Scanning electron microscope study of the palar pegs
of three species of Corixidae (Hemiptera)

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ABSTRACT. Scanning electron microscope studies were performed on the
palar pegs of male forelegs of Trichocorixa sexcincta, Sigara alternata and
Hesperocorixa interrupta. The studies showed the pegs to be basically conical
and chevron-ridged, with a wide base that tapered off to a narrow apex. Clear
species differences were apparent with respect to the size of the peg, the number
of ridges on an individual peg, and the number and arrangement of the pegs on
the pala. The possible behavioural and evolutionary significance of the palar
pegs is discussed in relation to mating.

Introduction

The existence of a row of pegs on the pala,
the single jointed anterior tarsus, has been
noted in the males of all species of Corixinae.
It was at one time believed to produce the
sounds heard during mating. This theory
was abandoned when von Mitis (1936; see
also Butler, 1923) implicated the pars stridens
in this function. Larsen (1938) suggested the
peg row was used to grasp the female
during copulation and Popham (1961)
explained how this hold was achieved. First,
the male darts to the back of the female and
presses his flattened head against her pro-
notum. Then he extends his front legs sideways
so that the ‘distal pegs become caught under
the curved longitudinal ridge of the lateral
flange of the hemelytron’ (Popham, 1961).
This firm clasping permits the two sexes to
swim around while in copula. Furthermore,
Popham described the peg as composed of a
‘circular base on which is a short peduncle
supporting a larger conical structure’. The
peg is not inserted perpendicularly but rather
is slanted toward the centre of the pala.

Our study deals with three species of
Corixinae collected in New Haven, Connecticut.

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It focuses on the microscopic characteristics
of the palar pegs with respect to their beha-
vioural and evolutionary significance.

Procedure

Specimens were maintained in water, and air-
dried for several days before dissection and
mounting. Species were identified using
Hungerford’s (1948) guide to Corixidae of
the Western Hemisphere. The forelegs were
taken off by inserting a dissecting needle
into the region between the femur and thorax
and snapping them off in a lever-like motion.

The scanning electron microscope used was
the ETEC Corporation Autoscan with speci-
men stages up to 5 cm in diameter. Forelegs
were secured to the stages by double stick
tape and coated with gold-palladium to
prevent ‘charging’. Close-up photographs of
the pegs were made at similar powers of
magnification (1800x and 2200x) to
facilitate interspecific comparison.

Results

Scanning electron microphotographs of the
palae and the pegs revealed interesting
distinctions between the species. As is well

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known (e.g. Hungerford, 1948), the peg row of *Sigara alternata* (Say) (Fig. 1) has about thirty-three pegs lying close to the dorsal margin. The much smaller *Trichocorixa sexcincta* (Champion) (Fig. 2) has fourteen pegs in the row, lying along the midline, while the large *Hesperocorixa interrupta* (Say) (Fig. 3) has twenty-eight pegs lying slightly off the midline. The pegs appear as conical projections, but they are ornamented with an entirely unsuspected set of chevron-shaped ridges. On the squat
and stubby pegs of *H. interrupta*, the largest species, and of *T. sexcincta*, the smallest species studied, there are usually ten such ridges (Figs. 4 and 5 respectively), while on the slender, pointed pegs of *S. alternata* there are thirteen to sixteen (Fig. 6). In some cases, the two sides of the chevron do not meet. In *H. interrupta* the eight most distal pegs are small and have reduced (four) ridges (Fig. 7). These small pegs probably
are out of line when the pala is used in grasping the female, and thus of little functional significance,

**Discussion**

In the laboratory, pairs *in copula* both alive and instantaneously killed by boiling water, were examined to determine the actual mating configurations. It was evident that the male has two separate methods of grasping the female. As he mounts the female, he splits his abdomen between the fifth and sixth segments on the side displaying the strigil. The female inserts her abdomen in the resulting
groove, so that the distal part of his abdomen is underneath hers and the strigil is in contact with her ventral side. Quite possibly, the male scrapes or strokes (moves the strigil back and forth across the female's abdomen) the strigil against the hard surface of the female's abdomen producing one of the sounds heard during mating. In *Micronecta*, King (1976) has found that the strigil is used in sound production by scraping the organ against the sharp, smooth edge of the fifth segment as part of the premating behaviour. It may be suggested that, as the stridulatory mechanisms of the front legs were developed, the strigil has evolved rather differently in the Corixinae.

In addition to the abdominal hold, the male grasps the female using his front legs. He slides the row of palar pegs into the lateral flange of the hemelytron. The pegs with ten to sixteen chevron-shaped ridges (sometimes rather asymmetrically aligned) may reasonably be regarded as increasing friction and therefore providing a firmer grasp of the female. This double hold securely attaches the female and allows the two to swim together while *in copula*.

Popham (1961) also suggested an evolutionary relation and explanation for the different arrangements and sizes of the pegs. He hypothesized that more primitive species have straight front legs (pala—tibia—femur) and a functional peg row which is parallel to and runs along the entire dorsal margin of the pala (e.g. *Hesperocorixa sahlbergi* (Fieb.)). In contrast, more advanced species (e.g. *Sigara distincta* (Fieb.)) have evolved a curved tibia which improves their filter feeding technique. In line with this change, they also have a characteristic arrangement of two types of pegs on their triangular curved pala. On the distal half of the pala, these pegs are fully developed (large and pointed) and chevron-ridged while on the proximal half they are vestigial and undeveloped.

Our findings corroborate and elaborate on Popham's theory. In observing *H. interrupta* and *S. alternata* (by coincidence two of the same genera considered by Popham) we noticed that the former species had a straight front leg and a rectangular pala with two types of pegs (Fig. 4): a long straight row of chevron-ridged pegs along the dorsal margin which are apparently used for grasping the
female (Fig. 5), and a small clump of less well differentiated semicircularly-ridged pegs at the distal tip which are out of line and probably not involved in grasping (Fig. 7). The other species, *S. alternata*, also had two types of pegs, but their arrangement is reversed. That is, the distal pegs are chevron-ridged and developed while the proximal ones are vestigial. This is undoubtedly a consequence of the curved tibia which now forces the proximal region of the pala out of line for grasping, leaving only the distal pegs of the pala functional for grasping (Fig. 1).

It may be suggested that differences in size, shape and arrangement of pegs on the pala are another part of species isolating mechanisms in corixids. Thus, if a male of one species attempts to clasp the female of another, his peg row will either not fit into the lateral flange of the hemelytron, or the pegs will be too large or too small to fit in comfortably.

Acknowledgments

Our thanks are due to Dr Alan Pooley for the electron microscopy and to Dr Keith Thomson for making this research possible.

References


Received 18 July 1977