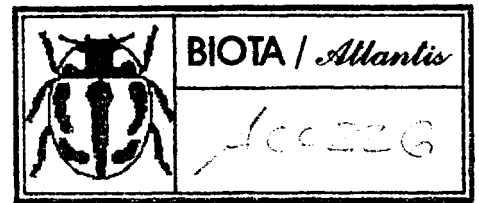


# A review of the Palearctic blackfly subgenus *Simulium* (*Rubzovia*) with the emphasis on *S. (R.) paraloutetense*, a species confined to Gran Canaria Island (Diptera: Simuliidae)

R. W. CROSSKEY, B. MALMQVIST and A. N. NILSSON



Ent. scand.



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The larval and pupal stages of *Simulium* (*Rubzovia*) *paraloutetense* Crosskey are described following their first discovery in a spring trickle in Gran Canaria Island where the species is endemic; data from the polytene chromosomes of the larval silk glands are included. Subgeneric placement of the species is revised in light of all the findings. A diagnosis for the subgenus *Rubzovia*, a discussion of its geographical distribution and habitat, and a key to the four known species are included.

R. W. Crosskey, Department of Entomology, The Natural History Museum, Cromwell Road, London SW7 5BD, UK.

B. Malmqvist & A. N. Nilsson, Department of Animal Ecology, Umeå University, 901 87 Umeå, Sweden.

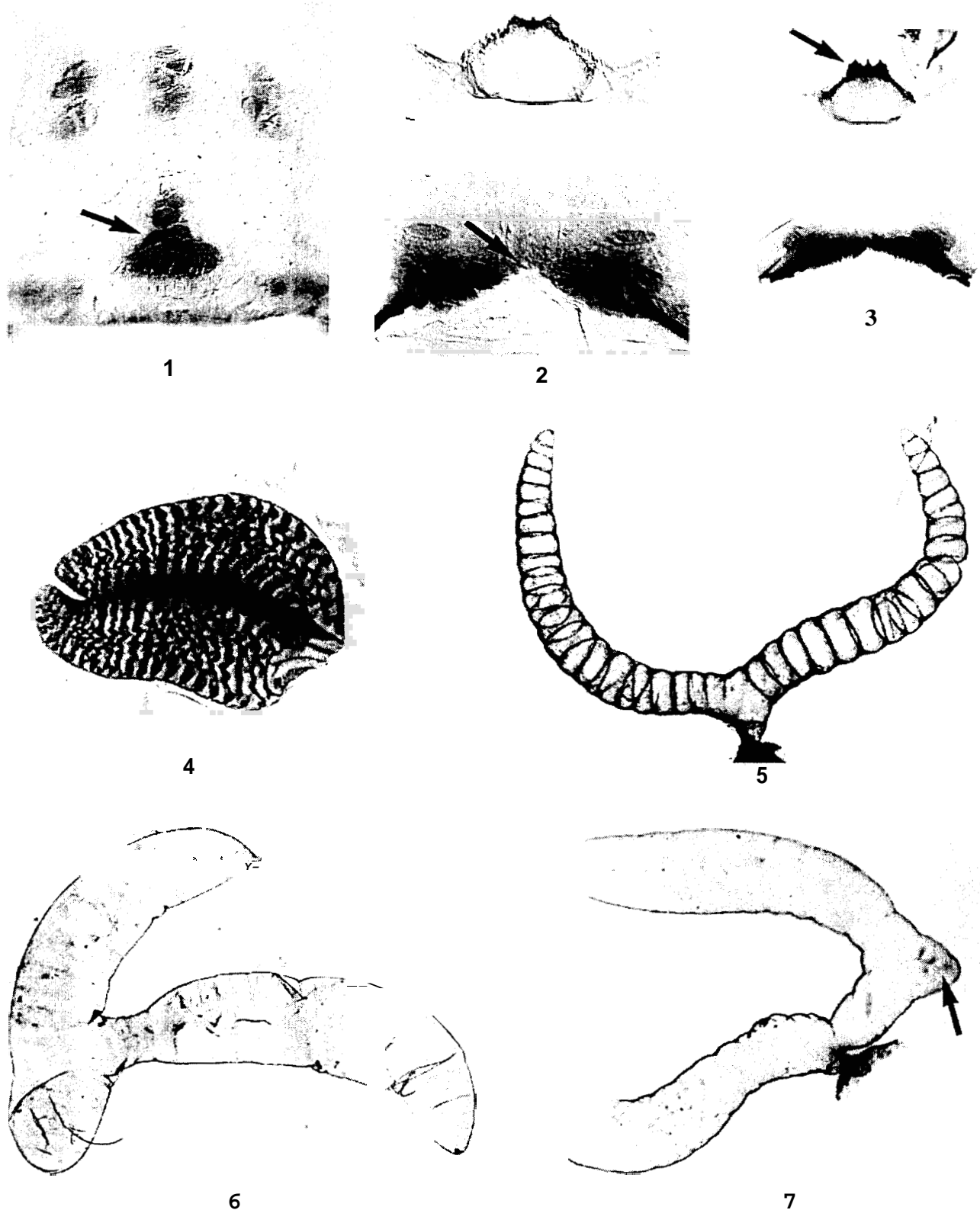
## Introduction

The volcanic Canary Islands such as Tenerife and Gran Canaria were once richly supplied with running streams (aguas manantiales), as well shown by the abundance of deep, radiating, and now almost entirely dry ravines (barrancos) that scar their mountainous flanks. The situation now is very different. Human demand for water is such that almost all the potential supply to streams, especially in Tenerife, is captured in hundreds of tunnels (galerias) and delivered in pipes to satisfy the needs of agriculture and urbanization; little of it finds its way into natural stream beds or breaks out in springs. The disappearance of permanent streams, from natural and man-made causes, has been particularly drastic in Gran Canaria, where they declined in number from 285 to 20 (and in flow from about 1000 to 150 litres per second) in the forty years prior to 1973 (Afonso Pérez 1980) and where – the situation having deteriorated still further – it is now very hard to find any running water at all, even in spring after wet winters. As Malmqvist et al. (1995) have discussed, in relation to Tenerife, such near-total disappearance of lotic

habitat could be disastrous for many freshwater macroinvertebrates – and totally disastrous for Simuliidae because their immatures are adapted for existence only in a running water environment.

Ten years ago one of us (R.W.C.) published a taxonomic account of the simuliid fauna of the Canaries in the main text of which it was suggested, in the belief that running water no longer existed there, that blackflies were already extinct in Gran Canaria; however, while the paper was in press our colleague Marcos Báez (University of La Laguna, Tenerife) visited Gran Canaria and found two just-flowing streams in which simuliid larvae and pupae were present; this was noted by an addition in proof at the end of the work (Crosskey 1988b: 355). Since that time we have each had the opportunity to prospect for running water habitat in Gran Canaria, as the result of which several breeding sites for blackflies have been discovered.

The most unusual of these breeding sites is a spring-fed trickle in the Barranco de Guayadeque where some unidentifiable *Simulium* larvae were found by B.M. and A.N.N. in March 1994 and recognized from taxonomic study (by R.W.C.) to be



Figs 1-7. Larval and pupal characters in species of *Simulium* (*Rubzovia*): (1) *S. paraloutetense*, positive head-spots of larval cephalic apotome showing (arrowed) sagittate form of the posteromedian spot; (2) *S. paraloutetense*, larval head capsule venter showing (arrowed) virtually absent postgenal cleft; (3) *S. vantshi*, larval head capsule venter showing (arrowed) more or less trifold form of the hypostomium; (4) *S. paraloutetense*, pharate pupal gill; (5) *S. paraloutetense*, pupal gill in lateral view, as seen in slide preparation with transmitted light; (6) *S. knidirii*, pupal gill, as seen slightly flattened in slide preparation to show the almost triramous form; (7) *S. lamachi*, pupal gill, showing (arrowed) the characteristic elbow-like projection at the base of the upper arm (tips of arms missing). (Note: because of rarity of the species fresh material was not available for figures 6 and 7 and the poorly defined annulation and pallid appearance of the gills are due to long alcohol storage of the pupal exuviae used for the preparations.)

of exceptional interest. Later collection of pupae containing pharate adult male flies (also by B.M. and A.N.N.) made it possible to study slide-mounted and dissected genitalia and thereby to associate the aquatic stages with the species earlier described by Crosskey (1988b) on the basis of wild-caught adults from Gran Canaria as *Simulium* (*Nevermannia*) *paraloutetense*. (These adult flies had been collected in 1931 by the Finnish entomologist R. Frey when on an expedition to the Canaries and remain in the Zoological Museum in Helsinki.) Discovery of the early stages of *S. paraloutetense* offered a new insight into the affinities of the species, which R.W.C. had thought to lie with the Afrotropical species *S. loitetense* Roubaud & Grenier in the subgenus *Nevermannia* Endlerlein: in fact, *S. paraloutetense* unequivocally belongs to the small and very little-known Palearctic subgenus *Rubzovia* Petrova, members of which are very rare inhabitants of spring-fed and glacier-fed streams. The taxonomic investigation of *S. paraloutetense* led R.W.C. to a wider look at the subgenus *Rubzovia* and we now present a paper with four main purposes, to: (a) describe the hitherto unknown larval and pupal stages of *Simulium* (*Rubzovia*) *paraloutetense* Crosskey, (b) establish the reasons for assignment of this species to the subgeneric taxon *Rubzovia*, (c) provide a diagnosis of this subgenus, and (d) provide a key to the four known species of *Rubzovia*.

***Simulium* (*Rubzovia*) *paraloutetense* Crosskey**

(Figs 1, 2, 4, 5, 8-11, 1213)

*Simulium* (*Nevermannia*) *paraloutetense* Crosskey, 1988b: 330. Holotype ♂ and 2 ♂ and 2 ♀ paratypes: CASARY ISLANDS: Gran Canaria, Las Lagunetas. 22. viii. 1931 (R. Frey) (Zoological Museum, Helsinki except for paratype of each sex in Natural History Museum, London). [Examined.]

*Description.* – Adult ♂ and ♀: See Crosskey (1988b, text pp. 330-331 and figures 52-60, p. 348).

Larva (last instar): Length approximately 7.5-8.5 mm. Head pale honey yellow with positive brown head-spots, ground colour darkened to yellowish brown on most of venter and to varying extent above eyebrow stripe and in front of stemmata; cephalic apotome with all sets of spots equally developed, posteromedian spot with characteristic sagittate form (Fig. 1, arrowed); sides of head capsule below stemmata with a pair of small circular

spots (sometimes faint) and with large dark spots against postociput. Stemmata normal. Postgenal cleft almost absent, at most represented by a shallow widely triangular or trapezoidal excavation (Fig. 2, arrowed) or by a tiny median incision. Hypostomium slightly trifold (as in *vantshi*, Fig. 3) but with usual number of apical teeth, median tooth moderately long, each corner tooth forming a somewhat nipple-like projection from lobate development of anterolateral area of hypostomial plate; intermediate teeth small, central one recessed in relation to those on either side, all intermediate teeth with their axes directed slightly outwards instead of directly forwards; lateral serrations very jagged, 5-8 on each side; hypostomial setae in very irregular rows, 10-14 of varied size on each side. Antenna extremely long and slender, much longer than stem of cephalic fan, colourless, without trace of secondary annulation. Mandible with normal brushes, main apical tooth rather narrow and other apical teeth small and inconspicuous; comb-teeth irregular, weak and rather spinous; distal mandibular serration very large, long-triangular and sharply pointed, basal serrations tucked in closely to base of distal serration and very small, two or three in number. Cephalic fan with 22-25 primary rays. Thorax and abdomen very pale, dirty whitish or creamy white, without segmental mottling but most specimens with some pale purplish chromatocyte patches dorsally on swollen part of abdomen; ventral nerve cord not conspicuous except for most distal ganglia (these reddish purple and sometimes only last ganglion visible). Abdomen widest at sixth/seventh segments, body profile as typical for species with ventral papillae; thoracic proleg rather short, its circlet with few hook rows and very few hooks in each row. Cuticle bare except for minute colourless hairs on dorsal swellings of last abdominal segment [similar to those in *lamachi* as illustrated by Doby & David (1960: fig. 27b)]. Pharate pupal gill with two massive elements each strongly marked with closely parallel serpentine wrinkles manifesting annulations of free pupal gill (Fig. 4), very black in fully mature condition. Abdominal ventral papillae very strongly developed, conspicuously pointed when seen in larval profile. Anal sclerite of normal X shape, basal halves of upper arms widely connected by sclerotization [similar to that in *knidirii* illustrated by Giudicelli & Thiery (1985: fig. 5E)]. Accessory sclerites absent. [Rectal organ lobes not extruded in any specimen seen.] Posteri-

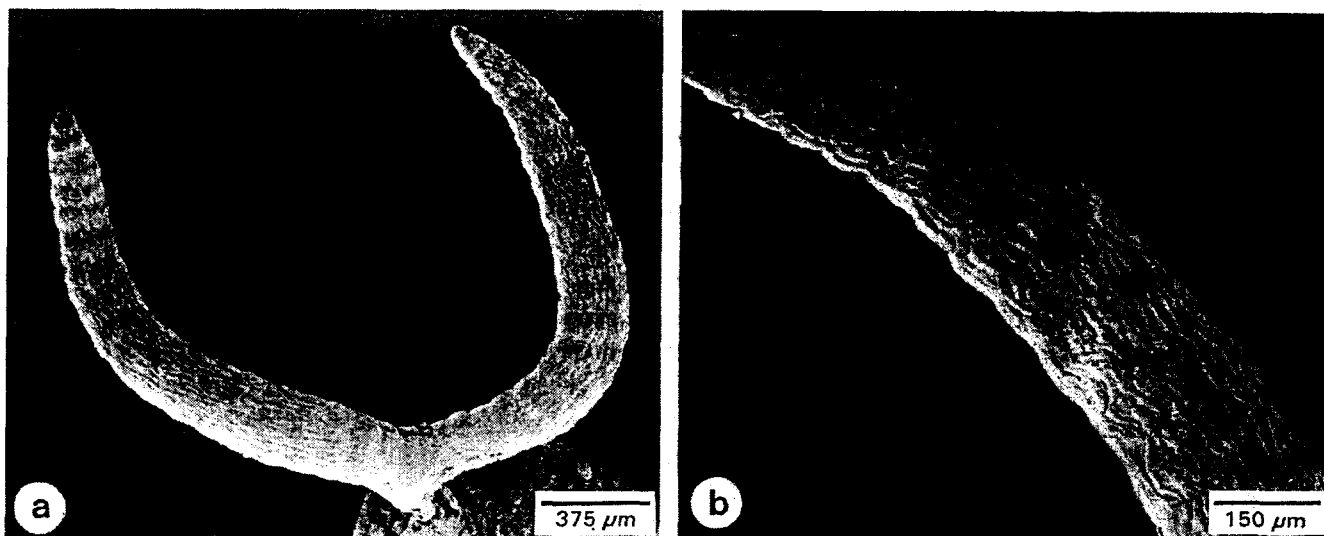
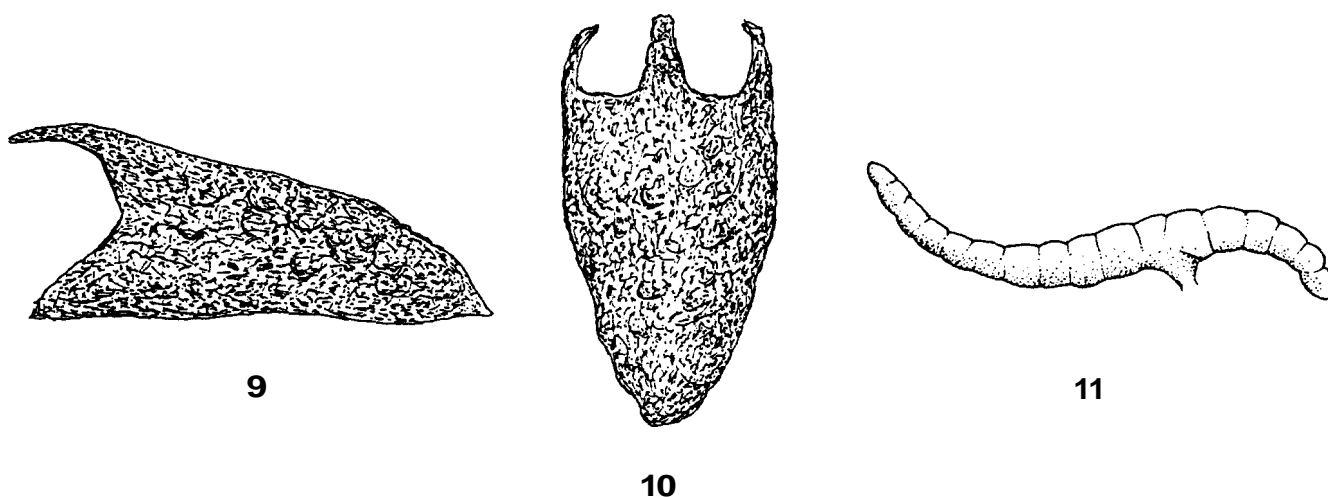


Fig. 8. Pupal gill of *Simulium (Rubzovia) paraloutetense* as seen by SEM: (a) whole gill in lateral view; (b) enlargement of tip of the upper arm showing more detail of surface sculpture.

or circlet with about 85 rows of 12-15 hooks per row.

Pupa: Body length 3.2-3.7 mm (gills excluded). Gill biramous (Fig. 5 and Fig. 8), very large and obvious, configured in U-like form (cf. S-like form in *vantshi*, Fig. 11) with two stout arms lying more or less in vertical plane, arms only very slightly tapering and upper arm without trace of an 'elbow' near base (cf. *lamachi*, Fig. 7); both arms with marked annular structure, each showing some 18-22 shallow annular constrictions along its length (these very conspicuous in slide preparation, Fig. 5), sections between constrictions with fine and irregular longitudinal grooving (this most obvious in dried gill and under SEM, Fig. 8); lower arm

swept strongly downwards to abut substrate. Head plate and thoracic dorsum appearing granular at low magnification, closely covered with domed or slightly thorny microtubercles, outline shape of these subcircular or irregular. Trichomes minute, very inconspicuous, simple hair-like. Abdominal ciiticle very delicate, tergal and sternal plates only faintly detectable (except sternum of segment 8) and with microgranular surface. Terminal segment sclerotized as normal, paired tubercles in form of small sharp thorns. Abdomen with normal ground plan onchotaxy but without dorsal spine-combs: segments 3 and 4 dorsally with usual four hooks each side, segments 5-7 ventrally with usual pair of hooklets each side (those on 5 closer than oth-



Figs 9-11. (9 and 10) Pupal cocoon of *Simulium (Rubzovia) paraloutetense* in lateral and dorsal view showing the elongate anteromedian projection ('horn') occurring in this species; (11) pupal gill of *S. vantshi*, lateral view to show the widely sinuous S-configuration in this species (drawn after Petrova 1983).

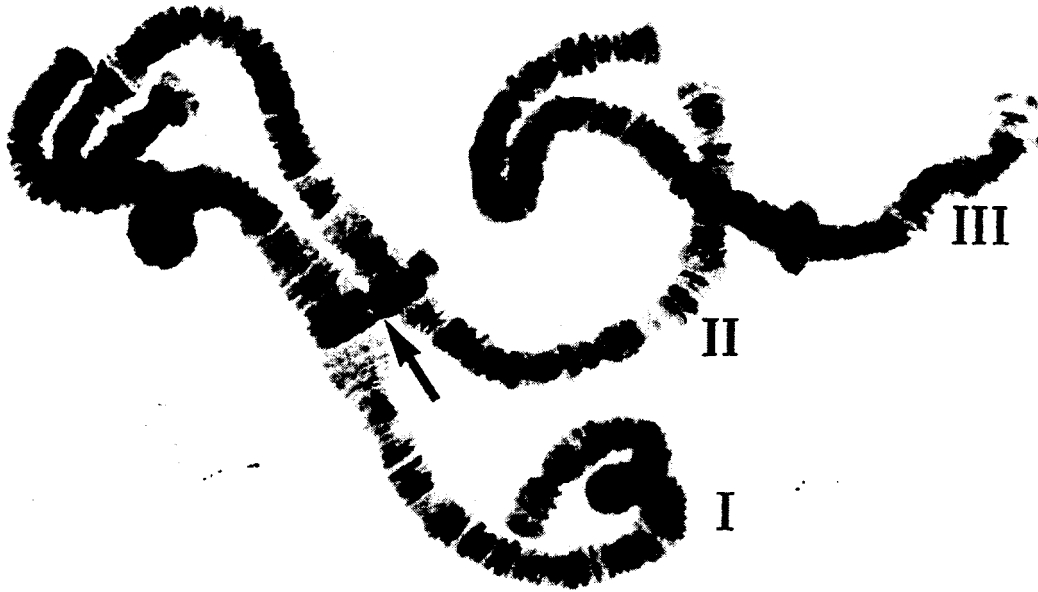


Fig. 12. Larval polytene chromosome complement of *Simulium* (*Rubzovia*) *paraloutetense*, with Roman numbering of chromosomes conventional in simuliid cytotaxonomy and arrow marking the closely associated centromeres of chromosomes I and II in this species.

ers), in addition segment 2 dorsally with 4 spinous hairs each side, segment 3 laterally with 3-4 fine hairs, segment 4 lateroventrally with 2-3 fine hairs, sides of segment 5 with one or two minute hairs.

Cocoon: Length 4.2-4.5 mm (including 'horn'). Slipper-shaped, enclosing most of pupal body, not flared laterally but with long and narrow antero-medial projection ('horn') that is much longer than its basal width (Figs 9 and 10). Without neck (pupal head applied close to substrate). Closely woven (strandwork not evident even with transmitted light) but having rather lumpy appearance and haphazardly incorporating minute particles of sediment. Rim and base of 'horn' somewhat lumpily thickened.

Chromosomes (Fig. 12): Polytene chromosomes of larval silk glands with normal haploid number 3 ( $2n = 6$ ); nucleolar organizer in chromosome II immediately next to its centromere; no large heterochromatic chromocentre but strong tendency for centromeres of chromosomes I and II to associate in a partial chromocentre (indicated by arrow Fig. 12); sex chromosomes undifferentiated; polymorphisms not observed. [Data from P.H. Adler, based on preparations from five female and two male larvae.]

*Material collected.* - CANARY ISLANDS: Gran Canaria, mountainside spring in Barranco de Guayadeque, c. 15 km WNW of Agüimes [UTM grid reference DR498898], 970 m: 8 larvae, 27.iii.1994 (Malmqvist & Nilsson); 29 larvae, 1 pupal cocoon, 29.iii.1995 (Crosskey); 3 pupae [all containing pharate adult male flies], 16.xi.1995 (Malmqvist & Nilsson); 1 larva (immature), 18.iii.1997 (Crosskey).

*Distribution.* - Endemic to Gran Canaria island, where still known from only two places: Las Lagunetas (source of adult type specimens collected in 1931) and a spring trickle in the Barranco de Guayadeque. Other undiscovered crebral habitats possibly existing elsewhere in Gran Canaria mountains. (Las Lagunetas lies 10.5 km northwest of the Barranco de Guayadeque site at a height of 1200 metres [UTM grid reference DR425975]).

*Habitat.* - *Simulium* (*Rubzovia*) *paraloutetense* is a crebral species, the only discovered breeding site being a spring-fed trickle on the southern flank of the Barranco de Guayadeque, a mountain ravine with a west-east orientation on the mid-eastern side of Gran Canaria island. Here a little water seeps from a north-facing mountain slope and drops steeply and irregularly for about 10-15 metres before gathering in a small open-top concrete roadside water tank (Figs 13a-c); from here the



a



b



c

Fig. 13. The habitat of *Simulium (Rubzovia) paraloutetense* in the Barranco de Guayadeque, Gran Canaria Island, the only discovered site of the early stages of this endemic species: (a) general view of the wooded slope where the spring breaks out and discharges into a cement roadside cistern (visible, centre, see text description of habitat); (b) a section of the spring-trickle habitat; (c) end of the spring-trickle habitat at the cement cistern. The narrow entry channel to the cistern (arrowed) indicates how small is the flow that has been sufficient to sustain development of *S. paraloutetense* larvae. Photograph 'a' by B. Malmqvist, photographs 'b' and 'c' courtesy of Mrs M. E. Crosskey.

water overflows and vanishes into porous ground. Water runs in places over smooth bedrock, squeezes through small gullies or splashes over rock lips. The depth is generally less than 5 cm and larvae and pupae occur mainly in very shallow spots (2–10 mm depth). The trickle width is mostly 20–25 cm but widens up to about 50 cm where it forms a thin water film over bedrock inclines. Flow is more or less unbroken on the surface when wet conditions prevail but discontinuous on the surface at times of prevailing drought, then vanishing below ground at intervals and reappearing further down the cliff face. The site is mainly shaded by tree cover. Water temperatures in March/April (three readings) were in the range 13–16.4°C and in November (one reading) 18°C. We noted that in spring on 27 March 1994 the pH was 7.6, conductivity 210 uS/cm and discharge 50 ml/s, whereas in early winter on 16 November 1995 the corresponding figures were 7.8, 205 uS/cm and 35 ml/s.

Larvae and pupae attach to trailing leaves and roots of living plants, fallen leaves, sticks and small stones but have not been found on bedrock substrate. The larvae show no obvious modifications suggesting that they are substrate-scrapers rather than filter-feeders, though this might be so, as has been suggested by Giudicelli & Thiery (1985) for *Rubzovia* species in general. Pharate pupae have been collected in March, pharate adults in November, and wild-caught flies (those from Las Lagunetas on which the original description was based) in August and these facts suggest that *S. (R.) paraloutetense* is a multivoltine species. No other simuliid species are present in the habitat.

See Table 1 for a comparison of the habitat data with that for other *Rubzovia* species.

*Hosts.* – Unknown. Possibly autogenous, although the female syntrophium is fully developed with toothed laciniae and mandibles typical of blood-sucking species. If bloodsucking, birds are the likely hosts. The female claws possess the basal tooth characteristic of ornithophilic simuliids, though it is not as large as in some bird-biting species.

### Subgeneric position of *Simulium paraloutetense*

When *Simulium paraloutetense* was first described it was thought to be related to the Afrotropical species *S. loutetense* Grenier & Ovazza because of the

many morphological resemblances in the adult (the only life stage then known). Particularly telling appeared to be the similarity in the characteristic very large and multiple parameral spines of the male genitalia, one of the diagnostic features of the *S. loutetense* species-group in the subgenus *Nevermannia*. The finding of the early stages of *S. paraloutetense* changes the picture and it is now certain from the full suite of characters from larva, pupa and adult that R.W.C.'s original placement in *Nevermannia* was inappropriate. Without doubt, *S. paraloutetense* belongs with a small group of very rare and little known, mainly spring-inhabiting, species of *Simulium* s.lat. that occur widely scattered in the Palaearctic region and which together form the subgenus *Rubzovia*.

*Rubzovia* was originally proposed as a new genus of Simuliidae by Petrova (1983) for the reception of *R. vantshi* Petrova 1983, a new species found by her in the Pamir mountains of Tajikistan, and for *Simulium lamachi* Doby & David (1960) from France. Very shortly afterwards Giudicelli & Thiery (1985), unaware of Petrova's paper, described the subgenus *Crenosimulium* for *S. lamachi* and *Simulium knidirii*, the latter being a new species found by them in Morocco. However, when the original description of *Simulium paraloutetense* was drawn up by R.W.C. in 1985 the possibility that this new species from Gran Canaria was related to *vantshi*, *lamachi* and *knidirii* was overlooked: none of these species was at that time represented in the collection of the Natural History Museum in London [then British Museum (Natural History)], Doby & David (1960) had put *lanzachi* in *Simulium* s.str., and the papers of Petrova and of Giudicelli & Thiery were unknown to R.W.C.. It is now apparent that clusters of large parameral spines in the male genitalia (an important character of *paraloutetense*) are characteristic of all species belonging to the subgenus *Rubzovia*, and in this respect there is strong similarity between *Rubzovia* and the *Simulium loirtetense* Grenier & Ovazza species-group in the subgenus *Nevermannia* Enderlein. The similarity can be seen well by comparing the figures of these spines in *S. rutherfordi* De Meillon and *S. loutetense* Grenier & Ovazza in Freeman & De Meillon (1953, figs 49d and 50a) with those for *S. lamachi* in Doby & David (1960, figs 1, 19a) and *S. paraloutetense* in Crosskey (1988b, fig. 54). Taking this fit of the parameral spines into account, together with all other morphological characters of

*S. paraloutetense* from the adult ♂, adult ♀, pupa (especially the structure of the spiracular gills) and larva, leaves no doubt at all that *paraloutetense* is consubgeneric with *lamachi* and must be assigned to *Rubzovia*. Crosskey & Howard (1997) have listed it accordingly in their inventory of world Simuliidae.

## Diagnosis of *Simulium* (*Rubzovia*)

### Subgenus *Rubzovia* Petrova, 1983

*Rubzovia* Petrova, 1983: 1912 (as genus). Type species: *Simulium lamachi* Doby & David, 1960, by original designation. [New status as *Simulium* subgenus by Crosskey (1988a: 469).]

*Crenosimulium* Giudicelli & Thiery, 1985: 118-119 (as subgenus of *Simulium*). Type species: *Simulium lamachi* Doby & David, 1960, by original designation (as *lamachei*). [Junior objective synonym.]

*Diagnosis.* – ♂ ♀: Wing without basal cell; radial vein with basal section haired along its length. Calcipala and pedisulcus present (latter usually shallow and less well developed in ♂). Pleural membrane bare. Katepisternum bare. Postnotum bare. Fore tarsus very slender, basitarsus 8-9 times as long as wide. Scutum without pattern.

Q: Frons narrow and parallel-sided. Syntrophium of fully biting type, mandible toothed on both edges; cibarium unarmed. Tarsal claws toothed (tooth size varied). Ovipositor valves bluntly rounded. Cerci and paraprocts unspecialized. Spermatheca subspherical, with polygonal pattern, without sclerotized nipple-like extension at duct base (though sometimes with rim of opening slightly raised).

♂: Hind basitarsus long-subfusiform, 4-5 times as long as greatest width. Style shorter than coxite, subconical or bluntly truncate according to viewpoint, with one apical spinule; ventral plate broadly lamellate, without down-curved lip and lower surface thus nearly straight in profile, lower surface finely haired, hind margin without posterolateral 'shoulders', basal arms short and parallel; median sclerite elongate, strap-like or slightly flared or bifurcate apically; 5-7 very strong parameral spines.

Pupa: Gill biramous, with two stout thin-walled arms bearing weakly or strongly marked annulation, upper arm sometimes with a projection near base (most developed in *knidirii* in which gill somewhat triramous). Abdomen with normal basal plan onchotaxy supplemented with fine hairs, ter-

ga and sterna very weakly sclerotized, terminal tubercles thorn-like.

Cocoon: Slipper-shaped, with or without anteromedian projection ('horn'), coverage of pupal thorax sometimes incomplete, texture weak.

Larva: Cephalic fan with rather few primary rays (in range 22-35). Head capsule pale with positive head-spots, posteromedian spot characteristically sagittate. Postgenal cleft absent or virtually so. Hypostomium with apical teeth very prominent and arranged in three differentiated groups (e.g. as Fig. 3), median tooth very sharp. Antenna very elongate, exceeding length of cephalic fan stem; without secondary annular banding. Thoracic and abdominal cuticle bare (except conspicuously haired on swollen regions above posterior circlet). Ventral papillae present, large and subconical. Posterior circlet with 85-109 rows of 12-15 hooks. [Rectal organ unprotruded in known larvae and thus undescribed: lobes probably without secondary lobules.]

*Included species.* – *Simulium* (*Rubzovia*) *knidirii* Giudicelli & Thiery 1985, *S. (R.) lamachi* Doby & David 1960, *S. (R.) paraloutetense* Crosskey 1988, and *S. (R.) vantshi* (Petrova 1983).

*Relationships.* – The phyletic affinities within *Simulium* remain to be established and have not become certain yet from knowledge of the polytene chromosomes or other criteria. Petrova (1983), when she described *S. (R.) vantshi*, observed that the karyotypic data suggested relationship to *Montisimulium* Rubtsov, a subgenus widespread in the massifs of Central Asia and the Caucasus and inhabitants of cool mountain springs. However, at this stage of knowledge it is impossible to be certain from the chromosomes just where the affinities of *Rubzovia* lie with other subgenera and – as Adler noted to R.W.C. (personal communication) – to resolve things further will 'need careful band-by-band comparisons with all likely taxa – a Ph.D. thesis in itself!' In the context of possibly related taxa those that might best be considered, besides *Montisimulium*, include the Holarctic subgenera *Byssodon* Enderlein, *Hellichiella* Rivosecchi & Cardinali, *Nevermannia* Enderlein (especially the *feuerborni* Edwards species-group) and *Schoenbaueria* Enderlein. A morphological character sure to be significant in any assessment of the phylogenetic position is the presence in *Rubzovia* of large and multiple parameral spines in the male genitalia, as illustrated for *lamachi* by Doby & David



(1960), for *knidirii* by Giudicelli & Thiery (1985) and for *paraloutetense* by Crosskey (1988b). (The adult male of *vantshi* is still unknown but it can be predicted to have similarly strong and numerous parameral spines.)

The spiracular gill of *Rubzovia* and with its two stout tubular arms (exemplified by the newly discovered pupa of *paraloutetense* here described) has a conspicuous resemblance to the pupal gills of some Afrotropical species belonging to the *Simulium griseicolle* Becker species-group (subgenus *Byssodon*) and to the *Simulium cervicornutum* Pomeroy species-group (subgenus *Pomeroyellum* Rubtsov), a point that Petrova (1983) and Clergue-Gazeau & Vinçon (1990) have mentioned. The latter authors have tentatively hypothesized that the wide gap in the distribution of *Rubzovia* (next section) is due to two routes of ancient northward movement from continental Africa (into Europe and through Asia Minor) and have linked this to a possible phyletic relationship with one of the Afrotropical groups just mentioned. Rubtsov's view was that *vantshi* should be placed in the Afrotropical group *Gibbinsiellum* Rubtsov (an erstwhile name for the *griseicolle* group in *Byssodon*), though he did not publish this: our information comes from Dr Petrova (pers. comm.) and from the fact that slides of *vantshi* in the St Petersburg collection (seen by R.W.C.) are labelled 'Gibbinsiellum vantshi' in Rubtsov's hand, clearly because he was influenced by the similarity of the pupal gills. Convergent resemblance in pupal gill structure among unrelated taxa, however, is commonplace in the Simuliidae and we are dubious about the hypothesis. Provisionally we think that Petrova's idea of a relationship to *Montisimulium* is more plausible: in this subgenus there are species which in both sexes have a very weak pedisulcus, in which the male genitalia have multiple parameral spines and a simple lamellate ventral plate, in which the pupal cocoon is slipper-shaped or 'horned', and in which the larva has prominent hypostomial teeth arranged in three rather definite groups and in which the postgenal cleft is absent. (Complete sclerotization of the cranial floor so that the postgenal cleft is obliterated is fairly rare in simuliid larvae: the head capsule is quite different in *Rubzovia* from that in the Afrotropical groups just mentioned, these having a very large helmet-shaped or subcircular postgenal cleft that extends forwards nearly to the base of the hypostomiurn.)

*Distribution and habitcit.* – The subgenus is restricted to the Palaearctic region, where it is known (apart from Gran Canaria) from mountain ranges in France (Pyrenees, Doby & David 1960; Alps. Bernard et al. 1975; Massif Central, Beau-cournu-Saguez 1972), Spain (Andalusia, Clergue-Gazeau & Vinçon 1990, Vinçon & Clergue-Gazeau 1993), Morocco (Atlas mountains. Giudicelli & Thiery 1985, Rif mountains. Giudicelli & Dakki 1984) and Tajikistan (Pamir mountains, Petrova 1983).

The ostensibly wide gap in distribution between Central Asia on the one hand and southwest Europe/North Africa on the other is puzzling but probably reflects a lack of adequate prospection for the right kind of habitat in mountain massifs of intervening areas. The crenal trickles and hygro-petric seepages in which the species typically occur are easily missed unless special searches by experienced specialists are made for them. Moreover, even when such biotopes for a species are known – as with *S. (R.) vantshi* in the Pamirs and *S. (R.) paraloutetense* in Gran Canaria – it is sometimes impossible to find any breeding at subsequent visits. Species occur at low density and survival in their specialized habitats is clearly fraught with uncertainty. The nature of these habitats is indicated by the habitat characteristics listed for the four known species of *Rubzovia* in Table 1.

#### Material examined of the other species of *Simulium* (*Riibzovia*)

All species of *Rubzovia* are rare and little material pertaining to this subgenus exists in any collection. However, it was necessary for LIS to consider for this paper the other species in detail before drawing our conclusions and some material of all species has been examined (by R.W.C.) in order to verify and augment the information available in the literature. These notes record the specimens seen and provide type information for the three species of *Rubzovia* other than *S. (R.) paraloutetense*. NHM = The Natural History Museum, London; ZISP = Zoological Institute, Academy of Sciences, St Petersburg.

#### *Simulium* (*Rubzovia*) *knidirii*

Giudicelli & Thiery

(Fig. 6)

Specimens seen: 1♂ (reared, in alcohol with pupal pelt),

Table 1. Recorded biotopic data for species of subgenus *Rubzovia*.

	<i>paraloutetense</i>	<i>knidirii</i>	<i>lamachi</i>	<i>vantshi</i>
Geographical area	Canary Islands (Gran Canaria)	Morocco	France, Spain, Morocco	Tajiki stan
Altitude (metres)	970	2550-2700	690/700 France 1200; Spain 1600; Morocco	3300
Water source	Crenal	Crenal	Crenal and madicolous	Glacial**
Aspect	North-facing	North-facing	North-facing, Spain & Morocco (? also France)	North-facing*
Luminosity	Shade	Open (alpine grass)	Shade	Open
Water temperature	13-18°C	11.5°C	8-10°C, Spain 8.7°C, Morocco	4-5°C
Stream depth	0.2-1.0 cm	0.1-1.5 cm	<10 cm, Spain; '1 mm to a few cm', France & Morocco	10-50 cm
Stream width	15-25 cm (up to 50 cm in thin film on bedrock)	10-60cm	10-20 cm	[Broken into several branches]
Flow length	10-15 m (disappears)	40 m (disappears)	30 m, Morocco (disappears)	Not disappearing
Flow regime	Permanent	Permanent	Permanent or intermittent	Permanent

\* Dr Petrova (pers. com.) has described the habitat for us as a powerful and permanent stream above the tree-line that arises from under the ice of the Medvezhiy glacier on the north-facing slope of the Vanchskiy range in the western Pamir mountains.

4 pupae, 2 pupal pelts, 8 larvae (including one pharate pupa), MOROCCO: High Atlas, source of assif Tifer-guine, 2700 m, 17.v.1984 (NHM).

Notes: This material is from the type locality of the ♀ allotype (Giudicelli & Thiery 1985: 113) but collected in the following year. The slide-mounted pharate adult ♂ holotype from the High Atlas spring in the Oukairneden cirque at 2500 m altitude is in the Giudicelli collection (Marseilles).

### *Simulium (Rubzovia) lamachi* Doby & David

(Fig. 7)

Specimens seen: 1 mature larva (pharate pupal gill slide-mounted), FRANCE: Massif Central, Lozère, Meyruies, 8.vii.1970 (Beaucournu-Saguez) (NHM); 2 pupal pelts, FRANCE: Pyrénées-Orientales, Olette, ix.1958 (Doby & David) (NHM); 3 slides of various parts, same data (ZISP); 1 pupa, 1 pupal prlt. 3 larvae, SPAIN: Andalusia, Granada Province, Sierra de Tejada, Cortijo de la Huerta de Hoyas, 1200 m, 14.iv.1987 (Vingon) (NHM).

Notes: The specimens in NHM and ZISP collected at Olette are part of the larval and pupal material listed as 'paedotypes' by Doby & David (1960: 115) in the original description. These authors noted that they had sent some paedotypes to Rubtsov in Leningrad (St Peters-

burg). There was no holotype designation in the original description, Doby & David referring to all their adults (6♂, 5♀) as syntypes. The depository was the Laboratoire de Parasitologie (Université de Rennes) but the original material there has deteriorated badly; Beaucournu-Saguez (in litt. to R.W.C) writes 'Malheureusement notre matériel en *S. lamachi* est très pauvre et en mauvais état de conservation'. The specimens listed from Spain are part of the material reported by Clergue-Gazeau & Vingon (1990: 304) and relate to the Tejada site listed by Vingon & Clergue-Gazeau (1993).

### *Simulium (Rubzovia) vantshi* (Petrova)

(Fig. 3)

Specimens seen: 3 paratype pupae (individually slide-mounted, all with both gills), TAJIKISTAN: Western Pamir, Vanch canyon, 3300 m, 17.vi.1975 (Petrova) (ZISP); 1 mature larva (head pieces, mouthparts, anal sclerite, posterior circlet and pharate pupal gill, on one microscope slide), same data except only with 1975 year date (Petrova) (NHM).

Notes: The specimens seen are from the original material. All slides are labelled directly on the glass in black ink and Cyrillic script and bear Petrova's preparation dates (iv.1977 for the larval slide and iv.1982 for the

pupal slides). The latter are numbered respectively '46', '47' and '48' and all have been labelled 'Gibbinsiellum vantshi' in Rubtsov's hand (for the significance of this see the discussion above of the affinities of *Rubzovia*).

### Key to species of *Simulium* (*Rubzovia*)

Adults and larvae of *Rubzovia* differ extremely little between species and the differentiating characters that can be used for a practical identification key are in the pupal stage and its cocoon. The following key is presented on the basis of the material studied (R.W.C.).

1. Pupal gill arms in form of simple tubes, neither arm with a swelling or prolongation near its base ..... 2
- Pupal gill with ventral arm simple but dorsal arm with a swelling or prolongation near its base ..... 3
2. Pupal gill in profile widely S-shaped, one arm directed backwards and the other forwards (Fig. 11). Cocoon rim evenly concave. (Larva: polytene chromosomes with all three centromeres amalgamated into a large and conspicuous heterochromatic chromocentre, see Petrova 1983, fig. 2e) [Tajikistan] ..... *vantshi*
- Pupal gill in profile U-shaped (Figs 5 and 8). Cocoon with a long and well-formed antero-medial 'horn' (Fig. 9 and 10). (Larva: polytene chromosomes without large heterochromatic chromocentre but with strong tendency to amalgamation of centromeres of chromosomes 1 and 11, Fig. 12) [Canary Islands (Gran Canaria only)] ..... *paraloutetense*
3. Pupal gill arms more or less in dorsoventral plane and dorsal arm with an elbow-like swelling externally near its base (Fig. 7). Cocoon rim with a short and ragged anteromedian projection but not a definite 'horn'. [France, Morocco, Spain] ..... *lamachi*
- Pupal gill arms spreading more three-dimensionally, dorsal arm with conspicuous inwardly-directed prolongation that gives the gill a somewhat trifid form (Fig. 6). Cocoon rim evenly concave. [Morocco] ..... *knidirii*

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Preliminary announcement

The 25th Nordic-Baltic Congress of Entomology will be held in

## VESTFOLD, NORWAY

28/6 - 2/7, Year 2000

By request of the General Assembly of the XXIV Nordic Congress of Entomology in Tartu, Estonia on August 9, 1997, the Congress will now be held in Norway.

The meeting in Norway is organized by

**the Nonvegian Entomological Society  
and  
the University of Oslo (Zoological Museum)**

And will be held at Melsomvik School of Agriculture in beautiful surroundings between Tønsberg and Sandefjord.

Topics of the symposia:

Section 1. NORDIC-BALTIC ENTOMOLOGY

- General entomology
- Special sections and workshops (Lepidoptera, Coleoptera, Diptera, Hymenoptera, Aquatic insects, etc.)

Section 2. NORDIC-BALTIC FAUNISTICS, COLLECTION MANAGEMENT AND USE OF DATABASES

Section 3. THREATENED INSECTS AND CONSERVATION STRATEGIES IN **THE** NORDIC-BALTIC COUNTRIES

At the opening of the congress there will be a plenary session with selected topics of entomology presented by invited speakers. Plenary sessions, symposia, poster presentations and excursions will be organised. The language of the Congress is English.

The participants are invited to present their contribution as lectures/posters on the sections as suggested above. Each lecture should be 15 min (+ 5 min for discussion). The main sections will be held with as little overlapping as possible, while sections on special taxonomic groups may be run simultaneously. Besides insects, the Congress covers also other terrestrial arthropods.

Excursions to interesting places for the collector:

- Tjøme (seashore meadows and dry meadows) – localities for rare Lepidoptera and Hymenoptera etc.
- Larvik (old pine and deciduous forests) – Coleoptera localities
- Drangedal (forest) – rare Coleoptera

For preliminary registration of participants for further information, please contact no later than May 30, 1999. Please send your name and address by letter or by e-mail to:

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c/o Zoological Museum, University of Oslo,  
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