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Collaborative Management of River Basins

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Abstract

Expansions in the scale of river management have led to expansion in the level of human resources involved in management, and therefore the need for partnering between government agencies, non-governmental organizations, and the public. Inclusion of partners requires a more flexible and evolving process to plan for change, and poses new challenges for all involved. Collaboration requires major institutional reorientation at the policy level to ensure responsiveness to local demand, and to empower and enable communities to act. At the program level, it means detailed outlines for action can no longer be drawn up at the outset because problem solving must be based on partnerships and cooperation. I review the relevance of collaborative management, approaches for initiating collaborative efforts, challenges associated with accommodating diverse interests, communication among partners, assembly and development of relevant information, development of an action plan, and selected case histories.

Key words: river basin, participatory, co-management, collaboration, public involvement.

Restoring fish habitat as an alternative to stocking in a river with strongly reduced flow**Arne Fjellheim, Bjørn T. Barlaup, Sven E. Gabrielsen, Gunnar G. Raddum**

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Abstract.

River Teigdalselva, western Norway was strongly regulated for hydroelectric purposes in 1969. This resulted in declining populations of anadromous brown trout and Atlantic salmon. An evaluation of a stocking programme, which was initiated in 1990, concluded that density dependent factors mainly controlled the populations of juvenile fish in the river. Absence of suitable habitat, especially during winter, caused a high mortality, particularly amongst hatchery-reared fish. A main conclusion was that natural spawning maintained the carrying capacity. As an alternative, population decline could be mitigated through habitat improvements. In 1996, the stocking programme was terminated and four weir basins were constructed in suitable stretches of the river. Substrates were improved in the inlet to one of the basins by placing large stones on an area of fine, uniform substrate. Two years after establishment, one of the basins hosted 1124 ± 86 brown trout and 489 ± 58 Atlantic salmon juveniles. An other hosted 915 ± 124 brown trout juveniles. Riffles were dominated by 0+ fry but the weir basin populations mostly consisted of older juveniles. Fish densities in other areas of the river showed no signs of decline after the stocking programme was stopped, suggesting that the carrying capacity of the river was maintained by natural recruitment. The situation in the River Teigdalselva indicates that restoring fish habitat is a better method of increasing salmonid densities than direct stocking, in rivers with strongly reduced discharge.

Keywords: Brown trout, Atlantic salmon, habitat reduction, carrying capacity, weir basins, natural recruitment, river restoration

Energetic gradients in catfish feeding in the lower Mississippi River, USA

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Abstract

Diet composition of blue catfish *Ictalurus furcatus* and flathead catfish *Pylodictis olivaris* were compared from the main river channel, secondary river channels, and floodplain lakes in the lower Mississippi River, USA. Feeding by catfishes varied among habitats and between years, though trends were stronger for blue catfish than flathead catfish. Catfishes in the main channel tended to consume lower-energy foods (e.g. molluscs and crayfishes) whereas those in secondary channels and floodplain lakes fed on higher-energy foods (e.g. aquatic insects, oligochaetes, and clupeid fishes). However, despite the energetic differences in the foods consumed, catfishes did not exhibit greater rates of energy intake in non-main channel habitats as might be expected under contemporary theory on the ecology of floodplain rivers.

Key words: fish, feeding, energetics, rivers, floodplains, flood-pulse concept

**Fate of stocked trout *Salmo trutta* L. in Danish streams:
Survival and exploitation of stocked and wild trout by anglers.**

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Abstract

Sub-legal sized trout age 1 and 2 years were stocked in Danish lowland streams in summer or autumn and survival, emigration, and anglers catch and effort was monitored.

Initial mortalities were high but decreasing after 8–20 days. 0–33% survived the first winter and maximal observed emigration was 35 %.

Angling could be responsible for a maximum of 5.3% of total mortality, and return rates to anglers were between 0.5–5.1%. Between 0–13.2% of the stocked trout inside the experimental sections were caught by angling each month. The relative CPUE increased for stocked trout with increasing effort. Angling was size selective (larger specimens having higher catchability) and the impact from angling on wild trout populations varied between 3–132% of observed populations of legal-sized trout inside the experimental area.

Key words: stocking, trout, *Salmo trutta* L, survival, angling, catchability, angling impact.

The value and performance of large river recreational fisheries in England

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Abstract

There are over 2 million coarse (non-salmonid) anglers in the UK, about half of whom regularly fish rivers. They make an average of 43 trips per year, have a typical catch rate of 100 g angler⁻¹ h⁻¹ and spend £ 1000 each per annum on their sport. The overall value of coarse fisheries is high, providing both economic benefit to rural communities and social benefit to urban ones. Thus it is important to recognise the need to monitor the performance of river fisheries in terms of angler satisfaction as well as stock assessment of the fish populations. This case study shows how angling contest results can be used effectively for this purpose. The fishery performances of England's larger rivers were investigated using historical records comprising up to 24 years of data. Fisheries that supported a high proportion of successful anglers were generally dominated by smaller fish such as roach (*Rutilus rutilus*). In contrast, fisheries in which larger shoaling species such as bream (*Abramis brama*) were important had more highly skewed catch distributions with only a small percentage of anglers catching most of the fish. The long term mean catches per unit effort (CPUEs) ranged from 56 to 320 g angler⁻¹ h⁻¹ and most rivers showed a consistent improvement in annual average CPUE and % success rate since the time that reporting began. Possible reasons for the upturn in CPUE on most rivers included better opportunities for selection of fishing place, increases in fish abundance, and improvements in the skill base and efficiency of anglers. Despite these demonstrable improvements in catch rates, however, there remains a perception amongst the angling community that rivers are under-performing. This indicates that factors other than CPUE and success rate are important in satisfying anglers in UK rivers. Nonetheless, monitoring of contest results is a useful and cost-effective tool for fishery appraisal and the management of anglers' expectations.

Keywords: Angling catches, Socio-economic value, Fishery performance

Seasonal Foraging by Channel Catfish on Terrestrially Burrowing Crayfish in a Floodplain-River Ecosystem

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Abstract

The seasonal use of terrestrially burrowing crayfish as a food item by channel catfish *Ictalurus punctatus* was studied in channelized and non-channelized sections of the Yockanookany River (Mississippi, USA). During seasonal inundation of the floodplains, the crayfish occupied open water on the floodplains. Adult channel catfish aggregated in locations where the river channel and floodplain were coupled and subsequently foraged heavily on the crayfish. Decoupling floodplains from the river by flood control activities such as channelization, dredging and levee construction can modify channel catfish stock interactions with terrestrially burrowing crayfish and reduce potential benefits from this foraging.

Key words: floodplain coupling, decoupling, river inundation, foraging, catfish, crayfish

Influence of climate-related temporal changes on fish assemblages in oxbow lakes and in their parent Pilica River (continuation)

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Abstract

Three oxbow lakes of the alluvial Pilica River, each in a different stage of connection with the channel, display different levels of importance for maintaining fish diversity in the catchment and as moderators of climatic stress. During a five year investigation, from 1996 to 2000, following a series of hot summers and minimal river flows, heavy floods occurred in 1997 and 1999. Soon after the first, fish populations declined in both river and oxbow habitats and partially recovered in the following year. During the flood in 1999 a significant decrease in diversity and abundance occurred in the oxbow lake with no connection with the channel, where dissolved oxygen decreased below $1 \text{ mg O}_2 \text{ dm}^{-3}$. However, as water quality started improving, a natural regeneration of ichthyofauna was observed. In 2000 fish movements between oxbow lakes and the sections of the parent river were recorded indicating that both habitats are important. This was also confirmed by recapture of tagged fish in both habitats. We could not distinguish clearly separated species assemblages typical for both habitats using a gradient analysis (PCA). This could be a result of a monotonic response to gradients as observed for roach, perch and pike in both habitats. However, some species were more abundant in the channel (lithophils) and others in the oxbow lakes (phytophils).

Species richness and diversity were higher in the channel than in the oxbow lakes, but it was concluded that the latter are also important for maintaining historical fish diversity in the catchment.

Key words: oxbow lakes, parent river, species number, diversity, fish populations, relative density, relative biomass, migrations, flood effect

The impact of monsoon on the distribution of fish in a small stream, Korea

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Abstract

The impact of monsoon on the fish community in a 30 km segment of a small stream (Yugu, total length: 45 km), a tributary of the Kum River (414 km; middle part of Korea), was studied from May 1995 to March 1996. Rainfall was greater during summer monsoon season of July-August 1995 (1010 mm) than the remaining season (800 mm). The monsoon rains resulted in higher total suspended solids (24.2 mg dm^{-3}) and higher fluctuation in discharge compared with other seasons ($2.4 - 4.4 \text{ mg dm}^{-3}$). The diversity of the fish assemblage in the Yugu increased during the monsoon from 27 species in 4 families to 32 species in 6 families. In particular the piscivores *Hemiculter eigenmanni*, *Erythroculter erythropterus*, *Leiocassis ussuriensis*, *Pelteobagrus fulvidraco*, and *Pseudobagrus koreanus*, which are usually distributed in the main channel, migrated to the tributary during the monsoon probably to find food. Some omnivore species may also migrate to the tributary to avoid catastrophic drift and for better visibility for feeding. The increased flow during monsoon events may be important mechanisms for the redistribution of main river fish fauna in Korea where small weirs are common..

Key words: monsoon, redistribution, weir, migrate, *H. eigenmanni*, *E. erythropterus*

Factors affecting fish diversity and abundance in drying ponds and lagoons in the upper Paraná River basin, Brazil.

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Abstract.

Monthly samples were taken from April 1992 to March 1993 of fish assemblages present in six permanent lagoons and four ponds, fragmented from them during the drought period and during the terminal phases of desiccation, to evaluate changes in their diversity, abundance and dominance. Their relationships with hydrological and environment conditions were examined. A total of 63 fish species were identified. Species composition and abiotic factors were heterogeneous among the different water bodies. The proportion of piscivores and oxygen concentration were the determining factors for structuring the assemblages. The impact of piscivory upon fish diversity was neutral at the beginning and negative at the end of the dry season. In the terminal phase of desiccation, diversity was higher in ponds that contained a moderate proportion of piscivores than in those containing a higher proportion.

Key words: Paraná River – Floodplain – Temporary water – Fish diversity – Density – Piscivorous

Anglers' catches as an indicator of fish population status**Stanislav Lusk, Věra Lusková, Karel Halačka, Martin Smutný**

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Abstract

Long-term catch-records from sport anglers can be used as a significant indicator of changes in the distribution and population size of some fish species, as well as the effects of stocking. Evaluating 50-year series of records in the Czech Republic, we conclude that there is a marked decrease in the numbers of *Barbus barbus*, *Chondrostoma nasus*, *Vimba vimba* and *Leuciscus cephalus*, i.e. species characteristic of the *Barbus* type fish community. This is the result of a gradual but marked restriction of this community type in individual streams caused by dam construction and canalisation. Catches of *Thymallus thymallus* have shown a marked increase in size, resulting from the increased extent of suitable waters caused by damming and from intense stocking with yearlings of the species. Catches of *Salmo trutta m. fario* and *Thymallus thymallus* indicate heavy predation pressure exerted by cormorants (*Phalacrocorax carbo*) upon these species in a section of one river, the river Dyje below a dam.

Key words: statistic of catches, bioindication, barbel fish community, predation by cormorants

Rehabilitation of the lower Dyje River floodplain for fish**Václav Horák**

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Abstract

In 1970 canalisation and flood alleviation work disconnected parts of the floodplain of the Dyje River in the southeast of the Czech Republic from the channel of the River Dyje near its confluence with the Morava River. This led to the start of a gradual degradation of the riparian alluvial forest and floodplain aquatic habitats. In 1990, rehabilitation of the hydrological regime was begun through a system of new channels and modifications to the old system. This led to the recolonisation of the previously degraded habitats by fish such that high species richness has now been attained approximating to the condition before canalisation. Thirty-two species of fish, including 10 fluvial species, are now found in the connected habitats compared with 19 in those not connected.

Key words: Floodplain, fish, restoration

Growth of pike *Esox lucius* L. and gudgeon *Gobio gobio* (L.) in a degraded river system**Joanna Kostrzewa,¹ Mirosław Przybylski,² Lidia Marszał³**Department of Ecology and Vertebrate Zoology, University of Łódź,
Banacha 12/16, 90-237, Łódź, Poland¹joko@biol.uni.lodz.pl, ²mprzybyl@biol.uni.lodz.pl, ³lmar@biol.uni.lodz.pl**Abstract**

The growth patterns of pike and gudgeon were studied in two lowland river systems. In one of them (the Ner River drainage) the main river is completely polluted, so fish can live only in the tributaries. The second one (the Liswarta River system) remains relatively undisturbed. The restriction in mobility should be more disadvantageous for species potentially reaching large body size, like pike. Consequently, the reduction of their life space to small streams can result in lower growth rate. On the contrary, small-bodied gudgeon should not be affected by the space limitation as it can live whole life in low order streams.

Scales from 34 individuals of pike and 111 of gudgeon were used to determine age and estimate growth rate by a back-calculation method. In both river systems no pikes older than 5+ were caught and no difference in their growth rate, described by coefficient b of regression age on body length was found (ANCOVA; $F= 0.104$; $df= 1; 30$, $P>0.05$). The life span of gudgeon was 4+ in both studied drainage basins. The growth rate varied among different sites of the same catchment more than between the Liswarta and Ner River systems. Concluding, there was no evidence of pike and gudgeon growth limitation caused by restriction of movements.

Key words: Fish, growth, pollution, von Bertalanffy parameters

Carassius "gibelio"* in fish communities of the Czech Republic*Karel Halačka, Věra Lusková, Stanislav Lusk**

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Abstract

Carassius gibelio is non-indigenous to the ichthyofauna of the Czech Republic. The first individuals of this species penetrated into the area of confluence of the rivers Morava and Dyje from the Danube via the lower reaches of the Morava in 1975-76. Subsequently, *C. gibelio* enlarged its range rapidly mainly due to the accessibility for migration in the region's aquatic habitats. Its further spread into habitats, localities and drainage areas (of the rivers Odra, Labe, Vltava), not connected with the region, was facilitated, both intentionally and unintentionally during stocking with carp where gibel were included in transfers. Over 15 years (1990), *C. gibelio* populated all suitable aquatic habitats. The species has also now become the object of sport fishing. Until the 1990s, the populations of *C. gibelio* consisted of females only. The reproduction of this species was realised through so-called gynogeny connected with sexual parasitism against males of other cyprinids. Not until 1995 did we find, in the lower reaches of the river Dyje, the first male individuals, their representation in our samples varying between 0 and 18.5 %. Our investigations have shown that, besides largely triploid individuals (almost exclusively female ones), there also occur diploid ones (males and some of the females) and, occasionally, even tetraploid ones (females). At present, the initially portioned spawning has been mostly limited to a one-time spawning. In some habitats the high abundance and biomass of *C. gibelio* exerts a negative influence on the occurrence of indigenous species mainly, *C. carassius* and *Tinca tinca*, in alluvial habitats. In some cases *C. gibelio* has even become an undesirable component among carp populations in fishponds.

Key words: Prussian carp, distribution, importance, ploidy.