CHAPTER 3

Distribution and Habitat

Black flies are intimately bound to their ancestral habitat-flowing freshwater-although reasons for this virtually exception less association are still poorly understood. Possibly the tie to running water is for respiratory reasons or because the primary larval feeding mode, filtering, requires delivery of food. Alone, neither explanation is satisfactory, for even the fanless, non filtering genera such as *Twinnia* and *Gymnopais* are restricted to flowing water, and larvae of many species can live in standing water for long periods of time.

Flowing water is the livelihood of all the species of black and these flies have been able to exploit the entire feasible freshwater habitat from hot springs to glacial melt waters, sulphur springs, irregular streams, subterranean flows, and from trickles to rivers. Almost all the fresh water flowing habitat harbour black flies species at some time during the year (Adler and McCreadie 1997). One particular stream may contain at one time, usually three to four species and rarely the number may be more than nine to ten species.

Each geographical region with a particular habitat is associated with each species of black flies and on the basis of stream and landscape
characters the distribution pattern can be by and large easily expected (Corkum and Currie 1987, Burger 1988, Ciborowski and Adler 1990, McCreadie and Adler 1998). Predictors of distribution depend on a spatial scale ranging from a specific substrate to a zoogeographic region (Adler and McCreadie 1997, McCreadie and Adler 1998). Both biotic and abiotic factors also influence the distribution of black flies which in turn also affect their population dynamics (Ross and Merritt 1988).

The distribution pattern of different species at microhabitat level may vary with the age of the larvae or may be due to environmental factors, and so may be seen in conspicuous aggregate patterns such as bands, clumps or in evenly spaced distribution. And the distribution pattern also varies significantly with the flow of water and the substrate that are available. Even in the same stream the polyethylene bags smooth surfaces of plastic or glass bottles or objects may harbour larvae in large cluster than the other substrate. Substrate preference of the larvae and pupae are still unknown. These distribution patterns (as well as densities) are influenced by micro hydraulic factors, size and surface features of the substrate, food availability (Cressa 1997, Eymann 1985, 1991a, 1991c, Chance and Craig 1986, Ciborowski and Craig 1989, Beckett 1992, Lacouseiére 1992), settlement rates form the drift (Fonseca 1996, Fonseca and Hart 2001), disturbance events (Love and Bailey, 1992), and the presence of other organisms (including conspecifics) that might act as predators, facilitators, or competitors. Larvae of
some species, for example are territorial, with food typically the contested resource, whereas larvae of other species, especially those living at the outflows of impoundments where food is abundant, are not territorial (Harding and Colbo 1981, Hart 1986, 1987, 1988). Competition is apparently common with other benthic macroinvertebrates (Hemphill 1988, 1991, Morin 1991, Kohler 1992), as well as with macroalgae (Dudley et al., 1986). Most studies indicate that fewer larvae occur on substrates with accumulated peripyton and debris than on cleaner surfaces, possibly because of the greater difficulty in attaching the silk pad (Barr 1982). At larger scales, such as within a stretch of flows up to 20m, distributions are often correlated with substrate type (e.g., vegetation or rocks), velocity, and depth (Morin et al., 1986, McCreadie and Colbo 1993b, Adler and McCreadie 1997).

In addition it has been found that the presence of other organisms can also influence the distributional patterns and as well as population levels within sections of a stream. For example, the spawning activities of salmon and the subsequent death and decay of the fish can significantly influence simuliid distribution and biomass (Minakawa 1997). In longer reaches, physicochemical gradients and the presence of impoundment outflows are good predictors of distribution (Adler and Kim 1984, McCreadie and Colbo, 1992).

The largest number of species has so been described from the Palearctic Region so far but taxonomists are of the opinion that
many synonyms may probably be present among the names of currently described or recognized species. However most of the regions of Palearctic Region, like the Himalayas is still yet to be fully surveyed and the existing guess of the presence of about 959 species might be reasonable.

However, though Nearctic Region has been most completely surveyed, but the number of species present was far fewer than half of what had been predicted. The Neotropical Regions have about 558 species and the Oriental Regions have 524 species respectively, which is roughly equal. But the taxonomic scrutiny of the Oriental Regions has not been done at the same intensity as of the Neotropical regions (Currie and Adler 2007).

Relatively fewer studies have been conducted in South Asia taxonomically which require much more study. The black flies of the Afrotropical Region have received significant attention, but most of this attempt has been focused toward vectors (e.g., *Simulium damnosum* complex) of the causal agent of human onchocerciasis. The Australasian Region has not been intensively studied since the early 1970’s (Mackerras and Mackerras 1952, Dumbleton, 1973). Indeed, the 71 species recently described from Irian Jaya, Maluku, and Sulawesi (Takaoka 2003) represent more than 36% of all the morphospecies currently recognized from Australasia. More intensive surveys in Irian Jaya, Papua New Guinea and Western Australia will increase the number of species for the region. The
simuliid faunas of Antarctica (Crozet Islands) and the Pacific Oceanic Islands have been well surveyed (Craig et al., 2003, Craig and Joy 2000); yet, additional species continue to be discovered in the Pacific Region as new collections are made. The Nearctic and Oriental Regions have the fewest endemic taxa among the major zoogeographic areas, perhaps owing in part to their close association with the Palearctic Region. The Neotropical region has by far the largest number of endemic genus-group taxa; however, a number of currently recognized ‘valid’ names (e.g., Kempfsimulium, Pedrowygomyia) undoubtedly will fall into synonymy, as phylogenetic relationships become better understood. In contrast, several additional genus-group taxa will have to be recognized for species that are currently assigned to the Australian “Paracnephia.”

The Afrotropical Region, with its 11 unique genus-group taxa, is second only to the Neotropical Regions in terms of endemicity. Antarctica (Crozet Islands) and the Pacific Oceanic Islands have one and two endemic genus-group taxa, respectively. In terms of faunal similarities, the Nearctic and Palearctic Regions share by a far the greatest number (18) of genus-group taxa. The Nearctic and Neotropical Regions share six genus-group taxa, as do the Palearctic and Oriental Regions. At the other end of the spectrum, Antarctica (Crozet Islands), with its one endemic genus (Crozetia), exhibits no clear relationship with any other zoogeographical region (Craig et al., 2003).