UDK 903'12(282.243.7.043)"633"
Documenta Praehistorica XXXVII (2010)

Mesolithic fish and fishermen of the Lower Danube (Iron Gates)

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ABSTRACT – *This study analyzes the importance of fishing as part of the survival strategies of the Mesolithic and Early Neolithic groups of the Danube Iron Gates. It considers the species of fish present in the archaeological record of the Iron Gates sites, ecology, and possible fishing tools and techniques, in order to determine if the quantities caught during favorable seasons could have also insured food reserves for the winter. The author concludes that the presence of large species like sturgeon may be misleading with regard to how intensively these fish were caught, and that besides common species such as carp and catfish, the bulk of the harvest was mainly of smaller species that had fewer chances of being well preserved in the archaeological record.*

IZVLEČEK – *V študiji predstavljamo pomen ribolova v kontekstu preživetvenih strategij mezolitskih in zgodnje neolitskih skupin ob Donavi v soteski Železna vrata. Preučujemo vrste rib v arheoloških zapisih, ekologijo, ribiško opremo in tehnike ribolova. Želimo namreč ugotoviti ali je količina ulova predstavljala dovolj veliko rezervo za zimo. Ugotavljamo, da je prisotnost velikih vrst (jeseter), glede na to, kako intenzivno je bilo lovljenje, lahko zavajajoča. Poleg krapov in somov večina pripada manjšim vrstam. Njihovi ostanki pa so v arheoloških zapisih slabo ohranjeni.*

KEY WORDS – *Mesolithic; Danube Iron Gates; Schela Cladovei; sample bias; fishing technology; climate*

Introduction

The particular features of the Danube in the Iron Gates defile area (Fig. 1), such as the swift current, variable depth, and mostly rocky bottom, conditioned the existence of a self-regulating ecological community with a great number of individuals, but a relatively small number of species.

Within this ecological community, the ichthyofauna is mainly dominated by reophillic (flowing water) species like *Barbus barbus* (barbel), *Leuciscus cephalus* (European chub), *Chondrostoma nasus* (undermouth), *Vimba vimba* (Baltic vimba), but also by limnophil (not flowing water) species like *Cyprinus carpio* (carp), *Stizostedion lucioperca* (pikeperch), *Silurus glanis* (catfish), *Tinca tinca* (tench), *Perca fluviatilis* (perch). One particularity of the area is the massive migration up to 3–4km upstream in small tributaries of young fish of species such as *Leuciscus idus* (golden orfe), *Alburnus alburnus* (bleak), *Rutilus rutilus* (roach), *Aspius aspius* (asp), *Blicca bjorkna* (white bream). Of importance is the presence of a number of sturgeon species: *Acipenser nudiventris* (or *A. glaber*, *A. schipa*) (spiny sturgeon), *A. ruthenus* (starlet, sterlet), *A. stellatus* (starry sturgeon), *A. gueldenstaedtii* (Russian sturgeon), and *A. huso* (*Huso huso*, Linnaeus) (beluga).

Most of these species have been recovered from Mesolithic and Early Neolithic sites in the Iron Gates region. Regrettably, even if excavations of the first sites began more than forty years ago, a thorough investigation of the fish remains has never been conducted. Moreover, some of the osteological material shown here (Fig. 2A) has been found in storage facilities labeled as 'not studied yet'. The study of the diet and subsistence economy of the Mesoli-

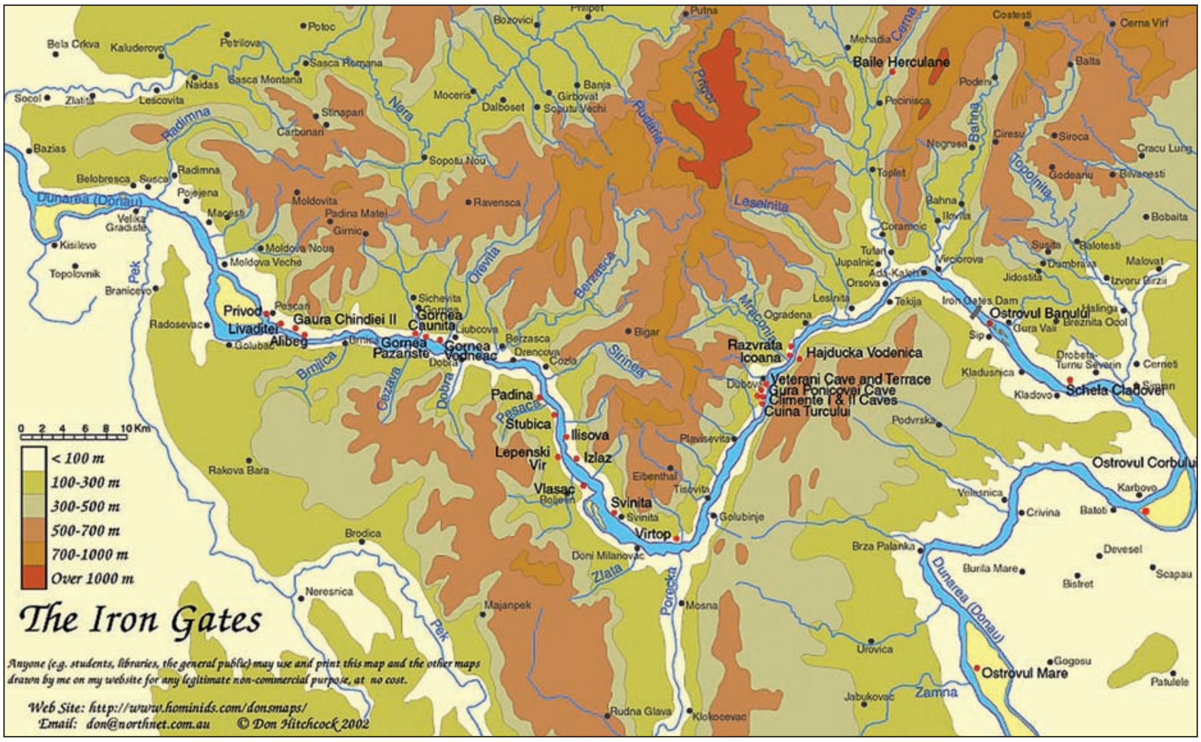

Fig. 1. General map of the Iron Gates region.

thic and Early Neolithic groups of the Iron Gates (*Bartosiewicz et al. 1995; 2001; 2006; Bartosiewicz and Bonsall 2004; Bokonyi 1970; 1972; 1978; Bolomey 1973a; 1973b; Bonsall et al. 2000; 2004; 2002/3; 1997; Borić 2001; 2004; Dinu et al. 2006*) cannot be fully understood unless a more in-depth analysis of the fish remains is performed. Although fishing was a major part of the daily struggle for survival of the inhabitants of the Gorge, it has been given only partial attention in previous publications, except for rather succinct species identification. Undoubtedly, there are some extremely difficult obstacles to overcome, such as preservation, less careful excavation techniques, or sample bias, and such aspects will be considered in this paper. However, we can only hope that in the future, fish remains from the Iron Gates sites will receive the attention they deserve. The information on peasant fishing tools and techniques presented here was collected during the last part of the nineteenth century (*Antipa 1909*). Sadly, modernization took its toll, and almost none are now in use. It is important to note that the implements contained no metal parts, except for the hooks, which could also have been of bone or wood (Fig. 2 B).

This study will explore the fish species, and fishing techniques that could have been employed by Mesolithic and Early Neolithic groups at Iron Gates, in an attempt to better understand their economic importance, and the role and the magnitude played by this activity in the life of these people.

Importance of fishing

Schela Cladovei-Lepenski Vir was obviously a riverine culture. Had it been otherwise, there would have been no reason whatsoever for these people to settle *ad literam* at the waters' edge. In fact, only about 20km away on the Cerna River (a tributary of the Danube) at Herculane (Fig. 1), Upper Paleolithic and Neolithic settlers from Pestera Hotilor (Thieves' Cave) benefited from the same richness of fauna, flora, and the same climacteric conditions enhanced by dozens of hot springs; however, no Mesolithic Schela Cladovei culture remains have been found at this location, (*Bitiri 1959; Nicolaescu-Plopsor and Comsa 1957; Nicolaescu-Plopsor, Comsa, and Paunescu 1957; Nicolaescu-Plopsor and Paunescu 1961; Paunescu 2000*). It may be assumed, therefore, that fishing was perhaps the first reason that led the Mesolithic Iron Gates communities to settle along the Danube rather than inland.

Although the importance of fishing as a resource procurement strategy of the Mesolithic Iron Gates population has never been underestimated, publications solely on ichthyological analysis have never been offered. Some authors (*Prinz 1987*) implied that the importance of fishing relative to hunting

Fig. 2. Huge* Silurus *vertebrae from Icoana, and Early Neolithic fish hooks from Iron Gates. Photos by the authors. Courtesy of the Institute of Archaeology 'V. Parvan', Bucharest, and Museum of the Iron Gates, Turnu Severin.

was much greater than has been generally suggested, referring in particular to Vlasac. Prinz considers that the reason for this underestimated importance of fishing arises from sample bias – a consequence of poor recovery techniques – and offers as an example the quantity of pike remains at Vlasac, and of barbel at Ostrovul Banului, where larger quantities of remains were excavated. This may indeed be a problem at all sites if attempts to reconstitute ancient diets are undertaken.

Furthermore, considering the archaeological data, it is extremely difficult to outline a general image of the volume of aquatic food harvested and consumed by the ancient population in the Iron Gates. Sample bias truly plays the determining role in this estimation, and more than one factor affects it. It is more likely that mostly large bones were collected. The fact that no fish remains were reported at Alibeg, Razvrata, and Ostrovul Corbului may be a result of such biased material recovery; it is extremely hard to believe that fish was not consumed at these sites. Only after 1990 was fine sieving applied systematically at Schela Cladovei, the only northern shore Mesolithic site still accessible.

As was true at Lepenski Vir and Vlasac, fishing was very important from the Mesolithic into the Neolithic (*Bonsall et al. 1997.57*). However, at Schela Cladovei the fish bone assemblage differs from those at Lepenski Vir and Vlasac in the high representation of anadromous species, especially sturgeon. It has been suggested (*Bonsall et al. 1997*) that since these fishes are larger than most other species present in the Danube, their dietary contribution may have been correspondingly higher. On the other hand, as shown in Table 2, the presence of sturgeon in the Danube is restricted to a rather short period of the year, a factor that may have greatly influenced the dietary contribution of these species.

In many cases, fish bones do not preserve well; as a result, subsequent species identification was problematic. In the sturgeon case, the identification problem arises from the fact that aside from plates (scutes), little else would preserve. Moreover, other small fish are often eaten whole, and it can be also assumed that a great percentage of the fish caught was actually of a smaller size, given the techniques described later in this paper.

One other problem is presented by the number of species recovered. Of the sixty-nine species of fish presently found in the Danube at Iron Gates (*GCCPF 1976*), only seventeen were identified at the Mesolithic Iron Gates sites (Tab. 1). Of these, only two, carp and catfish are present at all sites. Both of these, particularly the latter, may grow to a very large size, therefore the probability of bone preservation is higher. Although it may be assumed that preference was given to some species of large fish and to large specimens, it is correct to assume that all fish caught belonged to the category of food, even if some were perhaps used for other purposes, such as bait. It should not be forgotten that, because over-fishing did not constitute a problem until very recent times, the chances of catching some larger fish of all species was much higher 9000 years ago, even using rudimentary tools.

The absence of barbel (*Barbus barbus*) at all sites is remarkable, because this fish may easily reach 4kg (*Berg 1962*). Isolated individuals may reach 10–12kg, so this species may have been an important source of meat. It is very abundant in this area of the Danube, preferring stronger currents and a rocky or gravel river bed, conditions associated with the region of Iron Gates. There are two characteristics of this species that may explain its absence: it is nocturnal, and the roe are poisonous.

On other hand, *Silurus glanis* (catfish) is present at all sites; like barbel, it is nocturnal and the roe are poisonous (*Berg 1962; Pirogovski, Sokoloff and Va-*

Site	Alibeg	Razvrata	Icoana	S.Cl. M.	S. Cl. N.	O. Ban.	O. Corb.	O. Mare	Cu. Turc.*	L. Vir, I	L. Vir, II	L. Vir, III	Pad.	Vlas.	Starc.
Species															
Sturgeon sp.				■	■										
Huso huso ; beluga			■			■			■				■		
Acipenser gueldenstaedtii; Russian sturgeon									■						
Acipenser ruthenus; sterlet			■	■	■	■			■					■	
Silurus glanis; catfish			■	■	■	■	■		■	■	■	■	■	■	■
Esox lucius ; northern pike				■	■				■					■	■
Stizostedion lucioperca (Sander lucioperca) ; zander, pikeperch			■	■	■	■			■						
Chondrostoma nasus; sneep, undermouth															
Barbus barbus; barbel															
Cyprinus carpio carpio; European carp			■	■	■	■	■		■	■	■	■	■	■	■
Abramis brama; bream			■	■	■	■			■						■
Leuciscus idus; orfe				■	■										
Small *cyprinidae*				■	■				■				■		■
Leuciscus cephalus; chub			■			■			■						
Hucho hucho; Danube salmon, huchen													■		
Perca fluviatilis; European perch									■						
Aspius aspius; asp															■

Tab. 1. Species of fish identified at Iron Gates sites. *Cuina Turcului: Epipaleolithic. Sites: Ali., Alibeg; Raz., Razvrata; Ico., Icoana; S.Cl.M., Schela Cladovei Mesolithic; S.Cl.N., Schela Cladovei Neolithic; O.Ban., Ostrovul Banului; O.Corb., Ostrovul Corbului; C.Tur., Cuina Turcului; L.Vir.I, Lepenski Vir I; L.Vir.II, Lepenski Vir II; L.Vir.III, Lepenski Vir III; Pad., Padina; Vla., Vlasac; Stac., Starčevo. (**Bartosiewicz et al. 1995; 2001; Clason 1980; Nalbant 1970; Paunescu 2000; Radovanović 1996*****).***

sil'ev 1989). As a parallel, it seems unlikely that barbel was not consumed at any of the sites. It also appears somehow striking that at Schela Cladovei, neither undermouth nor barbel is present in the archaeological strata associated with the Mesolithic and Neolithic, but they do appear in Iron Age strata. Meanwhile, pike, bream, and pikeperch are present in the Mesolithic and Neolithic, but not in the Iron Age (*Bartosiewicz et al. 2001*).

Moreover, *Perca fluviatilis* (perch) for instance, which is one of the most abundant fish in the Danube, is present only at Cuina Turcului in the Epipaleolithic strata (*Nalbant 1970*), but absent from other sites and periods. One other species, *Aspius aspius* (asp), which can grow up to 1m long and 10–12 kg (*Berg 1962*) is only present at Starčevo site. Like salmon, for reproduction it migrates up smaller rivers, when it can be caught easily. It appears, therefore, that Prinz's (*1987*) observation regarding sample bias due to poor recovery techniques is true, unfortunately.

The situation is further complicated because in most cases the stratigraphic level of provenance of remains was not specified. Simply comparing ichthyological material from Icoana with Schela Cladovei and Ostrovul Banului in general, for instance, results in a very coarse picture.

Aside from sample bias, other factors may contribute to a negative view of the presence or absence of fish species at these sites, and the fishing capabilities of Mesolithic groups in general. The two most important such factors are fishing tools, and climate. To better understand these factors, I present some of the most prized species found in the Danube, and some of the fishing tools and techniques that could have been used by Mesolithic people.

Migratory and large fish in the archaeological record

A. Acipenseriformes

Acipenseridae are commonly known as sturgeons. The name sturgeon, however, is a misused generalization of *Acipenser sturio* (Linnaeus), which is only one the species of genus *Acipenser*. Other 'sturgeon', like *Huso huso* (Linnaeus) and *Huso dauricus* (Brandt), belong to the family *Acipenseridae*, but not to the genus *Acipenser*.

There are mainly five species of sturgeon found in the Danube: *Acipenser güldenstaedti* (or, *gueldenstaedti*) *colchicus*, *Acipenser stelatus*, and *Huso huso*, live in the Black Sea and migrate upstream for reproduction. The other two, *Acipenser nudiventris* and *Acipenser ruthenus ruthenus* do not migrate. However, the Danube as a terra typica has been established only for *Huso huso* (*Banarescu 1964*).

❶ *Acipenser güldenstaedti* (or, *gueldenstaedti*) *colchicus natio danubicus* (Marti). Also known as the 'Russian sturgeon', it lives in the Black Sea, the Caspian, and their large tributaries (*Vlasenko, Alexander, and Pavlov 1989*). In the Danube, it grows up to 4m and 100kg, but the usual size is 1–2m and 20–30kg (*Banarescu 1964.210*). According to some authors (*Seeley 1886*), it may live up to fifteen to twenty years. It is an anadromous migratory species, very much like *Huso huso*. First migration begins after the *H. huso* by the end of February-March – when the water temperature rises to 8–11°C – reaching a peak in April, and by mid-May. The second migration begins by August-September, peaking by late September to mid-October, and ending by mid-November. In contrast to *Huso*, during autumn migrations, there is a greater number of individuals than during the spring migration. Apparently, this species was not present further upstream from the Iron Gates region (*Banarescu 1964.213*). It is caught with the same technique as for *Huso*.

❷ *Acipenser stelatus* (Pallas), also known as the starry sturgeon, lives in the Black Sea, Caspian and their large tributaries (*Banarescu 1964.218; Berg 1962.95–97*). In the Danube, it used to be fished upstream as far as Austria (*Seeley 1886.393*). It grows up to 2m long and 20kg, but average size is 1–1.2m and 6–8kg. It is an anadromous migratory species. In the Danube, the first migration begins a little later than *Huso* and *A. güldenstaedti*, in late March and April – when the water temperature reaches 8–11°C – and peaks in May. The second migration begins by August to September/mid-October, and is more intense than the first (*Berg 1962*).

❸ *Huso huso* (Linnaeus). Also known as 'Beluga', it lives in the Black Sea, Caspian, Adriatic, and their big tributary rivers. It may live beyond 75 years. Usually reaches a weight of 100–250kg, and 4–6m long, although fish of almost 900kg have been caught in the Danube. Moreover, examples of over 9m long and 1300kg have been caught (*Banarescu 1964.198*), and other authors (*Pirogovski et al. 1989. 157*) have reported fish weighting up to 3200kg. According to older accounts:

"*...it was formerly much more abundant, and attained a far larger size in the Danube than it ever grows to in the present day... Fish twenty-four feet long were common, and it was slaughtered in Hungary by the thousand.*" (*Seeley 1886.414*)

The species is anadromous, marine. It has two spawning migration periods, one in the spring, and one during early autumn, ascending as far as the Morava River (*Berg 1962.58*). In the Danube region, if the spring is early and the water temperature is at least 4–5°C, it may begin its first migration upstream in January. However, the usual time is during the second half of March or the beginning of April. In April, it reaches peak intensity, and in late May-June, ends completely. The first migration is more intense than the second, which begins by very late August, peaking in October or the first half of November, after which, it ends completely. The phenomenon is not understood yet; the puzzle arises from the fact that reproduction takes place only during the spring migration when the water temperature is no lower than 15°C, but no higher than 17°C. For egg-laying, holes on the river bed are used, at depths of 8–20m. The river bed must be a mix of clay, gravel, and sand. Apparently, from the Iron Gates to the Black Sea there are only two stretches of the river where such conditions are met: at Iron Gates, and the last few kilometers before the river drains into the sea. Banarescu (*1964.199*) cites sources according to

Month	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Species												
Huso huso; beluga or European sturgeon												
Acipenser gueldenstaedtii; Russian sturgeon												
Acipenser stellatus; starry sturgeon												
Acipenser nudiventris; fringebarbel sturgeon												
Acipenser ruthenus; sterlet												
Cyprinus carpio carpio; European carp												
Silurus glanis; wels catfish, sheatfish												
Stizostedion lucioperca (Sander lucioperca); zander, pikeperch												
Esox lucius; northern pike												
Chondrostoma nasus; sneep, undermouth												
Barbus barbus; barbel												
Abramis brama; bream												
Leuciscus idus; orfe												
Leuciscus cephalus; chub												
Hucho hucho; Danube salmon, huchen												
Perca fluviatilis; European perch												
Aspius aspius; asp												
Alosa pontica; Pontic Shad												

Tab. 2. Fish species availability at Iron Gates. Darker shades represent peak availability.

which, after reproduction, the fish return downstream, swimming on the surface of the water at high speeds. According to some descriptions:

"*The fishery in the Danube is carried on in a variety of ways. Lines are stretched over the river, to which bright glistering hooks, without barbs, but well baited, are suspended, and sunk to different depths, so as to intercept the fishes like a curtain. As the sturgeon come up, they strike the festoons of hooks with their noses, and turn about till they get entangled, when the fisherman, seeing the strain on the line, knows where a fish may be found... When swimming on the top of the water, they are harpooned... It is sold either alive or frozen or salted. It is also dried in the sun (then termed balik), and often smoked.*" (*Seeley 1886.418*)

Unfortunately, data on Danube *Huso huso* are generally scarce (*Banarescu 1964.199*), with some authors mentioning it, but offering no detailed information.

❹ *Acipenser nudiventris* (Lovetzky). Also known as the ship sturgeon, it is found in the Caspian Sea, the Aral Sea and their large tributaries. Strangely, it is present in the Azov Sea, but nowhere else in the Black Sea (*Sokolov and Vasil'ev 1989a*). In the Danube, it practically does not leave the river, and is only found from Komarno (Czech Republic) downstream. In the past, on exceptional occasions, it has been found in the delta and the Black Sea. It reaches a maximum length of 1.5m and a weight of 46kg. The most common examples average 8–10kg. It lives at depth, in strong currents, on a clean rocky or sandy/gravel river bed. Reproduction takes place during the second half of April and May if the water temperature reaches 10–15°C. Eggs are deposited on sandbanks and gravel exposed to fast current. Both fish and eggs need very high water oxygen content. They reproduce once every 2–3 years.

❺ *Acipenser ruthenus ruthenus* (Linnaeus). Also known as the sterlet or starlet, it lives exclusively in fresh water, inhabiting most of the great rivers flowing into the Black and Caspian seas, but also the northern rivers flowing into the Baltic, White, Barents and Kara seas (*Sokolov and Vasil'ev 1989b*). In the Danube, before the building of the Iron Gates I Dam, this was the predominant species along the entire canyon sector. It prefers very deep, clean water and a hard river bed, usually finding shelter in a hole next to a higher edge. It comes closer to the shore only if there is an abrupt, rocky formation. During winter, it congregates in large numbers, retreating to deep river-bed depressions with a hard, clean floor. Reproduction takes place during April-May if the water temperature reaches 15–17°C. The eggs are laid on sandy or small grain gravely banks, at about 10m depth. Although along the Danube cataracts this fish is always abundant, the highest population density of *A. r. ruthenus* is found between Coronini and Turnu Severin at: Coronini (Moldova Noua), Tisovita, Plavisevita, and Svinita.

B. Family Siluridae

The Danube has one species, *Silurus glanis* (Linnaeus) (*Berg 1964.470; Seeley 1886.90–133*), commonly known as catfish. It spawns in early spring, when the water temperature is below 10°C. It grows up to 5m and 300–400kg (*Banarescu 1964.548*). It prefers depths with muddy water and eats:

"*... anything that lives in the water or comes into it. It will seize on swimming ducks or wading geese; and Heckle and Kner mention that a poodle and the remains of a boy have been found in the stomachs of old fish.*" (*Seeley 1886.93*).

Having very sharp teeth, *Silurus* is both predator and scavenger. It eats dead fish and animals even if the decomposing stage is extremely advanced. *S. glanis* is nocturnal. It feeds only at night, spending the day hiding on the bottom. It does not feed during winter (*Banarescu 1964.549*). The best fishing time is from June to September.

C. Family Clupeidae

Represented by *Alosa pontica*, *Alosa maeotica*, *Alosa nordmanni* and *Clupeonella delicatula*. Of these, the most important is *Alosa pontica* (Danube shad). It is also an anadromous migratory fish, swimming upstream for spawning. As the water becomes warmer, *A. pontica* crowds closer to the Danube's mouth in less deep areas. They begin to swim into the Danube when the water temperature becomes relatively stable at about 5–6°C. This usually happens in the last ten days of March/beginning of April. The maximum intensity of migration is at the end of April to May, when the water temperature is about 9–13°C. Usually, the migration lasts for 120–130 days. *Alosa* may swim upstream for about 1000km from the sea, passing Iron Gates. By June, the migration is completely over. *Alosa pontica* is very sensitive to water temperature, water turbidity, and the amplitude of water level oscillations. High turbidity or low water levels have a strong negative impact on migration (*Banarescu 1964; Ciolac 2004*). There is an extremely interesting detail about this species: although not large in size, by migration time it becomes extremely abundant, making it economically very attractive. Despite its abundance, it does not occur at any of the pre-Mesolithic, Mesolithic or Early Neolithic sites at the Iron Gates, or any of the Early Neolithic sites along the Danube from the Iron Gates up to the Black Sea. It was found only at Harsova, Neolithic Gumelnita, about 3800–4000 BC. This absence is not fully understood, but may relate to the fact that it swims only along the main river channel, and only accidentally – such as when a strong storm alters the topography of the riverbank – does it enter fishing baskets placed at lower depths and intended to catch other species. During migration upstream, it does not feed, and therefore can only be caught with fine nets. It may be inferred, but not stated with a maximum degree of certainty, that the Mesolithic and the Early Neolithic inhabitants of the Danube shore were not able to weave such fine nets, or perhaps caught only small quantities, accidentally.

D. Family Cyprinidae

In the Danube, this species is represented by *Carpio cyprinus* (carp). Quantitatively, it is the most important species in the river. It prefers more tranquil water, with a softer, muddy bottom in which it can dig for food. Like many other fish, it feeds more intensively before the spawning season. In winter, as soon as the water begins to freeze, the carp takes refuge on the bottom of the river in the deepest places, excavating holes and often hibernating until spring, almost without feeding. It becomes active again in April-May, depending on an early or late spring (*Seeley 1886.97*). During summer, the carp prefers the more abundant aquatic vegetation of shallow waters, 1–2m deep, which warm up to about 25°C. In rivers, it prefers sandbanks, particularly at river confluences. The length of adult individuals may surpass 1m, and they can weigh over 16kg (*Berg 1962.392*). Among the material excavated at Icoana, there were great numbers of carp teeth larger than a corn kernel, extremely suggestive of the size of these fish. The density and dispersal of the carp population in the Danube depends on the way migration for reproduction occurs in relation to water level (floods) and temperature, which must be as high as 12–15°C, usually by May. It returns to the main river once the eggs have been laid in the flooded area (*Ciolac 2004*).

F. Family Esocidae

In the Danube represented by *Exos lucius* (pike) – it may grow up to 65kg, but most commonly 1–1.5m and 16–24kg (*Seeley 1886.363; Berg 1962.487*), and live up to 26 years. Spawning occurs at the end of March/beginning of April, when the water temperature is less than 10°C in the shallow waters of flooded areas. During this period, the female is listless and sluggish.

In summarizing the data in this section, it can be understood that most of the fish presented here, although being valuable prizes for fisherman, are available only during limited periods of the year, and that catching them may pose serious problems even with modern tools. Most are sensitive to water temperature for reproduction, and warmer or cooler years may affect reproductive success, and therefore fishing productivity. It is possible to assume that large specimens were not caught on a regular basis; water currents, fluctuations in water quality and nutrients, may have had a strong influence on fish availability. As a whole, considering the species listed here, and their characteristics, fishing may have insured a regular, constant source of food during the warmer period of the year. However, if the bulk of the harvest consisted of smaller fish or species easier to catch, the importance of fishing as a major source of insuring preserved nourishment during the late autumn/early spring period appears to be questionable, at least.

Fishing productivity

It may be assumed that the ancient inhabitants of the Iron Gates were very well acquainted with the habits of the fish they caught. There is not much evidence, however, of the fishing tools these people may have used. Aside from two barbed harpoons from Vlasac (*Prinz 1987.61*), it is only possible, in the light of ethnological and ethno-archaeological information, to guess about the tools they used. Large hooks for large sturgeon and catfish were probably made of bone or antler. There is no direct evidence of nets, sinkers, floats, ropes or lines of any kind, but the possible use of large hooks (Fig. 2B) for sturgeon implies the existence of strong fishing line, to which a number of hooks were attached across the water (Fig. 3 B, D). In addition, sturgeon is the host of a parasite located under its scales that produces an unpleasant sensation in the fish. In order to get some relief, the fish rubs against big rocks. Up to the construction of Iron Gates I Dam, this was the best moment to harpoon them close to shore (personal communication with the villagers of Dubova, Iron Gates).

The method is extremely productive, but it requires teamwork, particularly for landing the fish. For bottom-dwelling sturgeon such as *A. ruthenus* and other bottom fishes, reed baskets were used extremely successfully until the construction of the hydroelectric dam (Fig. 3 A, C; Fig. 5).

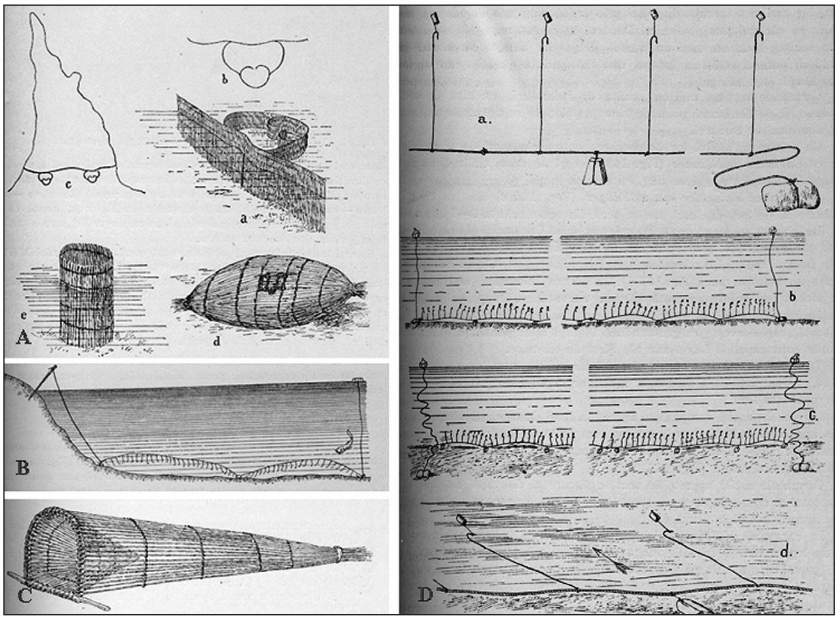

Fig. 3. Sturgeon hocks line (*Antipa 1909*). Courtesy of Museum "G. Antipa", Bucharest.

Although there is some evidence for frequent swimming and particularly deep diving (*Frayer 1988; Miritoiu, Sultana and Soficaru 2004*), the Iron Gates people needed some equipment in order to manage some of the requirements associated with fishing for large sturgeon and catfish, or even other species. The remains of Mesolithic boats have not been found at any of the Iron Gates sites, but it seems only obvious that dugout canoes were used (Fig. 4), not only for fishing, but also for access to the sites on islands at Ostrovul Banului, Ostrovul Corbului, Ostrovul Mare (Fig. 1).

With regard to the other species (*Nalbant 1970*) it may be safely suggested that during floods fences of reeds were probably built across small valley-ends and river mouths (Fig. 3Ac); when the water receded, fish could be harvested in high quantities. Fishing (scooping) from small, artificial enclosures next to the shore is still practiced in the region (Fig. 6).

Such fishing practices using fencing, "basketing", or weirs, were common in Mesolithic Europe (*Andersen 1985; 2004; Bogucki 2004; Zaliznyak 1997*), and widely practiced until the late 1960's in many Iron Gates villages (personal communication with villagers from Dubova and Ogradena). According to some local accounts, large carp could jump such a fence over 2m high.

Furthermore, given the location of the sites, and the fact that almost all of them were placed either at, or near the confluence of a small tributary, or on islands partly submerged during high waters, fishing by fencing and basketing as illustrated above could be considered the main method of insuring a large amount of food with the minimum effort. One great advantage of such methods lies in the fact that only reeds and tree bark or perhaps leather strings are needed; therefore, for smaller species, the Mesolithic inhabitants of the Iron Gates could have insured a good catch even without hooks, boats, or ropes.

The problem is that fishing may have been only a temporary solution to the resource acquisition problem; some methods as described above were practicable only if the water was high enough and for a short period of time during the spring, and sometimes during autumn. Additionally, even a constant supply of aquatic food could hardly have insured the necessary amount of protein. There is also the problem of resource seasonality, since not all fish are available throughout the year, and the large ones are present in the area only for a very limited time.

One analysis of fish remains from the pre-Mesolithic Cuina Turcului levels (*Nalbant 1970*) indicates the

Fig. 4. Early Neolithic dugout canoe at the Iron Gates Museum in Turnu Severin. Photo by the authors. Courtesy of the Museum of the Iron Gates.

Fig. 5. Fishing device used in the Iron Gates region for catching* A. ruthenus ruthenus. *Photo by the authors. Courtesy of the Museum of the Iron Gates in Turnu Severin.

predominant species during Epipaleolithic Romanello Azilian I, and II. During the first period, bream and pikeperch are predominant, but there is also carp and perch. For the second level, *Acipenseridae* becomes predominant, with pike, pikeperch, smaller *Cyprinidae*, chub, and catfish also being present. Due to the location of the site in the center of the Greater Cauldrons – where the Danube once flowed at high speeds before the construction of the hydroelectric plant, very high turbulence – and the very rough bottom, with many deep holes, huge rocks and boulders, and whirlpools, most of the species listed for this site, excepting sturgeon, are less likely to be found in the site vicinity, preferring the calmer waters of many of the small gulfs like Dubova and Ogradena that border the Cauldrons.

Combining site location and identified fish species, it is possible to reconstruct a certain fishing strategy: both Cuina Turcului and the Mesolithic sites were located at points which allowed fishing for species preferring more turbulent waters, and those preferring a more peaceful environment, without the need to cover long distances on expeditions to either type of site (Fig. 7).

This may constitute another point in supporting the hypothesis that the sites were located primarily with regard to fishing rather than hunting, the latter being less problematic in terms of site location or species availability.

It can be seen (Tab. 2) that all the larger fish are available only for a limited time, and only during warmer periods, while smaller species are available all year round. It may be that large sturgeon was not caught for winter food storage, or at least not in large quantities, because it generally appears somewhat too early in the year to allow preparation for long-term storage. It also appears that fish did not comprise a major food source for the most difficult period of the year, winter/early spring. By February/March, the water was still too cold for humans to enter and spend time building artificial enclosures, for instance.

Conclusion

Several general patterns appear in the above presentation. First, water levels/currents and temperatures affect the reproduction, feeding, or presence in a particular river area of all of these species of fish. Looking again at Table 1, it can be seen that the two species present at all sites, including Upper Paleolithic Cuina Turcului, Mesolithic sites, and the Neolithic levels at Schela Cladovei and Starcevo, are catfish and carp – the two most resistant and most adaptable species, which will eat almost anything. More drastic climatic changes that could have affected the Danube's water levels and temperature could have also disrupted to a rather high degree the life-cycle of the fish species inhabiting the region of Iron Gates, with serious effects on the subsistence economy of Mesolithic groups, but this was less likely to have affected highly adaptable species like carp and catfish.

Fig. 6. Ogradena Gulf. Scooping fish from an artificial enclosure. Photo by the authors.

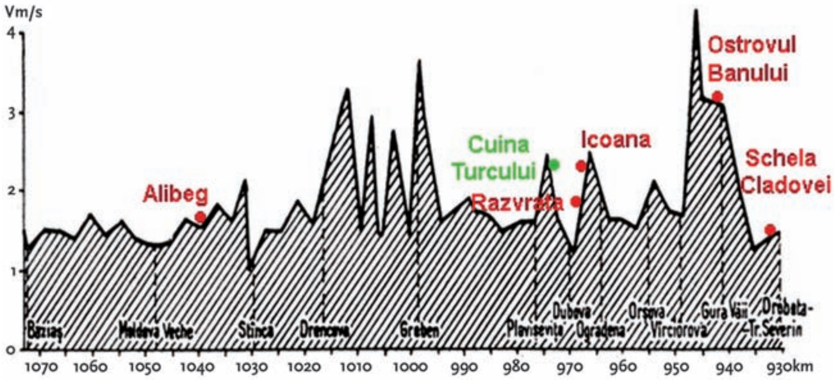

Fig. 7. The surface water speed at Iron Gates from Bazias to Turnu Severin (*I.G.G.A.R.S.R. 1969.297*). Courtesy of the Institute of Geography, Bucharest.

It is not impossible that larger scale fishing could have been practiced by means of very basic techniques and rudimentary tools. Implements and techniques such as those presented here were recovered from other Mesolithic sites like Tybrind Vig (*Andersen 1985; 2004*) and some Eterbølle sites (*Bogucki 2004*). It is, however, very difficult to argue in favor of a fishing productivity that would have insured food for the long winter months, even considering the milder climate of the Iron Gates.

Shortages of fish during the autumn/spring period could have triggered more intensive hunting during times of less optimal climatic evolution, a development that would show clearly in the archaeological record in a fluctuation in the number of terrestrial animal bones. Some authors (*Bokonyi 1978*) argue that climatic fluctuations within the Gorges were always less pronounced than in the surrounding environment because of the natural sheltering effect of the canyon walls and the stabilizing humidity and warmth of the river. However, what must be considered here is not a climatic fluctuation on a small scale, but on a wider, European scale. These kinds of change could have affected the debit and temperature of the Danube River, affecting therefore, the ichthyofauna in terms of migration and reproduction. Nevertheless, for this alternative to be considered, there should be consistency in the increased terrestrial faunal record at all sites for the same period. Such a change in diet was proposed for the site at Schela Cladovei for the end of the Mesolithic (*Bonsall et al. 1997*), yet the causes remained unclear.

ACKNOWLEDGEMENTS

Many thanks to Vasile Boroneant, discoverer and excavator of most of the Romanian Iron Gates sites, for permission to access the material constituting the basis of this study; to The Institute of Geography in Bucharest; to the the Museum of the Iron Gates in Turnu Severin: to Valentin Radu at the Museum of National History, Bucharest; and to Adina Boroneant at the Institute of Archarology 'V. Parvan' in Bucharest.

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