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Minutes of the Percis II working group

Ruffe (*Gymnocephalus cernuus*)

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1. Introduction

Little attention has been paid to the ruffe (*Gymnocephalus cernuus*) in the past because of its size and its low economic value. However, the ruffe has been increasingly noticed in recent years for different reasons in Europe and also in North America. These include colonisation of new areas outside the former geographical range, posing threats to indigenous fish communities and freshwater habitats. As the consequences of these translocations are largely unknown, it is suggested that the study of ruffe should be given a high priority.

This report does not intend to give a full synopsis of publications on ruffe. However, a synopsis on this species is desirable and should be attempted. A bibliography on ruffe is published by Winfield and McCulloch (1995). The aim of the present report is to give recommendations stemming from the adhoc ruffe workshop which met during Percis II. Current knowledge on ruffe is summarized briefly and, on the basis of this, further areas of priority for research are suggested.

2. Nomenclature

There is still some confusion about the correct Latin name for ruffe with both *G. cernua* and *G. cernuus* being used. However, according to general nomenclatural rules the correct name is *G. cernuus*.

3. Current knowledge

3.1. Distribution

The natural distribution of ruffe ranges from eastern and northern Europe to the northeast of France

(Berg 1965). Ruffe are found in freshwater but also in areas of low salinity, such as estuaries and areas of low salinity in the Baltic. Ruffe were introduced into several new areas outside its natural range of occurrence. This includes the Great Lakes in North America (Pratt *et al.* 1992), Lake Constance, Germany (Hartmann 1993, Rösch & Schmid 1996), as well as lakes in northern England and Scotland (Winfield 1992). It is remarkable that this took place mainly from the 1980s onwards and not earlier. Presumably introductions of ruffe into other lakes have previously taken place, but no self-reproducing populations were established.

The routes of these introductions are unknown. However, for the Great Lakes a ballast water transport is suggested (Moyle 1991). For Great Britain a connection with bait fishing is discussed (Winfield 1996).

3.2. Biology

In Middle Europe, age of ruffe does not normally exceed 6 years (Hölker & Hammer 1994). Maximum body length generally remains below 20 cm. However, from the river Elbe estuary a maximum length of 29 cm for ruffe is reported (Hölker & Hammer 1994). Studies on ruffe biology revealed that the ruffe is a "generalist" regarding food and ecological preferences (e.g. Bergman 1987, 1991, Kangur & Kangur 1996). In contrary to most other fish species ruffe does not undergo ontogenetic dietary shifts, it remains mainly a bottom feeder throughout the whole life cycle (Collette *et al.* 1977, Bergman 1991). Only large specimens ingest fish additionally. Ruffe utilize a much larger depth distribution than perch. Ruffe are present at all depths in all seasons (Bergman 1991). All these features apparently enable ruffe to live sufficiently well as to establish new populations after introduction in nearly all water bodies in temperate zones, regardless of trophic status. However, knowledge about ruffe is still rare due to its low economic importance. Species interactions in particular are not well understood, e.g. ruffe–pikeperch, ruffe–perch, ruffe–perch–pikeperch, ruffe–perch–roach (Bergman 1987, Bergman & Greenberg 1994). A better knowledge of these interactions in "stable" populations provides the basis for a better understanding of expanding ruffe populations.

Additionally, ruffe is an effective predator of whitefish/vendace eggs and larvae (Adams & Tippett 1991, Rösch & Schmid 1996). This raises questions concerning the negative influence of newly introduced ruffe on endangered coregonid populations (Rösch & Schmid 1996, Winfield 1996). Although ruffe and coregonid fishes have coexisted for a long time within their natural range of occurrence, the situation is different in lakes where ruffe is a newly introduced species.

3.3. Genetics of the genus *Gymnocephalus*

Until the early 1970s, the genus had been thought to be represented by three species, the widely distributed Eurasian *G. cernuus, G. schraetser* from the Danube and Kamchia river basins and *G. acerinus* from northern tributaries of the Black Sea. A new species of the genus, *G. baloni* (Holcik & Hensel 1974) was discovered in 1974. Several studies have been focused on this species to reveal possible genetic differences between both species (Ráb *et al.* 1987, Sivkov 1985, Slechtová & Slechta 1995) because of doubts as to the specific validity of a new taxon. These studies have shown that individuals of *G. cernuus* and *G. baloni* can be easily identified using both biochemical and chromosomal markers. Mayr *et al.* (1987) analyzed chromosomal NORs in the three Danubian species of the genus using sequential fluorescence stainings. They found identical chromosomal locations in all three species concluding that such location is phylogenetically conserved among European percid fishes. Comparison of heterochromatin markers in the karyotypes of ruffe individuals from the Elbe and Loire river basins revealed detectable differences (Ráb & Ozouf-Costas, unpubl.). The only available study on genetic structures of different *G. cernuus* populations from the Elbe and Danube river basins as well as differences among all three Danubian ruffe species using several allozyme markers is that of Slechtová and Slechta (1996). The electrophoretic analyses revealed remarkable interspecific differences in the electrophoretic patterns of different enzymes which enabled the distinction of the three species as well as incidental hybrids.

4. Suggestions for research priority areas

The recent spread of ruffe into new areas urgently requires further studies as there are considerable implications for fish conservation and management:

— First of all, the present knowledge on recent trends in introduction and establishment of new populations of ruffe exceeding its former range has to be collated and published. Only with such an overview can most of the recent introductions and changes be documented.
— The biology of ruffe and its role in lakes where this species occurs naturally have to be studied more in detail. Interaction and competition with other species need to be investigated more intensively.
— Detailed life history studies are needed. So far, most of the knowledge on early life history is based mainly on empiric data. For example, basic questions concerning early life history of ruffe are unknown, such as multiple spawning, preferred spawning sites, larval distribution, etc.
— In order to cope with negative effects of introduced ruffe it is necessary to learn from case studies of other introduced species which are also generalists.
— Research on the genetics of ruffe is essential to provide answers on the number of fish initially introduced, the origin of the fish (Danube drainage basin, Rhine), and to identify the species occurring: *Gymnocephalus baloni* or *G. cernuus* or a hybrid.

5. Management strategies

The occurrence of ruffe has direct or indirect management implications. The ruffe has been introduced into lakes with economically very important species, for example perch or whitefish. The main question is, whether it is possible to control the population of ruffe. Several ideas were suggested:

— The enhancement of the stock of possible predators on ruffe, e.g. pikeperch, perch and eel.
— An example of successful control of ruffe is the fisheries management in Lake Võrtsjärv, Estonia, where by supporting pikeperch and pike the ruffe population is at a tolerable level (Kangur & Kangur 1996).
— In Finland a high price is paid for ruffe caviar. If demand could be increased, this could generate increased commercial fishing for this species.
— General management strategies may not be suggested due to the wide range and different situations in which ruffe established populations.

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