

Notes on the life cycles of Norwegian *Dixella* species (Diptera, Nematocera, Dixidae)

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The life cycle of 5 Norwegian species of the genus *Dixella* Dyar & Shannon, 1924, was investigated, some of them by a sampling programme in one or two localities, and one from samples taken in different places in southern Norway. Some of the species, possibly all, have two generations each year. Two of the species, *D. amphibia* (De Geer, 1776), and *D. nigra* (Stæger, 1840) spend the winter in the 3rd or 4th larval stage, the others (*D. aestivalis* (Meigen, 1818), *D. hyperborea* (Bergroth, 1889) and *D. dyari* (Garrett, 1924) probably in the egg stage.

Key words: Life cycle, Diptera, Dixidae, *Dixella*, Norway.

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Introduction

The larvae of Norwegian Dixidae are very similar in their way of nourishment and size, at least within the two genera found in Norway. The *Dixa* Meigen, 1818 species are found mostly in running waters, the *Dixella* Dyar & Shannon, 1924 species usually in standing waters. Often several species are found on the same locality. When several congeneric species coexist in a small pond or a stream, there is a great probability of differences in life-cycle patterns to avoid competition and to be reproductively isolated from each other (Illies 1952).

Very few studies have been done on the life cycle of the different species of Dixidae. Hubert (1952) studied *Dixella californica* (Johannsen, 1923) and found that the larval stage would take 43 to 63 days. Adding a few days for the egg stage (5 days are reported by Hubert 1952 and Peach & Fowler 1986) and the pupal stage (3–5 days as reported by Nowell (1951), Nicholson (1978, 1979)), the life cycle would take 2–3 months in California. D. Forsyth (1968), in an appendix

to the treatise of John Belkin on the Culicidae of New Zealand, reported on the culturation of *Paradixa neozelandica* Tonnoir, 1924, having a lifecycle of only 20 days under optimal conditions in the laboratory. Vaillant (1969) says that *Dixella aestivalis* (Meigen, 1818) and *D. autumnalis* (Meigen, 1818) have two generations per year, one in the spring and one in the autumn, that the winter is spent in the larval stage and that the summer generation has a prolonged egg diapause, but gives no data to support these claims. He also says that most of the species have two generations a year, but that *Dixella verna* (Vaillant, 1969) has only one. Peach & Fowler (1986) studied the development of *Dixella autumnalis* in the laboratory, probably close to natural conditions, saying that it took 172 days from one generation to the next. Goldie-Smith (1989) investigated the eggs and larvae of two species of British Dixidae, *D. autumnalis* and *D. amphibia* (De Geer, 1776), but give no information on the duration of the larval stages. In the Handbook to the aquatic insects of North Europe, Wagner (1997) says that the Dixidae probably have only one generation each year.