though this character is liable to homoplasy, if it is found in one sex only of some of the species of an apparently monophyletic genus, we may assume that it evolved only once in this genus, until there are indications to the contrary. Thus, the complete loss of the spots in the males of *G. tumpa* and *G. lebadea* is considered an autapomorphy of their common, direct ancestor.

g. Subapical spots in forewing.— These spots are present in *G. thyrsis* only. The expression of spots seems to have a simple genetic basis. Spots are absent in so many unrelated species of HesperIIDae that it seems possible, if not probable, that there is a mechanism which if switched on can suppress the expression of the spots while the genetic code for the spots remains intact, and which can be switched off again. In that case, the presence of spots does not a priori mean a plesiomorphic state. In a number of cases in which the spots are absent in one sex only (as in *G. lebadea*) the switch is sex-linked. If such a switch mechanism really exists the spots may reappear after they were seemingly lost. So far, however, this is speculation. Without evidence to the contrary the presence of spots is considered a plesiomorphic state. Thus, the loss of the subapical spots in *G. sanguinocculus*, *G. lebadea* and *G. tumpa* can be considered a synapomorphy linking the species together.

Although the number of characters is low, on the basis of the above discussion we can propose a hypothesis on the phylogenetic relationships between the *Gangara* species. Thus, we arrive at the cladogram in fig. 3a. If we take the sister group relationship of *G. tumpa* and *G. lebadea* for granted two more cladograms are possible (figs 3b, 3c), but in both a homoplasy occurs and for this reason cladogram 3a is preferred.

The distribution of the *Gangara* species is outlined in fig. 4. Although small, the genus follows the common pattern of a widespread Oriental genus with widely overlapping species ranges, a concentration of species in the area Burma-Thailand-West Malaysia (may extend to Sumatra or even Borneo), and with or without an outlier in Sulawesi. For comparison, see, e.g., de Jong (1983) for the genus *Matapa*. The distribution of the *Gangara* species is a further indication of the predominantly Oriental character of the Sulawesi hesperiid fauna (de Jong, 1990). Since it is generally believed that Sulawesi was never joined to either Borneo or the Philippines, the ancestor of *G. tumpa* must have reached Sulawesi by jump dispersal from Borneo or the Philippines. In this case as well as in the rest of the genus there are no indications of speciation by

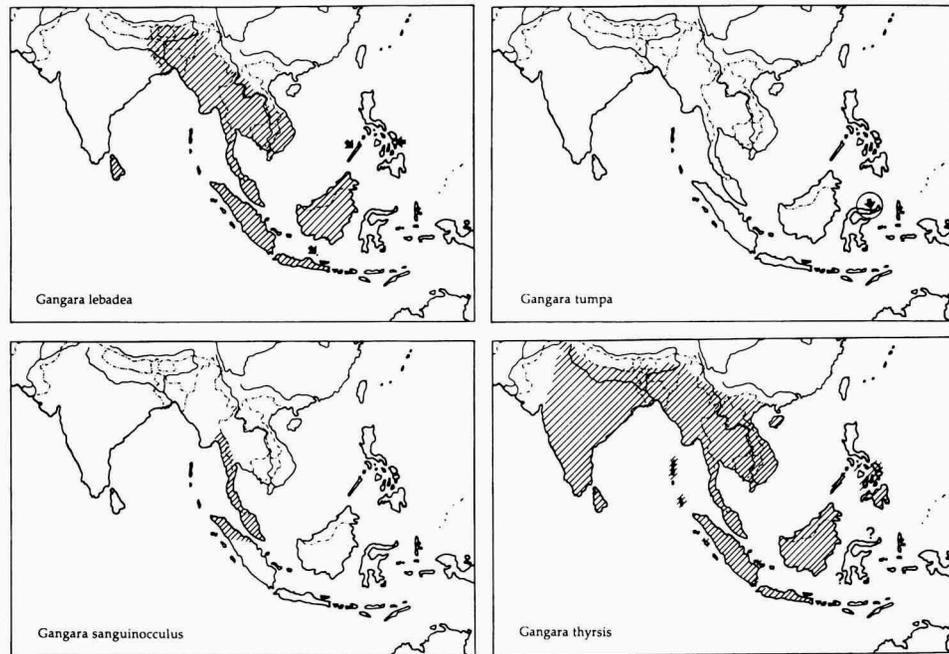


Fig. 4. Distributions of the four *Gangara* species.

a vicariant event. The pattern of many closely related sympatric species over much of the Oriental Region and the concentration of species in the central part of the region ask for an explanation. This, however, can only be given after the phylogeny of more genera has been studied. Preliminarily it can be remarked that an explanation may involve other modes of speciation than the allopatric mode and that the invocation of vicariant events may not be sufficient.

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