MITTEILUNGEN DER SCHWEIZERISCHEN ENTOMOLOGISCHEN GESELLSCHAFT
BULLETIN DE LA SOCIÉTÉ ENTOMOLOGIQUE SUISSE
69, 127 – 133, 1996

Geographical distribution of mayflies and stoneflies (Insecta: Ephemeroptera, Plecoptera) in Switzerland - preliminary results

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In 1993 a project was launched by the "Centre suisse de cartographie de la faune" (CSCF) with the aim to produce distribution maps of mayflies, stoneflies and caddisflies and to (re)evaluate their endangerment. Data obtained from private and public collections as well as those contained in publications were stored on a data bank. Simultaneously insects were collected in selected parts of Switzerland. The Swiss geographical characteristics i.e. the Alps covering most of Switzerland have a great influence on the distribution of most species. Some of them, especially those living in large rivers, became rare due to human impacts such as river training and pollution. Preliminary results are discussed with the help of six examples.

Keywords: Distribution, Switzerland, mayflies, stoneflies

INTRODUCTION

Recent studies in Switzerland have shown a strong regression in the biodiversity of aquatic insects due to human impacts such as pollution and river training (e.g. AUBERT, 1985, 1986, 1989; SCHRÖDER & REY, 1991; ZURWERRA & TOMKA, 1984). In order to improve the ecological conditions and to preserve the biological richness of aquatic habitats, more detailed information about the insect fauna in rivers and lakes is necessary. With the exception of dragonflies (MAIBACH & MEIER, 1987), the geographical distribution of the aquatic insects in Switzerland is poorly known. To fill this gap a project was launched in 1993 by the "Centre suisse de cartographie de la faune" (CSCF). The aim of this survey is to produce distribution maps of mayflies, stoneflies and caddisflies and to (re)evaluate their endangerment. The comparison with historical data will allow the changes in the distribution area of some species to be assessed.

Apart from providing a spatial and temporal overview of the distribution of every species, the database may be used to produce different maps at different scales e.g. the distribution in the Alps of species in a particular family. If the database is regularly revised, it will allow more precise evaluation of the distribution area. Distribution maps can serve as good tools to identify the critical areas when decisions are required from responsible authorities. The implementation of protection and rehabilitation measures should thereby be aided.

METHODS

In a first step, data from private and public collections as well as those found in publications were stored on the data bank of the CSCF. In addition, field collections in selected parts of Switzerland were conducted three times from March till

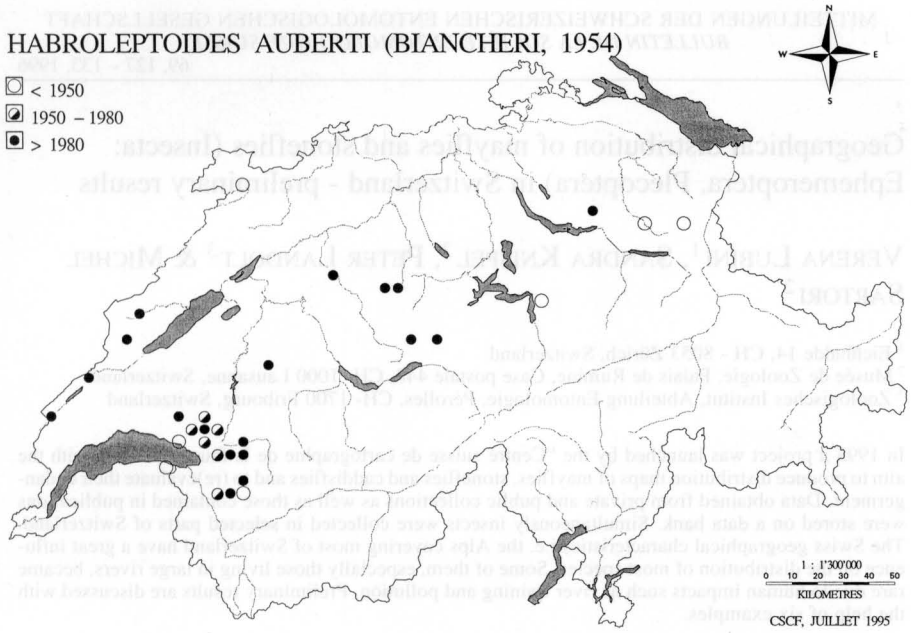

Fig. 1. Geographical distribution of *Habroleptoides auberti* (BIANCHERI, 1954) in Switzerland.

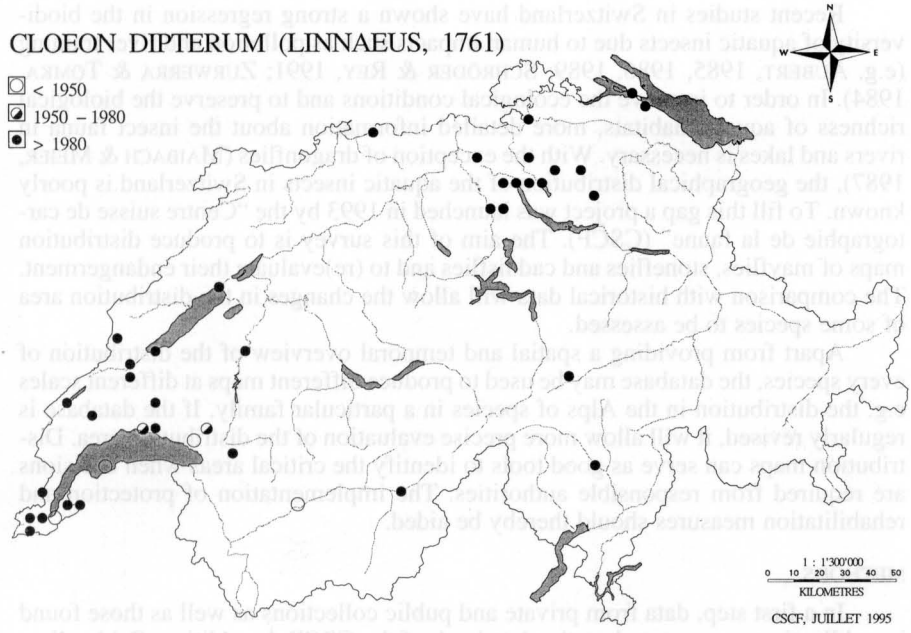

Fig. 2. Geographical distribution of *Cloeon dipterum* (LINNÉ, 1761) in Switzerland.

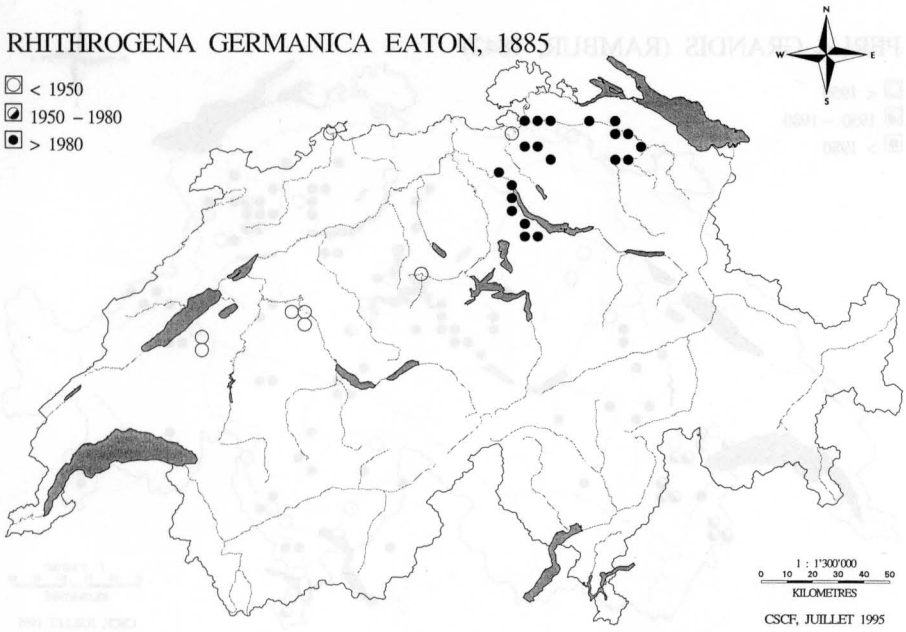

Fig. 3. Geographical distribution of *Rhithrogena germanica* EATON, 1885 in Switzerland.

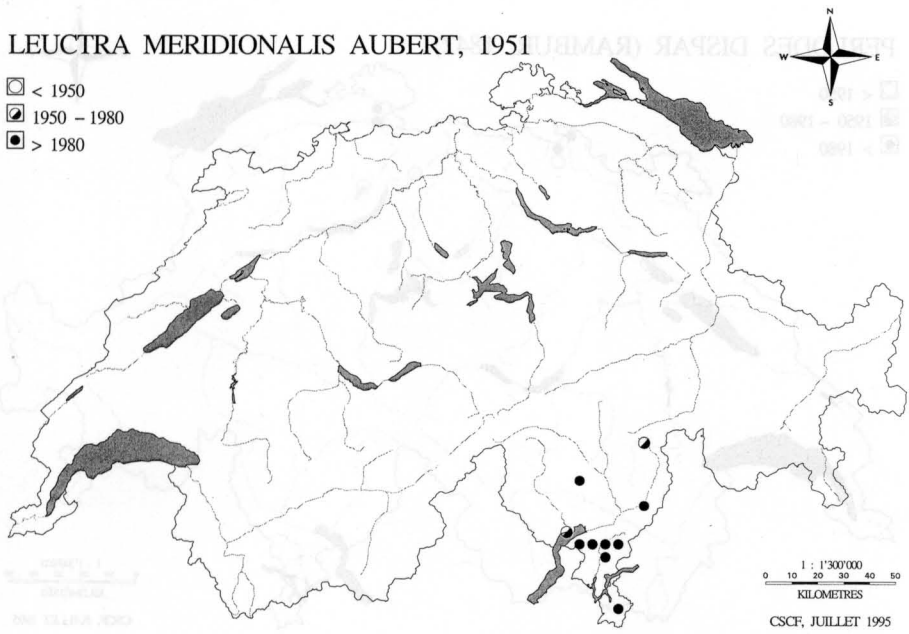

Fig. 4. Geographical distribution of *Leuctra meridionalis* AUBERT, 1951 in Switzerland.

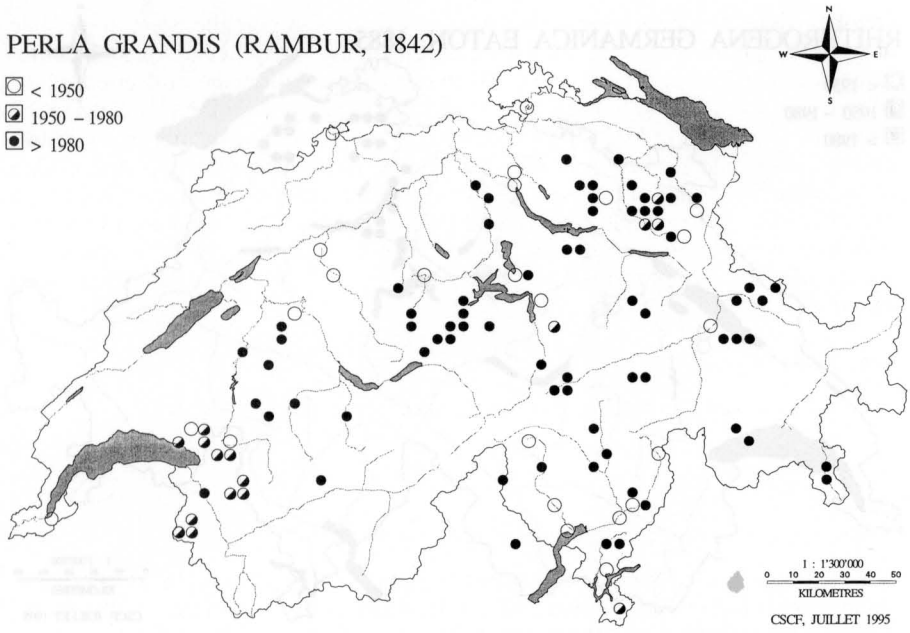

Fig. 5. Geographical distribution of *Perla grandis* (RAMBUR, 1842) in Switzerland.

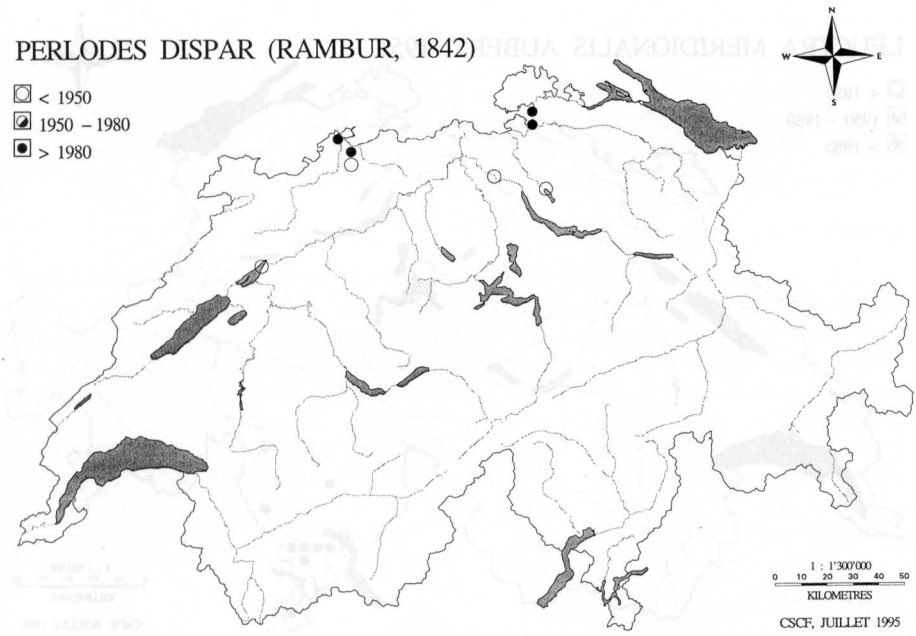

Fig. 6. Geographical distribution of *Perlodes dispar* (RAMBUR, 1842) in Switzerland.

October 1993. The collection sites were chosen so as to give the greatest possible areal coverage. Larvae were caught by kicksampling, imagines by using an entomological handnet and light traps. All material is stored in the collection of the Museum of Zoology in Lausanne. All records are handled by the CSCF using the computer program ORACLE. For each species, the following details are recorded: date of collection, locality, altitude, stage of development, sampler and person responsible for the determination. The distribution maps were printed with the help of ARCINFO. For multiple records within a grid of 5 km^2, a summarized value is indicated as one point on the map. Three different symbols show the evolution of the distribution area of the species. The maps will be published in the *Documenta Faunistica Helvetiae*.

PRELIMINARY RESULTS

Six selected species (3 mayflies, 3 stoneflies) are presented here.

Mayflies

Habroleptoides auberti (BIANCHERI, 1954)

H. auberti is restricted to the alpine region (PUTHZ, 1978). The larvae live in streams and small rivers. In Switzerland, its distribution is bordered by the northern calcareous Prealps and the southern Jura massif (Fig. 1). The altitudinal range extends from 800 m to 1500 m a.s.l. Although widely distributed, the species is locally not very abundant (STUDEMANN *et al.,* 1992).

Cloeon dipterum (LINNAEUS, 1761)

C. dipterum is a holarctic species considered to be widespread and very abundant (STUDEMANN *et al.,* 1992). The map, however, reflects rather the collectors efforts than the real distribution (Fig. 2). The larvae of this pioneer species are found chiefly in small organically enriched ponds, shallow water in lakes and slow-flowing sections of rivers and streams up to 1500 m a.s.l.

Rhithrogena germanica EATON, 1885

R. germanica is a European rheophilic species, deemed to be vulnerable and therefore considered to be endangered (SARTORI *et al.,* 1994). The larvae colonizes the lower reaches of streams and rivers. In Switzerland, the species has progressively disappeared since 1950. However, several populations have been (re)discovered in the last decade (LUBINI & SARTORI, 1994). The species is now restricted to the Rhine and some of its tributaries in the northwestern part of Switzerland (Fig. 3), suggesting a possible (re)colonization of its former habitats through surviving populations after the improvement of the water quality. Populations are found up to 620 m a.s.l.

Stoneflies

Leuctra meridionalis AUBERT, 1951

L. meridionalis was described by AUBERT from material of the southern part of Switzerland (AUBERT, 1951). The species is restricted to a small part of Switzer-

land which forms the most northern boundary of its distribution area (Fig. 4). It is an alpine species, found also in Italy (RAVIZZA DEMATTEIS & RAVIZZA, 1988) and Austria (THEISCHINGER & HUMPESCH, 1975). In Switzerland, the larvae live in streams and small rivers up to 1600 m a.s.l..

Perla grandis (RAMBUR, 1842)

P. grandis is a European species with its geographical distribution in the central and southern parts of the continent (ILLIES, 1978). In Switzerland, the species is widespread (fig. 5). Before 1950, it was very abundant in streams and rivers in the Prealps and southern slopes of the Alps. Through these rivers it also extended down to the Swiss Plateau. Recent collections show that *P. grandis* is also common in the Alps, but has almost disappeared from the Plateau in the last 40 years. In Switzerland, it is the biggest stonefly species, the wing span of the females reaching 7 cm.

Perlodes dispar (RAMBUR, 1842)

P. dispar of which the male is short-winged, is widely distributed in the central and northern part of Europe (ILLIES, 1978). The larvae live in large rivers and stony streams (LILLEHAMMER, 1988). In Switzerland, 100 years ago, *P. dispar* was found on the border of several large rivers of the Swiss Plateau such as Aare, Limmat and Rhine (AUBERT, 1949). Since then the species has almost disappeared and is now confined to the river Rhine (fig. 6). It must therefore be considered to be endangered as in Germany (ZWICK, 1984).

ACKNOWLEDGEMENTS

Alain BADSTUBER from the CSCF kindly provided the distribution maps and Andrew O. FAEH helped with the English. The survey is financially supported by the Swiss Federal Governement (BUWAL), the "Schweizerischer Bund für Naturschutz", the Centre suisse de cartographie de la faune (CSCF) and the Museum of Zoology in Lausanne.

RÉSUMÉ.

Répartition géographique des Ephéméroptères et Plécoptères (Insecta: Ephemeroptera, Plecoptera) de Suisse - Résultats préliminaires. - En 1993 le Centre suisse de cartographie de la faune a mis sur pied un projet de carthographie de la distribution des éphémères, plécoptères et trichoptères de Suisse, permettant de (ré)évaluer leur statut. Les données proviennent de collections privées ou publiques et de publications. Des récoltes complémentaires de matériel ont été nécessaires dans certaines régions. La prédominance du milieu alpin en Suisse détermine la répartition de nombreuses espèces. Les impacts humains tels que pollution et rectification des cours d'eau ont provoqués la raréfaction de plusieurs espèces, liées principalement aux grandes rivières. Les résultats préliminaires de six espèces sont présentés ici.

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