

## 24. Family SIMULIIDAE

By Roger W. Crosskey

The Simuliidae form a family of small, sturdy-bodied midges with a notorious reputation in some parts of the world as bloodsucking pests. About 1,475 species are currently recognized; however, a large number of additional unnamed species, distinguished chromosomally, have been identified by cytologists. Most morphologically recognized species seem to be complexes of "sibling species" or "cytospecies," which are biologically and chromosomally distinct but anatomically very similar to each other. Modern studies of Simuliidae must take special account of this problem.

Members of the family are usually called black flies, but in New Zealand they are widely known as sand flies. Bloodsucking is not a universal habit, but females of most species feed on warm-blooded vertebrates, often preferring either birds or mammals. In Australia and New Zealand a few species of *Austrosimulium* are serious mammal biters; *A. pestilens* is a livestock pest that undergoes major periodic outbreaks in Queensland, and *A. unguatum* can be a vicious man-biting pest in parts of New Zealand. Except in the Marquesas, where they can be a severe local scourge, simuliids are rarely more than a minor biting nuisance in the Pacific Islands. There is no evidence that black flies are involved in any human disease in Australasia or Oceania, but they are believed to play a part in the transmission of *Onchocerca gibsoni*, a filarial parasite of Australian cattle. They have been incriminated as vectors of *Leucocytozoon* (a blood protozoan of birds) in penguins in New Zealand and are among the vectors of myxomatosis virus of rabbits in Australia.

Early stages are aquatic and virtually confined to running waters.

Larvae and pupae are attached to submerged substrates, most often trailing vegetation, stones, or the fixed bedrock of cascades and waterfalls. Those of some Polynesian species have been found in an unusual microhabitat, lodged between closely packed fallen leaves trapped in water current. In tropical Africa juveniles of some species live on mayfly nymphs or crabs in an obligate relationship

(phoresy), but no phoretic forms have been found in Australasia or Oceania. Surprisingly, simuliids have failed to colonize Tonga, Samoa, and Hawaii, island groups with flowing streams potentially able to support their development.

The simuliid fauna of the Australasian/Oceanian Regions, at least at the morphospecies level, is not very rich (120 spp.), but there is a clear relationship of its components to particular geographical areas. Nearly all species from these areas belong to *Simulium* s. l. or to the locally endemic genus *Austrosimulium*. The Australian fauna, in addition to these 2 genera, contains a few primitive forms assignable to the Prosimuliini. The generic affinities of these primitive taxa are obscure, but they do not belong to the Holarctic genus *Cnephia* Enderlein, in which they were formerly placed. They are treated here as generically unassignable, pending their comprehensive study in relation to the prosimuliines of other regions.

Only *Austrosimulium* is represented in the small New Zealand fauna and only *Simulium* s. l. in the much larger fauna of New Guinea. The same subgenera of *Simulium* are found in New Guinea as in Australia, but only 1 species (*S. ornatipes*) is known to be common to the 2 areas, despite their Pleistocene connection, their proximity, and the tropical character of northern Queensland. The fauna of Melanesia and Polynesia shows evidence of derivation from only the west and contains 2 endemic *Simulium* subgenera, *Hebridosimulium* and *Inselliellum*; species from Micronesia, known only from adults, are here provisionally assigned to the latter subgenus.

Distribution in the Pacific Islands is patchy, not only because of absence from some apparently suitable islands, but because black fly colonization is precluded on the innumerable small coral islands and atolls by absence of running water. Craig (1983) mapped the disjunct distribution and recognized several chromosomally and morphologically differentiated taxa in Polynesia, which are described in Craig & Craig (1987) and Craig (1987). *Simulium ornatipes* and *S. neornatipes* in Australia

and New Caledonia, respectively, represent cytological species complexes (Bedø 1977, 1984).

*Refs.*: Smart & Clifford (1965, keys New Guinean spp.), Crosskey (1967a, classif. W Pacific *Simulium*;

1985, nomencl.; 1988 world checklist), Dumbleton (1973, keys, rev. *Austrosimulium*), Colbo (1976, key Australian *Simulium*), Crosby (1981, key NZ immat.), Craig (1983, phylog. Polynesian spp.; 1988, keys, rev. Society Is spp.),

## Subfamily SIMULIINAE

### Tribe PROSIMULIINI

#### Unplaced species of Prosimuliini

- aurantiacum** Tonnoir, 1925a: 234 (*Simulium*). Australia (NSW); Australia (Qld, Tas, Vic).  
**fergusoni** Tonnoir, 1925a: 238 (*Simulium*). Australia (NSW); Australia (SA).  
**fuscoflava** Mackerras & Mackerras, 1948: 236 (*Cnephia tonnoiri* ssp.). Australia (Qld).  
**orientalis** Mackerras & Mackerras, 1950: 170 (*Cnephia tonnoiri* ssp.). Australia (Qld); Australia (NSW, Tas, Vic).  
**pilfreyi** Davies & Györkös, 1988: 107 (*Cnephia*). Australia (ACT).  
**strenua** Mackerras & Mackerras, 1950: 170 (*Cnephia*). Australia (Qld).  
**terebrans** Tonnoir, 1925a: 237 (*Simulium*). Australia (Vic); Australia (NSW).  
**tonnoiri** Drummond, 1931: 6 (*Simulium*). Australia (WA).  
**umbratorum** Tonnoir, 1925a: 237 (*Simulium*). Australia (Vic).

### Tribe SIMULIINI

#### Genus AUSTROSIMULIUM Tonnoir

**AUSTROSIMULIUM** Tonnoir, 1925a: 230. Type species: *Simulia australensis* Schiner, 1868, orig. des.

#### Subgenus AUSTROSIMULIUM Tonnoir

- AUSTROSIMULIUM** Tonnoir, 1925a: 230 (as gen.). Type species: *Simulia australensis* Schiner, 1868, orig. des.  
**albovelatum** Dumbleton, 1973: 524. NZ (NZ).  
**australense** Schiner, 1868: 15 (*Simulia*). NZ (NZ).  
*caecutiens* Walker, 1848: 113 (*Simulium*). *Nomen nudum*.  
*caecutiens* Hutton, 1874: 165 (*Simulium*). *Nomen nudum*.  
*tillyardi* Tonnoir, 1923d: 11 (*Simulium*). NZ (NZ).  
**bicorne** Dumbleton, 1973: 538. NZ (NZ).  
**campbellense** Dumbleton, 1973: 535. NZ (Campbell I).  
**colboi** Davies & Györkös, 1988: 111. Australia (Vic).  
**cornutum** Tonnoir, 1925a: 243. Australia (Vic); Australia (NSW, Tas).  
**crassipes** Tonnoir, 1925a: 242. Australia (Vic); Australia (NSW, Qld).  
**dumbletoni** Crosby, 1976: 17. NZ (NZ).  
**fulvicorne** Mackerras & Mackerras, 1950: 184. Australia (Qld).  
**laticorne** Tonnoir, 1925a: 254. NZ (NZ).  
*alveolatum* Dumbleton, 1973: 522 (*laticorne* ssp.). NZ (NZ).  
**longicorne** Tonnoir, 1925a: 254. NZ (NZ).  
**mirabile** Mackerras & Mackerras, 1948: 266. Australia (Qld).  
**montanum** Mackerras & Mackerras, 1952: 107. Australia (NSW); Australia (Vic).  
**multicorne** Tonnoir, 1925a: 254. NZ (NZ).  
*fiordense* Dumbleton, 1973: 518 (*multicorne* ssp.). NZ (NZ).  
**stewartense** Dumbleton, 1973: 522. NZ (NZ).

- tillyardianum** Dumbleton, 1973: 513 (n. n. for *tillyardi* Tonnoir). NZ (NZ).  
*tillyardi* Tonnoir, 1925a: 253. NZ (NZ). [Preocc. Tonnoir, 1923.]  
**ungulatum** Tonnoir, 1925a: 250. NZ (NZ).  
**unicorne** Dumbleton, 1973: 543. NZ (NZ).  
**vexans** Mik, 1881: 201 (*Simulium*). NZ (Auckland Is); NZ (Campbell I).

#### Subgenus NOVAUSTROSIMULIUM Dumbleton

- NOVAUSTROSIMULIUM** Dumbleton, 1973: 484. Type species: *Simulium bancrofti* Taylor, 1918, orig. des.  
**bancrofti** Taylor, 1918b: 168 (*Simulium*). Australia (Qld); Australia (NSW, Tas, Vic, WA).  
**furiosum** Skuse, 1889b: 1365 (*Simulium*). Australia (NSW); Australia (Qld, Tas, Vic, WA).  
*weindorferi* Tonnoir, 1925a: 248. Australia (Tas).  
*simile* Tonnoir, 1925a: 249. Australia (Tas).  
*austrosimile* Smart, 1944: 133 (unnec. n. n. for *simile* Tonnoir).  
**magnum** Mackerras & Mackerras, 1955: 109. Australia (Qld).  
**pestilens** Mackerras & Mackerras, 1948: 260. Australia (Qld); Australia (NSW, NT).  
**torrentium** Tonnoir, 1925a: 247. Australia (Tas); Australia (ACT, NSW, Vic).  
*hilli* Mackerras & Mackerras, 1949: 401 (*torrentium* spp.). Australia (ACT).  
**victoriae** Roubaud, 1906c: 521 (*Simulium*). Australia (Vic); Australia (NSW, Qld, Tas).  
*tasmaniense* Tonnoir, 1925a: 245. Australia (Tas).

#### Genus SIMULIUM Latreille

- SIMULIUM** Latreille, 1802: 426. Type species: *Rhagio colombaschensis* Fabricius, 1796, mon.

#### Subgenus EUSIMULIUM Roubaud

- EUSIMULIUM** Roubaud, 1906b: 521. Type species: *Simulia aurea* Fries, 1824, mon.  
**bonninense** Shiraki, 1935: 21 (*Eusimulium*). Bonin Is.

#### Subgenus GOMPHOSTILBIA Enderlein

- GOMPHOSTILBIA** Enderlein, 1921a: 199 (as gen.). Type species: *Gomphostilbia ceylonica* Enderlein, 1921, orig. des.  
**barretti** Smart & Clifford, 1965: 603. PNG (PNG).  
**catleyi** Smart & Clifford, 1965: 608. PNG (Bismarck Arch); PNG (PNG).  
**centrale** Smart & Clifford, 1965: 611. PNG (PNG); PNG (Bismarck Arch).  
**heldsbachense** Smart & Clifford, 1965: 594. PNG (PNG).  
**hemicyclium** Smart & Clifford, 1965: 604. PNG (Bismarck Arch); PNG (PNG).  
**keravatense** Smart & Clifford, 1965: 597. PNG (Bismarck Arch); PNG (PNG).  
**kuingingiense** Smart & Clifford, 1965: 606. PNG (PNG).  
**munumense** Smart & Clifford, 1965: 599. PNG (PNG); PNG (Bismarck Arch).  
**nami** Smart & Clifford, 1965: 612. PNG (PNG).  
**peregrinum** Mackerras & Mackerras, 1950: 175. Australia (Qld).

#### Subgenus HEBRIDOSIMULIUM Grenier & Rageau

- HEBRIDOSIMULIUM** Grenier & Rageau, 1961: 96 (as gen.). Type species: *Simulium jolyi* Roubaud, 1906, orig. des.  
**anatolicum** Craig, 1988: 382. French Polynesia (Society Is).  
**jolyi** Roubaud, 1906a: 142. Vanuatu.  
**laciniatum** Edwards, 1924f: 572. Fiji.

#### Subgenus INSELIELLUM Rubtsov

- INSELIELLUM** Rubtsov, 1974: 275 (as gen.). Type species: *Simulium oviceps* Edwards, 1933, orig. des.

- adamsoni* Edwards, 1932b: 109. French Polynesia (Marquesas).  
*admixum* Craig, 1988: 397. French Polynesia (Society Is).  
*arlecchinum* Craig, 1988: 398. French Polynesia (Society Is).  
*buissoni* Roubaud, 1906c: 521. French Polynesia (Marquesas).  
*castaneum* Craig, 1988: 399. French Polynesia (Society Is).  
*cataractarum* Craig, 1988: 400. French Polynesia (Society Is).  
*cheesmanae* Edwards, 1927b: 242. French Polynesia (Society Is).  
*exasperans* Craig, 1988: 392. French Polynesia (Society Is).  
*gallinum* Edwards, 1932b: 108. French Polynesia (Marquesas).  
*guamense* Stone, 1964: 633. Guam.  
*hukaense* Séchan in Klein *et al.*, 1983: 24. French Polynesia (Marquesas).  
*lotii* Craig, 1988: 388. French Polynesia (Society Is).  
*malardei* Craig, 1988: 387. French Polynesia (Society Is).  
*mataverense* Craig & Craig, 1987: 364. Cook Is. [Cytotype "damn" Craig, 1983: 535.]  
*mesodontium* Craig, 1988: 403. French Polynesia (Society Is).  
*mumfordi* Edwards, 1932b: 109. French Polynesia (Marquesas).  
*neoviceps* Craig, 1988: 403. French Polynesia (Society Is).  
*opunohuense* Craig, 1988: 391. French Polynesia (Society Is).  
*oviceps* Edwards, 1933a: 37. French Polynesia (Society Is).  
*palauense* Stone, 1964: 633. Belau.  
*tahitiense* Edwards, 1927b: 242. French Polynesia (Society Is).  
*teruamanga* Craig & Craig, 1987: 358. Cook Is. [Cytotype "teruamanga" Craig, 1983: 535.]  
*trukense* Stone, 1964: 631. Micronesia.  
*uaense* Séchan in Klein *et al.*, 1983: 24. French Polynesia (Marquesas).

#### Subgenus MOROPS Enderlein

- MOROPS** Enderlein, 1930e: 93 (as gen.). Type species: *Wilhelmia pygmaea* Enderlein, 1922 [preocc., = *Simulium wilhelmlandae* Smart, 1944], orig. des.  
**PSELAPHOCHIR** Enderlein, 1936b: 120 (as gen.). Type species: *Pselaphochir oculata* Enderlein, 1936, orig. des.
- aureonigrum* Mackerras & Mackerras, 1950: 178. Australia (Qld).  
*avilae* Smart & Clifford, 1965: 566. PNG (PNG).  
*botulus* Smart & Clifford, 1965: 535. PNG (PNG).  
*brandti* Smart & Clifford, 1965: 589. PNG (PNG).  
*cervus* Smart & Clifford, 1965: 540. PNG (PNG).  
*clathrinum* Mackerras & Mackerras, 1948: 248. Australia (Qld); Australia (NSW).  
*clavum* Smart & Clifford, 1965: 541. PNG (PNG).  
*cristatum* Smart & Clifford, 1965: 553. PNG (PNG).  
*dycei* Colbo, 1976: 256. Australia (Qld); Australia (NT).  
*evelynae* Smart & Clifford, 1965: 545. PNG (PNG).  
*faheyi* Taylor, 1927: 71. Australia (Qld); Australia (NT).  
*farciminis* Smart & Clifford, 1965: 532. PNG (PNG).  
*fimbriatum* Smart & Clifford, 1965: 544. PNG (PNG).  
*gagiduense* Smart & Clifford, 1965: 573. PNG (PNG).  
*gorokae* Smart & Clifford, 1965: 558. PNG (PNG).  
*inornatum* Mackerras & Mackerras, 1950: 181. Australia (Qld); Australia (NSW, Vic).  
*inuitkiense* Smart & Clifford, 1965: 547. PNG (Bismarck Arch).  
*josephi* Smart & Clifford, 1965: 580. PNG (PNG).  
*kainantuense* Smart & Clifford, 1965: 564. PNG (PNG).  
*kaiti* Smart & Clifford, 1965: 582. PNG (Bismarck Arch).  
*kokodae* Smart & Clifford, 1965: 580. PNG (PNG).  
*lalokiense* Smart & Clifford, 1965: 576. PNG (PNG).  
*lawnhillense* Colbo, 1976: 264. Australia (Qld); Australia (NT).

- longirostre** Smart, 1972: 613 (n. n. for *rostrata* Smart & Clifford). PNG (PNG).  
*rostrata* Smart & Clifford, 1965: 587. PNG (PNG). [Preocc. Lundström, 1911.]
- mackerrasorum** Colbo, 1976: 261. Australia (Qld); Australia (NT, WA).
- mafuluense** Smart & Clifford, 1965: 586. PNG (PNG).
- matokoense** Smart & Clifford, 1965: 585. PNG (PNG).
- melatum** Wharton, 1949: 406. Australia (NSW); Australia (Qld, Vic).
- mendiense** Smart & Clifford, 1965: 562. PNG (PNG).
- minji** Smart & Clifford, 1965: 555. PNG (PNG).
- mussauense** Delfinado, 1971: 137. PNG (Bismarck Arch).
- nicholsoni** Mackerras & Mackerras, 1948: 251. Australia (Qld); Australia (NSW, Vic).
- oculatum** Enderlein, 1936b: 121 (*Pselaphochir*). PNG (PNG).
- papuense** Wharton, 1948: 359. PNG (PNG).
- purosae** Smart & Clifford, 1965: 560. PNG (PNG).
- raunsimnae** Smart & Clifford, 1965: 569. PNG (Bismarck Arch); PNG (Bougainville I, PNG).
- rounae** Smart & Clifford, 1965: 539. PNG (PNG).
- saihoense** Smart & Clifford, 1965: 549. PNG (PNG).
- sherwoodi** Stone & Maffi, 1971: 299. Solomon Is.
- standfasti** Colbo, 1976: 259. Australia (Qld).
- tafae** Smart & Clifford, 1965: 578. PNG (PNG).
- torresianum** Mackerras & Mackerras, 1955: 106. Australia (Qld).
- wamena** Smart & Clifford, 1965: 584. PNG (PNG).
- wantoatense** Smart & Clifford, 1965: 537. PNG (PNG).
- wilhelmlandae** Smart, 1944: 132 (n. n. for *pygmaea* Enderlein). PNG (PNG).  
*pygmaea* Enderlein, 1922a: 70 (*Wilhelmia*). PNG (PNG). [Preocc. Zetterstedt, 1838.]

#### Subgenus NEVERMANNIA Enderlein

- NEVERMANNIA** Enderlein, 1921a: 199 (as gen.). Type species: *Simulium annulipes* Becker, 1908 [= *Simulium ruficorne* Macquart, 1838], orig. des.
- CHELOCNETHA** Enderlein, 1936b: 117 (as gen.). Type species: *Chelocnetha biroi* Enderlein, 1936 [= *Simulium ornatipes* Skuse, 1890], orig. des.
- neornatipes** Dumbleton, 1969b: 213. New Caledonia (New Caledonia).
- norfolkense** Dumbleton, 1969b: 220 (*ornatipes* ssp.). Norfolk I.
- ornatipes** Skuse, 1890d: 632. Australia (NSW); Australia (Qld, SA, Vic, WA), PNG (PNG).  
*biroi* Enderlein, 1936b: 117 (*Chelocnetha*). Australia (NSW).