ON THE SO-CALLED "TERRITORIES" OF DRAGONFLIES (ODONATA-ANISOPTERA)

by

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(with 1 fig.)

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I. INTRODUCTION

Female dragonflies spend very little time by water: as soon as mating and egg laying are completed they fly away from it. On the other hand male dragonflies spend a considerable part of the day by water. The amount varies with the species, the weather, and probably other factors. But in all the species described in this paper adult males are to be found in their breeding areas during the middle of the day, if the weather is suitable. Not only do they feed and mate during this time, but they are engaged in other types of activity, an account and analysis of which forms the basis of this paper.

Whether the individual male insect beats up and down one stretch of river, as in most Aeshnidae, or spends most of its time perched in one or more places, from which it makes occasional sallies as in Sympetrum striolatum (Libellulidae) or combines both habits as in Libellula depressa (Libellulidae), the movements of each male dragonfly appear to be restricted to a fairly small area. When another dragonfly appears in or near this area the male dragonfly flies quickly towards it. If the other insect is a female of its own species copulation depends on the behaviour of the female; if the female is of another species she normally flies away; if the intruder is a male of the same species, the latter is pursued, and often a violent clash occurs. The reactions to males of other species vary from flying at them and then away from them to violent clashes as described above. These encounters with other males occupy much of the time of male dragonflies. For example, a male Libellula depressa was watched for 40 minutes in the afternoon of 16.6.50. During this time it made thirteen flights at other male insects, spending a

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total of about thirteen minutes in so doing. This is a typical example. These general facts are well known to all who have studied dragonflies in the field.

Since male dragonflies remain in approximately the same place, and since they appear to attack males of their own and other species which approach them, it is not surprising that they have been described as possessing territories analogous to those of birds. For example, males of *Crocothemis servilia* are described as "struggling for the mastery of their domain in the pursuit of other dragonflies" (Lieftinck, 1934). Males of *Pantala hymenaea* "chased away other dragonflies from their beat including the vigorous *Libellula pulchella* as well as other males of their own species." (Walker, 1933). One of the latest text books on entomology credits some dragonflies with "un territoire de chasse", the intrusion of other dragonflies into which they do not tolerate (Grassé, 1949). Further, the appearance of territorial behaviour is particularly strong in those species of Libellulidae, in which, after coitus, the male hovers above the ovipositing female, making darts at any other approaching dragonfly. Thus Williamson describes the males of *Erythemis* "protecting their own females against attacks" during oviposition (Williamson, 1923).

The only paper devoted entirely to the territorial behaviour of dragonflies appears to be that of Saint-Quentin (1934). He called the dragonfly territory "ein Jagdrevier", and defined it as a limited area in which the individual insect roams, within which no other similar dragonfly is tolerated, and which is occupied for some space of time. His interpretation of the struggles which he observed, was that the territory owner was evicting the intruder from its hunting ground. To determine how long individual insects remained in their "territories" he marked them with small pieces of material, and also by cutting out small pieces from the middle of the wing. He did not recover one marked insect, and so concluded that the "Jagdrevier" was of a transitory nature. He noted that live dragonflies "attacked" a dead one which was suspended on a thread and moved about in their "territories". He also noted that if an *Aeshna* was killed in its "territory" its place was taken by another individual within 24 hours or less.

The present paper reports experiments performed during the years 1949 to 1951. They were devised to discover whether dragonflies possess territories as defined by Noble, that is "defended areas" (Noble, 1939. See discussion by Nice, 1941). Two questions were asked:

1) How long do male dragonflies remain in the same area?

2) Do they *attack* males of their own or other species which fly past them, or is there some other interpretation of their behaviour?