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Notes on African Lepidoptera – foodplant relationships as phyletic clues

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ABSTRACT

SPICHIGER, R., R. VUATTOUX & V. SAVOLAINEN (1997). Notes on African Lepidoptera – foodplant relationships as phyletic clues. *Candollea* 52: 113-117. In English, English and French abstracts.

By their diet, oligophagous *Sphingini* and *Philampelini* segregate asterid foodplants into two distinct groups, viz. one containing Dahlgren's *Solaniflorae*, *Lamiiflorae* and *Asteriflorae*, and a second one made up of *Gentianiflorae*. The supposed relationship of *Araliaceae* and *Icacinaceae* with asterids is also supported in this indirect way. The circumscription of the Malvifloran lineage sensu Thorne and Dahlgren, and of Thorne's *Rutanae*, coincides with the feeding habit of polyphagous *Smerinthini* and *Charaxinae*. The neighbourhoods *Malvales/Sapindales* (*Smerinthini*), and *Vitaceae/ Dilleniaceae* (*Chaerocampini*), respectively, proposed by Chase & al. are also supported by this phagotaxonomy.

RÉSUMÉ

SPICHIGER, R., R. VUATTOUX & V. SAVOLAINEN (1997). Notes sur les Lépidoptères africains – indications phylétiques sur leur relation alimentaire. *Candollea* 52: 113-117. En anglais, résumés anglais et français

Le régime alimentaire des *Sphingini* et *Philampelini* oligophages sépare deux groupes astéridiens: d'une part les *Solaniflorae*, *Lamiiflorae* et *Asteriflorae* selon Dahlgren, d'autre part les *Gentianiflorae*. L'appartenance des *Araliaceae* et *Icacinaceae* aux astérides est aussi corroborée. Le concept malviflorien sensu Thorne et Dahlgren ainsi que les *Rutanae* de Thorne s'accorde avec le spectre trophique des *Smerinthini* et *Charaxinae* polyphages. Les groupements des *Malvales/Sapindales* (*Smerinthini*) et des *Vitaceae/ Dilleniaceae* (*Chaerocampini*) proposés par Chase & al. sont aussi corroborés par cette phagotaxonomie.

KEY-WORDS: *LEPIDOPTERA* foodplants – Angiosperm phylogeny.

1. Introduction

As observed by THORNE (1983), insects are pragmatic, but excellent phytochemists. Their food choices are the result of a long coevolution with plants. From oligophagous insects we can get very useful information about plants containing similar biochemicals (THORNE,

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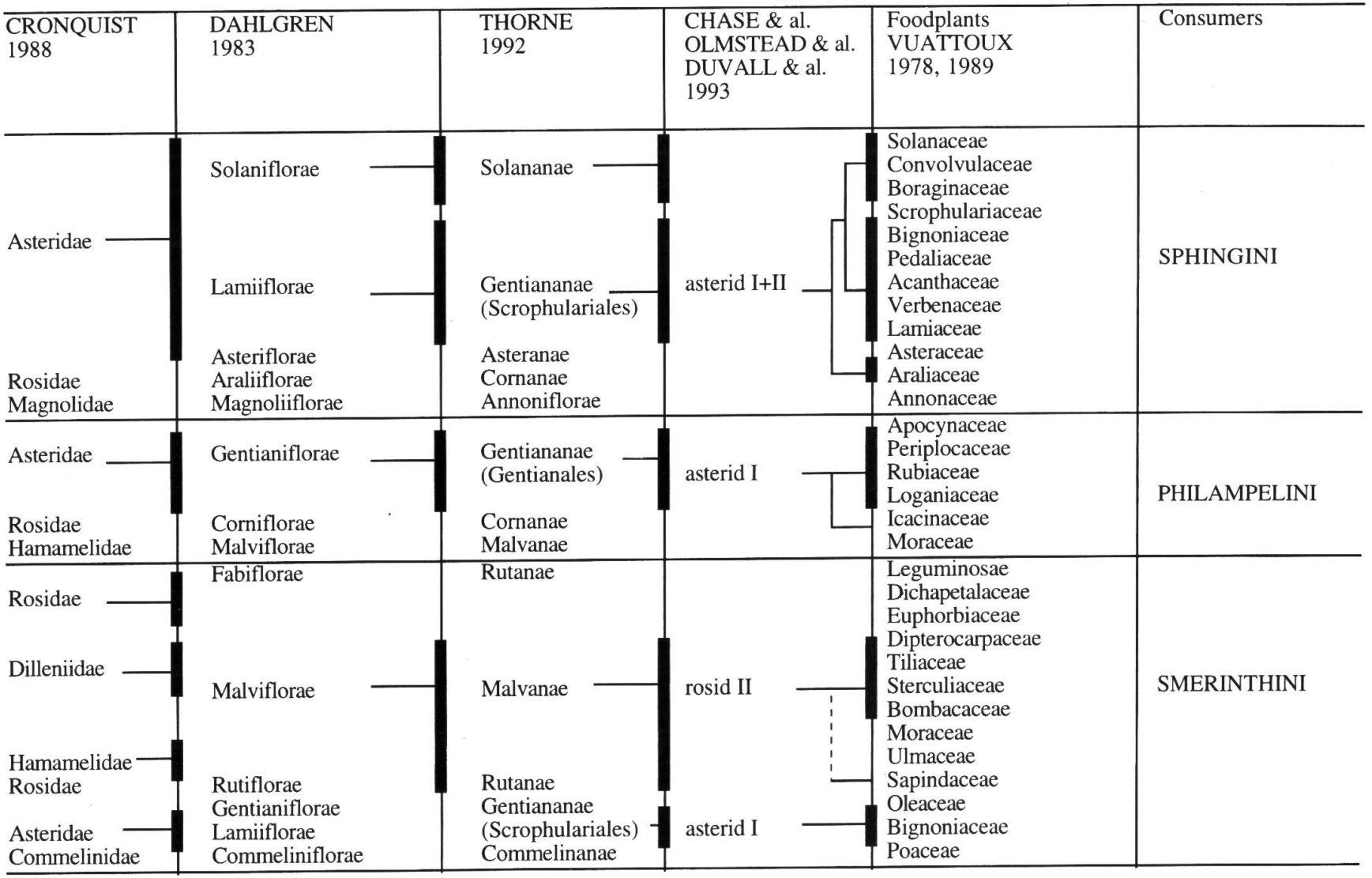
CRONQUIST 1988
DAHLGREN 1983
THORNE 1992
CHASE & al. OLMSTEAD & al. DUVALL & al. 1993
Foodplants VUATTOUX 1978, 1989
Consumers
Asteridae
Rosidae Magnolidae
Solaniflorae
Lamiiflorae
Asteriflorae Araliiflorae Magnoliiflorae
Solananae
Gentiananae (Scrophulariales)
Asteranae Cornanae Annoniflorae
asterid I+II
Solanaceae
Convolvulaceae
Boraginaceae
Scrophulariaceae
Bignoniaceae
Pedaliaceae
Acanthaceae
Verbenaceae
Lamiaceae
Asteraceae
Araliaceae
Annonaceae
SPHINGINI
Asteridae
Rosidae Hamamelidae
Gentianiflorae
Corniflorae Malviflorae
Gentiananae (Gentianales)
Cornanae Malvanae
asterid I
Apocynaceae
Periplocaceae
Rubiaceae
Loganiaceae
Icacinaceae
Moraceae
PHILAMPELINI
Rosidae
Dilleniidae
Hamamelidae Rosidae
Asteridae Commelinidae
Fabiflorae
Malviflorae
Rutiflorae Gentianiflorae Lamiiflorae Commeliniflorae
Rutanae
Malvanae
Rutanae Gentiananae (Scrophulariales) Commelinanae
rosid II
asterid I
Leguminosae
Dichapetalaceae
Euphorbiaceae
Dipterocarpaceae
Tiliaceae
Sterculiaceae
Bombacaceae
Moraceae
Ulmaceae
Sapindaceae
Oleaceae
Bignoniaceae
Poaceae
SMERINTHINI

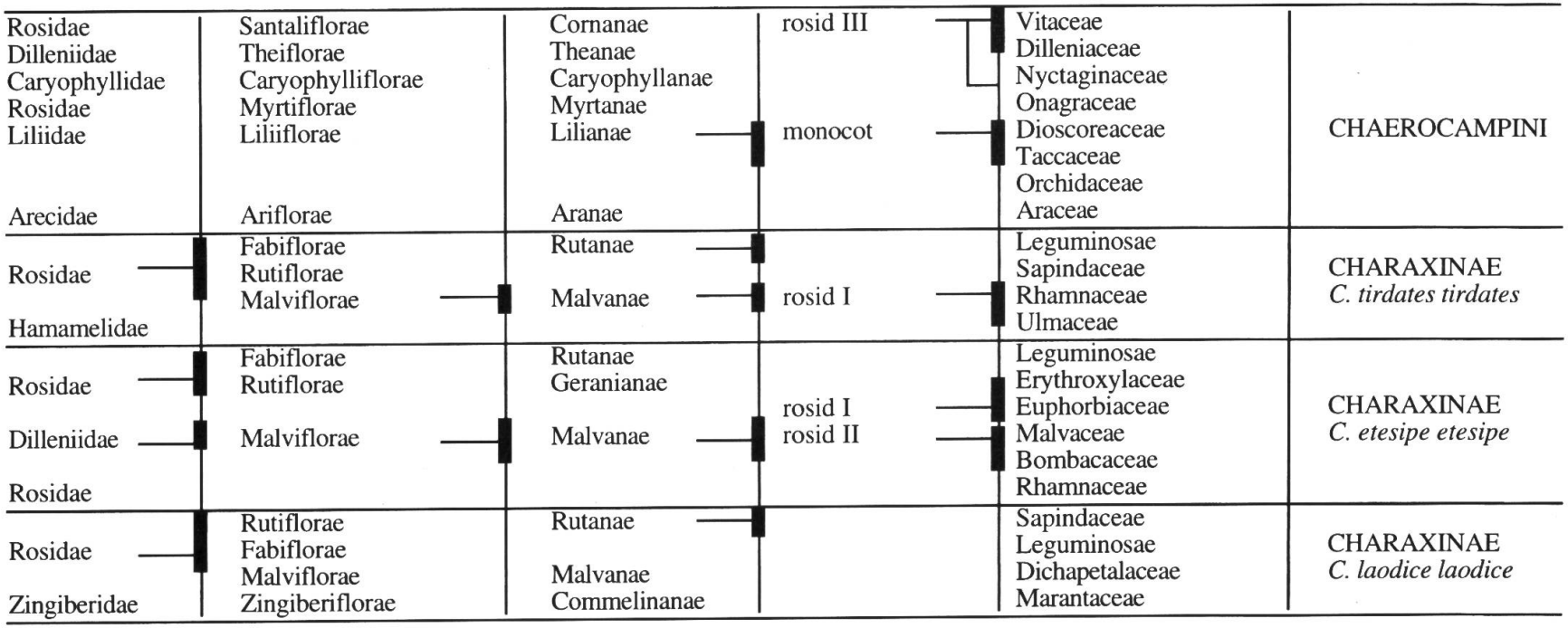

Table 1. – Correlations between African Lepidoptera (upper line) and foodplant taxa classified according to different authors (lines below). Bold lines indicate phagotaxonomic relationships.

1983). This paper aims at comparing the pragmatic classification of some caterpillars with recent botanical classifications in order to point out correlations.

2. Material and method

Lepidoptera caterpillars have been bred successfully for more than 15 years on their particular foodplants at the Tropical Ecology Institute of Lamto in Ivory Coast. Thus, the feeding is strictly limited to the plants on which the larvae have been found. The list of consumers and foodplants, as well as the detailed methods, can be found in VUATTOUX (1978) and VUATTOUX & al. (1989). The *Sphingidae* have been determined by J. Pierre (Museum of Paris), the *Charaxinae* (*Nymphalidae*), by M. J. Plantrou, and the foodplants by L. Aké Assi, specialist of the West African flora.

3. Results and discussion

Table 1 presents for each group of *Lepidoptera* the phylogenetic placement of the consumed plants according to various classifications.

The upper line indicates the tribes (*Sphingidae*) or some subspecies (*Charaxinae*) of the phytophagous *Lepidoptera*. The second one gives the plant families that are eaten by the above-listed caterpillars. The other lines indicate the taxonomic placement of each family in the recent classification systems, i.e. their belonging to superorders according to DAHLGREN (1983), THORNE (1992) and to subclasses according to CRONQUIST (1988). Furthermore, the results based on *rbc*L sequencing have been taken into account (CHASE & al., 1993; DUVALL & al., 1993; OLMSTEAD & al., 1993).

With the exception of some atypical taxa (*Annonaceae*, *Moraceae*), all foodplants of the *Sphingini* and *Philampelini* belong to the asterid phylum. The amazing occurrence of *Moraceae* as foodplants of *Philampelini* could maybe due to the presence of latex, a character which is shared with the *Apocynaceae*. Nevertheless, this "incident" has still to be explained.

The fact that *Icacinaceae* and *Araliaceae* are eaten by these latter caterpillars could support their asterid status as emphasized by OLMSTEAD & al. (1993) and CHASE & al. (1993).

The above-mentioned asterid families are not all eaten by species of the same tribes of *Sphingidae*. *Gentianiflorae* sensu Dahlgren are eaten only by *Philampelini*, whereas *Solaniflorae*, *Asteriflorae* and *Lamiiflorae* are foodplants of *Sphingini*. It is an argument in favour of Dahlgren's classification; he divides *Gentiananae* sensu Thorne into *Lamiiflorae* and *Gentianiflorae* sensu stricto. Chase and Olmstead point out a lineage comprising *Gentianaceae-Rubiaceae-Apocynaceae-Loganiaceae-Asclepiadaceae* which corresponds to Dahlgren's *Gentianiflorae* and which is clearly distinct from the other asterid clades.

Smerinthini are more polyphagous. Their foodplant families belong to lineages which correspond to *Malvanae/Malviflorae* sensu Thorne and Dahlgren (i.e. *Malvales*, *Urticales*, *Erythroxylaceae*, *Euphorbiaceae*, *Dichapetalaceae*), to *Rutanae* sensu Thorne (i.e. *Leguminosae* and *Sapindaceae*), to *Gentianiflorae* sensu Dahlgren, and to monocots. Furthermore the diet of *Smerinthini* could support the *Sapindales-Malvales* clade of CHASE & al. (1993), as do African *Nymphalidae* (*Euphaedra*) which consume *Sapindaceae*, *Anacardiaceae* and *Sterculiaceae* (HECQ & VUATTOUX, 1989).

The choice of foodplants of *Chaerocampini* supports the unexpected relationships of *Vitaceae* (*Leeaceae*) and *Dilleniaceae* which was pinpointed by CHASE & al., (1993). We can also note that these two families appear to be sisters of some caryophyllids (CHASE & al., 1993) as *Nyctaginaceae* are also eaten by *Chaerocampini*.

The feeding habit of *Charaxinae* (*Charaxes tiridates tiridates*) supports the belonging of *Rhamnaceae* and *Erythroxylaceae* to a Malvifloran lineage, whereas that of *Charaxinae* (*C. etesipe* and *C. laodice*) and *Smerinthini* supports the relationships between *Dichapetalaceae*, *Erythroxylaceae* and *Euphorbiaceae*; this is also suggested by CHASE & al. (1993) and Savolainen (unpubl.).

The above-mentioned observations are to be considered with caution, especially those based on polyphagous diets. They are not strengthened by statistically tested experiments. Some atypical occurrences (viz. *Moraceae* and *Annonaceae* and other cunsumed plants close to asterids) have still to be explained. Nevertheless, these data are based on long-term observations and provide interesting phyletic clues in an original way.

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