

Promoting terrestrial habitat- and species-diversity as consequence of river rewilding (middle Isar, Natura 2000-area)

Christine Margraf

Abstract

It is shown, that river restoration in Middle Isar between Freising and Moosburg resulted in for alpine-rivers typical morphological processes, even furcation. Vegetation and birds have become more diverse than in not restored stretches, and typical und very diverse species of wild bees/ wasps, carabids, spiders and birds benefit from the restoration. Essential factors for success are described.

Keywords

terrestrial biodiversity, alpine river-restoration, middle Isar

Introduction

Rivers and their floodplains are a hotspot of biodiversity in middle Europe. The special value of alpine rivers is the permanent changing spacial and temporal mosaic of different pioneer- und sucession-stages of very diverse habitats. They have become rare in regulated rivers, many of their typical species are threatened. By restoring rivers it is expected that these stages and their species are promoted.

The Middle Isar between Munich and Landshut (Upper Bavaria) with the broad floodplains is one of the most important area for coherent floodplain-forests, of national importance and part of the central line of habitat connection 'Isar'. It is protected as Natura 2000-area (FFH) 'Floodplain of Isar from Unterföhring to Landshut'. Additionally downstream Freising the area is protected as nature reserve 'Floodplain of Isar between Hangenham and Moosburg'.

Because of riverregulation, dike-construction, impoundment in the upper river, water outflow and therefore bedload-deficit and river-deepening the typical diversity of structures, habitats and species for an alpine river decreased. The area studied is a residual-water stretch with reduced hydrological and morphological dynamic.

Between Freising and Moosburg the authority for water resources Munich renaturated between 2002 and 2008 three sections (river-km 107,7 – 106,8 / 102 – 99 / 98,2 – 96,5): bank reinforcement was removed and in one section a river-neer dike was relocated to the edge of the floodplain (http://www.wwa-m.bayern.de/fluesse_seen/massnahmen/gek_mittlere_isar/index.htm).

The survey of flora and fauna in these sections was carried out by BUND Naturschutz in Bayern e.V. (environmental NGO), to explore the expected positive impact to terrestrial biodiversity and to the aims of the protected areas. The study was financially supported by the Bavarian fund for nature protection of the environmental ministry (85% of the costs).

Methods

In the three restoration-sections 2015 took place the mapping of flora/ vegetation (Margraf, Steidl), carabids / spiders (Willner), wildbees / wasps (Mandery), birds (Magerl), reptiles and amphibians (Drobny). Additional traps (yellow bowl, Barber pitfall trap and Malaise traps) were used. So the most essential groups of species in alpine rivers were mapped. The survey concentrated on the area with impact of the restoration measures (gravel banks and riverbanks).

Unfortunately no 'zero-mapping' before the restoration happened. However it is possible to correlate the mapped species with the restoration: through comparison with different data from earlier mappings, through long-term knowledge of the area of nearly all persons of the mapping-team and through comparison with non-restored sections.

Results

Since 2002 annual floods (HQ1 = 210 m³/s) and four high floods caused dynamic processes. Essential for the effectiveness of the restoration were especially the HQ80 in 2005 and HQ20 in 2013. The following for an alpine river typical structures increased: bank erosion, development of new and re-arrangement of existing gravel banks, deposition of gravel in different altitudes partially overlaying existent vegetation (even very high, new development of dry grassland), deposition of dead-wood and drifted parts of trees, smale-scale alternating diversity of soil-substrats, building new channels and waterbodies of very diverse character, widening of the until now 60 m narrowed river up to more than double width (bevor regulation the Isar was a 200-500 m broad and often moving river), shortening meander-radius. In one section even a diversification of the riverbed in three river branches took place (furcation, figure 1).

During mapping there was a flood in May 2015. The species-range is therefore and because of the limited time of only one year surely not complete. Nevertheless there are notable results for the gravel banks and riverbanks ('RL' = Red List Bavaria):

- 310 species of **vascular plants**, 75 species of which were not noticed in the mapping of the nature reserve in 1997.
- Diversification of the typical pioneer- und ruderal **vegetation**, a more small-scale spacial mosaic of different succession stages than bevor / outside the restoration-area.
- New development of typical shrubs of alpine rivers with eleagnos willow (*Salix eleagnos*) together with daphne willow (*Salix daphnoides*) (**FFH-habitat 3240**, figure 2. Before restoration only single plants). High regeneration of till now old-grown softwood-forests (*Salix alba*, Salicetum albae – **FFH-habitat 91Eo***), scattered forests with grey alder (*Alnus incana*, Alnetum incanae). New development of a dry nutrient-poor ruderal grassland on high gravel depositions in the floodplain.
- Of the 33 found species of **carabids** 10 are typical and 9 characteristic for gravelly or sandy gravel banks resp. 1 species for sandy riverbanks. Among these are species from all zones of the gravel banks (from waternear wash margin to the floodplain-forests), from all soil-substrates (gravel, sand, clay) and species which require complex habitats. For example: *Elaphrus aureus* (RL 2, especially in the range of bank erosion, steep bank in complex with (older) willow-shrubs and -forests) , *Bembidion testaceum* (RL V, gravel banks without vegetation), *Carabus ullrichii* (RL V, gravel banks with vegetation). 1984 not in the area found and therefore now new species are the three for alpine rivers typical carabid-species *Nebria picicornis* (RL V), *Carabus granulatus* and *Asaphidion austriacum*. High number of species of **wild bees and wasps**: 231 species from 10 families (119 of 506 species in Bavaria), among them 25 endangered und 8 highly endangered species. A lot of species are typical or of high quality, for example psammophilic species, oligolektic species specialised on willows (e.g. sand wasp *Andrena nycthemera*, RL 2, especially in floodplains), typical for floodplain-areas (e.g. digger wasp *Crossocerus walkeri* (RL 2, nest in rotten standing deadwood near waters) or alpine species (e.g. apex-furrowed bee *Lasioglossum bavaricum*, RL D, in Germany only in the alps, nests in a little bit hardened limestone gravel). In conclusion species with very different demands concerning their habitats. They reflect the increased morphological structures und the more diverse vegetation. Highest species-numbers occurred in this section, where river-restoration and dike-relocation took place.
- New occurrence of two for alpine rivers typical species of **spiders**, which 1984 along the Isar only were found in the Upper Isar: *Pardosa wagleri* (RL 3, especially in the area of open and regularly moved gravel with open-grained gap-system) and *Arctosa maculata* (RL 2, in cavities between gravels on gravel-banks, often close to drifted deadwood in their shadows)
- Concerning the **birds** it can be emphasised for example the successful reproduction of little ringed plover (*Charadrius dubius*) in the Isar after many decades without successful breeding, the increased number of breeding pairs of kingfisher (*Alcedo atthis*) or the general increased number of species in the restoration sections. The **amphibians** used 7 of 9 new developed water bodies very quick for spawning (*Bufo bufo*, *Rana temporaria* and species of the *Rana ridibunda/ esculenta*-group), although the waters have been regularly flooded and most have connection to the river. Despite existence of fish, *Rana ridibunda/ esculenta* reproduced successfully.
- For **Reptiles** like *Lacerta agilis* and *Natrix natrix* increased suitable habitats in quantity and quality (especially deadwoods for hiding, thermoregulation and protection during floods).

Discussion

As a guiding principle serve the structures and species of an intact alpine braided river with gravel-floodplains, summer-floods and not to steep declivity.

Essential and typical morphological structures and soils of an alpine river developed, leading to an increased variety of habitats and species (chapter 3). For some characteristic species and plant communities the new occurrence or benefits from the restoration can be proofed, for many this can be assumed. The three restoration-sections have different importance for different species-groups. For example is the middle section with its large gravel banks with great rearrangements during floods of high importance for spiders and carabids, whereas the other two sections with their broad ecological gradients and diverse vegetation, especially willow-shrubs and forests, are of special importance for wild-bees and wasps.

Nevertheless (still?) some expected typical species are missing, e.g. German Tamarisk (*Myricaria germanica*) or some carabid-species. It is possible, that time since 2002 was too short or that the distance to the next existant population is too far. Other deficits are the very limited effects in the floodplain (effects till now especially in the river and river-banks), not sufficient morphological dynamic in the area of the dike-relocation or increasing uncontrolled recreational use of the gravel banks.



Figure 1



Figure 2

Conclusion

The studied restoration-sections of the Middle Isar have become more in line with the guiding principles concerning morphological structures, species-composition and -diversity. The development corresponds to the aims of the nature reserve and the Natura-2000-area. The development is continuing, long-time studies are necessary.

Essential factors for the positive results are: additional and small-scale diversity of wet and dry habitats and soils, occurrence of high floods, new broad ecological gradients from river to floodplain and therefore more complex habitats, considerably increased dead-wood and drifted organic material, existence and new generation of broad development areas (to allow unregulated dynamics), widespread measures and combination of measures in sections with different characteristics. Especially the big (and often long stable) depositions of whole trees with their roots in the river and on the gravel-banks have central role for occurrence of morphodynamic and building of islands, for sediment-diversity, for occurrence of diverse waterbodies, as hiding-places, shady and wet places (e.g. in hot summers) and for transport of animals and seeds (to repopulate restoration sections). Still existant deficits can be reduced by additional measures, some of them are proposed in the study.

References

MARGRAF, CHR., M. DROBNY, K. MANDERY, CHR. MAGERL, W. WILLNER 2016. Renaturierung der Mittleren Isar zwischen Freising und Moosburg. Dokumentation und Erfolgskontrolle der Entwicklung von natürlich neu geschaffenen dynamischen Fluss-Lebensräumen. Freising. 41 S. + 5 Einzelberichte der Kartierungen + 3 Anhänge. Unveröffentlicht.

Contact

Christine Margraf
christine.margraf@bund-naturschutz.de
BUND Naturschutz in Bayern e.V. (BN)
Pettenkoferstraße 10a/I
80336 Münchentab
Germany
Phone: 089/54829889,
www.freising.bund-naturschutz.de (More information (including a presentation))