branches. The number of comb scales is usually between 40 and 60, and each individual scale is relatively small. The siphonal index is variable, and the siphon is usually slender and moderately to extremely long. At least 4–6 siphonal setae (1-S) are inserted along the ventral surface of the siphon, either paired or arranged in a straight or zig-zag row. The pecten teeth in some species are widely spaced distally. The saddle usually completely encircles the anal segment, and the saddle seta (1-X) is often branched. The precratal tufts (4-X) are usually reduced in number or absent, and the anal papillae are variable in shape and size.

The genus *Culex* with more than 750 described species from 24 subgenera world wide comprises only a few non tropical species. In Europe, species of the subgenera *Barraudius*, *Culex*, *Maillotia* and *Neoculex* can be found and most of them have a Mediterranean and/or central European distribution.

Several tropical *Culex* species from Asia and Africa are well known for transmission of lymphatic filariasis and various viral diseases.

10.3.1 Subgenus *Barraudius* Edwards

Members of the subgenus are small brownish species. The proboscis of the female is shorter than the fore femur, the margin of the eyes is usually ornamented with narrow scales, and the vertex has erect and broad light scales. The scutum has uniform brownish scales, and the scutellum is usually light scaled. The hind tarsomere I is distinctly shorter than the hind tibia. The abdominal terga are dark scaled without transverse pale bands, but basolateral pale patches of scales may be present, and the sterna have light scales. The palps of the male are longer than the proboscis, without long setae, but are covered with a few short spines. The gonocoxite is covered with small scales on the outer surface. The subapical lobe of the gonocoxite arises slightly beyond the middle, not as far apically situated as in the majority of other *Culex* species, with a number of spine-like or hair-like setae; any transparent, broad scale-like setae are absent. The gonostylus is slender, the paraproct apically has a group of small spines forming a paraproct crown, and the aedeagus has dorsal and ventral arms. The head of the larva is broader than long, the antenna is as long as the head or slightly longer and more spiculate towards the tip, and the antennal seta (1-A) is multiple-branched. The comb scales are numerous, small and elongated. The pecten occupies about half of the siphon length; each tooth has several lateral denticles. The siphonal tufts (1-S) are arranged in a zig-zag row on the ventral side of the siphon, and the main tracheal trunks are broad. The saddle entirely surrounds the anal segment, precratal setae (4-X) are absent, and the anal papillae are short.

The small subgenus *Barraudius* embraces only four species so far, *Cx. richeti* Brunhes and Venhard is only known in Nigeria and *Cx. inatomii* Kamimura and Wada reported from Japan. The two other members of *Barraudius*, *Cx. modestus* and *Cx. pusillus*, are partly distributed in the European region.

Culex (*Barraudius*) *modestus* Ficalbi 1889

Female: The proboscis is dark brown, paler on its ventral surface from the base to the middle, and slightly swollen at the apex. The palps, clypeus and flagellum of the antenna are dark brown. The vertex has dark brown setae which are directed anteriorly between the eyes. The head is covered with brown or yellowish narrow scales, with some broader pale scales on each side, and the occiput has dark brown erect and forked scales. The integument of the scutum is brown, and covered with chestnut-brown scales, rather lighter on the scutellum and in front of it. Fine, blackish setae are scattered mainly along the margin of the scutum, along the dorsocentral stripes and above the wing roots. The setae are more conspicuous and longer on the scutellum. The pleurites are pale brown, with small patches of pale scales on the mesepisternum and upper mesepimeron, 3–6 postpronotal setae, and one lower mesepimeral seta is present. The legs are mainly dark brown, the fore and mid femora have pale scales on the posterior surface, and the hind femur is pale except for the dorsal surface which is brown scaled, and the pale knee spot is distinct. The tibiae are dark brown dorsally, with pale scales on the ventral surface. All tarsomeres are dark scaled, and the hind tarsomere I is shorter than the hind tibia (Fig. 6.51a). The wings are entirely dark scaled, and the cross veins are well separated. The terga are dark brown scaled, transverse pale bands are

absent, but lateral pale patches usually form a continuous pale border on either side of the abdomen. The sterna are uniformly covered with pale yellowish scales. The abdomen is blunt ended, which separates the species from the similarly coloured females of *Ae. cinereus*.

Male: The palps are almost devoid of setae, and are longer than the proboscis. The long palps separate the males from the similarly coloured males of *Ae. cinereus* which have palps which are considerably shorter than the proboscis. The gonocoxite is approximately twice as long as it is wide with more or less dense scales on its outer surface (Fig. 10.91). The lobe of the gonocoxite is situated slightly beyond the middle of the gonocoxite and is divided into two distinct tubercles. The proximal one bears 2–3 spines of different size, 1 or 2 of them may be curved apically, and the more distal tubercle carries 2 strong setae. Broad transparent scale-like setae are absent. The gonostylus is long and slender (longer than in the similar *Cx. pusillus*), usually more than half as long as the gonocoxite, evenly tapering apically and curved in the apical half. The apex of the paraproct has one row of spines forming a paraproct crown. The ventral arm of the aedeagus is short, only slightly curved or nearly straight at the apex and not extending beyond the paraproct crown. The dorsal arm of the aedeagus is conspicuously bent upwards.

Larva: The antenna is moderately spiculate, slightly longer than the head, curved, darkly pigmented at the base and distinctly narrowing from the insertion point of the antennal seta (1-A) to the apex. Seta 1-A is inserted beyond the middle of the antennal shaft, and is half as long as the antenna, with 15–25 branches. The inner frontal seta (5-C) has 3–5 branches, the median frontal seta (6-C) has 3–4 branches and the outer frontal seta (7-C) has 7–8 branches. The comb consists of a patch of 50 or more fringed scales which are more or less rounded apically. The siphon is straight, the main tracheal trunks are broad, and the siphonal index is about 4.0–5.0 (Fig. 10.92). The pecten has about 12 relatively widely spaced teeth situated in the basal half of the siphon, and most of the teeth have 4–5 lateral denticles. Setae 1-S has 10–12 tufts arranged in a more or less ventral zig-zag row. The basalmost tuft arises proximal to the distalmost pecten tooth, and the distalmost tuft is located close to the apex of the siphon. Each tuft is slightly shorter, or occasionally slightly

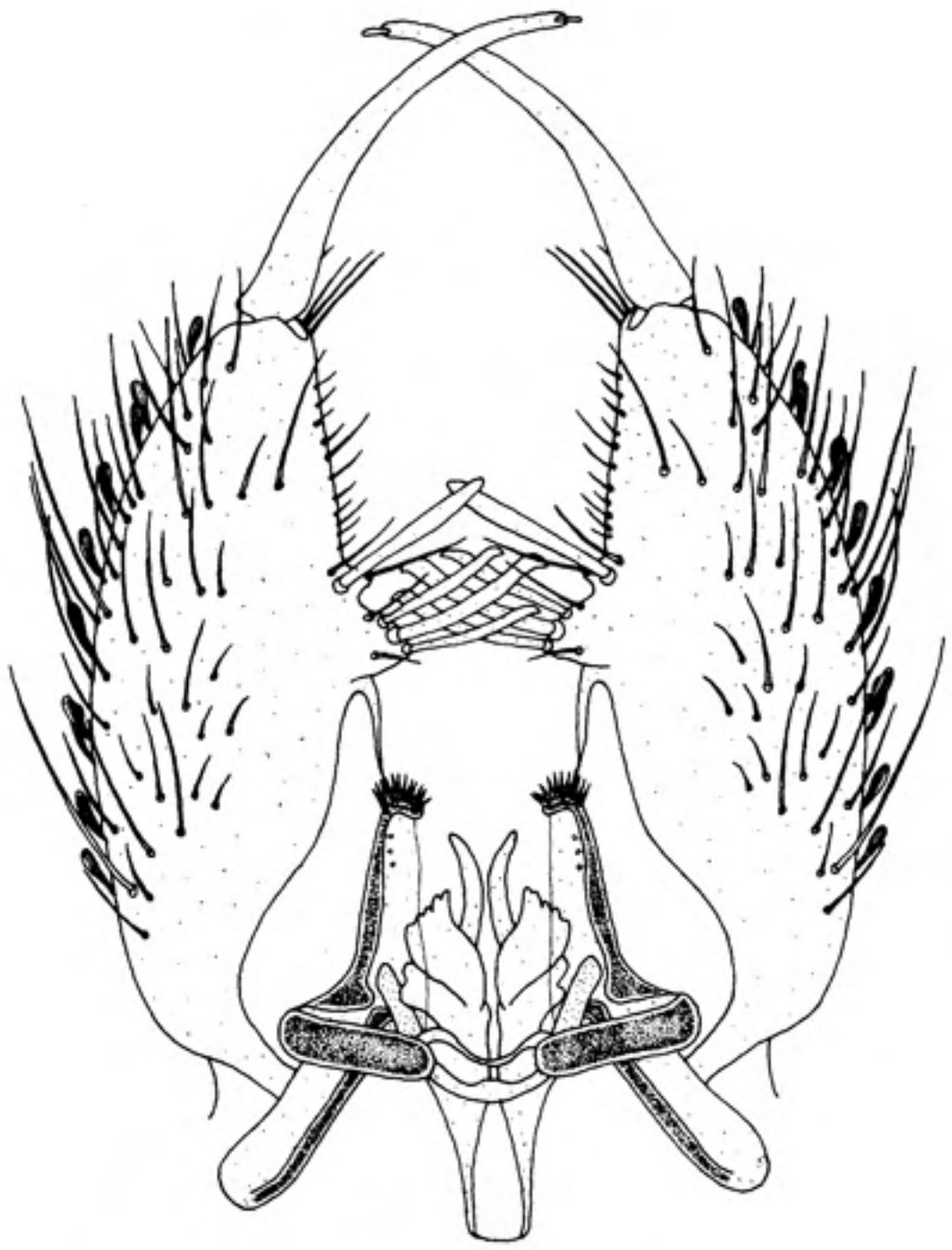

Fig. 10.91 Hypopygium of *Cx. modestus*

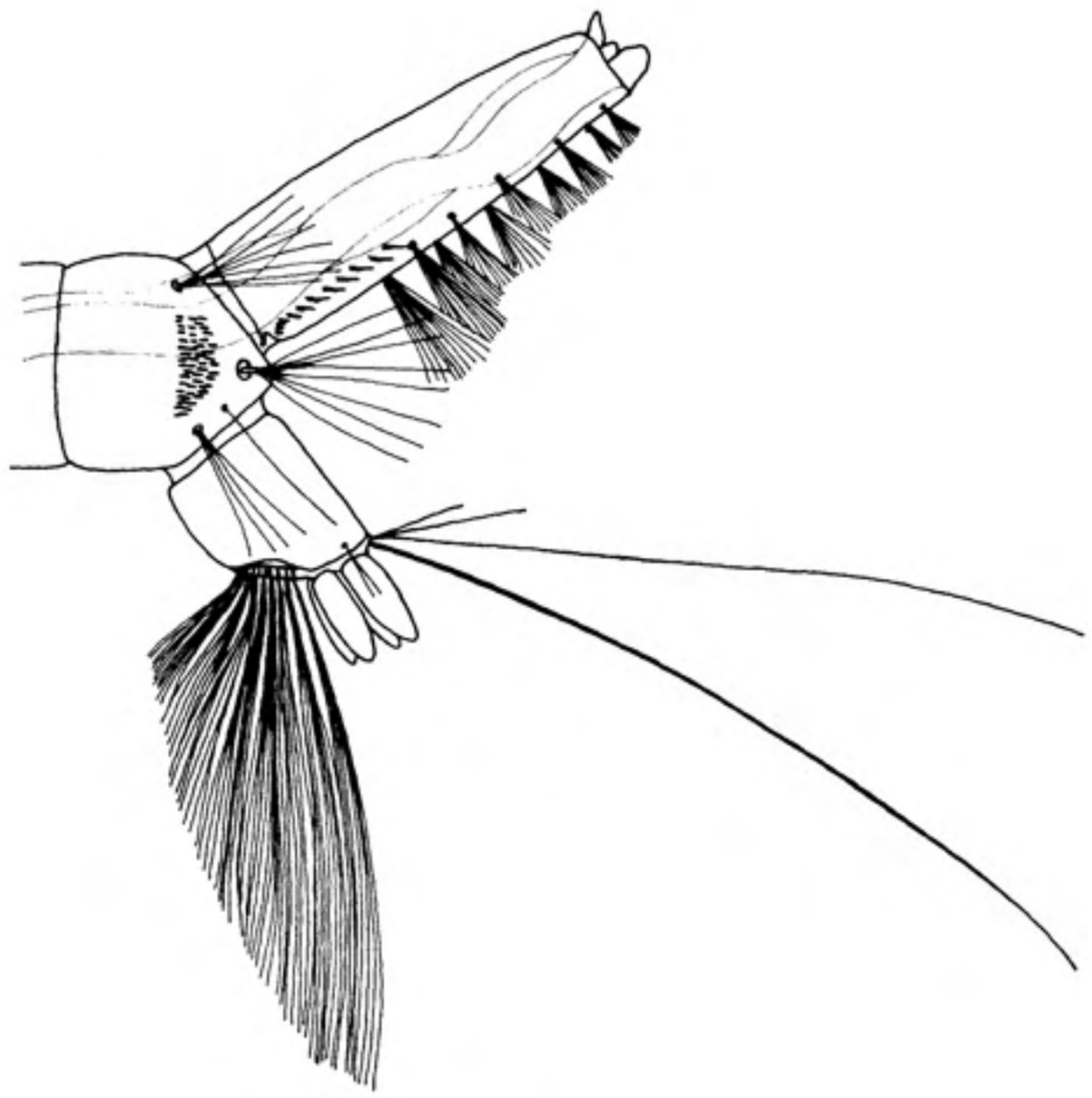

Fig. 10.92 Larva of *Cx. modestus*

longer than the width of the siphon at the point of its insertion. The saddle is as long as it is wide or slightly longer and completely encircles the anal segment. The saddle seta (1-X) is small with 2–3 branches. The upper anal seta (2-X) has 3–4 branches, one branch longer than the others, and the lower anal seta (3-X) is long and single. The ventral brush has 10–13 cratal setae (4-X). The anal papillae are shorter than the saddle, slender, and tapering.

Biology: The larvae show a preference for shallow sunlit habitats and are frequently found on meadows, in irrigation channels, inundation areas of rivers, or rice fields. Other common breeding waters are ground pools, ponds, swamps, and marshes with rich vegetation; the water may be fresh or slightly saline. In southern Europe they are mainly found in salt water marshes (Ribeiro et al. 1988) and rice fields. The larvae occur from late spring until late autumn and they are often found together with those of the *Anopheles* species. In central Europe the seasonal maximum of the adult population is recorded from the beginning of July to late September. Usually the females do not enter buildings, but readily bite humans outside, often during the day at sun and wind exposed places. They may cause a considerable nuisance in some regions, especially in late summer when the floodwater *Aedes* and *Ochlerotatus* species have already vanished.

Distribution: *Cx. modestus* is widely distributed in the Palaearctic region from England to southern Siberia. It is recorded from middle and southwest Asia, northern India, and northern Africa. In Europe it is a common species in the southern and central countries.

Medical importance: The species has repeatedly been reported as an arbovirus vector of two different Bunyaviremia, Tahyna and Lednice (Lundström 1994) and is also regarded as a potential vector of WNV (Ribeiro et al. 1988). In addition, it has been found naturally infected with tularemia (Gutsevich et al. 1974)

Culex (*Barraudius*) *pusillus* Macquart 1850

Female: It can be distinguished from the closely related *Cx. modestus* by its commonly darker colouration and the separated basolateral pure white patches of scales on the abdominal terga, which do not form a continuous longitudinal stripe usually present in *Cx. modestus*. The proboscis, palps and clypeus are dark brown, the proboscis is apically swollen and shorter than the fore femur. The pedicel is dark brown with a tuft of brown scales, and the flagellum is dark brown. The occiput is brown with golden narrow scales and dark forked scales, and the sides are scattered with whitish scales. All decumbent scales of the vertex are narrow and golden, with a few dark setae, directing anteriorly between the eyes. The integument of the scutum is brown, and covered with brown narrow scales and blackish brown setae. The scutellum is brown, occasionally with a pale greenish shine, with brown coarse setae. The pleurites are brown with large patches of pale scales, but prealar scales are absent. The femora have brown scales, usually slightly paler on the ventral surface, with an indistinct knee spot. The tibiae and tarsomeres are dark brown scaled, and the hind tarsomere I is shorter than the hind tibia. The wings are entirely dark scaled, and the cross veins are well separated. The abdominal terga are dark brown with separated basolateral spots of white scales, and the sterna are uniformly covered with whitish grey scales.

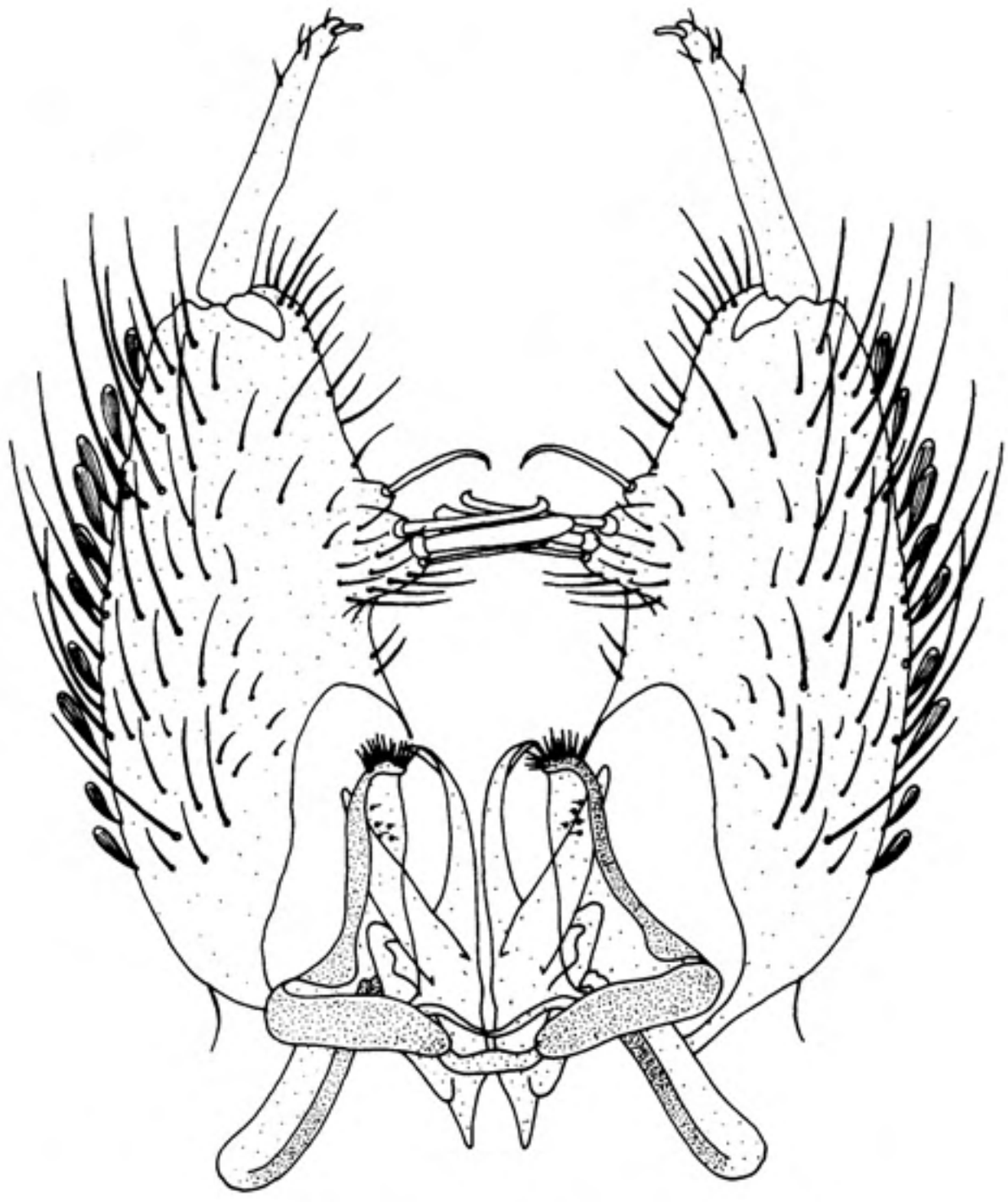

Fig. 10.93 Hypopygium of *Cx. pusillus*