Recent changes in distribution of dragonflies in Switzerland (Odonata)

Yves Gonseth & Christian Monnerat

Abstract

In 1998 the Swiss Centre for the Cartography of Fauna (CSCF) initiated 'Odonata 2000'. This project aimed at testing a method for periodical reassessment of Red Lists in Switzerland. The study was carried out on Odonata and consisted of the resampling of known localities of threatened species and the sampling of new localities. Based on the number of sites where a given species has been found in the periods 1970-1998 and 1999-2000, trends were calculated for each species. The results show that since 1994 three species have disappeared from Switzerland, nine species have declined, two species have increased and 64 species have remained stable. *Crocothemis erythraea*, *Lestes virens*, *Nehalennia speciosa*, *Sympetrum depressiusculum* and *S. pedemontanum* are discussed as examples of the different trend categories. The authors conclude that the situation is worse than in 1994 and that the conservation of threatened species should not only focus on their last remaining habitats, but also on increasing the number of favourable sites.

Key words: Odonata, Switzerland, faunistics, Red List, conservation, trends.

Introduction

In 1998, the Swiss Centre for the Cartography of Fauna (CSCF) was contracted by the Swiss Agency for Environment, Forest and Landscape (SAEFL) to develop a strategy and a program for a periodical reassessment of the Red List of threatened species in Switzerland. The first version of this Red List (Duelli 1994) included 376 vertebrates and more than 2000 invertebrates.

In order to evaluate the proposed strategy, we elaborated a pilot project dedicated to dragonflies referred to as 'Odonata 2000'. Its aim was to test a practical method enabling us to revise Red Lists of other groups in the next decade. As a first priority, we selected groups representative of the principal macro-habitats of the country: prairies (Rhopalocera, Orthoptera), freshwater ecosystems (Trichoptera, Plecoptera, Ephemeroptera and Mollusca) and forests (Coleoptera: Cerambycidae, Buprestidae and Diptera: Syrphidae). The project was founded by SAEFL from January 1999 to December 2001.

Partners

From the beginning, we asked seven experienced odonatologists to help guiding the project and organizing fieldwork in different regions of Switzerland. Furthermore, in 1999, we requested participation in the fieldwork to all active odonatologists and received 55 positive answers.

Methods

The general strategy used to generate or to reassess red lists was based on: a. resampling of known sites (fig. 1), b. sampling of areas for which we had few or no previous records (fig. 2). The chosen strategy was effective because the distribution of dragonflies in Switzerland is well known due to the publication of an atlas (Maibach & Meier 1987) and of several canton inventories in the 1990s.

Given the logistic and financial difficulties to gather a statistically significant number of new samples within known sites and for every species, we decided to concentrate on 'target species' to plan fieldwork. The choice of target species was based on the following criteria:

1. international Red List status, namely all the species listed in the Bern Convention and in the Habitat Directive (Helsdingen et al. 1996);
2. national Red List status as mentioned in the Red Databook of 1994 (Maibach & Meier 1994);
3. national and regional distribution;
4. habitat vulnerability;
5. expert opinions.

According to these criteria we selected 37 target species among the 81 Odonata species ever recorded in Switzerland.
In the resampling program, we sampled only the sites where target species were known to have reproduced with certainty or with high probability. Criteria for assessing reproduction were derived from Chovanec (1999) and Lehmann (1990). This procedure was chosen in order to eliminate observations of isolated individuals susceptible to be incidentally observed in an unfavourable environment. For those species that have been mentioned in less than 15 sites in one or several of the six main biogeographical regions of the country, all of these sites were revisited. For more common species, only a fraction of the known sites was revisited.

The new prospective sampling effort was concentrated on lakes and ponds at high altitude and on wetlands. In 2000, the prospective sampling was only realised in regions where the resampling program itself had been fully completed in 1999. We considered a target species absent from a reproductive site, when three unsuccesful visits were made during the optimum of its flight period, under good weather conditions. Therefore, chosen sites were visited a minimum of one time and a maximum of three times. During each visit, all observed species at the site were recorded. Abundances of larvae, exuviae, tenerals, males, females or tandems, copulation and oviposition were also reported.

Trend evaluation was based on the comparison of the number of sites where a given species has reproduced during the first period (1970-1998) and the number of sites where it has been found again during the second period (1999-2000), with or without proof of reproduction. As a weighting criterion, we used the number of positive sites of the second period, which had been unsuccessfully visited in the first one. This measure, which integrates possible modifications of local species distribution, was selected because it was proven to be efficient at recapturing stable trends for common species.

Trend formula : $trend_i = [(p21_i - p1r_i) + n2_i] / p1r_i * 100$

where for species i :
p1: between 1970-1998
p2: resampling in 1999/2000
p21: both in p1 and p2
$trend_i$ = trend (in %)
$p1r_i$ = number of presences in period 1 revisited in period 2
$p21_i$ = number of presences in both periods ($p21_i$ is a subset of $p1r_i$)
$n2_i$ = number of new presences among sites already visited for any species in period 1 (weighting index)

Limitations

Of course, this approach has its limitations. The sampling strategy having been targeted on particular species, information and trends for other species were sometimes hard to interpret because: a. numerous sites hosting common species were only partially sampled, b. species with a flight period in spring or fall (*Brachytron pratense* (Müller, 1764), *Sympecma fusca* (Vander Linden, 1820) and some *Sympetrum*) were locally underrecorded. In order to correct for this bias, supplementary visits targeted on these species were organized in 2001.

Changes in distribution ranges

Examples were chosen according to the calculated trends to represent different scenarios: stability, expansion, regression and extinction.

***Sympetrum depressiusculum* (Sélys, 1841)**
(trend = 4.8%, p21 = 15, p1r = 21, n2 = 7)
In the past, this species was probably widespread in the whole Swiss plateau and at low altitudes in alpine valleys (fig. 3). With the intensive drainage of the big marshes, it progressively disappeared in a large part of the west side of the country, but remained in big populations in central Switzerland (fig. 4).
The trend calculated between the two considered periods indicates the stability of the species. We also point out that some new sites were found during the second period.

***Crocothemis erythraea* (Brullé, 1932)**
(trend = 44.0%, p21 = 18, p1r = 25, n2 = 18)
Until 1969, this Mediterranean species was an

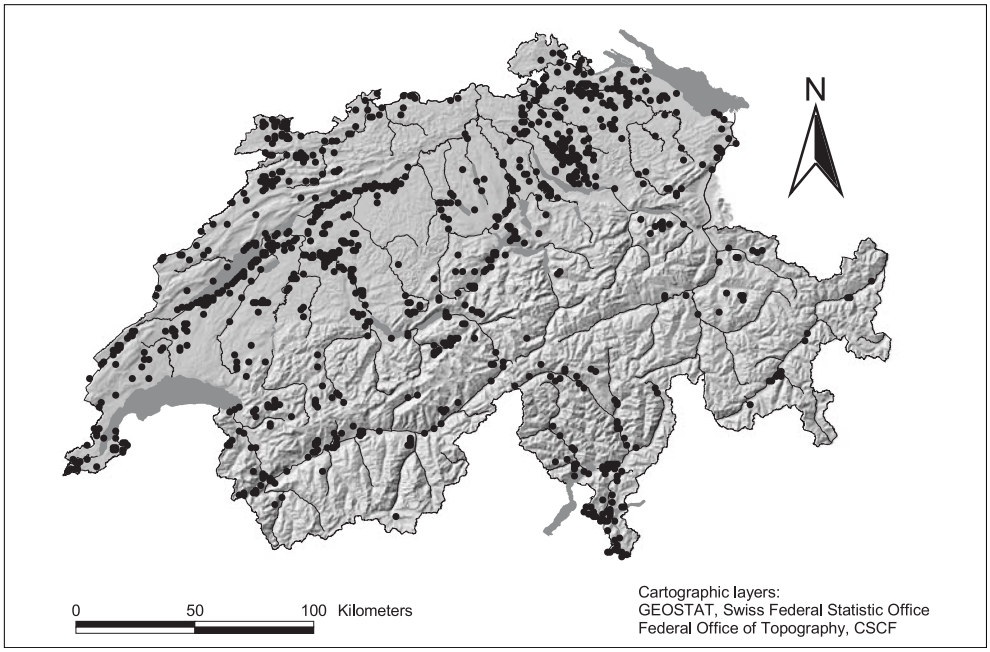

Figure 1
1 km squares revisited between 1999 and 2000.

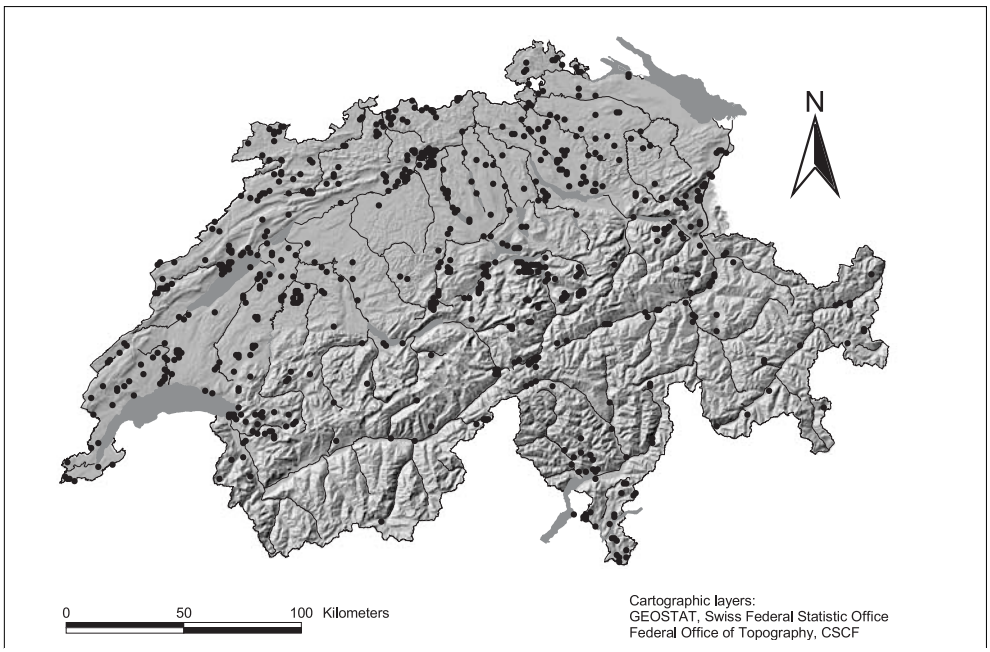

Figure 2
1 km squares visited for the first time in 1999 and 2000.

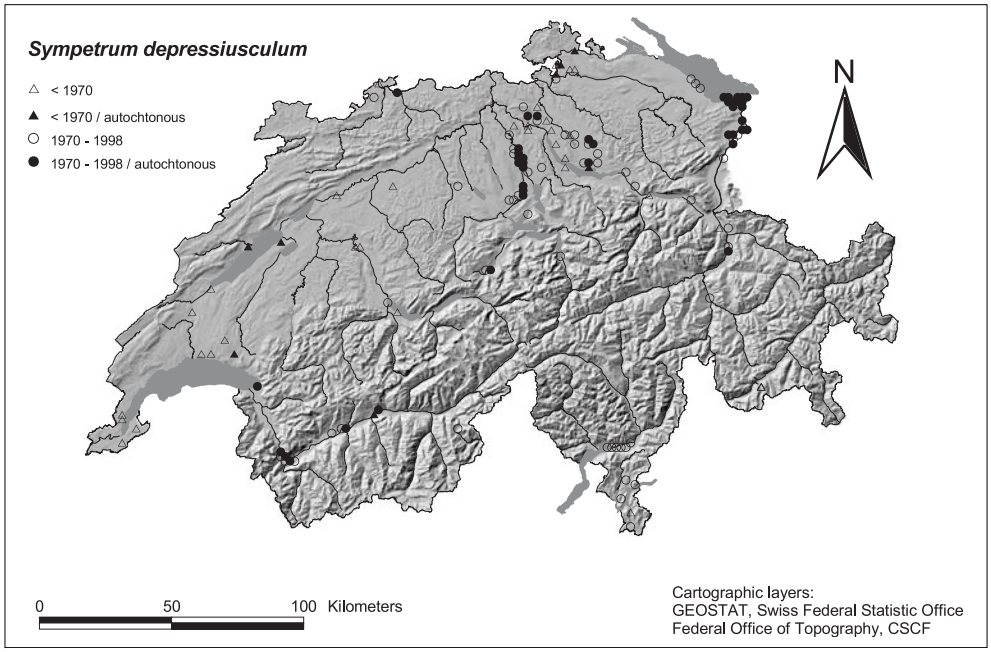

Figure 3
Distribution of *Sympetrum depressiusculum* before 1999.

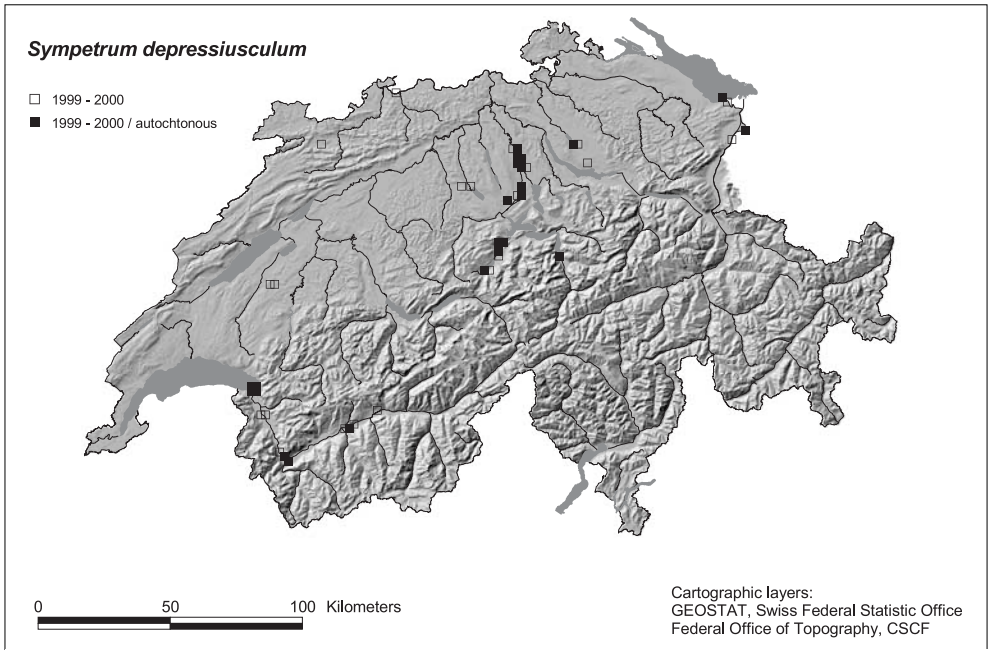

Figure 4
Distribution of *Sympetrum depressiusculum* since 1999.

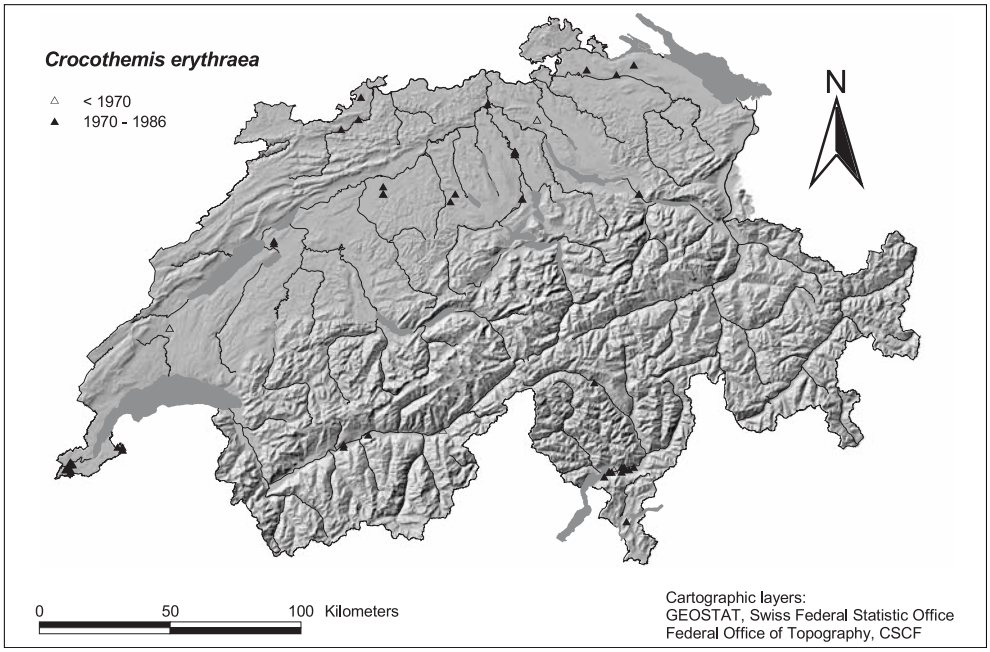

Figure 5
Distribution of *Crocothemis erythraea* before 1987.

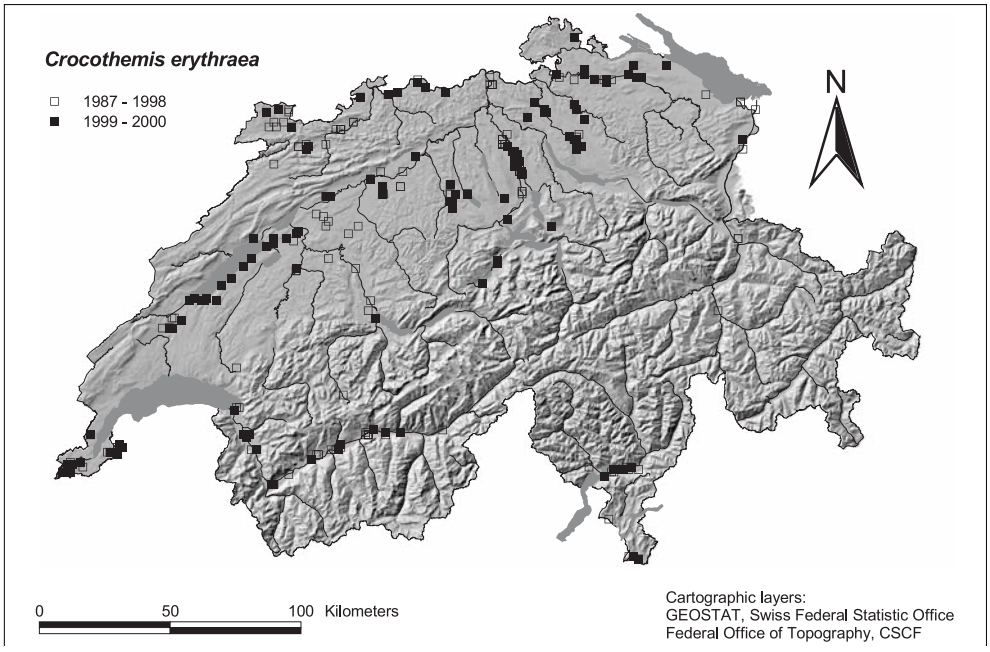

Figure 6
Distribution of *Crocothemis erythraea* since 1987.

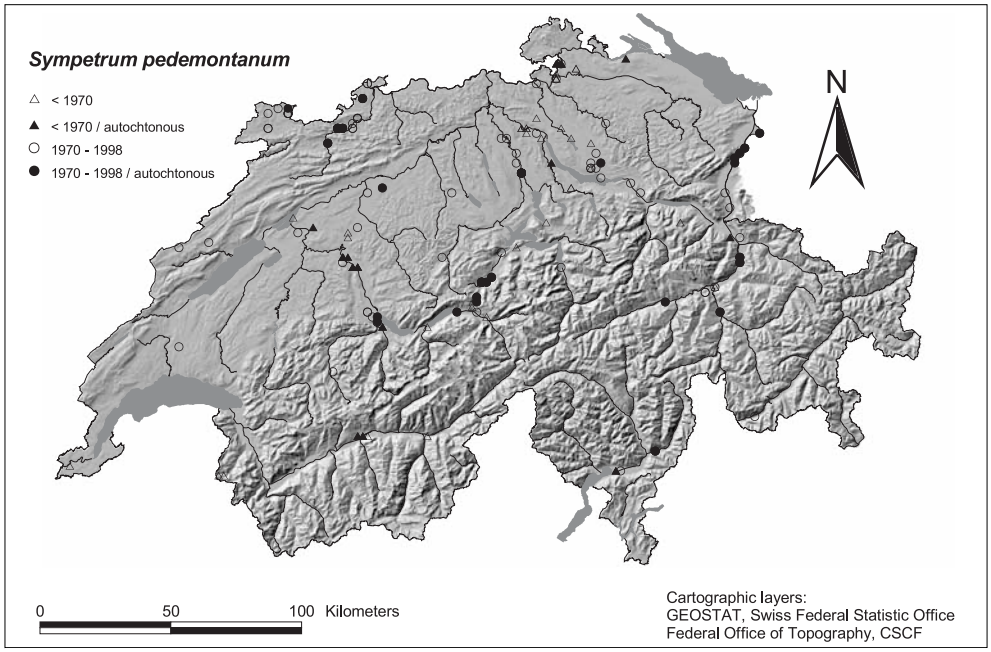

Figure 7
Distribution of *Sympetrum pedemontanum* before 1999.

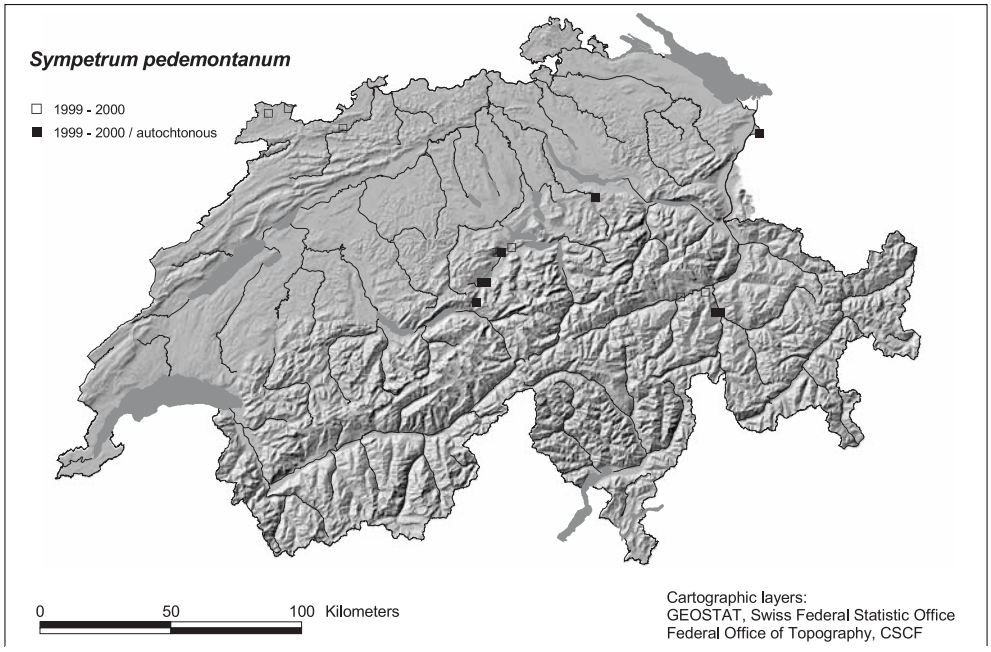

Figure 8
Distribution of *Sympetrum pedemontanum* since 1999.

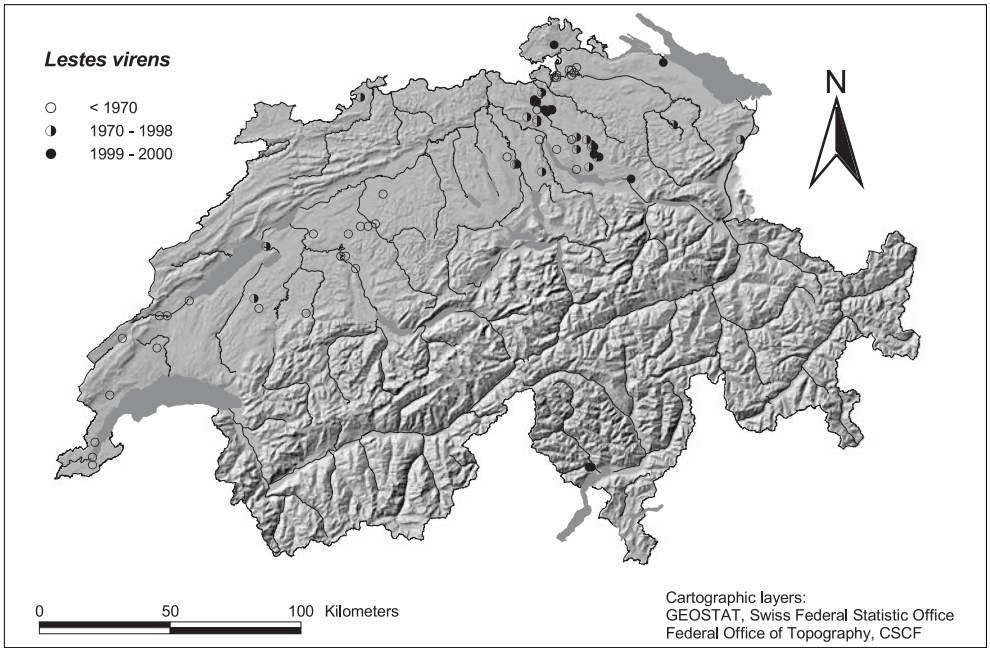

Figure 9
Distribution of *Lestes virens*.

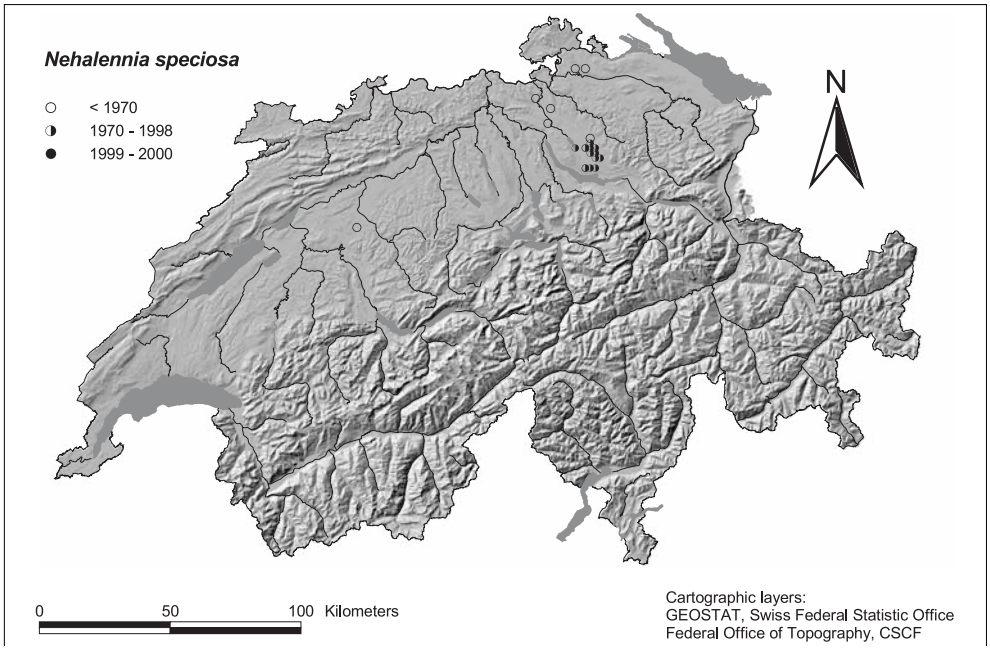

Figure 10
Distribution of *Nehalennia speciosa*.

occasional migrant with sporadic reproduction in Switzerland (fig. 5). Now the species is quite common in the low areas of the country with many regular reproduction sites. The main expansion of its range began in Switzerland at the end of the 1980s (fig. 6).

***Sympetrum pedemontanum* (Allioni, 1766)**
(trend = -43.8%, p21 = 8, p1r = 16, n2 = 1)
This species has taken advantage of the creation of numerous gravel pits and other artificial habitats during the 1960s and 1970s (fig. 7). Between 1999 and 2000 it only maintained stable populations in the central part of Switzerland and in several isolated localities (fig. 8). The probable reasons for this significant regression are the destruction of numerous pits and/or the natural succession of the pioneer ponds.

***Lestes virens* Rambur, 1842**
(trend = -57.9%, p21 = 7, p1r = 19, n2 = 1)
In the past, this species was probably widespread in the entire Plateau region. Between 1970 and 1998, it showed a strong regression in the western and central part of the country. During the last period, its regression continued in the western part and began in the eastern part of the country. Today it is extinct in many regions (fig. 9).

***Nehalennia speciosa* (Charpentier, 1840)**
(trend = -100%, p21 = 0, p1r = 11, n2 = 0)
This has always been an isolated and rare species in Switzerland, because the country is situated at the southern limit of its European range. In the beginning of the 1970s the species was recorded in nine sites North of the Lake of Zürich (Demarmels & Schiess 1977). The species was not found during the project and was last recorded by Hansruedi Wildermuth in 1990 at Wetzikon near Zürich in low numbers (less than ten males). The reasons of this dramatic decline are the isolation of the Swiss populations and the catastrophic effects of two very dry summers between 1975 and 1995. It is now considered as regionally extinct by odonatologists (fig. 10).

Result summary

The final reassessment of the Red List status of all Swiss species is made with the following criteria:

- calculated trends;
- ecological knowledge (e.g. vulnerability, phenology);
- Red List status in 1994 (the reason we took this into account is that stability, little expansion or regression are insufficient to justify a change of the initial status of species);
- expert opinion.

The main modifications of the Swiss odonatological fauna since 1994 are the following:

- three species have disappeared;
- nine species show a decline which justifies a higher Red List status;
- two species show a significant expansion which justifies a lower Red List status;
- 64 species are considered as stable or at least do not show trends which would justify a modification of their initial status.

Discussion

Our results show that 16% (12 species) of the Swiss fauna shows a significant negative trend since 1994 that might change their Red List status. At first glance the new Red List for Odonata of Switzerland will be quite similar to the one of 1994. In reality, we consider that the situation is worse than it seems to be, because many of the most threatened species of the Red List of 1994 have disappeared or are already almost extinct. This observation shows us that the conservation of very rare and threatened species should not only be focused on the conservation and management of their last remaining habitats, but should lead to the reinforcement of their populations by increasing the number of favourable sites.

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