HOOFDSTUK 15 SUMMARY

THE DUTCH DRAGONFLIES (ODONATA)

In 1991 the Dutch Youth Organisation for Nature Studies (NJN) initiated a project aimed to collect all the members' dragonfly records. Other organisations joined and by 1993 a national survey was, quite unintentionally, a fact. Between 1991 and 1997 more than 200 observers gathered over 165,000 records.

This book offers an account in the Dutch language of the current knowledge of the morphology, ecology, behaviour, diversity, threats and conservation of dragonflies, and presents the distribution of Dutch dragonflies from 1850 to 1997 (whilst indicating recent unexpected developments up to 2000 in some species).

Below a brief summary of the content of the various chapters is given. An English summary of the knowledge of each species is provided in Chapter 11.

CHAPTER 1 Introduction

M.A. Lieftinck was the founder of Dutch dragonfly research. His 'Odonata Neerlandica', published in 1925 and 1926, was the first account of all Dutch Odonata. Its successor, 'The dragonflies of The Netherlands' by D.C. Geijskes and J. van Tol, was published in 1983. The present book may be seen as the third generation in this development, and is the result of intensive field work by hundreds of volunteers and professionals, united in the Dutch Society for the Study of Dragonflies (Nederlandse Vereniging voor Libellenstudie, NVL): The European Invertebrate Survey in The Netherlands (EIS-Nederland) began to compile a database of Dutch dragonfly records in the 1970s. The project in the 1990s accelerated data-collection, and in 1997 the NVL was founded. The Dutch dragonfly database is now owned and updated by the NVL, EIS-Nederland and Dutch Butterfly Conservation.

CHAPTER 2 Morphology and development

Various aspects of the morphology of Odonata in relation to their life history are discussed, illustrated with many examples. Special attention is given to the development from egg to adult, sight, flight and the reproductive organs.

CHAPTER 3 Phenology

The timing of the life cycle of dragonflies is determined by the seasons. Different strategies to cope with this result in variation in the phenology within and between species. An analysis of the flight seasons of Dutch dragonflies is presented: species that fly in the middle of summer typically have a longer flight season with a higher variability in the average ('peak') flight date, than those that fly during spring and late summer. In years that early species fly late – for instance because of a cold spring – there is tendency towards a prolonged flight period, but when late species appear relatively late, this leads to an abbreviated flight period. For species that fly in the middle of the summer, the length of the flight period is independent of the average flight date.

CHAPTER 4 Ecology and behaviour

The life history and behaviour of dragonflies in relation to their environment – landscape, weather, prey and enemies – is described. Special attention is given to larval -, emergence - and reproductive behaviour, migration, predators and parasites.

CHAPTER 5 Diversity and nomenclature

This chapter puts the Dutch fauna in perspective to the evolution and diversity of the Odonata. Their classification is outlined and the Dutch families are presented. A short history of scientific and Dutch nomenclature is given, as is a checklist of Dutch dragonfly species, including their vernacular names. The meaning or derivation of the scientific names of the Dutch species is explained.

CHAPTER 6 Identification key

An identification key to the adults of the Northwest European species is given – based primarily on structural characters – and illustrated extensively.

CHAPTER 7 Habitat and landscape

This chapter discusses spatial aspects of dragonfly occurrence in The Netherlands at three levels: environmental parameters, habitat types and geographic regions. Firstly, aspects such as current, temperature, substrate, trophic level, acidity, oxygenation and salinity are discussed in relation to their influence on species (- assemblages). Secondly, aquatic habitats are classified and their significance for dragonflies is outlined. The most valuable habitats – with regard to species diversity and presence of specialised species – are streams and rivers, shallow soft-water lakes, fenlands, fresh dune waters and large oxygen-rich standing waters, like canals. Thirdly, the distribution of dragonflies in the major Dutch physical geographic regions is analysed. The fauna of each region is characterised by a list of the ten most abundant species, the species with a significant preference for the region and rare but characteristic species. Photographs of twenty characteristic Dutch freshwater habitats are accompanied by descriptions of their dragonfly faunas.

CHAPTER 8 Changes in the dragonfly fauna

Various aspects have contributed to the decrease or increase of dragonfly species in The Netherlands in the past 100 years. Destruction and fragmentation of habitats, canalisation of streams and rivers, desiccation, eutrophication, acidification, pollution and the introduction of fish have had a predominantly negative impact. Improvement of the water quality, restoration of natural habitats, the conversion of agricultural areas to nature reserves and climatic changes (all rather recent developments) have had a predominantly positive effect. The balance in the dragonfly fauna in the last 100 years is as follows: of the 70 recorded species, 65 are considered indigenous. Five of these have disappeared, 20 have decreased, 23 are more or less stable and 17 have increased. In terms of species the balance is

therefore approximately equal. However, specialised species (e.g. of streams and fens) have decreased, while many generalist species (often of southern origin) have increased. From this perspective, an impoverishment of the fauna is visible. *Coenagrion mercuriale*, *Nehalennia speciosa*, *Oxygastra curtisii*, *Leucorrhinia caudalis* and *L. albifrons* are thought to be extinct. *Coenagrion armatum* and *Gomphus flavipes*, believed extinct by 1997, were rediscovered in the late 1990s. *Hemianax ephippiger* was added to the Dutch fauna during the survey. *Erythromma viridulum*, *Lestes barbarus*, *Crocothemis erythraea* and *Sympetrum fonscolombii* were among the most striking examples of species that showed an increase.

CHAPTER 9 Conservation and management
Dragonflies play and increasingly important role in both nature management and policy in The Netherlands. The Dutch government has implemented a policy to protect endangered species, including dragonflies. In the framework of this policy research on status and ecology, specific management measures and preparation of Red Lists can be carried out. A monitoring scheme was started in 1997. Nature management organisations have shown a growing concern for the decline of certain dragonfly species, and value dragonflies as indicator species for habitat health. Despite these positive signals, improvement of the management is needed in many cases. This chapter gives an introduction on how to improve habitat quality for dragonflies, tailor-made for the different freshwaters habitats identified (chapter 8).

CHAPTER 10 Data collection and validation
The methodology of the collection, processing and validation of the data used for the distribution maps in the species accounts is described. The vast majority of records pertains to observations. All records outside the normal flight period or range of species, and those with unusually high numbers of individuals, were closely examined. All records of rare species in the period 1990-1997 were checked by an independent committee (CWNO) on the basis of photographs, drawings and descriptions submitted by the observers. Only accepted records were used in this book. Older records of rare species were judged by the editors or were previously checked by experts (e.g. collected material).

CHAPTER 12 The species
The habitat, life history, ecology, behaviour, range, conservation, status and distribution in The Netherlands is discussed for each Dutch species. Dot maps of the Dutch distribution (25 km² squares) in three periods – before 1950, 1950 to 1989 and 1990 to 1997 – are provided, as are range maps for North-west Europe. Records of reproduction are indicated for the last period. For the commoner species a separate map for the period 1990-1997 shows the distribution of observed numbers of adults, thus revealing the hotspots for these species. Other attributes for each species are tables summarising their status (including Red List category), flight season, habitat preference and accompanying species. The latter are based on the Dutch dragonfly database. Two lists were calculated (1 km² squares): the species that are most frequently found with the species considered ('everyday companions') and the species that have the most similar (i.e. strongly overlapping) distribution ('characteristic companions'). The flight season of each species is illustrated by a histogram of records of adults in ten-day categories. Each species account includes an English summary, highlighting the Dutch status and habitat of each species.

CHAPTER 12 Studying dragonflies
This chapter aims to stimulate future research. Guidelines for identification and data-collection are given. Research on behaviour, ecology and the effects of nature management is needed to enlarge the knowledge about dragonflies and to enhance conservation. Examples of small research projects are described.