ALLOMORPHIC GROWTH PATTERNS IN RELATION TO SEX-LIMITED POLYMORPHISM IN SOME MYCOPHAGOUS *TUBULIFERA* (THYSANOPTERA)

T. N. ANANTHAKRISHNAN

Entomology Research Unit, Loyola College, Madras-34

THE occurrence of diverse allomorphic growth patterns and the consequent structural complexities limited mostly to the males of species exhibiting œdymerism and gynæcoidism, with a reasonably graded series between them has been reported in several mycophagous species (Ananthakrishnan 1961, 1965, 1967, 1968). On the basis of the degree of complexity these patterns may be broadly designated (*a*) simple, unitary or monophasic involving minimal effects on the morphs, with utmost an enlargement of the forefemora and foretarsal tooth as in such species as *Dichæthrips indicus* Ananthakrishnan, *Nesothrips indicus* Ananthakrishnan, *Nesothrips robustus* Ananthakrishnan, *Pygothrips amplus* Faure, (*b*) multiple or polyphasic involving not only pronounced development of several parts and varying with species or species groups, but also resulting in the development of additional structures in the œdymerous males not known in the normal males of the species concerned, and the total loss or lack of several secondary sexual characters in the minimum on gynæcoid males, as in *Ecacanthothrips sanguineus* Bagnall, *Tiarothrips subramanii* (Ramakrishna), *Kleothrips agama* Priesner, *Nesothrips falcatus* Ananthakrishnan, *Sophiothrips parviceps* (Faure), etc. Again species inhabiting the same niche may show differential patterns as in the case of the different species of *Nesothrips*. Similarly apterous and brachypterous males are prone to show more pronounced œdymerism than their macropterous counterparts, as is evident in such species as *Hoplothrips fungosus* (Moulton), *Sophiothrips parviceps* (Faure) and *Carathrips orientalis* Ananthakrishnan. Recent observations on such mycophagous species as *Polyphemothrips cracens* Ananthakrishnan, *Symphyothrips associatus* Ananthakrishnan, *Pygothrips amplus, Hoplandrothrips natalensis* (Trybom), *Nesothrips acuticornis* (Hood), *Percnothrips turbinatus* Ananthakrishnan, *Priesneriana kabandha* (Ramakrishna) and *Hoplothrips orientalis* Ananthakrishnan have revealed striking differences from the basic pattern of the normal males of these species, introducing problems with regard to their proper determination. That the patterns are different and variable are also confirmed by the allomorphic indices of the various species.

Polyphemothrips cracens and *Symphyothrips associatus* are invariably associated on fungus infested twigs and dried leaves and examination of a reasonably good series of males of both species indicate clearly that while the effects of œdymerism in *S. associatus* are unitary, involving only the size of the forefemora (80–160 μ wide, 176–336 μ long), in *P. cracens* the effects are considerable. While the ratio of the forefemoral width in the gynæcoid and œdymerous males of both species is 1 : 2, *P. cracens* exhibits striking differences in (1) the excessive forefemoral elongation, (2) the development of basal and apical forefemoral teeth, (3) development of conspicuous foretibial tooth at apex, (4) very characteristic tooth-like prolongation posteriorly on the outer margin of the forefemora. The gynæcoid males of both the species however are almost similar, in having unspecialised forefemora resulting from the apparent loss of the excessively pronounced secondary sexual characters, which express themselves strongly only in the œdymerous males. A feature of interest is that in spite of the excessive specialisation of the forelegs of the œdymerous males in *P. cracens*, there is no corresponding enlargement of the foretarsal tooth (32–48 μ) unlike as was earlier reported in *N. falcatus* Ananthakrishnan (1967) where the foretarsal tooth enlarges beyond proportions. However another species, *Hoplandrothrips natalensis* shows the œdymerous males with excessively long postoculars, anteroangulars and midlateral prothoracic setæ, as was reported in *N. falcatus*. *Pygothrips amplus* Faure, the males of which were discovered for the first time in good numbers, represents a remarkable example of a species with unitary effects, showing excessive enlargement of the forefemora (length 128–272 μ, width 88–160 μ) accompanied by enlargement of the prothorax, but without any resulting specialisation of any of the other parts or the development of accessory structures.

While *Percnothrips turbinatus*, *Pygothrips amplus* and *Priesneriana kabandha* appear to fall within the same unitary type of allomorphic growth pattern, the œdymerous males developing a distinct concavity on the inner side

of the forefemora, the species *Hoplothrips fungosus*. *Sophiothrips parviceps* and *Hoplothrips orientalis* are distinctly polyphasic with varied patterns but with one uniformity, *viz.*, all of them have highly elongate forefemora and short foretibia with prothorax highly enlarged in the œdymerous males. In *C. orientalis* the presence of a short, but distinct anteocular projection characteristic of the brachypterous females and males—and particularly in œdymerous males—and head with angular eyes in the brachypterous females and males, are hardly recognisable in the macropterous counterparts. Again the maximum or minimum effects of œdymerism in so far as has been studied by the author ranges between *Nesothrips acuticornis* and *Nesothrips falcatus* where both are polyphasic, but with *N. acuticornis* showing only a lateral mesothoracic process in the œdymerous males apart from the usual enlargement of the forelegs, while *N. falcatus* shows the maximum effects of polyphasism, the œdymerous males developing several extra structures like stout, curved spines on the coxæ and femora, the foretibial teeth, the excessively enlarged foretarsal tooth, the highly elongate anteroangulars, and the development of a metanotal pterothoracic tongue-like process.

In the assessment of allomorphosis or allomorphic growth patterns, three indices appear essential for species comparison in relation to growth diversity. These indices are referred to in this work as HW/FW, HL/FL, TL/FL to denote head width/forefemoral width, head length/forefemoral length, foretibial length/forefemoral length respectively. It is only where there is lack of specialisation of the forelegs especially the foretarsus, there is very close similarity between the two sexes; but in all the mycophagous species discussed, not only are the allometric indices substantially different in the two sexes, but also very much different in the two extreme individuals—the gynæcoid and œdymerous males.

TABLE I

Allomorphic indices of some mycophagous Tubulifera (*males*)

Species	Index HL/FL		HW/FW		TL/FL	
	Gynæcoid	Oedymerous	Gynæcoid	Oedymerous	Gynæcoid	Oedymerous
Polyphemothrips cracens ..	1·1	0·8	1·00	1·25	0·65	0·45
Symphyothrips associatus ..	1·25	0·85	2·3	1·5	0·6	0·45
Sophiothrips parviceps ..	0·7	0·4	1·75	1·75	0·6	0·4
Hoplothrips fungosus ..	0·9	0·45	1·4	1·00	0·6	0·4
Hoplothrips orientalis ..	1·2	0·7	2·00	1·00	0·8	0·45
Ecacanthothrips sanguineus ..	1·2	0·8	1·9	0·6	0·8	0·65
Kleothrips agama ..	1·5	1·00	1·45	0·45	0·9	0·8
Pygothrips amplus ..	0·6	0·7	1·7	1·25	0·4	0·5
Priesneriana kabandha ..	1·1	1·00	2·2	1·7	0·75	0·6

While all the above examples discussed refer to male polymorphism, only a solitary instance of a mycophagous species has been noted by the author where major and minor females occur with striking differences between them [also seen in the gall species *Arrhenothrips acuminatus* Ananthakrishnan (1968)]. *Plectrothrips corticinus* Priesner, a new record to the Indian region and hitherto known only from the Neotropical region, is an interesting example in view of the striking differences between the major and minor females emphasising the need for a knowledge of the various morphs for correct species determination. Particular mention may be made of the following significant features in this species between the two forms: (*a*) Postoculars in major females more than twice as long, (*b*) Prothorax in major females 1·5 times as long and width at posterior margin 1·8 times as long, (*c*) Epimerals almost twice as long, (*d*) Forefemora nearly twice as long, (*e*) Development of a distinct foretibial tubercle, absent in minor females.

In view of the set patterns of differentiation accompanying the phenomenon of œdymerism in different species, it is evident that there may be a pattern determining set of genes in the males, the action of which may be suppressed in the gynæcoid males or triggered in the œdymerous males. Further studies relating to the various patterns in several other species are in progress.

Thanks are due to the U.S. Department of Agriculture for the award of a PL 480 grant (FG-in-381; A 7-Ent-77) during the tenure of which this work was possible.

1. Ananthakrishnan, T. N., *Proc. Biol. Soc. Wash.*, 1961, **74**, 275.
2. —, *Bull. Ent.*, 1965, **6**, 57.
3. —, *Bull. Nat. Inst. Sci. India*, 1967, **34**, 371.
4. —, *Curr Sci.*, 1967, **22**, 610.
5. —, *Indian J. Ent.*, 1967, **29**, 61.
6. —, *Ann. Soc. Ent. France*, N.S (In press).
7. —, *Indian Forester*, 1968 (In press).
8. —, *Senckenb. Biol. Frankfurt*, 1968 (In press).