

3rd European Conference on River Restoration**RIVERRESTORATION**2004

Zagreb, Croatia, 17-21 May 2004

Oder border meanders – experience from the countries of transition

Petr Obrdlík

ABSTRACT: Oder River between Czech Republic and Poland with equilibrated bed load and natural fluvial-morphological processes is an exception among the European transboundary rivers. The plans for the river training and fixing of the state border had been elaborated after the flood in 1997. The successful negotiation between river basin authorities, Czech-Polish Border Commission and WWF resulted in the postponement of water construction measures.

The keeping of the natural morphological processes has been analysed from the point of flood protection, land-use and maintaining of biodiversity. Based on the results of expert studies the plans to fill up the new river bed were abandoned. The area was nominated for inclusion in the list of European NATURA 2000 network.

The next step to provide security for the sustainable development of the border meanders would be the acceptance of the concept "Espace de liberté" and new definition of state border.

KEYWORDS: transboundary river, fluvial-morphological processes, NATURA 2000, FWD, state border, sustainable development

Introduction

The majority of European meandering foothill and lowland rivers have been regulated. Especially the border stretches of the running waters in EU have been straightened or at least their banks have been restricted in a tight corset. Who would expect to see the free creation of river meanders, arms and branches, islands, bank slides and gravel bars on a border river such as the Oder? The meanders of the River Oder between the Czech Republic and the Republic of Poland are one of the few exceptions.

Following the disastrous summer floods of 1997, the WWF-Institute for Floodplain Ecology in Rastatt began to map and assess the condition of the Oder floodplain [1]. While this work was being carried out, it became clear how unique these border meanders were. It was not only the natural state of the meanders which awoke special interest, but more especially the Polish and Czech river basin authoritiesž plans to develop and thereby destroy them. In accordance with water management plans the new river course was to have been filled up. An alternative idea was to shorten the meander stretch by using artificial cut-off. The reason for contemplating such water engineering measures was based on the fear that the surrounding land and crossborder bridges further upstream could have been in danger of erosion. There was also a fear that the Oder river-bed would silt up in the area of the Polder Buków in Poland, which currently being developed, and that the flood defences of the town of Bohumín would be threatened. The need to secure the course of the national boarder also played a part.

Following the intensive lobbying the Czech-Polish Border Water Commission allowed the WWF time to carry out an essential survey of the area, a study and evaluation of the current situation as well as produce a forecast of further development of the border meanders. Right from the beginning, professional and open dialogue with the river authorities, the local municipalities which were affected, companies, as well as nature conservationists, country planners and state border authorities was carried out, and the Polish and Czech scientists were charged with expertises. The local people were informed about the unique character of the meanders through leaflets, exhibitions and bilingual booklet. The arguments for maintaining of the natural status and the sustainable development of the border river meanders are discussed in the next chapters.

Site description, hydrology and morphology

The border meanders form the final stretch of the upper reaches of the Upper Oder River. They begin at the Bohumín - Chałupki border crossing and wind their way for 7 km along a broad floodplain as far as the Oder-Olza confluence. The Czech town of Bohumín lies in the floodplain while the Polish villages Chałupki and Zabełków (Fig.1) have been established on the river terraces.

The average discharge in the profile Odra-Bohumín is 48.1 m³.s⁻¹. The Upper Oder, especially downstream from the point where the tributaries Opava and Ostravice join the river, is notable for the wide fluctuations in discharge. A 100 year flood represents a discharge of 1,640 m³.s⁻¹. The highest recorded discharge in 1997 was 2,160 m³.s⁻¹. The average smallest discharge is 4.65 m³.s⁻¹. This comparison shows the importance of dynamic conditions in the border meanders. A flood greater than biennial flood (≥ 551 m³.s⁻¹) overflows the banks of the Oder and inundates the floodplain. Historical records of the floods show that most floods occur in summer following stormy, heavy rainfall over the Beskydy and Jeseníky mountains.

Despite water engineering measures undertaken in the 1930's, the border section is noted for its highly diverse current morphology. The creation and destruction of different habitats in the river and along the banks is dependent on the transport of deposits. The natural bed load determines balanced erosion and sedimentation in the meanders, as confirmed by Czech [2] and Polish [3] experts. The most striking phenomenon in the process of formation of the river course manifests itself in the breaks of the meanders (avulsion) and in the creation of ox-bows and their gradual silting up. The speed of morphological development is dependent on the strength of the discharge. In the second half of the 20th century, there were two breaks of the meanders. During the summer flood of 1997, the meander near Starý Bohumín-Chałupki was broken. The length of the border Oder was shortened by 512 m. The original gradient of the meander bed of $\approx 0.7\%$ was raised to $\approx 1.6\%$. The beginning of the cut-off meander loop has gradually silted up; above a water level of 60 to 80 cm (gauge Bohumín) the meander will flow again with water. Surveys showed that the deposits from the newly created river-bed and adjacent areas were subsequently deposited 1.5 to 2 river kilometres away [4]. It did not result in a permanent rise of the river-bed of the Polish Oder as a result of increased erosion in the border meanders. In the newly-created river course an approximate 30 cm step (sill) had been formed. Its geological composition and its occasional drying up during low water levels awoke fears about the possible collapse of the sill and the resulting retrogressive erosion of the river course. The stability of the gauge station lying upstream and the cross-border bridge would have been in danger. Members of the Czech -



Fig. 1 Arial view of the border meanders, August 2001.Oder-Olza confluence on the top, Polish villages Chałupki and Zabełków west-, the edge of Bohumín suburbs east of the Oder (Photo: by courtesy of Městský úřad Bohumín)

Polish working group for river regulation, water supply and melioration at the Czech-Polish border are in agreement with the WWF that the sill has to be measured and regularly observed. If necessary, at some time in the future, the durability of the step could be ensured by using suitable, ecologically sensitive measures (e.g. river bottom ramp) without disturbing the movement of fish and aquatic macroinvertebrates in the river.

Flood protection, fluvial-morphological processes and state border

Bohumín and its city areas are to found in the floodplain, which, as long as one can remember, has inundated. Historical sources document that there has been flooding since the thirteenth century [5]. In view of the low population density -2,259 people lived in the area in 1804 – and in view of the small area of land that was used for agriculture, damage caused by flooding was small [6]. Following the arrival of the railway in 1847 and the following rapid industrial development, the population multiplied rapidly. In the same flooding area, the population is today more than 23,000 and most of the agricultural land is used intensively. As a result, damage caused by flooding has increased. The worst damage followed the floods of 1997. 4/5 of the town of Bohumín was affected, for the first time in history, the district of Nový Bohumín was flooded. After adaptations were made to the foreshore and the Oder bridge further downstream from the Olza confluence in Poland was modernised. no backwater has occurred. During similar floods, the water level will be much lower. The discharge of flood water in the Oder River stretch below the Bohumín-Chałupki road bridge has improved thanks to the new river-bed in the broken first meander. The fast flow of water from the area also guarantees the abandoned flood water channel on the Polish side. It is therefore important that this flood channel in its current state is maintained, i.e. without obstructing the flow of water (e.g. by willow planting).



Fig. 2 Main Oder River course 1742 (red dotted line) in a historical map of the meanders from 1829 (by courtesy of Zemský archiv Opava)

The new river course created by avulsion of the first border meander in 1997 has had no negative effects on the outflow and height of the inundation of the floodplain in the area of the border meanders. The Polish villages of Chałupki and Zabełków are with exception of few constructions, lying on the river terrace out with the area of inundation. Effective flood protection for the town of Bohumín can only be achieved using technical measures – by building dikes. The maintenance of free border meanders in their current state neither contradicts the planned dikes for Bohumín nor the flood protection measures in Poland downstream the Oder – Olza confluence (Polder Buków).

Since 1742 the state Czech-Polish border on the Oder River has been movable thanks to a contract between the Prussian and the Austrian monarchies. It lies in the central line of the Oder. Following agreements between the then Czechoslovakia and the Republic of Poland in 1959, the position of the border was confirmed. The "wet" movable border in the untamed river underwent constant, relatively-quick changes. This is why the state border had to be regularly measured and corrected. The morphological changes of a river from the point of view of gaining or losing state territory are in the long-term balanced, as it has been confirmed by the comparison of historical maps over the last 250 years (Fig. 2).

Nature of meanders

The new river-bed, deposits of gravel, sand and mud sediment and the regular inundation of the floodplain are conditions for the natural succession of plants and animals. Steps in the process of river course formation guarantee a high biodiversity, the strengthening of threatened animal populations present and the eventual return of original native plants to the border meanders. A number of species are in danger throughout Europe because most European rivers have lost their dynamics for river course formation. Pioneer areas for these plants and animals are not created but the old habitats are destroyed by natural succession.

Seven of the habitats listed in appendix I of the Fauna-Flora-Habitat Directive (92/43/ EEC) are present in the meanders:

- natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation (3150)
- water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260)
- rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation (3270)
- hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430)
- lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis) (6510)
- (softwood) alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (*91E0)
- (hardwood) riparian forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*) (91F0)

Half of the habitats recorded in the area are not listed in the FFH Directive, but they are important for the Czech and Polish nature protection. These include the dynamic habitats [7] whose existence is directly dependent on the stages of river course formation

(riverine reed vegetation, unvegetated river gravel banks, willow shrub of loamy and sandy river banks).

It is highly probable that there is none of the plant species listed in appendix II of the FFH directive growing in the border meanders today. On the other side they have reported finding strong, healthy populations of animals and birds included in the FFH and Bird (79/408/EEC) Directives and species from the Czech and Polish Red Lists. Large blue (Maculinea nausithous) is found on wet meadows with flowering great burnet, large copper (Lycaena dispar) larvae develop on swamp plants. In alluvial forests with old trees and dead wood, xylophagous hermit beetle (Osmoderma eremita) and cucujead beetle (*Cucujus cinnaberinus*) have been found. Bitterling (*Rhodues sericeus amarus*) lives in the cut-offs. In the permanent and temporary ponds yellow-bellied toad (Bombina variegata) breeds. In the bank erosions kingfishers (Alcedo athis) breed and sandmartins (Riparia riparia), sandpipers (Actitis hypoleucos) and little ringed plovers (Charadrius dubius) build their nests on the sandy banks. The border meanders are the only regular nesting site for goosanders (Mergus merganser) in the Czech Republic. Their presence testifies the excellent feeding conditions for these fish-eating ducks. Beavers (Castor *fiber*) and fish-otters (*Lutra lutra*) also live in the meanders. The presence of indicator species in every stage of development confirms that the river ecosystem is fully functioning.

The first success and the next arrangement for sustainable development

The WWF proposal to resign from the filling-up of the new river bed and further river training measures was accepted by the Czech and Polish river basin authorities. Their decision was confirmed by the Czech-Polish Border Commission in November 2002.

Both countries realising the habitat and species diversity of the meanders have placed the area on the national potential list of SAC (PL, CZ) and SPA (CZ) for the NATURA 2000 network. The lists will be proposed EU by 1st May 2004. The procedures for the declaration of nature protected areas according Czech and Polish nature protection acts are running. Management plans of the future protected areas must strength arrangement for the maintenance of the balanced erosion and sedimentation processes.

Regarding Water Frame Directive (2000/60/EC) the Member States of EC should achieve objective of at least good water status. The border meanders have been delineated as running water body. Its present good ecological status must be maintained. The plenary meeting of the International Commission for the Protection of the Oder River against Pollution (December 2003) recommended to coordinate the Czech and Polish activities in the meanders for the purpose of description of type-specific hydromorphological, physical-chemical and biological reference conditions.

Those decisions are important for the preservation of the present fluvial-morphological dynamic and balanced ecosystem. But the next steps must be realised in the medium und long-term horizon to secure the sustainable development of the area. The significant river-bed creating processes use to occur by flows bigger than 700 m³. s⁻¹. Extreme floods ($\geq 1000 \text{ m}^3.\text{s}^{-1}$) will manifest in meander avulsions. It means that by the present juridical conditions and international agreements new discrepancy between water management, nature protection and land-use are pre-programmed. The damage resulting from lateral erosion on forests are accounted as natural loss and they are foreseen in forest management. Farmers are of another opinion. Fields in the meanders lie outwith

the active zones of the inundation area, i.e. the arable land is not directly affected by erosion and deposition of gravel and sand. If loss occurs, it is damage to flooded field crops. By managing it differently, e.g. changing to green fields, economic loss could be avoided. The EU programmes for making agriculture more extensive offer appropriate financial support.

The main task of the future management of the area will be to secure the free river course formation processes. Without this, there would be no point in protection. The wise decision could build on the concept "Espace de liberté" – free zone [8]. For this concept, experts from the areas of river morphology, sedimentology and limnology would be allocated a zone along the river valley where the river course formation processes are undisturbed. The extent and size of "free zone" might take into consideration the distribution of the easily eroded, gravel-sand sediments (app. 90 ha) or the outer border of "free zone" might be identified on the basis of cartographic measurements of the river course movement over the last 250 years (app. 290 ha) The concept was, for example, realised in France and Switzerland, where floodplain development did not allow optimal limitations on free space for river morphological processes to take place. Because of this, irreversible changes in the river valley, such as industrial plants, settlements, infrastructure, etc., must also be taken into account. Free space can be provided by the state in the form of suitable consolidation of (state) land or the purchase or exchange of potentially endangered private land.

The establishing of "free zone" in meanders seems to be pre-condition for the last step towards the long-term sustainable development of the area. The present international agreement about the character of the Czech-Polish border on the Oder River (movable border) must be changed. The future state border in this stretch should have not movable character. It means e.g., that the new characterised, fixed state border in the central line of the Oder will not be replaced (and hydraulic works will not be realised) by the changing of the river course as far as they do not exceed the outer border of "free zone". Such solution would be the real breakthrough in the ecologically sound management of the transboundary rivers and it could make excellent example of the fruitful cooperation among water management, nature protection and state border authorities.

Conclusions

The decision to keep the present dynamic morphological status of the meanders on the border Oder River is the important prerequisite for the successful management of the future NATURA 2000 sites.

The long-term sustainable development can be ensured by establishing of the "free zone" for fluvial-morphological processes and by new international agreement on the state border.

References

- Rast, G., Obrdlík, P. & Nieznański, P. (Eds) 2000: Oder-Auen-Atlas. WWF Deutschland, WWF-Auen-Institut, 103 pp, 9 + 52 maps.
- Veselý, J., Maleňák, J., Pařilková, J. & Zachoval, Z. 2002: Studie über Transport von Geschieben, Erosions- und Sedimentationsvorgänge entlang der tschechisch-polnischen Strecke der Odra (Km -3,93 bis 3,976). Bericht, VUT Brno, Ústav vodních staveb, 103 pp.

- Parzonka, W. & Kasperek, R. 2002: Die Studie der Oderflußentwicklung (die Erosions- und Sedimenationsvorgänge) stromabwärts der Olse-Mündung (Km 27,7 – Km 33,6). Bericht, Akademia Rolnicza, Wrocław, 20 pp.
- Zieliński, T. 2002: Prognose der Entwicklung des Oderflußbetts zwischen Bohumin und der Olse-Mündung. Bericht, Uniwersytet Śląki, Wydzial Nauk o Ziemi, Sosnowiec, 31 pp.
- 5. Maníček, J. 1998: Flood 1997. Povodí Odry a.s., Ostrava, 2nd part of Annual Report, 32 pp.
- 6. Demel, J. 1997: Nový Bohumín 150 let historie. Městský úřad Bohumín, 120 pp.
- Chytrý, M., Kučera, T. & Kočí, M. (Eds) 2001: Katalog biotopů České republiky. Agentura ochrany přírody a krajiny ČR, Praha, 304 pp.
- Malavoi, J.R. & Souchon Y. 1996: Dynamique fluviale et dynamique ecologique. La Houille Blanche, 6/7: 98 – 107.

Author:

Petr Obrdlík, WWF-Germany, Institute for Floodplain Ecology, Josefstr.1, D-76437 Rastatt, e-mail:obrdlik@wwf.de