Decisions in fish taxonomy of earlier days were often based on a few samples of very dissimilar sizes and poorly preserved as a result of the logistical problems and difficult technical conditions of field work at that time. Authors often observed variability, but the available material did not allow them to conclude whether the variability was ontogenic, geographic, intra- or interspecific; and with the then prevailing species concepts it was usually conservatively concluded for intraspecific variability (Ng and Kottelat 2000).

The present concept is that fresh water fishes are distributed in a particular river basin and their congeners in an entirely separated different basin are proved to be different species. Various revisional studies of 'such highly variable' and widely distributed forms of earlier days have now shown to be aggregates of distinct, often not even closely related species (Kottelat and Lim 1993; Kottelat 1996; Roberts and Ferraris 1998; Ferraris and Runge 1999; Ng and Kottelat 2000; Ng 2003; Chakrabarty and Ng 2005).

Thus, the distribution of *Garra rupecula* in the Chindwin basin of Manipur may be considered invalid with the validation of *G. abhoyai*.

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12. NATURAL HISTORY AND EARLY STAGES OF THE WESTERN GHATS ENDEMIC GOLDEN FLITTER *QUEDARA BASIFLAVA* (HESPERIIDAE, LEPIDOPTERA) FROM SOUTH-WESTERN INDIA[1]

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The genus *Quedara* Swinhoe, 1919 (Family Hesperiidae, Lepidoptera) has five species, which are distributed from southern India to Borneo and Sumatra in South-east Asia. The genus is represented by a single species in the Western Ghats, south-western India: the Golden Flitter *Quedara* (=*Hyarotis*) *basiflava* de Nicéville. The genus is allied to *Hyarotis*, which has two representatives in the Western Ghats: the Tree Flitter *H. adrastus* Stoll and the Brush

Flitter *H.* (=*Kineta*) *microstictum* Wood-Mason & de Nicéville. Early stages of *H. adrastus* were described by Bell (1927), but those of *H. microstictum* and *Q. basiflava* have so far been unknown. Nothing is known about *Q. basiflava* apart from its taxonomic status, and this is the first report of the natural history and early stages of the species.

This article is based on work carried out mainly in the Karian and Varagaliar sholas in the Anamalai Hills (10° 13'-10° 31' N; 76° 52'-77° 23' E) over eight months (November 1998-May 1999, and additional field work during 1999-2001). During this period I successfully reared nine adults from first or second instar caterpillars, and observed more than 500 caterpillars. The natural history of this species has also been studied in recent years in Ponmudi-Kallar Valley and in Arippa and Schendurni wildlife sanctuaries (WLS) near Thiruvananthapuram, Kerala, by C. Susanth, B.V. Premkrishnan, S. Kalesh and Satya Prakash. Their observations, if different from mine in the Anamalai Hills, are also reported below.

Status and distribution: The species is narrowly endemic to the Western Ghats. It occurs south of Coorg up to the southern tip of the Western Ghats, both north and south of the Palghat Gap, on the eastern as well as the western slopes. It is most common in the Anamalai Hills southwards up to Arippa and Schendurni WLS in Kerala. It has always been considered a very rare species and some of the earlier authors had missed it south of the Palghat Gap (Evans 1910, 1932; Ugarte and Rodricks 1960; Larsen 1988). However, judging from the abundance of the caterpillars, I propose that the species is actually common in its habitat, but, as described below, the adults are rarely seen possibly because of their habits. The exception is the Rosemala area of Schendurni WLS, where adults are seen in fair numbers (C. Susanth pers. comm.).

Habitat: The habitat described here is only for caterpillars because adults were seen rarely. In the Anamalai Hills the host plants were various species of canes (*Calamus* spp.); hence, the caterpillars were commonly seen in dense evergreen forest patches as well as close to small natural openings and around forest paths, but not in large man-made openings. They were found between 500 and 1,400 m above msl although the numbers declined significantly above 900 m. The occurrence of the species in the Grass Hills and Eravikulam national parks, and in small forest fragments in the Akkamalai area close to Valparai, was confirmed by sightings of a few caterpillars and indirect evidence, such as bite marks (and characteristic leaf damage) and cells made on the host plants by the caterpillars. However, at these high elevations (>1,100m) they were uncommon even when at low- and mid-elevation evergreen forests I found dozens of caterpillars on single cane plants, and presence on a high proportion of individual plants.

Breeding season: Breeding was continuous throughout the year, but peaked from October to February in the Anamalai Hills and from June to August in Schendurni WLS (C. Susanth pers. comm. for Schendurni WLS). There were two brief lulls in breeding activity, one during March-April and the other during August-September. It is not known whether these periods were spent in egg, caterpillar or pupal stage. One caterpillar stayed dormant in captivity for three months from August to October and pupated at the end of it, but the length of the pupal stage was normal (C. Susanth pers. comm.).

Host plants: Three species of cane were identified on which caterpillars were seen for many months: *Calamus pseudo-tenuis* Beccari ex Beccari & Hook, *C. rotang* Beccari ex Beccari & Hook and *C. thwaitesii* Beccari ex Beccari & Hook (Arecaceae). Whether any of these cane species is preferred over others is still unknown.

Eggs: The eggs were faintly shiny white and dome-shaped with vertical ribs, but their detailed structure was not studied. They were laid in batches of 2-13 eggs (5.9 ±2.9, N = 20 clutches), mostly on the underside of *Calamus* leaves. The eggs were laid in one or two rows, touching each other, mostly on fresh leaves, but a few were on older leaves, which were later eaten by the caterpillars. I did not notice a preference for *Calamus* in shaded or open areas: the caterpillar density seemed equal on plants inside the forest or near natural forest edges and on forest paths.

Caterpillars: The caterpillar was white with a light reddish-brown head (Fig. 1a). There were three pairs of markings on the face: the first pair – large, tear-shaped, sharply defined prominent yellow markings above the mandibles with yellowish area in between, the second pair – much smaller and faint yellow spots above the first pair, and the third pair – faint whitish-yellow markings above the second pair of markings, close to the top of the head (Fig. 1b). The mandibles were darker in colour, almost chocolate-brown, and the eyes were initially brown but turned white in later instars. The sides and the back of the head, towards the second segment, were darker reddish brown or almost black. The head of the recently moulted caterpillar was light green with the yellowish markings paler; the markings darkened within a few hours. The coloration of the caterpillar remained unchanged throughout, except for markings on the head that became progressively more prominent in successive instars. The head had a distinct groove on top. The anal flap was rounded, prominent and covered with fine white hair. Approximately three days before pupation a pair of white lines appeared on the back of the caterpillar. These lines were a continuation of the two white bars present on the anal flap of the caterpillar throughout its life.

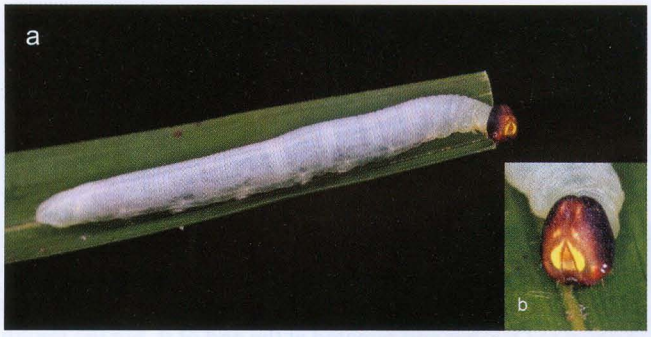

Fig. 1a: Caterpillar of *Quedara basiflava*;
1b: close-up of the head

Fig. 2: Cells made by the first instar larvae

Fig. 3: Cells made by third to fifth instar larvae

The caterpillars dispersed immediately after consuming their eggshells. Each caterpillar occupied an entire leaflet to make its cell and feed, and caterpillars from the same clutch occupied adjacent leaflets. Early larval cells were small (*c.* 2-4 cm in length) and made in the middle of the leaf margin. These were simple tubes made by turning the leaf margin downwards and holding it in place by silk threads (Fig. 2).

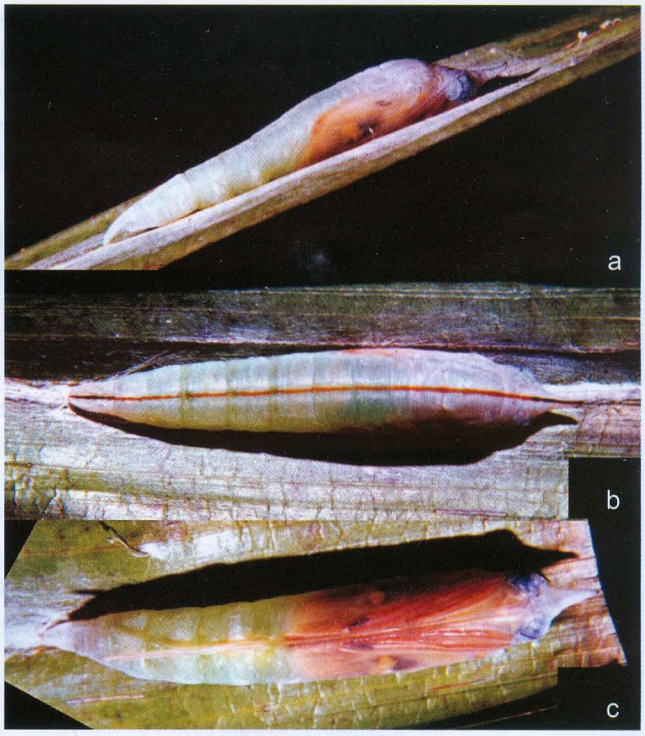

Fig. 4: Pupa of *Q. basiflava* a day before eclosion, showing change in wing coloration
a: lateral view; b: dorsal view; c: ventral view

Fig. 5: Freshly eclosed *Q. basiflava* drying its wings

Fig. 6: Underside of freshly eclosed *Q. basiflava*

After the second instar, caterpillars made larger cells by putting the two margins of a leaf together, bending the leaf longitudinally at the midrib (Fig. 3). The caterpillars consumed portions of the leaf between their resting spots inside the cells and the terminal portions of the leaf, usually leaving the midribs and edges of leaves intact, which produced characteristic leaf damage. This characteristic pattern allowed distinguishing between the leaf damage caused by this species and that by other sympatric *Calamus*-feeding species: the Common Palmfly *Elymnias hypermnestra* Linnaeus and the Giant Redeye *Gangara thyrsis* Fabricius that damaged the leaves more extensively, and the Maculate Lancer *Salanoemia sala* Hewitson that did not leave the leaf margins intact, and had more elaborate cells.

The caterpillars stayed stretched on the roof of the cells, their heads pointing towards the leaf apex, without turning their heads on their sides, as many hesperiids do. They fed mainly at dusk and at night. The frass pellets, which were considerably dry, were shot away with force, and so the cells and surroundings were always clean. The caterpillars were shy, and their movements were slow. They made very thick mats of silk to line their larval and pupal cells, which remained bright white and quite conspicuous for many months after they had been abandoned. Just before pupation, caterpillars discharged light brown rather than greenish droppings. The total length of the caterpillar, just before pupation, was 40 mm.

Pupae: Pupae were pale green and slender, with a pointed projection at the anterior end and the proboscis running free beyond the wing cases almost up to the tip of the abdomen (Figs 4a,b,c). There was a brown longitudinal line on the dorsal side of the pupa. Unlike many southern Indian hesperiids (e.g. *G. thyrsis* Fabricius and the Common Banded Awl *Hasora chromus* Cramer (Kunte 2000)), pupae of this species did not form cereus powder.

The caterpillars always wandered off before pupation, so the pupae were never found on the host plant. Pupal cells were probably formed close to the ground on other plants or among the leaf-litter as in spite of extensive searching pupal cells could not be located. The pupal cells made by caterpillars that were confined to host plant twigs, using mosquito netting, were structurally similar to the larval cells of late instars.

Pupae were 30 mm long, with a maximum circumference of 6 mm. The average pupation period was 13-15 days, and the adults always eclosed during the early half of the day, between 0800 and 1300 hrs.

Morphometric measurements: Morphometric measurements were taken (in millimetres) with callipers on two newly emerged specimens (Table 1).

Table 1: Morphometric measurements of adult *Quedara basiflava*

Body length	Thorax length	Thorax width	Wingspan	Proboscis length
17 mm	6 mm	4 mm	39 mm	24 mm
16 mm	6 mm	4 mm	39 mm	19 mm

Imago: Although caterpillars were abundant, I saw only two adults in nature. Whether they were crepuscular or inhabited some microhabitat that was mostly inaccessible to human observers, such as the canopy of tall evergreen forests, is still unknown (although no adults were seen during canopy observations totalling approximately 30 hours). On May 12, 1999, at 1415 hrs, I saw an old specimen – the colours had faded and scales had been lost, but the wings were not torn – in a small clearing in Karian shola. It was sunny, but light penetrated to the forest floor in stray beams. The butterfly was perched on the upper side of a leaf, 1 m off the ground, in a partly shaded part of a sapling. It was basking in the usual hesperiid fashion – hindwings spread flat, forewings at an angle. Its flight was similar to that of the Common Banded Demon *Notocrypta curvifascia* Felder and Felder, a sympatric hesperiid. In fact, this species may be confused with *N. curvifascia* when it is basking when the underside of the wings is not visible because the markings on the upperside of their forewings are similar particularly from a distance.

The newly eclosed adults dried their wings while spreading them in the fashion of a noctuid moth, forewings covering the hindwings (Fig. 5), but otherwise they kept the wings closed, revealing the characteristic yellow base of the chocolate-brown hindwings (Fig. 6).

Parasitoids: Bell (1927) noted that parasitism by parasitoid wasps seemed to be a big factor contributing to mortality in the early stages of a related species, *H. adrastus*, in which up to 80% of the eggs and caterpillars were parasitised by Ichneumon wasps. However, parasitism on *Q. basiflava* was not significant; none of the caterpillars that were observed were parasitized.

In this note I have presented the first detailed account of the natural history of this endemic hesperiid butterfly of the Western Ghats. However, early stages, habitat requirements, population and conservation status remain unknown for other Western Ghats endemic hesperiids such as the Coorg Forest Hopper *Arnetta mercara* Evans, the Sitala

Ace *Thoressa sitala* de Nicéville and the Evershed's Ace *T. evershedi* Evans, 1910. We cannot assess relevant conservation issues for these butterflies if we do not have any information about them. Considering the rapid habitat degradation and destruction that is taking place in the biologically diverse southern Western Ghats, I hope such basic information on these species will be available soon through a more collaborative effort from naturalists in southern India. This will ultimately help us protect these endemics and their habitats.

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13. RANGE EXTENSION OF THE WAVY MAPLET *CHERSONESIA INTERMEDIA* (NYMPHALIDAE, LEPIDOPTERA), FROM PAKKE TIGER RESERVE, ARUNACHAL PRADESH, INDIA[1]

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Tribe Cyrestini (Nymphalidae, Lepidoptera) is represented in India by two genera: (a) *Cyrestis* Boisduval, 1832, and (b) *Chersonesia* Distant, 1883; commonly known as Maps and Maplets. Of these, *Chersonesia* is highly restricted in distribution: *Chersonesia risa* (Doubleday 1848), the Common Maplet, occurs in the Himalaya from Kumaon and Nepal eastward to north-east India, extending to Indo-China and south-east Asia (Smith 1989). *Chersonesia intermedia* Martin, the Wavy Maplet, is also distributed in Indo-China and south-east Asia, but is more restricted in India. It has been collected from Manipur and Naga Hills in north-east India and is reportedly very rare (Evans 1932; Wynter-Blyth 1957). Note that the subspecies of *C. intermedia* that occurs in NE India, i.e. *C.i. rahrioides* Moore, 1896, was previously treated under *C. rahria* (Evans 1932). *Chersonesia rahria* Moore, 1858, as currently classified, does not occur in India.

On May 30, 2007 I photographed *C. intermedia* mud-puddling in a stream-bed running through the evergreen forest on the road to Khadi in Pakke Tiger Reserve in West Kameng district of Arunachal Pradesh. The species could be easily distinguished from *C. risa* in having: (a) the fifth line on the upper side of the wings reddish-brown and diffused, and (b) the sixth line from the wing-base curved and prominently angled near costa (Evans 1932; Wynter-Blyth 1957; Corbet and Pendlebury 1992; Pinratana and Eliot 1996). The fifth and sixth lines in *C. risa* are black, straight and of equal width, similar to the first four lines.

The precise localities from which *C. intermedia* was previously collected in Manipur are unknown but the sighting reported here comprises the first record of the species from Arunachal Pradesh and in the eastern Himalayas, at least 400 to 600 km away from the previously known distributional range of the species. It will be useful to find out whether the species also occurs in the Brahmaputra valley in Assam or whether it reaches Pakke only through the forested mountains of the south-eastern and northern Arunachal Pradesh.

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