

COMPARATIVE MORPHOLOGY OF ALIMENTARY ORGANS OF SOME PYRRHOCOROIDS (HEMIPTERA: TRICHOPTERA)*

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Comparative accounts of alimentary organs and salivary glands of *Antilochus* sp., *Dysdercus koenigii* (Fabr.), *Pyrrhocoris apterus* (Linn.) and *Scantius* sp., are given and compared in a tabular form with those of other pyrrhocoroids reported in the literature.

Key words: Comparative morphology, Alimentary structures, Pyrrhocoroidea.

INTRODUCTION

Except for the classical work of Miyamoto [1] that treated three species of Pyrrhocoroidea, and an incomplete study of *Dindymus* sp., by Kumar [2], the comparative morphology of the alimentary organs and salivary glands of the Pyrrhocoroidea found in the Indo-Pakistan Subcontinent has largely been ignored.

Mohammad *et al.* [3] and Ahmad and Mohammad [4] recently emphasized the importance of male and female reproductive organs in ascertaining the phylogenetic position of many groups within Pyrrhocoridae. More recently, Ahmad *et al.* [5] studied variations in the alimentary organs in different macropterous and brachypterous forms of *Pyrrhocoris apterus* Linn., in relation to host plants and observed that significant differences occurred in the various races. Otherwise, these aspects have largely remained unstudied in the literature.

Therefore, in this paper, the alimentary organs, including salivary glands, of *Antilochus* sp., *Dysdercus koenigii* (Fabr.), *P. apterus* (Linn.) and *Scantius* sp., are studied and compared with those given in the literature and the differences noted in Tables 1 and 2.

MATERIALS AND METHODS

Living adults studied at the Karachi University Zoological laboratory were collected from the following localities and hosts: Karachi University Campus on *Thespesia populnea* L. and *Withenia somnifera* L., from Hasan Abdal and Lahore on wild grass and from Sariab (Baluchistan) on *Althaea rosea* (L.) Cav. and *Foeniculum vulgare* Miller. Dissections and illustrations were made using procedures

especially those documented by the present authors [4,5].

RESULTS

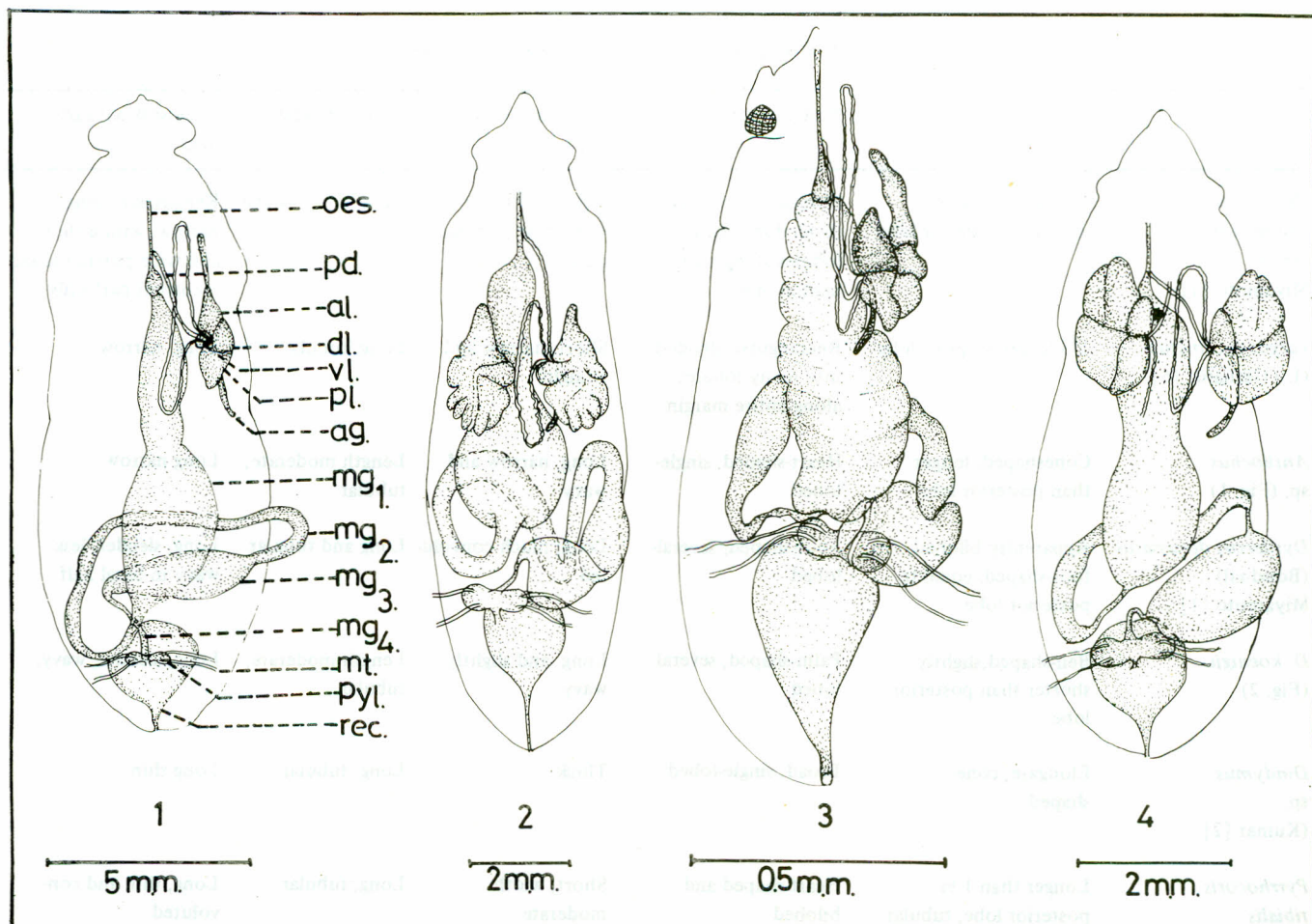
General morphological aspects of pyrrhocorid alimentary organs. The alimentary organs include the alimentary canal and a pair of salivary glands which open through long, principal salivary ducts independently into the salivary pump. The principal salivary glands are divided into four main lobes, the anterior being short or long, the dorsal small; and the posterior lobe divided into two or many lobules of different shape and size. The principal salivary duct is short or long, wide or narrow, and usually convolute. The accessory gland is usually long and tubular.

The alimentary canal is comprised of a short or long oesophagus, with or without a terminal bulbous portion; a midgut with four subdivisions m-1 or the stomach usually large and elongate; m-2, remarkably long or of moderate length and of different shapes; m-3, or bladder, position beneath the end of m-1; and the posterior tubular portion or m-4, with or without gastric caeca of variable numbers. The pylorus, appears like the anterior prolongation of the posteriorly located bladder-like sacular rectum. The pylorus also appears embedded into the dorso-posterior region of the capacious m-1, and is divided into lateral globular lobes and from its either side arise two pairs of extremely convoluted, coiled and elongate malpighian tubules. The rectum tapers posteriorly and opens to the exterior through the anus.

Comparative accounts of the salivary glands (Table 1) and alimentary structures (Table 2) for *Antilochus* sp., *D. koenigii*, *P. apterus* and *Scantius* sp. (Pyrrhocoridae) studied presently and for *D. decussatus* (Boisduval), *Dindymus* sp. and *P. tibialis* (Stal) (Pyrrhocoridae) and for *Physopelta cincticollis* (Stal) and *Largus succinctus* (L.) (Largidae) reported in the literature are outlined.

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Figs. 1-4. Alimentary canals and salivary glands dorsal view.

1. *Antilochus coqueberti* (Fabr.) 2. *Dysdercus koenigii* (Fabr.) 3. *Pyrrhocoris apterus* (Linn.); 4. *Scantius distanti* Ahmad and Zaidi

Key to the letterings

ag	accessory salivary gland	mg-3	midgut-3	pl	posterior lobe
al	anterior lobe	mg-4	midgut-4	pyl	pylorus
dl	dorsal lobe	mt	malpighian tubules	rec	rectum
mg-1	midgut-1	oes	oesophagus	vl	ventral lobe
mg-2	midgut-2	pd	principal salivary duct		

DISCUSSION

Miyamoto [1] noted similarities in the salivary glands and pylorus of several representatives of Largidae and Pyrrhocoridae. However, he noted that the Physopeltinae of the Largidae differs from Pyrrhocoridae, in having a ventral diverticulum in the rectum. It should be noted that Gerhardt [6] did not report this ventral diverticulum in the rectum of *L. succinctus* (sic. *cinctus*) a member of the subfamily Larginae of Largidae. It could well be that the structure occurs only in the Physopeltinae and separates it not only from Pyrrhocoridae but also from largines. In largids in the oesophagus terminal bulbous portion is

absent but in all pyrrhocorids known to date the terminal bulbous portion is present.

Larginae (*L. succinctus*) also differ from those of Physopeltinae (*P. cincticollis*) in the posterior lobe of their salivary gland which divides along entire margin, has a much shorter and slightly swollen midgut-2 and a large, broadly oval rectum very slightly tapering posteriorly, in contrast to the posterior lobe of salivary glands divided into many lobules along outer margin only, remarkably large tubular midgut-2 and a pear-shaped gradually tapering rectum in Physopeltinae. The principal salivary duct in physopeltines, is long and distinctly wavy near principal salivary glands in contrast to short, narrow and straight

Table 1. Comparative accounts of salivary glands

	Anterior lobe	Posterior lobe	Principal salivary duct	Accessory gland	Accessory salivary duct
<i>Physopelta cincticollis</i> (Stal) Miyamoto [1]	Tubular, nearly 1/2 length of posterior lobe	Elongately oval, subdivided into many lobules along outer margin only.	Long, distinctly wavy near principal gland	Very long, tubular	Remarkably long, narrow, with a short and wide portion along recurrent part only.
<i>Largus succinctus</i> (L.) Gerhardt [6]	1/3 length of post. lobe	Rectangular, divided into many lobules along entire margin	Short, narrow and straight	Long, tubular	Long narrow
<i>Antilochus</i> sp. (Fig. 1)	Coneshaped, longer than posterior lobe	Heart-shaped, single-lobed	Long, narrow and wavy.	Length moderate, tubular	Long narrow
<i>Dysdercus decussatus</i> (Boisdual) Miyamoto [1]	Apparently bilobed, foot-shaped, equal to posterior lobe	Foot-shaped, several-lobed	Long, much convoluted	Long and tubular	Long, slender, less wavy in basal half
<i>D. koenigii</i> (Fig. 2)	Bell-shaped, slightly shorter than posterior lobe	Palm-shaped, several lobed.	Long and slightly wavy	Length moderate, tubular	Long, slender, wavy.
<i>Dindymus</i> sp. (Kumar [2])	Elongate, cone-shaped	Broad, single-lobed	Thick	Long, tubular	Long thin
<i>Pyrrhocoris tibialis</i> (Stal) (Miyamoto) [1]	Longer than 1 1/2 posterior lobe, tubular with outer margin apically sinuate	Heart-shaped and bilobed	Short, width moderate	Long, tubular	Long, thin and convoluted
<i>P. apterus</i> (Fig. 3)	Nearly 2x length of posterior lobe with outer margin deeply sinuate	Heart-shaped, bilobed	Short, width moderate	Long, tubular	Long, thin, and convoluted.
<i>Scantius</i> sp. (Fig. 4)	As long as posterior lobe, apparently bilobed, broadly oval	Quadrangle, single-lobed	Length moderate, narrow	Long, tubular	Long, thin and convoluted

Table 2. Comparative account of alimentary organs.

	Oesophagus	Midgut ₁	Midgut ₂	Midgut ₃	Midgut ₄	Pylorus	Rectum
<i>P. cincticollis</i> Miyamoto [1]	Without terminal bulbous portion	Anterior and posterior portions, pear-shaped	Remarkably large, tubular	Bladder like	Tubular, with 2 rows of long, finger-like, gastric caeca, increasing towards hind part.	Small	Pearshaped, gradually tapering posteriorly, with ventral diverticulum.

(Continued.)

(Table 2, continued)

<i>L. succinctus</i> Gerhardt [6]	Without terminal bulbous portion	Anterior slightly swollen, posterior sac-like	Short, globular	Narrow,	With 2 rows of short uniform gastric caeca	Large	Broadly oval, very slightly tapering posteriorly.
<i>Antilochus</i> sp. (Fig. 1)	With distinct terminal bulbous portion	Anterior and posterior portions bladder-like	Long and narrow, medially swollen	Tubular	Without gastric caeca	Small and narrow	Spherical, slightly tapering posteriorly
<i>Dyndymus</i> sp. (Kumar [2])	With distinct terminal bulbous portion	Anteriorly tubular, posterior portion much swollen	Spherical	Moderate, tubular, without	gastric caeca	Wide	Oval, very slightly tapering posteriorly.
<i>Desdercus decussatus</i> Boisduval (Miyamoto, [1])	With distinct terminal bulbous portion	Anterior tubular, swollen	Long, tubular, anteriorly narrow	Spherical	Small, slender, only female with 3 rows of short, uniform gastric caeca on hinder part	Moderate, globular	Anteriorly spherical, abruptly tapering posteriorly
<i>D. koenigii</i> (Fig. 2)	With distinct terminal bulbous portion	Anterior tubular, posteriorly balloon-shaped	Short, tubular, posteriorly	Globular	Small, slender, only female with 3 rows of short uniform gastric caeca	Moderate, globular	Anteriorly much spherical, abruptly tapering posteriorly
<i>P. apterus</i> (Fig. 3)	Short, with distinct terminal bulbous portion	Anterior to posterior barrel-shaped, posteriorly constricted	Long, tubular, medially swollen	Large, pear-shaped	Short, thin and tubular, only female With 7 rows of gastric caeca	Moderate, medially constricted	Large, anteriorly much swollen Gradually tapering posteriorly.
<i>P. tibialis</i> (Stal) (Miyamoto) [1]	With a distinct terminal bulbous portion	Anterior to posterior sac-like	Short, tubular throughout	Bladder-shaped	Short, wide and tubular, female with 7 rows of gastric caeca	Globular	Broad, abruptly tapering posteriorly.
<i>Scantius</i> sp. (Fig. 4)	With indistinct terminal bulbous portion	Sac-like, posterior slightly more swollen	Length moderate, not oval, of uniform width, anteriorly and posteriorly cone-shaped, much narrowed.	Oval	Short, tubular and with out gastric caeca	Large and wide	Sac-like, immediately tapering posteriorly

principal salivary duct in largines.

Within the family Pyrrhocoridae between *Dysdercus* and *Pyrrhocoris* groups [7] the former represented by *Antilochus* sp., *Dyndymus* sp. and those of *Dysdercus* spp. have principal salivary duct usually long and wavy in comparison

to short and almost straight duct in those of *Pyrrhocoris* group represented by *Pyrrhocoris* spp. and *Scantius* spp. In *Dysdercus* group the m-4 region in non carnivorous species e.g. *Dysdercus* spp. are with 3 rows of gastric caeca in females in contrast to those of *Pyrrhocoris* group e.g.

Pyrrhocoris spp. with 7 rows of gastric caeca in females. In both the groups the carnivorous species e.g. *Antilochus* sp., *Dindymus* sp. and *Scantitus* sp. the gastric caeca are absent in both sexes, similar to those reported in other *Trichophora* [8] of carnivorous habits.

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