

gh degree on
icture of the
en the land-
ts into little
decrease in
enorrhyncha
immigration
species), (4)
chenorrhyn-
l and habitat

idia

it on *Zygini-*
is (*Z. itaitca*
AN, *Z. ribau-*
IDANO) can
1982. Mem.
we devoted
, prolificity,
athological
1984. Proc.
considered
ible infesta-

o valley. Its
ens, *Arundo*
chloa crus-
stems or in
headlands.
ation takes
tracted by
on young
ceed from
he appear-
leaves for
to dechlo-
leafhopper,

that is a typical mesophyll-feeding species. Intense migrations of *Z. pullula* occur also on cultivations of *Sorghum vulgare*, and successively of summer sowing corn where 1 or 2 generations take place from August to October. Starting from September, the adults become remigrants to reach the former wild hosts for overwintering.

In heavily infested corn areas, the remigrations involve autumn sowing cereals too. Particularly *Hordeum vulgare* and *Triticum vulgare* are very attractive from the beginning of November to the end of March, i. e. during the overwintering period. *Z. pullula* remains on barley and wheat to carry out the spring generation.

New phylogeny of Delphacidae and its implication in geographic distribution

MANFRED ASCHE

Fachbereich Biologie/Zoologie der Philipps-Universität Lahnberge, Postfach 1929, D-3550 Marburg/
Lahn, Fed. Rep. of Germany

The situation of systematics in Fulgoroidea is still quite insufficient. Till nowadays a \pm artificial classification established already in the last or at the beginning of our century e. g. by STÄL, MELICHAR, MUIR is in use mainly based on diagnostic characters. By this nearly no subgroup of Fulgoroidea has been confirmed to be monophyletic by constitutive, i. e. common derived (= synapomorphic) characters. Almost the only group within Fulgoroidea which was supposed to be well defined and considered to constitute a most probably "natural group" by means of the existence of a movable and polymorphic spur at the distal end of the hind-tibia was the family of Delphacidae. Delphacids represent today within Fulgoroidea one of the largest families comprising almost 2000 species in about 280 genera so far described. They are distributed worldwide, and show a remarkable extent of variety in size, body shape, morphology, coloration as well as in ecology and biology. Despite of their conspicuous diversity only three attempts have been undertaken to subdivide Delphacids into groups: MUIR 1915, HAUPT 1929 and WAGNER 1963.

As none of the corresponding systems which differ considerably in the resulted groups were based on cladistic analysis we ourselves tried to clear up the phylogenetic relationships within Delphacidae. Preliminary results have been published in 1982 by ASCHE & REMANE.

Our main findings are: 1. All characters of Delphacidae in common with our outgroup Cixiidae could be considered to be symplesiomorphic, thus Cixiidae or parts of them cannot be proved to be sister-group of Delphacidae. 2. A hypothetical ancestor-species of Delphacidae should have shown for instance the following organisation: a) plesiomorphic characters: missing of any sexual differentiation in drumming organ; in ♀♀ the presence of a long, sword-like orthopteroid ovipositor; b) apomorphic characters: movable spine-like posttibial-spur, which - according to its postembryonic development - is derived from one of the stiff apical

spines of hind-tibia as present in Cixiidae; parameres shaped and functioning like a clamp for the ovipositor during copulation. 3. Remnants of the first evolutionary platform are found in Asiracinae sensu MUIR (t. c.) and FENNAH (1979), but there is no evidence for the monophyly of this group. 4. Within Asiracinae the Ugyopini sensu ASCHE & REMANE 1982 form a monophyletic group by means of a special shaped spur and the configuration of apical spines of hind-basitarsus. The relationship of this group to other Asiracinae are quite as unclear as of Asiracinae to higher derived Delphacidae, thus Asiracinae could be paraphyletic. 5. All non-Asiracine Delphacidae are monophyletic: main synapomorphies are found in the modification of the posttibial-spur and the sexual differentiation of the drumming organ. 6. Within this group three other well separated groups could be found: a) a group around *Kelisia* FIEB. and *Anakelisia* W.G. united by subanal-appendages in the ♂-genitalia; b) a group comprising *Stenocranus* FIEB., *Terauchiana* MATS., *Embolophora* STÅL and *Stenokelisia* RIB. united for instance by ditrysic ♀-genitalia; c) a group comprising all other higher derived Delphacidae united by prolonged and dorsally erected abdominal-sternite-2-apodemes of the ♂-drumming organ. Within this group all genera except one form again a monophyletic unit by means of a modification of the central part of the aedeagus which becomes a skinny non-sclerotized tube. As exception only one species from South America recently discovered possesses within this group still the plesiomorphic organisation of the aedeagus like in *Kelisia* and fills as a kind of missing link exactly the gap between two evolutionary platforms showing the sequence of phylogenetic changes from *Kelisia-Stenocranus*-level to the level of higher derived Delphacidae. 7. Within the latter group some other most probably monophyletic units could be found: a) a group around *Tropidocephala* STÅL; b) a group comprising *Saccharosydne* KIRK.,

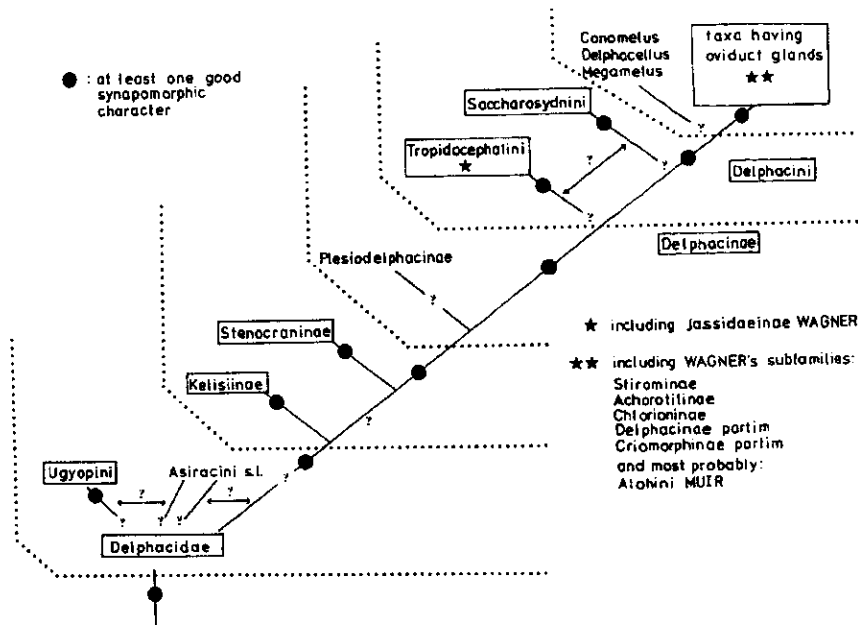


Fig. 1: Phylogenetic Relationship of Delphacidae: simplified cladogram

Memolaxa MUIR by the loss of sy...
 oviduct-glands (...)
 ...group. The
 ...shown in a sim
 ...results into a pri
 ...not concern th
 Delphacidae ir
 Tropidocephali
 ...the latter u
 ...Alabini

Accordin
 Delphacidae c
 ...graphical distri
 ...y of Delphaci
 ...not able to giv
 ...our knowle
 ...tion of hostpla
 Delphacidae?
 ...future investi
 ...scientific facts

Tab. 1: Geograph

Region	A	As.
Palaearctic		
Oriental		
Ethiopian		
Australian		
Pacific		
Holarctic		
Neotropical		

ASCH, M. &
 Fulgor
 FENNAH, R. G
 ...gist's R
 HAUPT, H. 19
 Zool.
 MUIR, F. 191:
 47: 204
 STÄUBING, J
 ...inzel
 WAGNER, W.
 burg.

e
y
e
n
i
a
l
r-
o
l-
e
g
a
1
;
f
L
S
-
y
3
1
1
3
L
2

Neomalaxa MUIR and *Pseudomacrocorupha* MUIR; c) a large group characterized by the loss of symbiont x. Within the latter group all genera with ♀♀ possessing oviduct-glands (see STRÜBING 1956) constitute another most probably monophyletic group. The phylogenetic relationships we could find within Delphacidae are shown in a simplified cladogram (fig. 1). In order to translate the phylogenetic results into a practicable system we propose to use same categories even if they do not concern the same evolutionary level. As conclusion of this we subdivide Delphacidae into the five subfamilies Asiracinae, Kelisiinae, Stenocraninae, Plesiodelphacinae nov. subfam. and Delphacinae, and the latter into three tribes Tropidocephalini including WAGNERS Jassidacinae, Saccharosydmini and Delphacini, the latter tribe comprising all the rest of WAGNERS subfamilies and MUIRS Alohini.

According to our phylogenetic results the newly defined subgroups of Delphacidae compared with older systems revealed a modified pattern of geographical distribution as shown in tab. 1. Changes may be expected as the inventory of Delphacidae in many parts of the world is not yet finished. At present we are not able to give serious explanations for the reasons of those distribution patterns as our knowledge about the ecology of species, their correlations with the distribution of hostplants (co-evolution of Angiosperms, especially Monocotyle plants and Delphacidae?) and about the geological age of Delphacids is very limited. Maybe future investigations elucidate the situation and turn speculations into reliable scientific facts.

Tab. 1: Geographical Distribution of Delphacidae, status in August 1984

Region	Asiracinae		Kelisiinae	Stenocraninae	Plesiodelphacinae subfam. nov.	Delphacinae		
	Asiracini s.l.	Ugyopini				Tropidocephalini	Saccharosydmini	Delphacini
Palaearctic	★	—	★	★	—	★	★	★
Oriental	—	★	—	★	—	★	★	★
Ethiopian	★	—	—	★	—	★	—	★
Australian	—	★	—	★	—	★	—	★
Pacific	—	★	—	★	—	★	{★}	★
Nearctic	★	—	★	★	—	—	★	★
Neotropical	★	★	—	—	★	★	★	★

(★): introduced by man

ASCHE, M. & REMANE, R. 1982. Zur Phylogenie der Delphacidae LEACH, 1815 (Homoptera Cicadina Fulgoromorpha) *Vorläufige Mitteilung*. Marburger Ent. Publ. 1 (7): 155-182.
 FENNAH, R. G. 1979. Tribal classification of Asiracine Delphacidae (Homoptera: Fulgoroidea). *Entomologist's Rec. J. Var.* 91 (4): 116.
 HAUPT, H. 1929. *Neueinteilung der Homoptera Cicadina nach phylogenetisch zu wertenden Merkmalen*. *Zool. Jb. Syst. Ökol.* 58: 173-286.
 MUIR, F. 1915b-e. *A contribution towards the taxonomy of the Delphacidae (Homoptera)*. *Canadian Ent.* 47: 208-212, 261-270, 296-302, 317-320.
 STRÜBING, H. 1956. *Über Beziehungen zwischen Ovidukt, Eiablage und natürlicher Verwandtschaft einheimischer Delphaciden*. *Zool. Beiträge, Berlin (N. F.)* 2: 331-357.
 WAGNER, W. 1963. *Dynamische Taxonomie, angewandt auf die Delphaciden Mitteleuropas*. *Mitt. Hamburg. Zool. Mus. Inst.* 60: 111-180.