

ORIGINAL ARTICLE

Open Access



Caviar, soup and other dishes made of Eurasian ruffe, *Gymnocephalus cernua* (Linnaeus, 1758): forgotten foodstuff in central, north and west Europe and its possible revival

Ingvar Svanberg^{1*} and Alison Locker²

Abstract

Background: Many freshwater fish species that were earlier appreciated by consumers have disappeared in the central, north and west European foodways. Although they were regarded as healthy and tasty, commercially captured marine species and highly processed products have nowadays replaced these fishes. The global transformations of the food system contribute to the erosion of many local foodstuffs. Habitual tastes disappear.

Methods: The article is based on a vast amount of scattered original data found in sources such as in local ethnographical studies, fishing reports, topographic literature, zoological literature, archaeological fish reports, and cookery books

Results and discussion: This article discusses how Eurasian ruffe, *Gymnocephalus cernua* (L., 1758), once was used, and the reason for its disappearance, as foodstuff in some parts of Europe. Actually, it is a fish with potential for a revival as fine food. The authors discuss the chances of its rediscovery as a foodstuff, which could be used for instance within the concept of the New Nordic Cuisine and beyond. There are also environmental reasons to increase the use of local biodiversity not to mention making tastier food.

Conclusion: Ruffe is a common species in many waters and nowadays a non-used potential food resource.

Keywords: Culinary use, Ethnoichthyology, Food-cultural studies, Swedes, Russians, Finns, Estonians, Germans, Heritage food, Invasiverism, Small-scale fishing, Future food

Introduction

Nowadays most anglers and fishermen in Central, North and West Europe probably have an aversion to the spiny Eurasian ruffe, *Gymnocephalus cernua* (L., 1758) (Synonym *Acerina cernua*), if it is accidentally caught on the hook or are trapped in nets. It is a well-known species over its distribution range and has many local names. A small (rarely over 20 cm long) member of the perch family (Perchidae) the ruffe is a voracious feeder, especially of the eggs of other fish. It can survive in lower oxygen levels than

perch, and naturally occurs in still and slow-moving waters in Europe from Pyrenees in the west, the eastern and southern part of the British Isles, the Alps, Central Europe, as well as the rivers entering the White Sea, north to about 69° N in Scandinavia, over the Baltics, Finland and Russia, including the Caspian, and Aral Sea basins, east to Kolyma River in Siberia [1]

It has been introduced in many places, including Loch Lomond in Scotland, Llyn Tegid in Wales and the Great Lakes in North America, where it is nowadays regarded as an invasive species [2, 3]. In parts of the River Rhine in France, Lake Constance (German *Bodensee*) on the German-Austrian border, northern Italy, the Strymonas River Basin in Greece, and in some parts of Sweden and

* Correspondence: ingvar.svanberg@ires.uu.se

¹Institute for Russian and Eurasian Studies, Uppsala University, Box 514, SE-751 20 Uppsala, Sweden

Full list of author information is available at the end of the article



Norway it has also been accidentally introduced (Fig. 2) [4, 5].

This article briefly discusses the former importance of ruffe as food in Central, northern, eastern and western Europe, providing an overview of this particular fishery whose decline owes more to changing culinary tastes than overfishing. It also deals with the catching methods, preparation and consumption of this fish resource. The questions we aimed to answer were when, where and by whom is ruffe caught and how it is exploited? Furthermore, we also briefly discuss this species' potential as a future food, a revival within the modern European food culture.

Materials and methods

The article is based on scattered original data found in sources such as in local ethnographical studies, fishing reports, topographic literature, zoological literature, archaeological fish reports, and in cookery books. Although this information is sparse, from these diverse sources a clear pattern emerges [6]. Essentially, we set out to review and analyse the historical prevalence of fishing and culinary use of ruffe.

Culinary past

Nowadays, the ruffe is seldom used for culinary purposes. In the past, as will be demonstrated, it was otherwise; the ruffe was part of a local traditional fishery. For instance, in the late 1720s, the Swedish dean Olof Broman (1676–1750) in his book about the local culture, history and natural resources of his native province Hälsingland, among the listed fishes used as human food,

describes how the ruffe was captured in springtime with various kinds of fish traps in streams when it was spawning, and thereafter in lakes until midsummer in late June with fish hooks [7]. There are several descriptions of the capture and use of ruffe in Swedish seventeenth and eighteenth century topographical sources and it was evidently subject to specialised fishing at that time. In the early nineteenth century, it was still captured by poor people in some parts of Sweden, and it was even known as 'royal food' (*kungamat*) among them (Fig 1) [8]. In other parts of north-western Europe, ruffe also used to be appreciated, and in some parts of Germany, its flesh was even perceived to be more delicious than its larger cousin, the perch, *Perca fluviatilis* L., 1758 [9].

However, by the mid-nineteenth century, most fishing of the ruffe had ceased, at least in Scandinavia and England (where it seems always to have been an angler's catch). The large spiny dorsal fin is a nuisance for fishermen as it often is caught up in nets and difficult to remove and some contemporary anglers dislike ruffe. Considering its small size and sharp fins, it seems unlikely that it once was a prized food fish in certain areas of northern Europe. However, it was eaten in earlier times and has been an appreciated fish in some parts of Europe.

However, it was eaten in earlier times and has been part of the culinary tradition in some parts of Europe. Subsequently, other, more attractive and larger fish species, replaced it on dinner tables. In some neighbouring countries, such as Germany, Finland, and Russia, it survived as food until the twentieth century (Fig. 2). Today



Fig. 1 Ruffe in the Pärnu River, Estonia. The stony river bed would a source of mollusca, crustaceans and larvae on which ruffe also feed (Wikimedia Commons CC BY-SA 3.0)

it is a vanished foodstuff which, for several reasons, deserves to be rediscovered.

Results

Historical use

It is well known in European folklore and there are several sayings about the ruffe [10–12]. Some local folk names are also used as pejorative, such as Swedish *snorgärs* 'snot ruffe' for immature boys [12]. There are several folk animal stories, such as 'The ruffe and the salmon', in Germany and the Nordic countries [13, 14]. The otoliths (a dense aragonite structure in the 'inner ear' of fishes used for hearing and balance) were also sought after for medicinal purposes, especially pneumonia and kidney disease, in earlier centuries. In Sweden Carl Linnaeus culled it from the official Swedish pharmacopoeia in 1750 [15, 16].

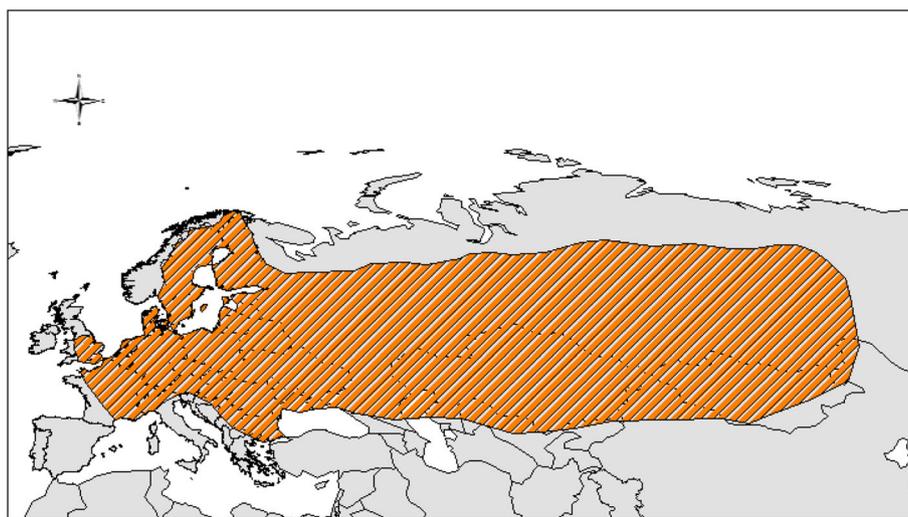
Archaeological finds of the bones of ruffe are rare and may have been classified as 'perch family' when it was not possible to make a specific identification. The perch is closely related and can hybridise with ruffe, though the offspring are sterile. Perch is identified more often in archaeological deposits, but usually in small numbers. Remains of ruffe have been found in Stone Age shellmiddens in Latvia, indicating that it has a long tradition as food [17]. Other examples include single bones in Roman deposits at Lincoln and Wroxeter, England [18], from Belgium at Namur in a seventeenth century latrine pit [19] and in medieval deposits at Laarne Castle in Flanders [20]. In Germany, three bones of ruffe were identified from Plesse Castle (near Göttingen) in fifteenth/sixteenth century deposits and one from sixteenth-/seventeenth-century deposits. Freshwater species were in the majority in this particular assemblage though ruffe were few [21].

It is described and depicted from Central Europe by Swiss zoologist Conrad Gessner 1558 in his *Piscium & aquatiliū animantium natura*, translated into German 1563. One specimen is from Strasbourg, the other one is from England (it is also shown on the title page of the German edition) (Fig. 3). Gessner renders the common German name as *Kaulbars*, but also some other local names for it (*Kutt*, *Kaut*, *Kaulbarss*, *Kaulpersich*, *Gold-fisch*, and from Cologne *Pösch*). He concludes that the ruffe has a very praiseworthy flesh, similar to the perch, and is very healthy to eat [22].

Used as food in Central Europe

Germany—As already observed by Gessner, it is known under many folk names in the German-speaking areas including *Kaulbarsch*, *Kugelbarsch*, *Steuerbarsch*, *Sture*, *Rauhigel*, *Rotzbarsch*, *Rotzheter*, *Rotzwelf*, *Pfaffelaus*, *Kutz* and *Kutzen* [9]. The documentary evidence suggests it was caught all over the German-speaking areas into the early twentieth century. According to a book from 1909, some connoisseurs regarded the taste to be superior to other fishes [9].

It was subject of commercial fishing in the Lower Elbe where in the past it was landed in larger amounts than the perch [23]. In Prussia, it was fished in the Curonian and Vistula Lagoons. Fish master Ernst Wilhelm Behrboom (1786–1865) in the village Feilenhof (contemporary Muižė in Lithuania), describes an interesting fishing technique by villagers at the Curonian Lagoon who made high pitched sounds using iron rings which attracted the ruffe into special nets in large numbers [24]. Soup made of ruffe, known as *Sturensuppe*, was considered a delicacy [25]. In the 1920s, the main ruffe fishing occurred in the Baltic haffs, i.e.



Distribution of *Gymnocephalus cernua* (L.) in Eurasia

Fig. 2 Eurasian distribution of *Gymnocephalus cernua* (Map by Hele Kiimann)

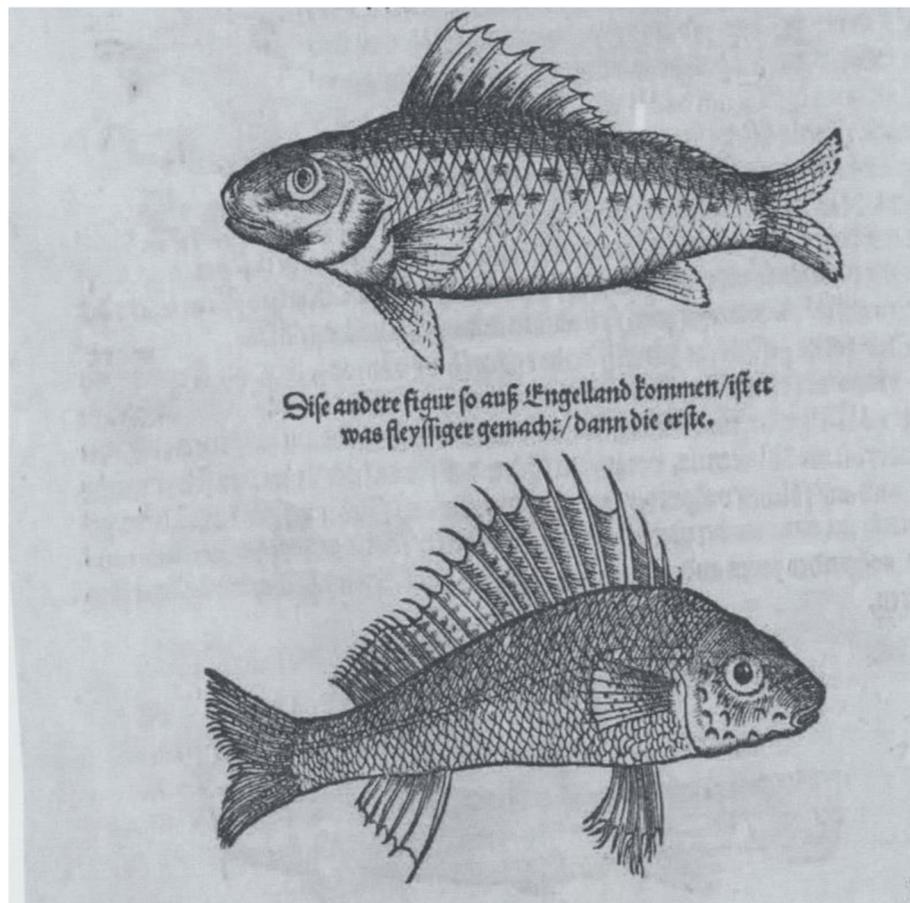


Fig 3 Illustrations of ruffe in Conrad Gessner's *Fischbuch* 1563. These illustrations clearly show the spiny dorsal fin rays which catch in nets and can pierce the hands of fishermen

Curonian Lagoon and Vistula Lagoon. The annual average catch for the whole of Germany during the period of 1926–31 was 1759 tons, 1711 tons from the Baltic haffs alone. The restriction of using trawls in the lagoons in the early 1930s changed the fish fauna and the fishing for ruffe ended [26]. After World War II, these parts of Germany became parts of Lithuania.

As late as 1950, Richard Gerlach reported that the flesh was so delicious that the people in East Germany usually mixed some into the water when they boiled pike-perch, *Sander lucioperca* (L., 1758) in order to give it a better taste [27]. Ruffe was also imported as food to West Germany from Denmark in the 1960s [28].

Hungary—it is known as *vágó durbincs* or *paptetű* and provides a delicious meat, which is used for preparing soup [29].

Use as food in Northern Europe

Denmark—It is known as *hork* in Denmark. There are several local names in the German-Danish borderland (Southern Jutland): *Kaulbarsch*, *Stuer* and *Stuerbarsch*.

Near the town Ringkøbing it was known as *sandknaegt* [12]. However, besides some general statements about its flesh in fish handbooks, there are only a few reports regarding its culinary value. In 1791, it was reported from the region Zealand (Sjælland) that it was considered a delicacy by many, and in 1802 a source says it provides a tasty soup [30]. In a research report from 1965, it is said that it is almost never used as human food, probably due to its size (28). In various places in Denmark, it has been used as bait for eel, or as feed for trout. It has been used as fodder for chicken and pigs [28, 30]. However, in some places where it reaches a reasonable size, it was still, in the mid-1960s, captured and exported together with perch to Germany as human food [28].

Sweden—It is common over almost all parts of Sweden [31]. There are many local Swedish names for ruffe, besides *gärs* (alternative spelling *gers*) it was also known as *snorgers*, *snorluf*, *snorpels*, *skattbonde*, *hork*, *glybba*, *pinnhork*, *grälänning* and *stenbit* [8, 10, 12]. There are several reports of its use as human food in the sixteenth,

seventeenth and eighteenth centuries [12]. According to the personal physician to Queen Christina, Andreas Sparman Palmcron in 1642, the flesh was esteemed by many and considered to be even better than perch [32]. Zoologist Sven Nilsson mentioned that it was captured in a few places in Sweden, but thought that it deserved to be more recognised as human food [10]. However, it disappeared from Swedish tables in the late nineteenth century [33].

Norway—It is known as *hork*, *horka*, *ryle*, *skrukke*, *snorgørs* and *steinpurke* in Norwegian and distribution is restricted to the southern part of Norway from Lake Glomma upstream to Lake Mjøsa in the province of Østfold [12]. According to Bishop Erik Pontoppidan, some people considered it a delicacy [34].

Finland—It is common over most of the country and in the Baltic Sea. In the Finnish-speaking areas, it is known as *kiiski*, *rökäs*, *kimalipponen*, *nokkapää* and *jorssi*, the ruffe was captured in large quantities by fishermen in the Finnish archipelago, and dried in ovens [35, 36]. In lake Oulujärvi in central Finland, it was still captured in fish traps in river mouths in the early twentieth century [37].

Use as food in Western Europe

England—The native range of ruffe in the British Isles is mainly in the south and east of England, although it was introduced to Loch Lomond, Scotland, where it was discovered in 1988 and in Wales at Llyn Tefid probably as bait for pike. Local names besides ruffe are *pope*, *tommy-bars*, *Jack Ruffe*, *Daddy Ruffe* and *stone perch* [38, 39]. Although archaeological bone evidence for this small fish is limited and there is no earlier culinary tradition it is recorded among freshwater fish bought by noble families in the medieval period. Records date to the mid fourteenth century in East Anglia where it was common and in the fifteenth century in the Chilterns near the Thames and Thame rivers [40]. However, there is no evidence that ruffe was an important part in the gift exchange of freshwater fish that took place between noble families in this period [41].

Ruffe also features in some early angling books, which remark it is good to eat and has firm flesh. Arguably the progenitor of all angling books *A treatyse of Fysshynge wyth an Angle* (1496) describes the ruffe as a right and wholesome fish. In the *Arte of Angling* (1577), the voracious appetite of the ruffe is described; for eating it is recommended for the sick, better than gudgeon or perch [42]. Isaac Walton writes in *The Compleat Angler* (1653), the bible of many an angler, that the ruffe, or pope, is not found in all rivers but is an excellent fish, no other fish tastes better and as a greedy feeder is an excellent prey for young anglers [43]. By the late nineteenth century, the ruffe is described as one of the small

fry found in the Thames and other streams, but seldom sought by anglers [44]. It has sometimes been regarded as a pest by British anglers seeking other fish. When live bait was used for trolling for pike in England the ruffe was a popular choice and a cork on the dorsal spine was sometimes used to keep it near the surface to attract pike. Today anglers are warned to be careful when handling ruffe as when caught the fish becomes rigid, extends the dorsal fin and flares its spiny gill covers (preoperculae). It is common in English canals today, especially in the north [45].

For other western European countries, it has proved difficult to find any culinary tradition for ruffe as shown below.

France—The Vivendier, a mid-fifteenth century manuscript, likely originating in north east France, includes a number of recipes for freshwater fish but neither ruffe nor the related perch feature [46]. La Varenne, the head chef for the Marquis d'Uxelles at his chateau in Bourgogne, was the author of cookery books published between 1651 and 1660. These became very popular, translated into many languages influencing culinary styles. They include fish recipes for all seasons and occasions, but while recommending a number of freshwater fish species no longer popular today, he does not mention ruffe [47]. Abad's study of the food supply to Paris during the late fifteenth to late eighteenth centuries provides a detailed account of the freshwater fish supply, including some small species not commercially viable to market in the capital [48]. Although he does not mention the ruffe (*la grémille*) specifically it probably belongs to this group. It may have been eaten in rural France in the past, but we were unable to find supportive documentary evidence.

Netherlands—A study of the sixteenth century *Fish Book* by Adriaen Coenen (1577–1581) reveals that ruffe were sold in Dutch markets with other freshwater fish [49]. Although Coenen gives some information as to the fish bought most commonly by different economic groups, he does not single out the ruffe for comment.

Use as food in Eastern Europe

Estonia—Ruffe, locally known as *kiisk*, has been the subject of commercial fishing in Estonia [28, 50]. The species has been the subject of a fishery, especially in Lake Peipus on the border with Russia. Today it has little value for commercial fishery. The Swedish-speaking coastal dwellers and islanders referred to it as *gers* [51].

Russia and Belarus—It is a widely distributed species over Russia and Siberia. It is known as *ёрш* (*ersh*) in Russian, and *Йорж* *iorž* and *bubyr' bobyr'* in Ukraine [11]. The many ethnic minorities in Russia also have a lot of native names for ruffe [52]. However, it is caught with nets in lakes and consumed locally mostly within

households. It has been regarded as the best fish for fish soup, and in the past, it was caught in the Gulf of Finland, in the mouth of the river Neva, and in the many northern lakes, for instance Lake Ilmen [52]. Opinions about its eating qualities have been mixed [11]. Ruffe have been of great importance as a commercial fish during the twentieth century, especially in Lake Peipos in the Estonian-Russian border, the Curonian Lagoon in the Kaliningrad-Lithuanian border, Lake Syamozero in Karelia and the reservoirs of the Volga, Ob and Yenisei Rivers. However, in the 1970s the authorities recommended reducing their numbers due to competition with other more valuable species. These attempts were not successful, though nowadays the ruffe population is declining due to environmental changes in many waters [53]. Ruffe still have some minor commercial importance in Russia and Belarus [54].

Fishing technique and catch

The ruffe has been captured with the help of seines and other nets and traps. It can also be taken on hooks baited with worms and is said to have a voracious appetite. In some areas, they used custom-made equipment and gear for the capture of this species. From the province of Blekinge in southernmost Sweden, it was captured in nets with a specially made mesh. The ruffe was taken especially in the autumn and sold at markets [55]. In Värmland, it was captured in large numbers in the early eighteenth century, according to a description from 1717, appreciated as nice food by some, used as swine feed by others [56]. From Kalmar, an author reported in 1767 that it was captured in the river mouth with seines [57]. Linguist Lars Levander (1943) reports from the province of Dalecarlia that young boys in the nineteenth century caught ruffe by hand in streams [58].

It is reported that it has been used as bait for fishing burbot, eel, perch and pike in Sweden, Finland and Norway in the eighteenth and nineteenth centuries [12]. It was regarded as resilient and could survive for several days on the hook [59]. In East Prussia the peasant fishermen also used specially made nets for catching ruffe [25].

Recipes

Although the data are scant, older descriptions confirm that the ruffe was good to eat. The flesh is described as white, with a good texture, tasty and easy to digest. Making soup seems to have been the traditional way of eating ruffe in Europe. It could also be eaten dried. In a Swedish menu from a Royal dinner in 1623 'ruffe with saltwater' is mentioned as a separate dish [60]. There are a few recipes in Swedish cookbooks from the nineteenth century. Margareta Nylander, the pen-name for Margaretha Emerentia Nordström (1783–1873), wrote a book

on "finer cooking" for the urban bourgeoisie. She published a cookbook in 1822 and it was reprinted in 20 editions, the last one in 1902. Her recipe for boiled ruffe is typical of the more modern cookery, which developed in the nineteenth century. The scales and intestines are removed and the fish is boiled for a short time in lightly salted water. A sauce is made with fresh butter, wheat flour, and fish broth. An egg yolk is whipped into the sauce [61]. The same recipe is repeated in more recent cookery books dealing with fish dishes [33, 62].

Islanders of the Finnish archipelago captured a lot of ruffe while seine fishing in autumn. They were dried in the oven [36]. However, in Ostrobothnia the roe was traditionally eaten as caviar with onion and pepper on bread. In Finland there seems to have been an unbroken tradition of eating ruffe caviar. It has long been sold in the food markets in Oulu and Helsinki. The Finnish president Urho Kekkonen (1900–1986), fond of local delicious food, appreciated caviar from the ruffe. In the late 1990s, one of the largest department stores in Helsinki, Stockman, still sold ruffe roe as caviar in the delicatessen store. Also, the now closed restaurant Havis Amanda in the centre of Helsinki served ruffe roe as caviar in 1998 [12].

In England, despite the earlier praise for its flesh ruffe fell out of favour on English dining tables along with most other freshwater fish, apart from the brown trout (*Salmo trutta* L., 1758). Specific recipes are scarce, though Hannah Glasse in her cookery book from the eighteenth century includes ruffe in a list of fish and how to choose them for the Christmas quarter, but no cooking instructions [63]. Another from the 1940s recommends frying and then removing the tough skin [64].

It seems to have been a common food fish in Russia. According to a mid-nineteenth century source it was brought in large numbers to the fish markets. A very tasty fish soup, Russian уха ершовая, was made of it Fig. 4 [65]. Famous Russian author Nicolai Gogol mentions in *Dead Souls* (first published in 1842) how the fishermen made soup of ruffe [66]. The soup was considered healthy, nutritious and delicious. The broth can be consumed as a bouillon or you add potatoes, carrots, celery root, and onion. Anglers are still trying to catch ruffe along the banks of Neva River in Saint Petersburg. The soup is mentioned in many historical and contemporary cookery books [25, 66–70]. However, according to some Russian proverbs, elsewhere, it was not a very appreciated food fish [11].

In addition, Germans, especially in East Prussia, enjoyed a soup made of ruffe [25, 71]. Pomeranian ruffe soup is still known among German *Heimatvertriebene* ('homeland expellees') from the lost provinces in the east. An old German cookery book gives also recipes for *Gebackener Kaulbars* 'baked ruffe' and *Kaulbars mit Buttersauss* 'ruffe with butter sauce' [72].



Fig 4 Traditional Russian fish soup, ukha. There are many family recipes for ukha, but besides fresh fish, the most common ingredients are potatoes, onions, parsley and black pepper. Some people add carrot to it. Local recipe variations might include other vegetables and spices. It is a simple soup to make and it takes approximately only 45 min to prepare and cook it (Photo Alexei Hulsov from Pixabay)

One can still buy dried ruffe chips in Estonia. Dried fish are a traditional beer snack in Russia and the Baltic States. At Tallinn Airport small plastic bags with salt-dried ruffe were sold in the spring of 2019 (Fig. 5).

Discussion

Once upon a time, ruffe seems to have been eaten over most of its natural distribution area in Europe. Commonly people made soup of it, or dried it for later consumption. The flesh was regarded as delicious and healthy. Although tastes changed over time, it does not explain entirely why ruffe disappeared as food. The ruffe is not the only small freshwater fish that earlier was eaten in northern, western and central Europe. Other now forgotten small fish once used and even regarded as delicacies include the stone loach, *Barbatula barbatula* (L., 1758), gudgeon, *Gobio gobio* (L., 1758), fourhorn sculpin, *Myoxocephalus quadricornis* (L., 1758) and minnow, *Phoxinus phoxinus* (L., 1758) [12, 73].

In fact, almost all kinds of freshwater fish from lakes and rivers were captured by artisanal fishermen and used as food in one way or other by the peasantry in earlier centuries [12, 41]. The main reason why people changed their preferences in the nineteenth and twentieth centuries (and earlier in England) was due to the increasing access to protein through other sources. The regression of many freshwater fish species as food is due to modernisation, especially the industrialisation of marine fishing, landing large quantities of fish and, with improved transport and chilling methods, reaching the inland market [41].

The agriculture sector also changed, famine occurred more seldom and food production and increased international trade made other foodstuff more available for all. The level of self-sufficiency of peasants decreased. Meat production became more intensive and together with increasing access to fish from the coastal areas and more distant waters preferences changed and freshwater fisheries became less vital. Highly processed fish was to become preferred being easier to prepare and nowadays very few consumers can even clean raw fish or may find it disgusting. Global transformations of food systems have contributed to the erosion of many local foodstuffs. Habitual tastes have disappeared [12].

With the exception of using the roe as a kind of caviar in Finnish restaurants making modern food *a la* the New Nordic Cuisine-concept, ruffe is now an almost forgotten culinary delicacy in north Western Europe [33].

Today, when many marine fish stocks are depleted due to overfishing and ongoing climate change it may be necessary to go back to the utilization of freshwater species. The ruffe is a common species in many lakes. Maybe western Europeans should learn from Finland and Eastern Europeans and revive an appreciation for ruffe. It has at least some potential within the New Nordic Cuisine. It can be locally caught, the fishery should be sustainable, and it is common in many waters and qualifies as a natural unspoiled product [74].

Contemporary fish consumption has changed so radically that species like ruffe are unlikely to be mainstream again, not with the contemporary food system. However,



Fig 5 Bag with dried, salted ruffe fillets sold as beer snacks in Estonia. Its distinct flavour and saltiness are commonly washed down with a glass of beer or traditionally with a glass of vodka (Photo Ingvar Svanberg, 2019)

the ruffe may have potential for a niche place in rather specialised products or high-end cuisine. A fish that was once regarded as “royal food” may have a future in restaurants. Their roe as caviar could have a future not only in Finland, but also elsewhere. Vendace, *Coregonus albula* L., 1758, roe is sold for high prices in Scandinavia [75]. Many freshwater fishes give excellent caviar although consumers (and producers) have not discovered that yet. Ruffe roe can have potential here, for everyone interested in local and cultural heritage food, especially chefs working with concepts like the New Nordic Cuisine and other avant-garde food cultures. In Finland, ruffe caviar is sold for high

prices [76]. In addition, the fish soup made from ruffe has the potential for revival. It is something for creative chefs, interested in local and slow food (slow fish!), to develop. There is right now a vogue in wild food use (game, seafood, plants), particularly within haute-cuisine [77]. It is possible to revive old foodstuffs and make them appealing for modern consumers [78]. The use of European smelt, *Osmerus eperlanus* (L., 1758), has, after decades of absence as human food, recently returned in German restaurant cuisine [79].

Ruffe soup is a dish with a terroir suitable for the modern consumer, as is the roe served as caviar [80].

When fish resources become rare, the invasive populations of ruffe in Scotland, Wales, several places in the European continent, as well as in North America, could be fished commercially. The presence of invasive fish species in the lakes disrupts the native ecosystem. Some scholars and food writers advocate *invasivorism* as a response, i.e. eating invasive species in order to reduce their populations. Fish are suitable for this kind of action. Good and innovative chefs can use the flesh to develop tasty dishes. Traditional soups can be modernised, roe of other species are already utilised within restaurants to which ruffe roe can be added [81].

Conclusion

Although the ruffe once was a popular fish for consumption and its flesh described as delicious and healthy, it has disappeared almost entirely from central, northern and western European food culture. It is no longer sought after in the market. However, it has survived to some extent as human food in Finland, Estonia, Belarus and Russia. In Finland, it seems to be the roe that still attracts some consumers, especially within restaurants serving the New Nordic Cuisine. In Estonia, it is sold dried and salted as snacks. In Russia, some people still make *ukha*, the typical clear fish soup, with ruffe. A fish, which is reputed to quickly dominate the fish fauna where it has been introduced, the ruffe would seem also as an ideal candidate for aquaculture as a re-discovered delicacy for a wider market.

Acknowledgements

Our sincere thanks to Dr Hele Kiimann, Estonian Maritime Museum, Tallinn, who draw the distribution map.

Authors' contributions

IS was responsible for study design. Both authors were responsible for data collection and data analysis. They both wrote the manuscript. Both authors read and approved the final manuscript.

Funding

Not applicable.

Availability of data and materials

All data generated or analysed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests.

Author details

¹Institute for Russian and Eurasian Studies, Uppsala University, Box 514, SE-751 20 Uppsala, Sweden. ²58 Avinguda del Pessebre, Edifici L'Inglia, Atic 1a, AD700 Escaldes-Engordany, Andorra.

Received: 7 October 2019 Accepted: 23 December 2019

Published online: 09 January 2020

References

- Kottelat M, Freyhof J. Handbook of European Freshwater Fishes. Berlin: Publications Kottelat, Cornol and Freyhof; 2007. p. 528–9.
- Winfield IJ. Threats to the lake fish communities of the U.K. arising from eutrophication and species introductions. *Netherlands J Zool.* 1992;42:233–44.
- Adams CE, Maitland PS. The ruffe population of Loch Lomond, Scotland: its introduction, population expansion, and interaction with native species. *J Great Lakes Res.* 1998;24(2):249–62.
- Ogle DH. A synopsis of the biology and life history of ruffe. *J Great Lakes Res.* 1998;24(2):170–85.
- Stepien CA, Haponski AE. Taxonomy, distribution, and evolution of the Percidae. In: P. Kestemont, K Dabrowski, RC. Summerfelt (eds.) *Biology and Culture of Percid Fishes: Principles and Practices.* Dordrecht: Springer; 2015. p. 3–60.
- Myrdal J. Source pluralism as a method of historical research. In: Hellman S, Rahikainen M, editors. *Historical knowledge: in quest of theory, method and evidence.* Newcastle upon Tyne: Cambridge Scholars Publishing; 2012. p. 155–89.
- Broman O. Gylsivallur och öfriga skrifter rörande Helsingland vol. 3. Upsala: Gestrike-Helsing Nation; 1912–54. p. 588.
- Ekström CU. Fiskarne i Mörkö Skärgård. *Kongl. Vetenskaps-Academiens Handlingar för År 1831:70–107.*
- Vogt C, Hofer B. Die Süßwasserrische von Mittel-Europa. Frankfurt am Main: Werner & Werner; 1909. p. 495.
- Nilsson S. Skandinavisk fauna vol 4. Fiskarna. Lund: Berlingska boktryckeriet; 1852. p. 33.
- Leder I. Russische Fischnamen. Wiesbaden: Otto Harrassowitz; 1968. P. 144.
- Svanberg I. Havsråttor, kuttluchor och rabboxar: folklig kunskap om fiskar i Norden. Stockholm: Arena; 2000. p. 76.
- Meyer G. *Essays und Studien zur Sprachgeschichte und Volkskunde.* Strassburg: Karl Trübner; 1893.
- Schreck E. *Finnische Märchen.* Weimer: Hermann Böhlau; 1887. p. 238–9.
- Linnaeus C. *Materia medica in regna animalia.* Uppsala [Diss]; 1750.
- Drake G. *Linné och Pharmacopoea Svecica Ed. I.* Svenska Linné-Sällskapets Årsskrift 1921;4:1–15.
- Ritchie K, Lübke H, Schmölke U., Meadows J, Berziņš V, Kalniņš M, Brinker U., Ceriņa A. The freshwater shellmidden at Rinnukalns: Stone Age fishermen in the eastern Baltic region. In: *Subsistence Strategies in the Stone Age. Direct and Indirect Evidence of Fishing and Gathering.* St. Petersburg; 2018. p. 43–44.
- Locker A. In piscibus diversis; the bone evidence for fish consumption in Roman Britain. *Britannia* 2007; XXXVIII:141–180.
- Van Neer W, Lentacker, A. Restes fauniques provenant de trois fosses d'aisances du Grognon à Namur (XIIe, XVe-XVIe et XVIIe siècles). In: J Plumbier, M-H. Corbiau (eds.) *Actes de la Quatrième Journée d'Archéologie namuroise.* Namur; 1996. p. 89–104.
- Ervinck A, Van Neer W. A preliminary survey of fish remains in medieval castles and towns of Flanders (Belgium). *Offa.* 1994;51:303–7.
- Heinrich D. Fish remains from castles and an urban context. In W Van Neer (ed.) *Fish Exploitation in the Past.* Tervuren: Annales du Musée Royal de l'Afrique Centrale, Sciences zoologique; 1994. p. 211–216.
- Gessner C. *Fischbuch, Das ist ein kurtze, doch vollkomne beschreibung aller Fischen so in dem Meer vnnd süßen wasseren, Seen, Flüsse, oder anderen Bächen jr wonung haben.* Zürich: Froschauer; 1563.
- Mohr E. Beiträge zur Naturgeschichte des Barsches (*Perca fluviatilis*) und des Kaulbarsches (*Acerina cernua* L.). *Mittelungen aus dem Hamburgischen zoologischen Museum und Institut.* 1923;40:79–94.
- Brehm AE. *Thierleben, allgemeine Kunde des Thierreichs.* Bd 3. Fische. Leipzig: Verlag des bibliographischen Instituts; 1879.
- Benecke B. *Fische, Fischerei und Fischzucht in Ost- und Westpreussen.* Königsberg: Hartungsche Verlag; 1881. p. 65.
- Neuhaus E. Untersuchung über den Kaulbasch. *Zeitschrift für Fischerei.* 1934;32:1–35.
- Gerlach R. *Die Fische.* Claassen: Hamburg; 1950.
- Johnsen P. Studies on the distribution and food of the ruffe (*Acerina cernua* L.) in Denmark, with notes on other aspects. *Meddelelser fra Danmarks Fiskeri- og Havundersøgelser.* 1965;4(6):137–56.
- Kováč V. Biology of Eurasian ruffe from Slovakia and adjacent Central European Countries. *J Great Lakes Res.* 1998;24(2):205–16.
- Brøndegaard VJ. *Folk og fauna: dansk etnozooologi vol. 1.* København: Rosenkilde og Bagger; 1985. p. 265.
- Lundberg R. *Om svenska insjöfiskarnas utbredning.* Kongl. Landtbruksstyrelsen: Stockholm; 1899.
- Sparman A. *Sundhetzens spegel, uti hwilken man beskodar sundhetzens natur.* Ignatium Meurer: Stockholm; 1642.
- Lindell G, Svanberg I. *Insjöfisk: recept och kulturhistoria.* Molin & Sorgenfrei: Stockholm; 2014.

34. Pontoppidan E. *Det første Forsøg paa Norges naturlige Historie* vol 2. Kiøbenhavn: Berlingske; 1753. p. 192.
35. Malmgren AJ. *Kritisk öfersigt af Finlands fisk-fauna*. Helsingfors: J.C. Frenckell; 1863. p. 3.
36. Sundman G. *Finlands fiskar*. Helsingfors: G. W. Edlund; 1893. p. 2.
37. Tolvanen V. Om fiskeriförhållanden i Uleträsk. *Finlands fiskerier*. 1915;3:1–13.
38. Houghton W. *British Fresh-water Fishes*. Webb & Bower; 1879 (reprinted 1981). p. 36–39.
39. Day F. *The Fishes of Great Britain*, vol. 1. London: Willian and Norgate; 1884. p. 12.
40. Dyer C. *The consumption of fresh-water fish in Medieval England*. In M Aston (ed). *Medieval Fish, Fisheries and Fishponds in England*. *British Archaeological Reports. British Series*. 1988;182(1):27–38.
41. Locker A. *Freshwater Fish in England*. Oxford: Oxbow Books; 2018.
42. Falkus H, Buller F. *Freshwater Fishing*. Cresset Press. 1992:190–1.
43. Walton I. *The Compleat Angler* 1653. Penguin Country Library; 1985, p. 105.
44. Manley J. *Notes on Fish and Fishing*. London: Sampson Low, Marston, Searle & Rivington; 1877, p. 331–332.
45. canalrivertrust.org.uk (Accessed 11 August 2019).
46. Scully T. *The Vivandier. A Fifteenth Century French Cookery Manuscript*. London: Prospect Books; 1997.
47. La ST. *Varenne's Cookery. The French Cook: The French Pastry Chef. The French Confectioner*. London: Prospect Books; 2006.
48. Abad R, Marché LG. *L'approvisionnement alimentaire de Paris sous l'Ancien Régime*. Paris: Fayard; 2002. p. 565–614.
49. Bennema F, Rijnsdorp A. Fish abundance, fisheries, fish trade and consumption in sixteenth century Netherlands as described by Adriaen Coenen. *Fisheries Res*. 2015;161:384–99 <https://doi.org/10.1016/j.fisheries.2014.09.001>.
50. Kendla M. *Lääne-Eesti kalanimetused*. Tallinn: Eesti Keele Instituut; 1999.
51. Danell G. *Ordbok över Nuckömdalet*. Uppsala: Lundequistska; 1951.
52. Сабанеев Л. *Рыбы России: Жизнь и ловля наших пресноводных рыб*. Москва: А. А. Карцева; 1911.
53. Dgebuadze YY. *Fishery and freshwater ecosystems of Russia: status, trends, research, management and priorities*. In: JF. Craig (ed.) *Freshwater Fisheries Ecology*. Chichester: John Wiley & Sons; 2016. p. 120–133.
54. Semenchenko V, Rizevski V, Ermolaeva I. Nature and status of freshwater fisheries in Belarus. In: Craig JF, editor. *Freshwater Fish Ecology*. Chichester: John F. Wiley; 2016. p. 216–20.
55. Lorch JE. *Kort Beskrifning, På de Mäst befintelige Fiske-Slagen i Cattegat, Bohuslänska Skärgården, In-sjöar och Öster-sjön*. Göteborg: Wahström; 1790. p. 12.
56. Hofsten EN. *Beskrifning öfwer Wermland. Värmland förr och nu*. 1917:115–21.
57. Modéer A. *Oeconomisk Beskrifning öfver Halltorps och Woxtorps Soknar i Calmare Län*. Kongl. Vetenskaps Academiens Handlingar. 1767;28:280–301.
58. Levander L. *Övre Dalarnas bondekultur under 1800-talets förra hälft* vol. 1. *Självhushåll*. Stockholm; 1943.
59. Schultze ST. *Then Swenske Fiskaren, Eller Wälment Underrättelse om Thet i Sverige nu för tiden brukelige Fiskeri*. Stockholm: Kongl. Tryckeriet; 1778.
60. Hagdahl CE. *Kok-konsten som vetenskap och konst*. Stockholm: P.A. Norstedt & Söner; 1896.
61. Nylander M. *Handbok wid den nu brukliga finare matlagningen*. Stockholm: H. A. Nordströms; 1835.
62. Haglund E. *Nöjesfiskarens kokbok*. Stockholm: AWE/Gebbers; 1984.
63. Glasse H. *First Catch Your Hare. The Art of Cookery made Plain and Easy*. London: Prospect Books; 1995. p. 163.
64. MacMahon AFM. *Fishlore: British Freshwater Fishes*. Harmondsworth: Pelican Books; 1946. p. 187.
65. Fischer J. Die Fische des St. Petersburger Gouvernements und ihre Bedeutung für das Volk. *Der Zoologische Garten*. 1875;16(8):281–91.
66. Gogol NV. *Dead Souls*. London: Garnett Press; 2008.
67. Аксаков СТ. *Записки об уженье рыбы*. Москва: Правда; 1966. (original 1856)
68. Molokhovet E. *Classic Russian Cooking*. Bloomington: Indiana University Press; 1998. p. 143.
69. Volokh A, Manus M. *The Art of Russian Cuisine*. New York: Macmillan; 1983.
70. Goldstein D. *Russia, Carême and the culinary art*. *Slavonic East Eur Rev*. 1990;73(4):691–715.
71. Heyl H. *Das ABC der Küche*. Berlin: Carl Habel; 1897.
72. Steinbrecher MA. *Vollständiges Kochbuch oder Was kochen wir heute? Was morgen? Ein Handbuch für wirthliche Frauen*. Wien: Leopold Grund; 1823.
73. Lundberg S, Svanberg I. Stone loach in Stockholm, Sweden, and Royal fishponds in the seventeenth and eighteenth century. *Arch Nat History*. 2010; 37:150–60.
74. Byrkjeflot H, Strandgaard Pedersen J, Svejnova S. From label to practice: the process of creating New Nordic Cuisine. *J Culinary Sci Technol*. 2013; 11(1):36–51.
75. Bonow M, Rytönen P. Kalix löjrom caviar– an institutional analysis of the application and implementation of Sweden's first PDO. *Spanish J Rural Dev*. 2013;43:12–24.
76. Rösch R, Kangur A, Kangur K, Krämer A, Ráb P, Schlächta V, Tapinen M, Treasurer J. Ruffe (*Gymnocephalus cernuus*). *Annales Zoologici Fennici*. 1996; 33:305–308.
77. Łuczaj Ł, Pieroni A, Tardio J, Pardo-de-Santayana M, Sökand R, Svanberg I, Kalle R. Wild food plant use in the 21st century Europe: the disappearance of old traditions and the search for new cuisines involving wild edibles. *Acta Societatis Botanicorum Poloniae*. 2012;81(4):359–270.
78. Minami N. The revival of traditional food in contemporary Japan. In: Lysaght P, editor. *The Return of Traditional Food*. Lund: Lund University; 2013. p. 136–45.
79. Svanberg I, Bonow M, Cios S. Fishing for smelt, *Osmerus eperlanus* (Linnaeus, 1758): a traditional food fish. *Slovak Ethnol*. 2016;64(2):136–56.
80. Ragnar M. *Regional matkultur: terroir i matlandet Sverige*. Stockholm: Carlsson; 2014.
81. Snyder M. Can we really eat invasive species into submission? *Scientific American*. 2017. <https://www.scientificamerican.com/article/can-we-really-eat-invasive-species-into-submission/> (accessed August 31, 2019).

Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Ready to submit your research? Choose BMC and benefit from:

- fast, convenient online submission
- thorough peer review by experienced researchers in your field
- rapid publication on acceptance
- support for research data, including large and complex data types
- gold Open Access which fosters wider collaboration and increased citations
- maximum visibility for your research: over 100M website views per year

At BMC, research is always in progress.

Learn more biomedcentral.com/submissions

