

Funktion der Durchgängigkeit für potamodrome Populationen



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- Welche Bedeutung hat die Durchgängigkeit für Populationen und Lebensgemeinschaften?
- Auf welchem räumlichen Maßstab brauchen wir Durchgängigkeit?
- Was bringt die Durchgängigkeit für den ökologischen Zustand?

Wissensstand

- Guter Wissensstand bei **flussaufgerichteter** Wanderung
- Große Defizite bei der **flussabgerichteten** Wanderung

Hypothesen Flussabwanderung

- Eine Flussaufwanderung wird durch eine entsprechende Flussabwanderung „kompensiert“
 - Rückwanderung der Adultfische
 - Flussabwanderung der Jungfische

Fischaufstieg bei Flschpässen

River	Mean flow [m ³ /s]	Location	Fish pass	Year	Number of species	Number of fish	Citation
Rhine	1 000	Iffezheim	Vertical slot	2001-2010	38	13 077-27 039	Degel 2010
Rhine	1 000	Gambsheim	Vertical slot	2006-2010	-	30 184-64 546	Degel 2010
Danube	2 000	Freudenau	Nature-like	1999-2000	38	19 801	Eberstaller & Pinka 2001
Danube	1 850	Melk	Nature-like	2007-2008	42	-	Franguez et al. 2009
Elbe	728	Geesthacht	Vertical slot	2010	43	300 000	Adam et al. 2012



Fischwanderung kleine u mittelgroße Flüsse

Bsp. Melk

Species	FFH	Total n Melk P
<i>Barbus barbus</i> (L.)		953
<i>Alburnus alburnus</i> (L.)		563
<i>Leuciscus cephalus</i> (L.)		101
<i>Abramis brama</i> (L.)		230
<i>Gobio gobio</i> (L.)		179
<i>Chondrostoma nasus</i> (L.)		100
<i>Rutilus rutilus</i> (L.)		113
<i>Blicca bjoerkna</i> (L.)		111
<i>Thymallus thymallus</i> (L.)		19
<i>Carassius gibelio</i> (Bloch)		63
<i>Salmo trutta f.f.</i> (L.)		27
<i>Oncorhynchus mykiss</i> (Walbaum)		25
<i>Leuciscus leuciscus</i> (L.)		27
<i>Cyprinus carpio</i> (L.)		37
<i>Alburnoides bipunctatus</i> (Bloch)		0
<i>Gobio albipinnatus</i> (Lukasch)	x	27
<i>Perca fluviatilis</i> (L.)		22
<i>Hucho hucho</i> (L.)	x	1
<i>Aspius aspius</i> (L.)	x	22
<i>Phoxinus phoxinus</i> (L.)		17
<i>Cottus gobio</i> (L.)	x	11
<i>Zingel zingel</i> (L.)		11
<i>Abramis ballerus</i> (L.)		10
<i>Sander lucioperca</i> (L.)		8
<i>Scardinius erythrophthalmus</i> (L.)		6
<i>Vimba vimba</i> (L.)		7
<i>Esox lucius</i> (L.)		5
<i>Salvelinus fontinalis</i> (Mitchill)		5
<i>Leuciscus idus</i> (L.)		5
<i>Proterorhinus marmoratus</i> (Pallas)		2
<i>Gymnocephalus cernuus</i> (L.)		4
<i>Tinca tinca</i> (L.)		3
<i>Barbatula barbatula</i> (L.)		2
<i>Gymnocephalus schraetzer</i> (L.)	x	3
<i>Gymnocephalus baloni</i> (Holcik & Hensel)		2
<i>Cobitis taenia</i> (L.)	x	1
<i>Silurus glanis</i> (L.)		1
<i>Abramis sapa</i> (Pallas)		1
Total number of species	6	37
Total number of individuals		2724

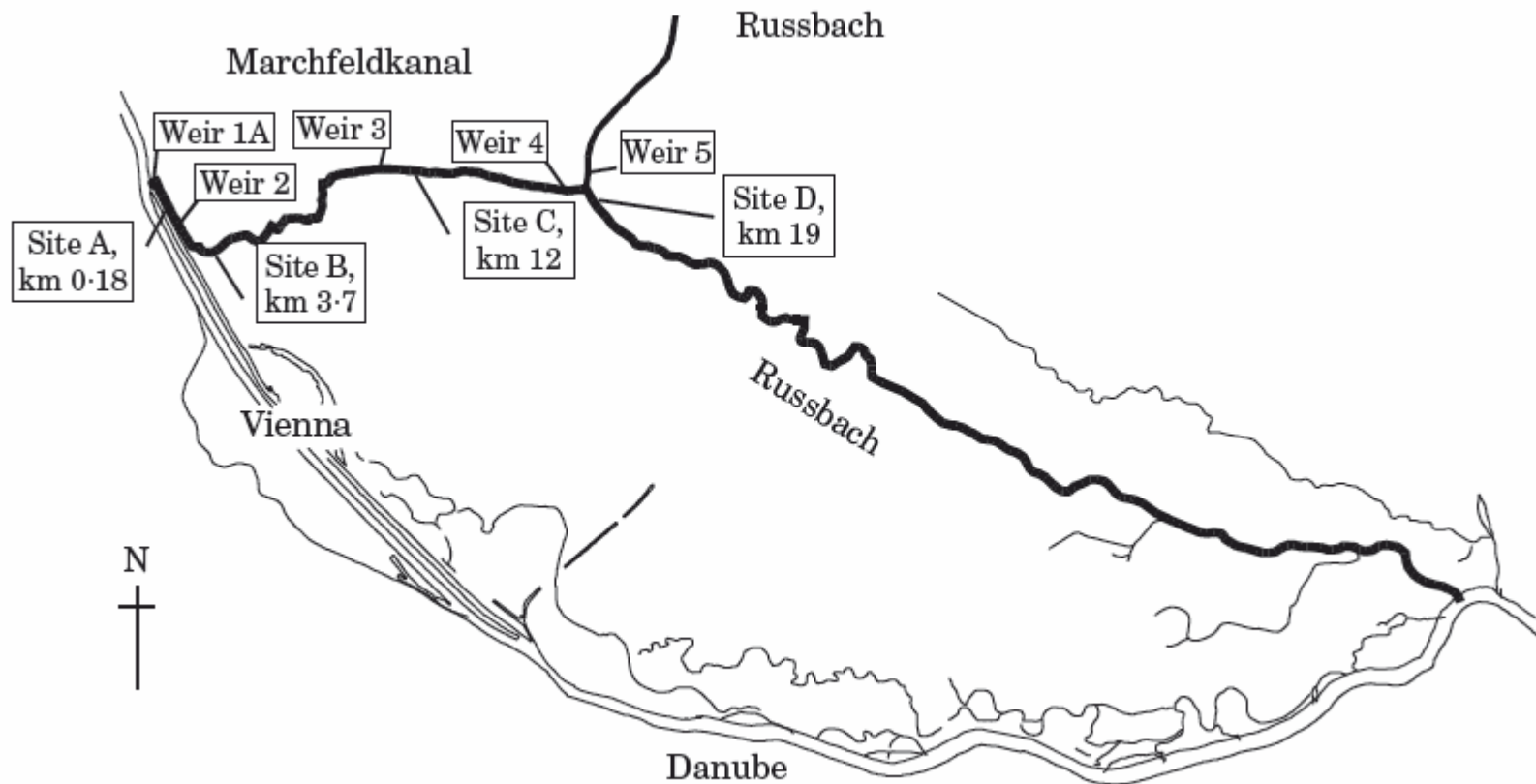


Anzahl Arten 37

Anzahl Fische

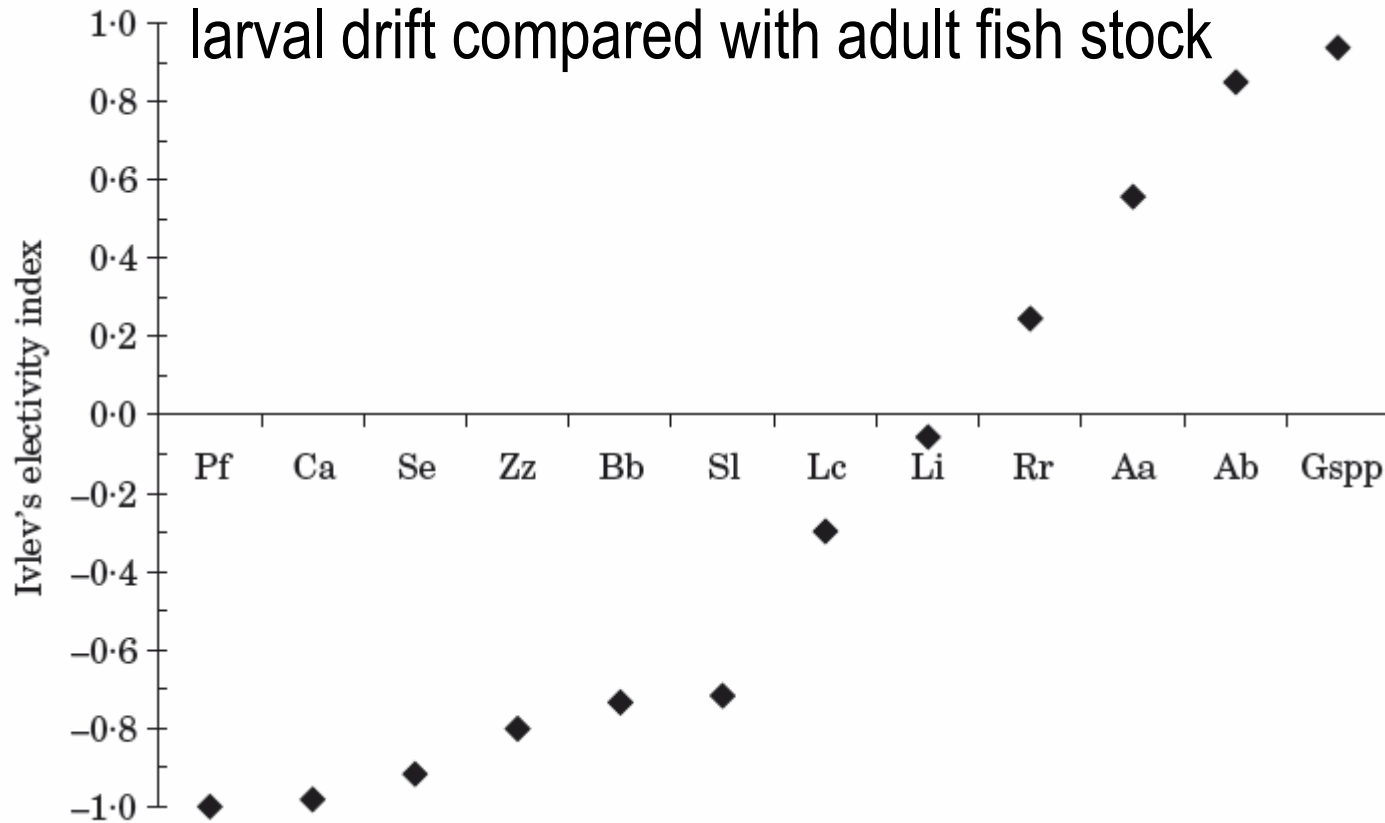
2 724

Fallbeispiel Marchfeldkanal



Driftindex

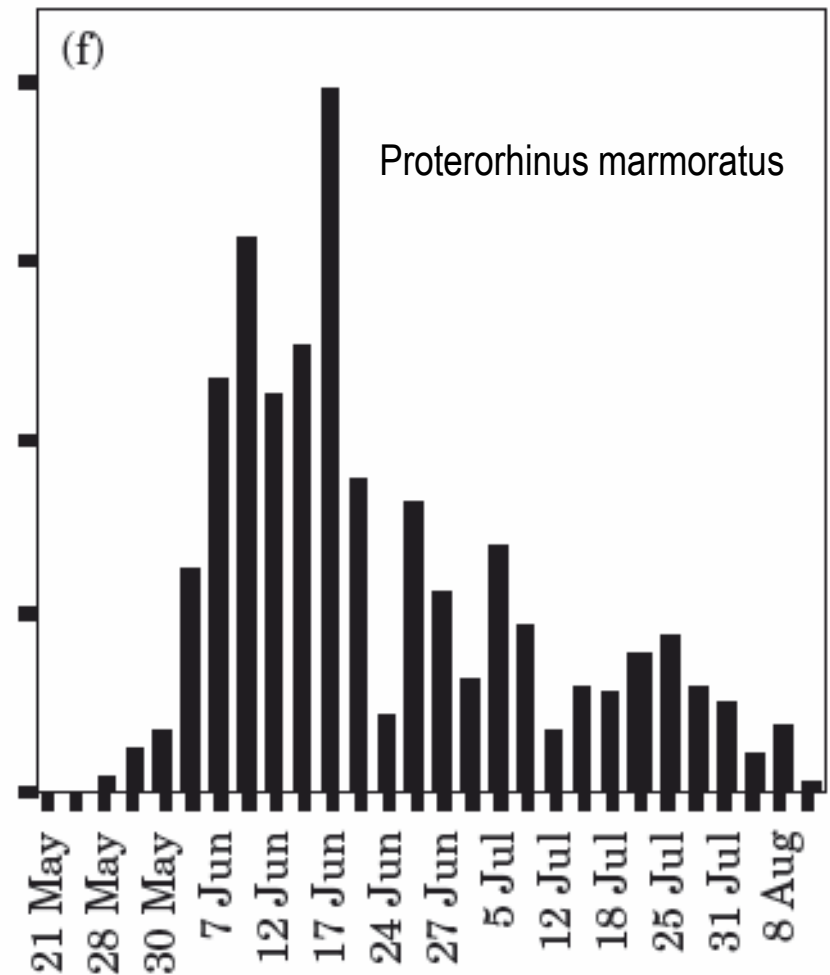
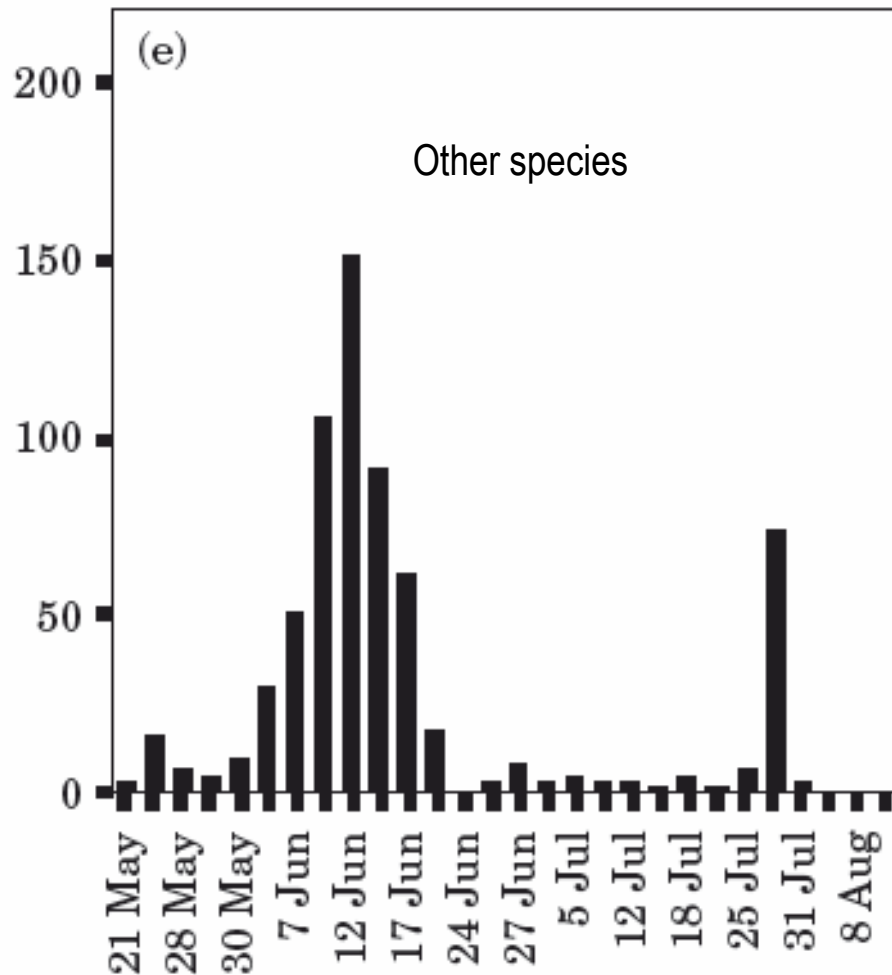
Drift index: propensity of species to drift,
larval drift compared with adult fish stock



Larval and juvenile drift stages

Species	Larval stages		Juvenile stages	Number of spawning events or continuous spawning activity
	L1–L2	L3–L6	J1–J2	
<i>Abramis brama</i>	x	x	x	3
<i>Alburnus alburnus</i>	x	x	—	3
<i>Aspius aspius</i>	—	x	x	2
<i>Barbus barbus</i>	x	x	—	Continuous
<i>Gobio</i> spp.	x	—	—	3
<i>Leuciscus cephalus</i>	x	x	—	3
<i>Leuciscus idus</i>	x	—	—	2
<i>Proterorhinus marmoratus</i>				Continuous
<i>Rutilus rutilus</i>	x	x	x	>3 to continuous

Quantity of drift



Diurnal variation of larval drift

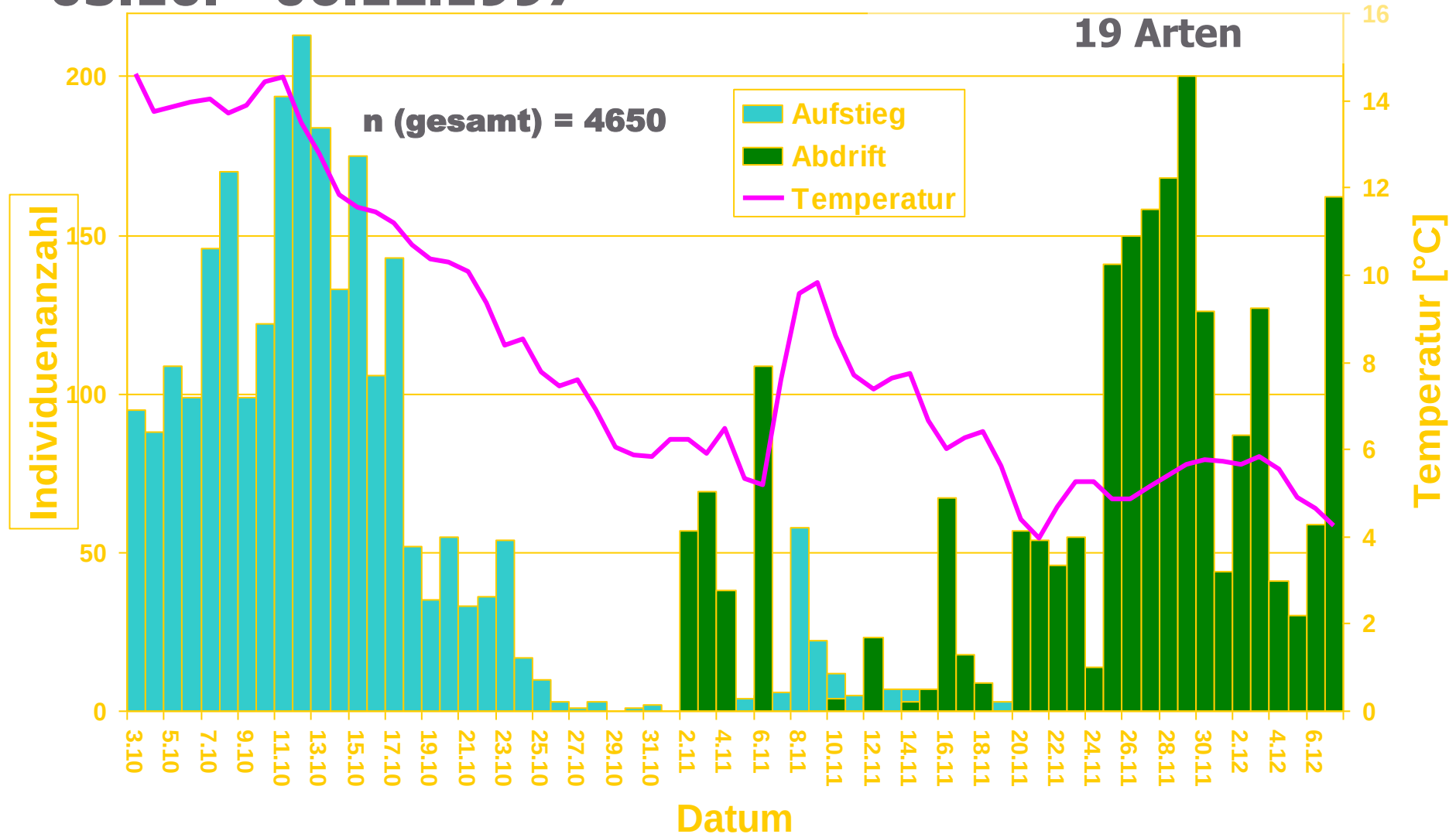


Species	Day		Dusk		Night		Dawn		Total <i>n</i>
	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>n</i>	
<i>Abramis brama</i>	47	22	5	2	45	16	3	1	41
<i>Alburnus alburnus</i>	29	80	4	11	63	153	5	13	257
<i>Aspius aspius</i>	38	3	0	0	40	5	22	2	10
<i>Barbus barbus</i>	0	0	0	0	100	12	0	0	12
Cyprinidae	18	133	5	39	67	448	10	58	678
<i>Gobio</i> spp.	8	10	5	5	83	86	4	4	105
<i>Leuciscus cephalus</i>	0	0	33	6	56	10	11	2	18
<i>Leuciscus idus</i>	9	9	5	7	64	70	22	19	105
<i>Proterorhinus marmoratus</i>	2	39	2	46	95	1612	1	23	1720
<i>Rutilus rutilus</i>	7	9	5	8	72	96	16	17	130
Total	7	305	3	124	86	2508	4	139	3076

Aufstieg bzw. Abstieg an FWH MFK

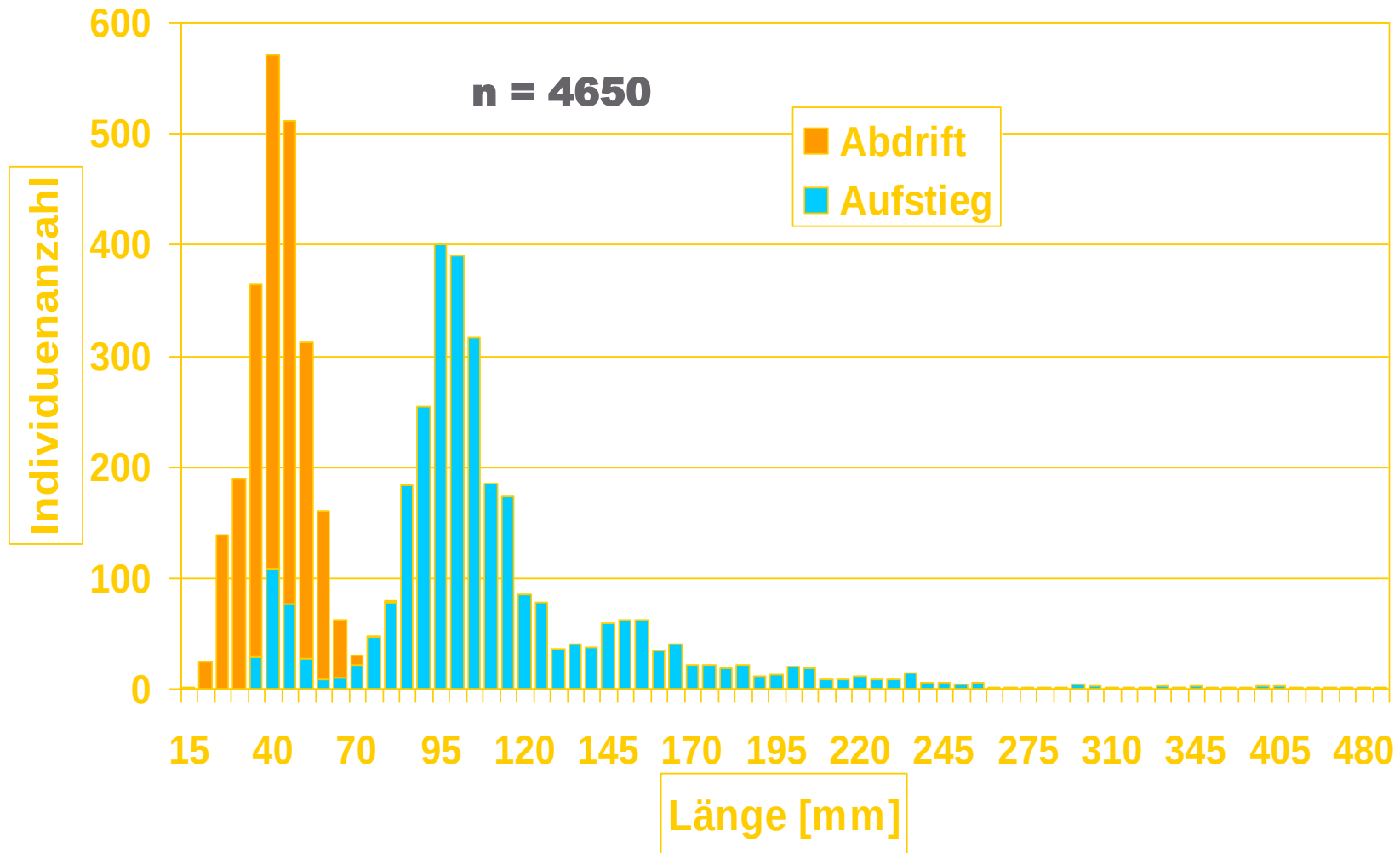
03.10. - 06.12.1997

Abstieg: 2202 Individuen



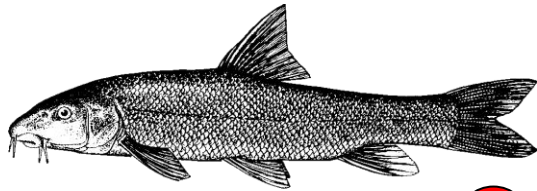
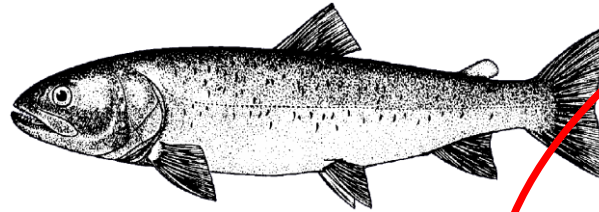
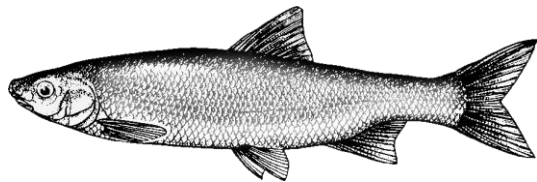
Längenhäufigkeit

Aufstieg/Abdrift



Bedeutung der Konnektivität zu Zubringern

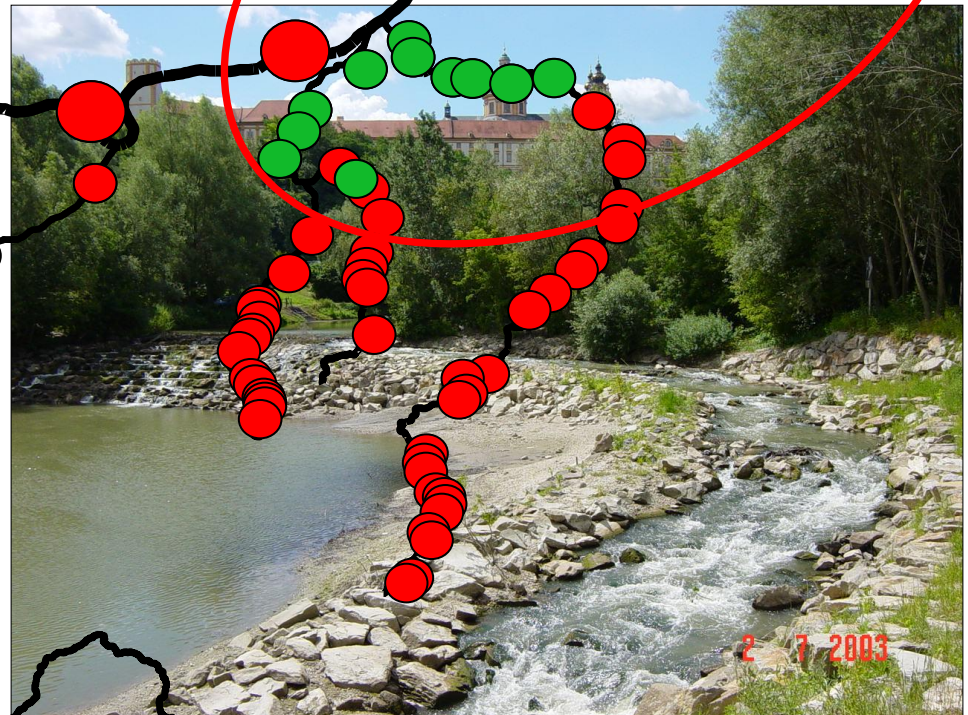
Measures and efficiency at the sub-catchment scale



Nase (*Chondrostoma nasus*)

Barbel (*Barbus barbus*)

Danube salmon (*Hucho hucho*)



0 10 20 40 Kilometers



Conducted measures

(1) 11 fish ladders

- Types of fish ladders
 - rock-ramps
 - nature like bypass channels
 - pool and weir bypass
- bypassed heights 1- 4 m
- channel slopes from 0.7 to 7.5 %
- Lengths from 20 - 300 m
- discharges from 250 l to >1500 l

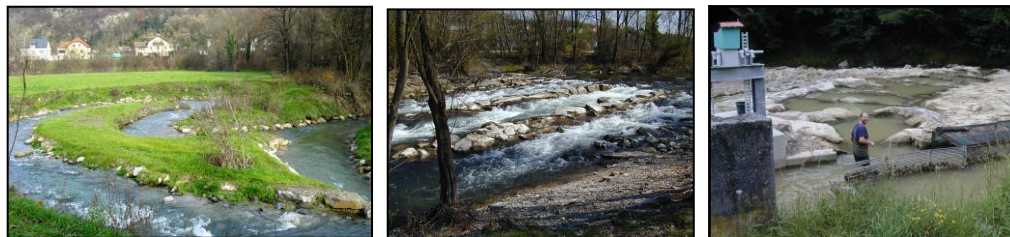
(2) River restoration

- Leitbild-orientated restoration of 2200 m regulated river channel



(3) Protection of river sections with natural dynamics

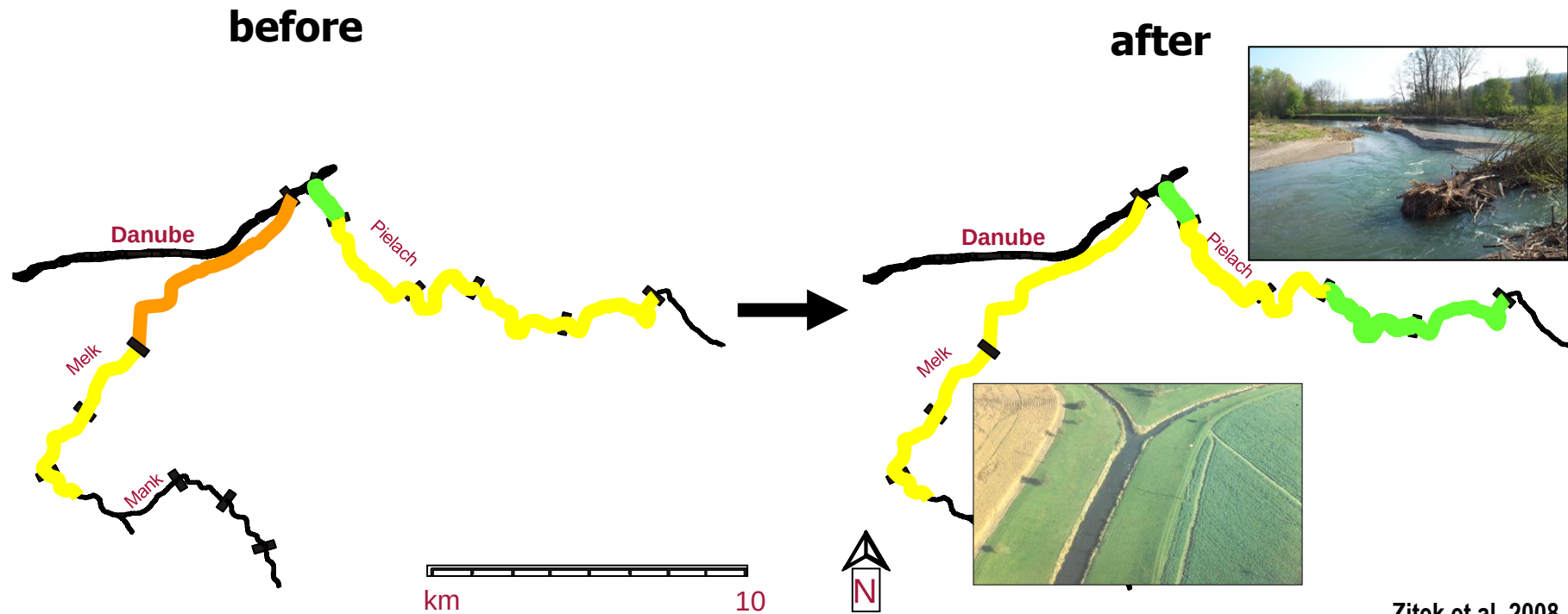
- Purchase of 71 ha land



Ecological quality – Fish Index



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Zitek et al. 2008

**River
Pielach**

2.6 = moderate quality

2.4 = good quality

**River
Melk**

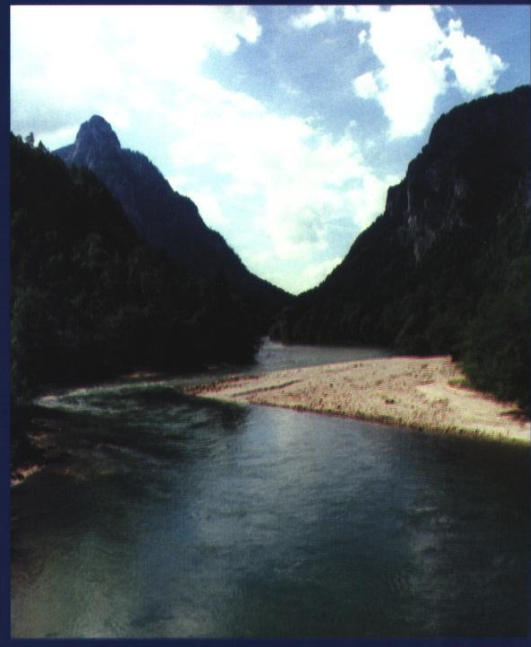
3.2 = moderate quality

3.0 = moderate quality

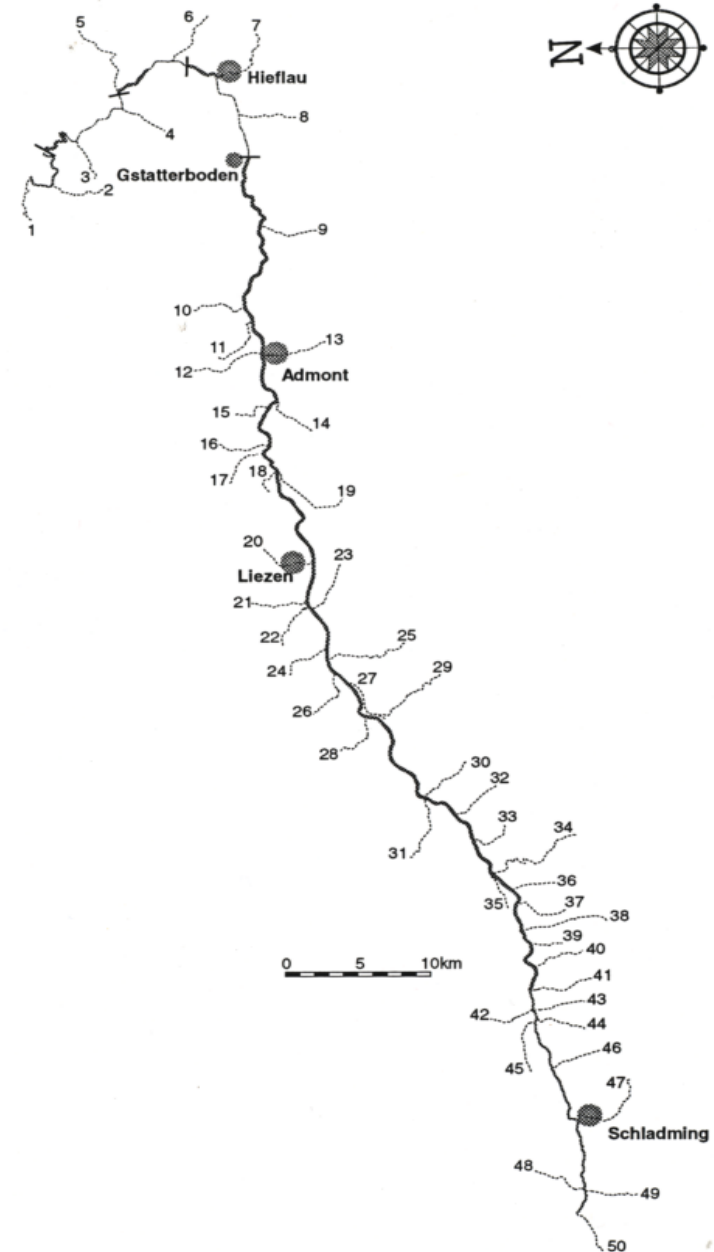
M.Jungwirth, S.Muhar, G.Zauner, J.Kleeberger, T.Kucher

DIE STEIRISCHE ENNS

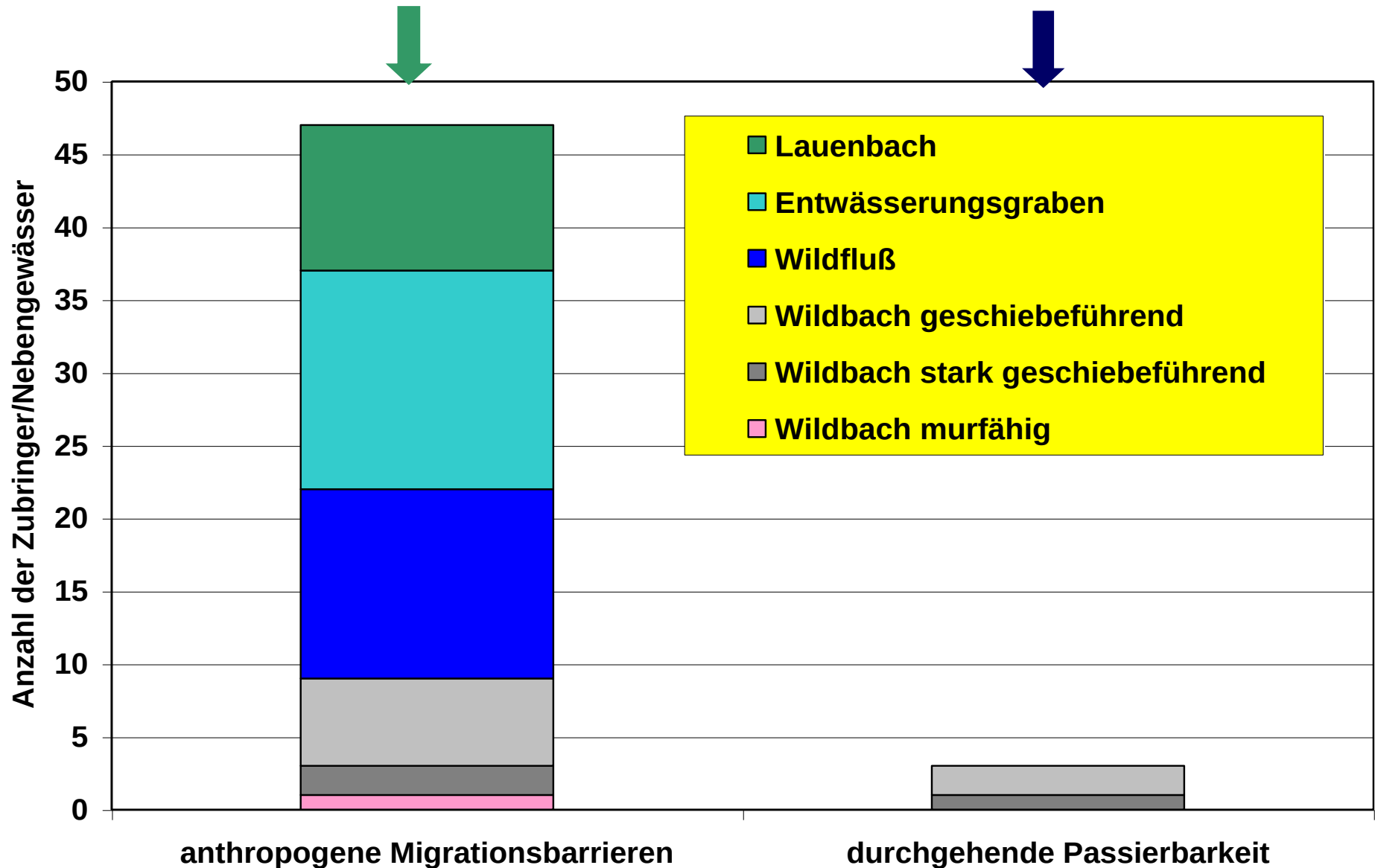
Fischfauna
und
Gewässermorphologie



- 1 Laussabach
- 2 Erzbach
- 3 Wolfsbach
- 4 Tamischbach
- 5 Salza
- 6 Schwabelbach
- 7 Erzbach
- 8 Hartelsgraben
- 9 Johnsbach
- 10 Wengbach
- 11 Hallbach
- 12 Eßlingbach
- 13 Lichtmeßbach
- 14 Schrabach
- 15 Gansmüllerbach
- 16 Ardnigbach
- 17 Metschitzbach
- 18 Brunnbach
- 19 Palten
- 20 Pymbach
- 21 Weißenbach
- 22 Retschitzbach
- 23 Döllachbach
- 24 Wörschachbach
- 25 Gulling
- 26 Leistenbach
- 27 Schwarzer Graben
- 28 Grimmingbach
- 29 Irndingbach
- 30 Niederöblarnbach
- 31 Salzabach
- 32 Walchenbach
- 33 Moarzbach
- 34 Großsölkbach
- 35 Spitalgraben
- 36 Tunzendorferbach
- 37 Moosheimerbach
- 38 Sattentalbach
- 39 Schlattenbach
- 40 Aubergbach
- 41 Seewigtalbach
- 42 Gradenbach
- 43 Gumpenbach
- 44 Ennslingbach
- 45 Weißenbach
- 46 Dürrenbach
- 47 Talbach
- 48 Grießbach
- 49 Preuneggbach
- 50 Forstaubach



Anzahl der Zubringer/Nebengewässer der Enns mit anthropogen bedingten bzw. keinen Migrationsbarrieren



Bedeutung der Konnektivität auf Einzugsgebietsebene

Continuity restoration: Rivers of priority



Nase

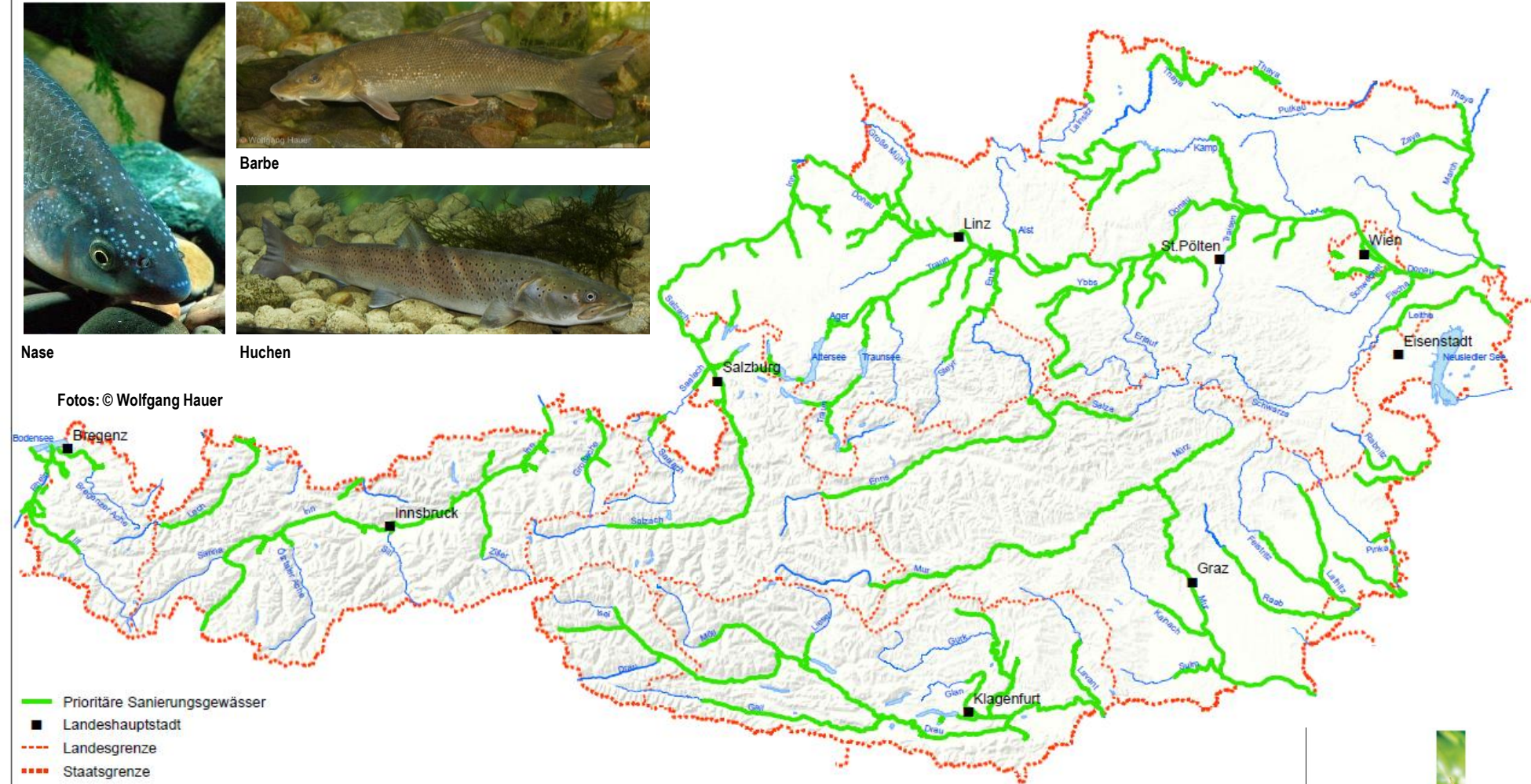


Barbe



Huchen

Fotos: © Wolfgang Hauer



Barriers in Austrian rivers

Freie Fließstrecke/Vollwasser

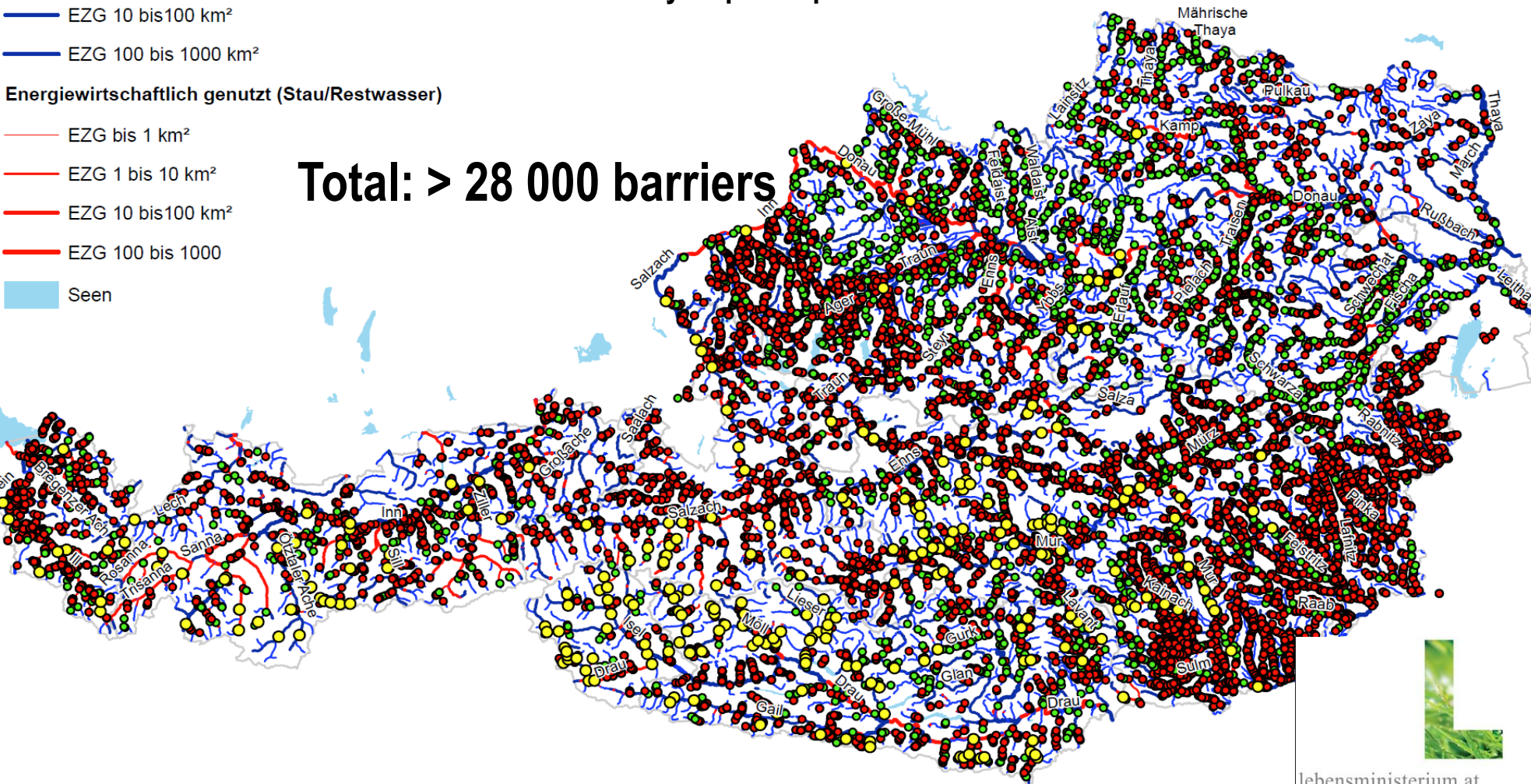
- EZG bis 1 km²
- EZG 1 bis 10 km²
- EZG 10 bis 100 km²
- EZG 100 bis 1000 km²

- Barrier not passable or fish
- Barrier passable or fish
- Planned hydropower plant

Energiewirtschaftlich genutzt (Stau/Restwasser)

- EZG bis 1 km²
- EZG 1 bis 10 km²
- EZG 10 bis 100 km²
- EZG 100 bis 1000 km²
- Seen

Total: > 28 000 barriers

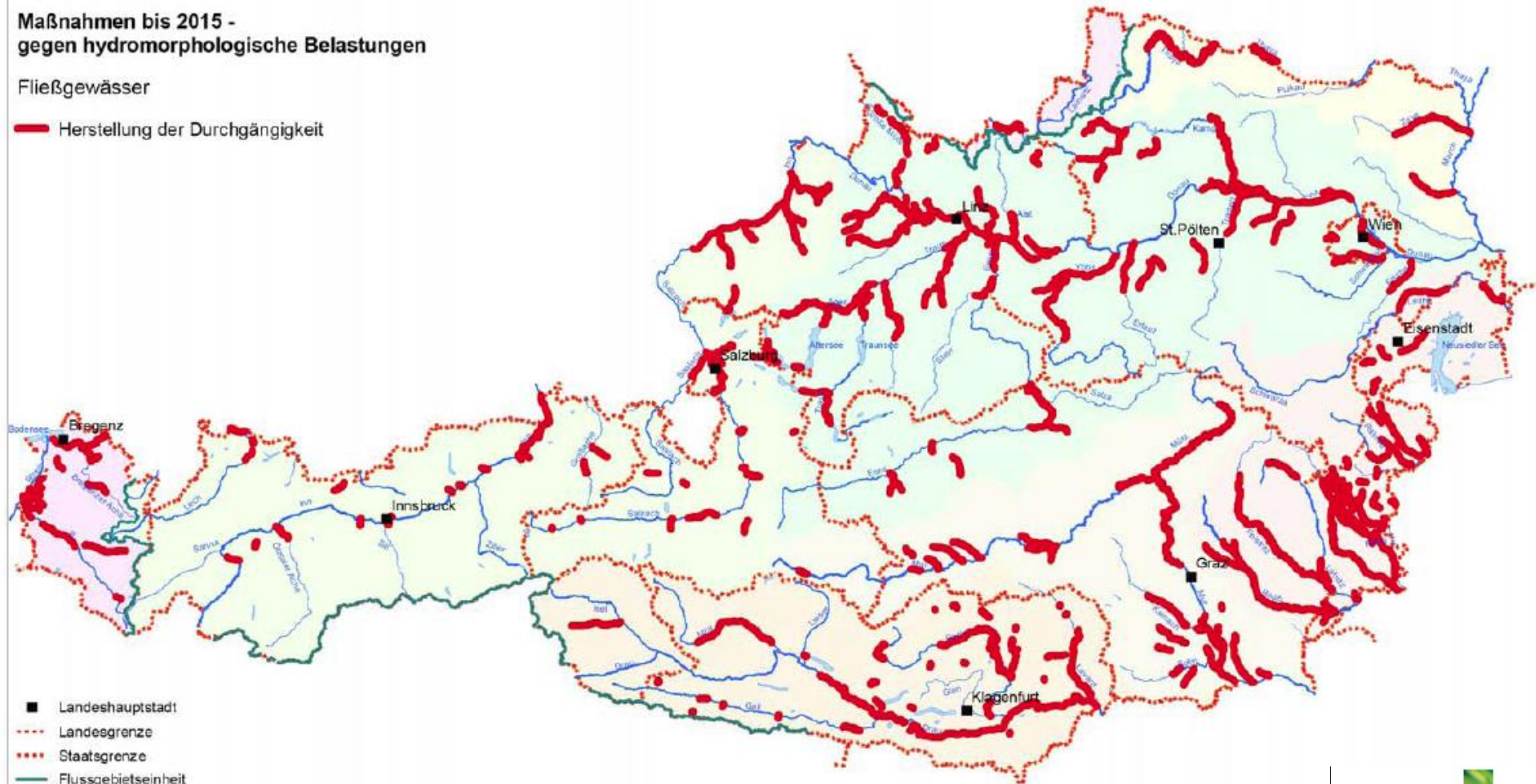


Restoration of migratory corridor

Maßnahmen bis 2015 -
gegen hydromorphologische Belastungen

Fließgewässer

— Herstellung der Durchgängigkeit



Continuity interruptions

Danube Catchment

Danube River Basin District:
River and Habitat Continuity Interruption - Current Situation (2009)

MAP 5



This ICPDR product is based on national information provided by the Contracting Parties to the ICPDR (AT, BA, BG, CZ, DE, FR, HR, HU, MD, RO, RS, SI, SK, UA) and CH, except for the following: EuroGlobalMap v2.1 from EuroGeographics was used for national borders of AT, CZ, DE, FR, HU, MD, RO, SI, SK and UA; ESRI data was used for national borders of AL, ME, MK; Shuttle Radar Topography Mission (SRTM) from USGS Seamless Data Distribution System was used as topographic layer; data from the European Commission (Joint Research Center) was used for the outer border of the CRBD of AL, IT, ME and PL.

Vienna, December 2009

www.icpdr.org

icpdr iksd

International Commission for the Protection of the Danube River

Danube catchment

Prioritisation of continuity restoration

Danube River Basin District: Ecological Prioritisation Regarding Restoration Measures for River and Habitat Continuity

MAP 28

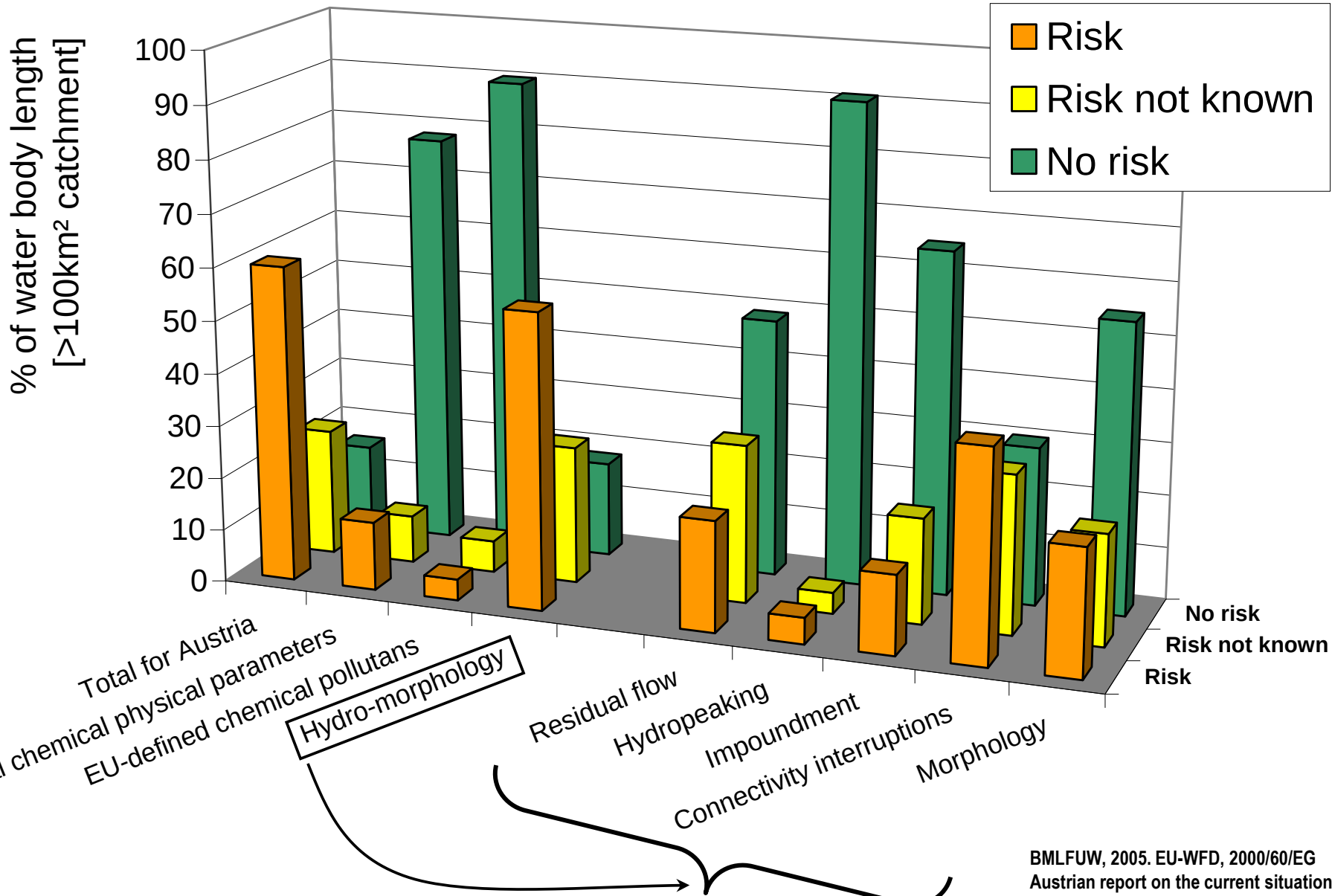


The ecological prioritisation approach (Part A) is not meant to substitute similar national approaches but to outline the basin-wide perspective. Low restoration priority indicated on the basin-wide level does not imply that no measures should be undertaken on the national level as all fish species need open river continuity. On the other hand, ecological prioritisation is only one of many aspects in deciding which measures to adopt and implement. Final decisions must be taken at the national level.

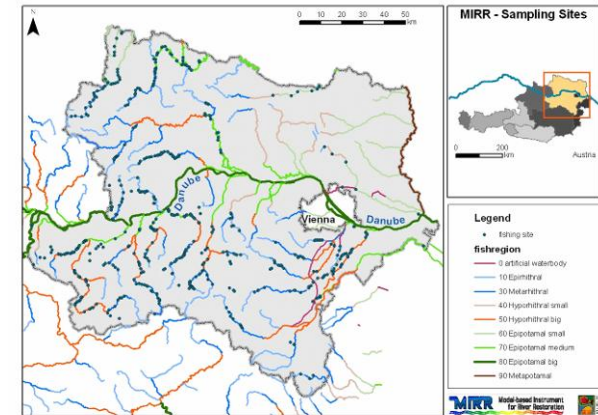
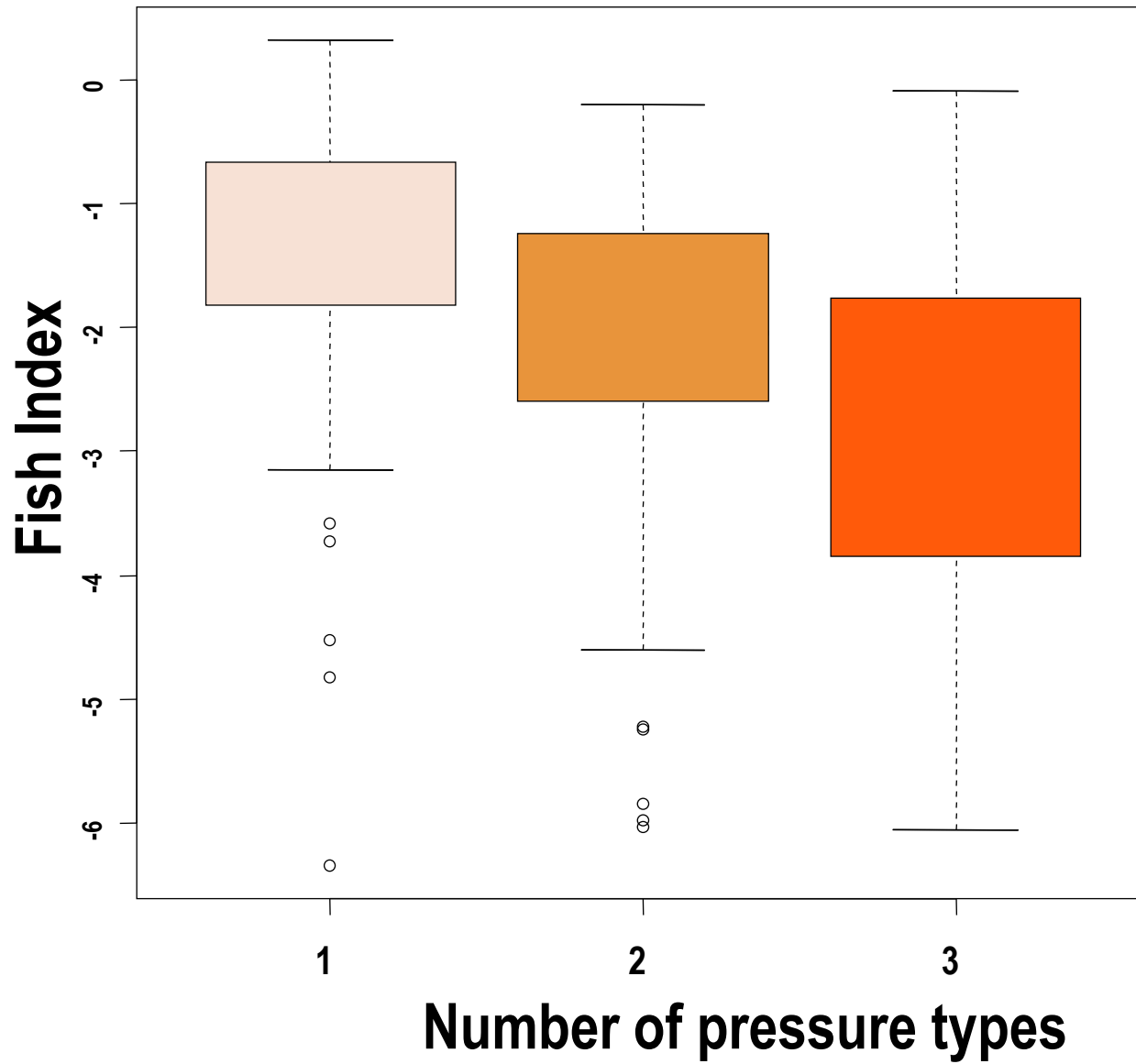
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Mehrfachbelastungen

Risk assessment of Austrian rivers



Effects of multiple pressures

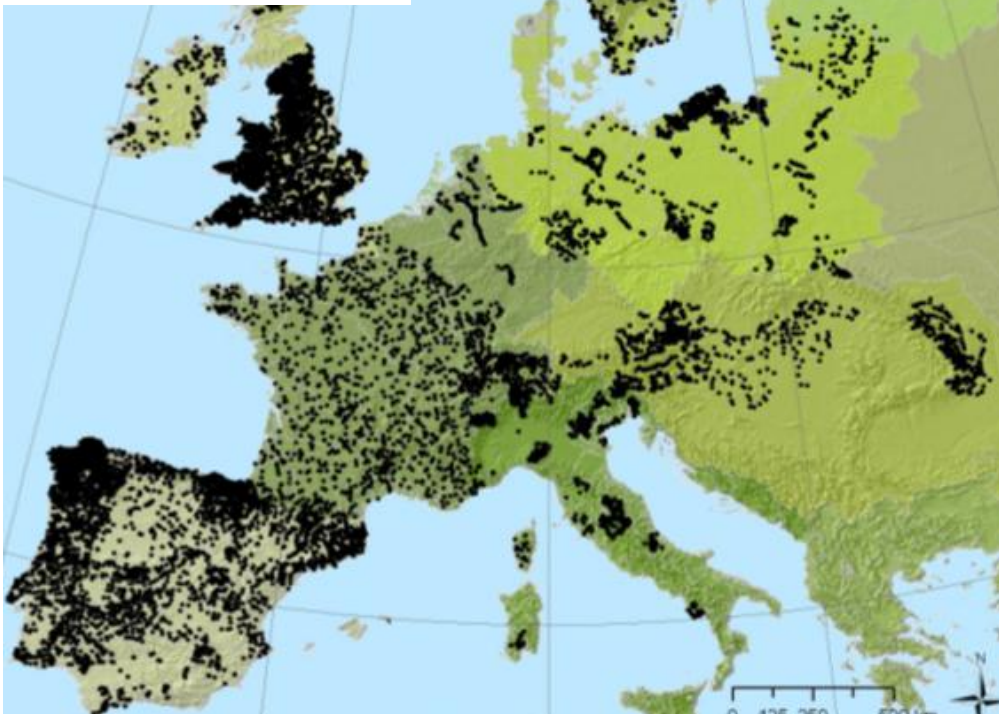


N=433 sites

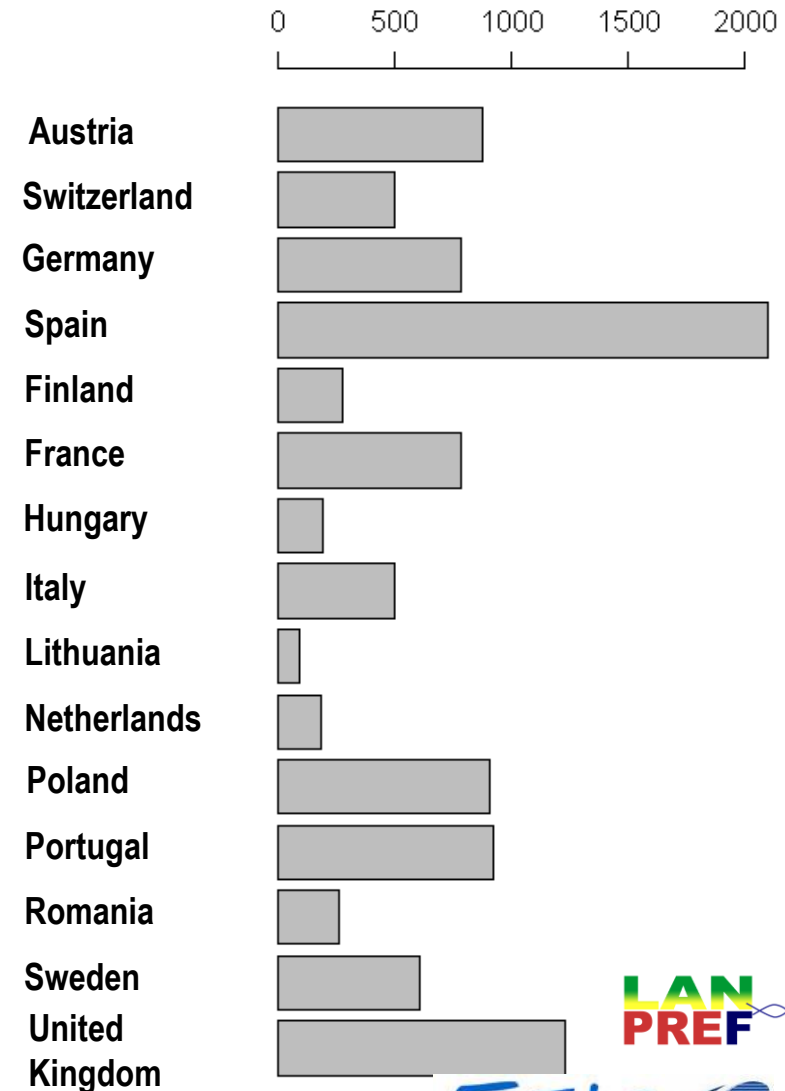
Schmutz et al. 2007

Data availability – EFI+ DB

N = 14221
sites spread
over 4800
rivers and 16
ecoregions



Nr. of sites per country



Multiple pressures at European scale



W: water quality pressures only

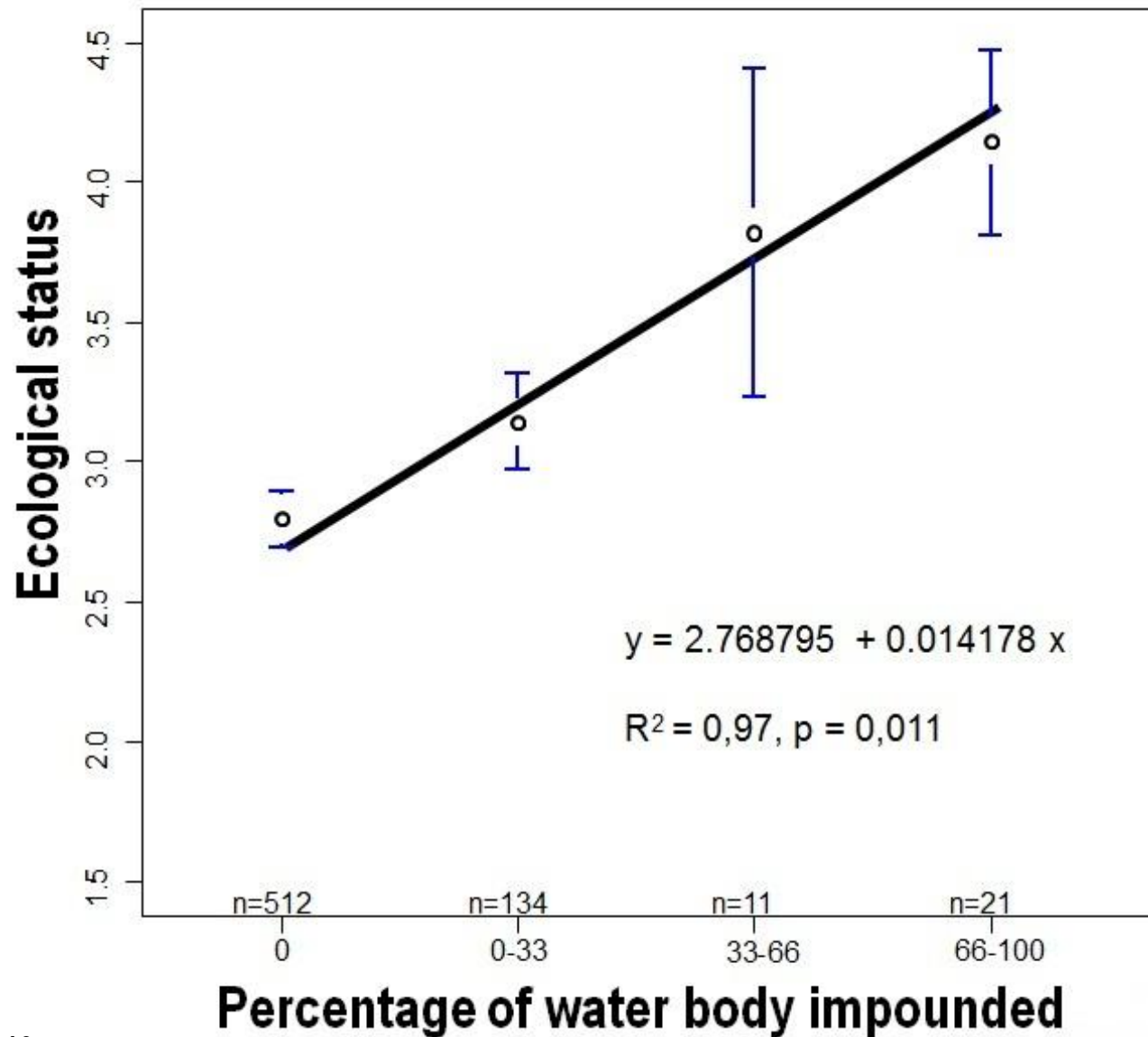
W + HMC: water quality and hydromorphological pressures

HMC: hydromorphological pressures only

No P: nearly undisturbed sites

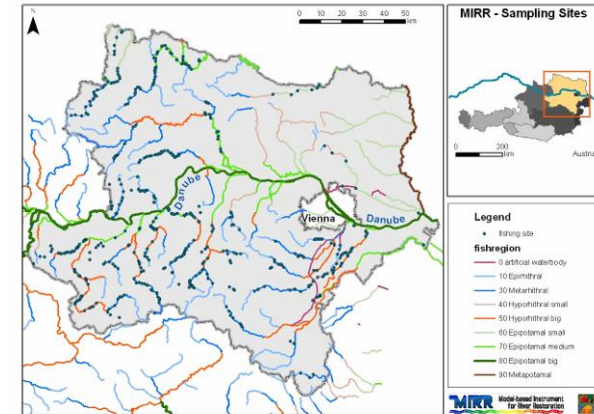
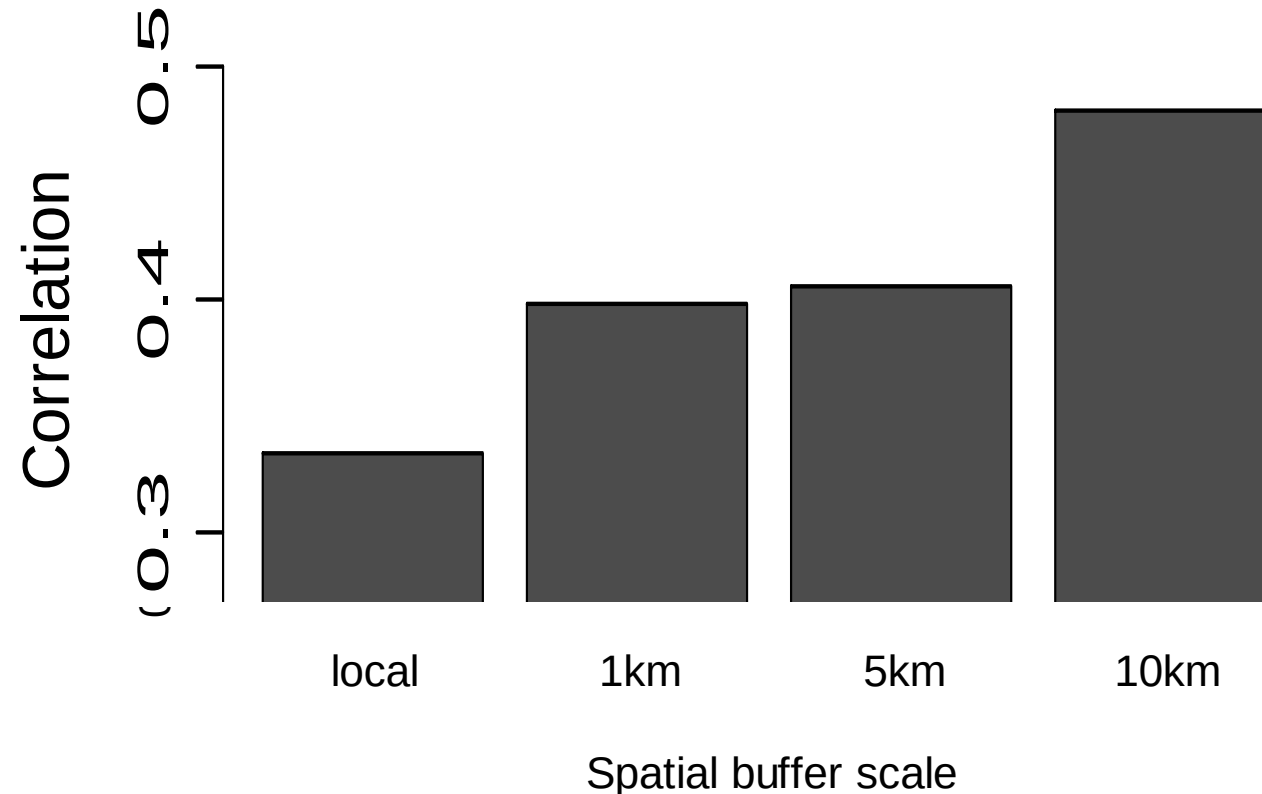
Räumliche Wirkung von Mehrfachbelastungen

Protection of free flowing river sections



Spatial scales and river bed morphology

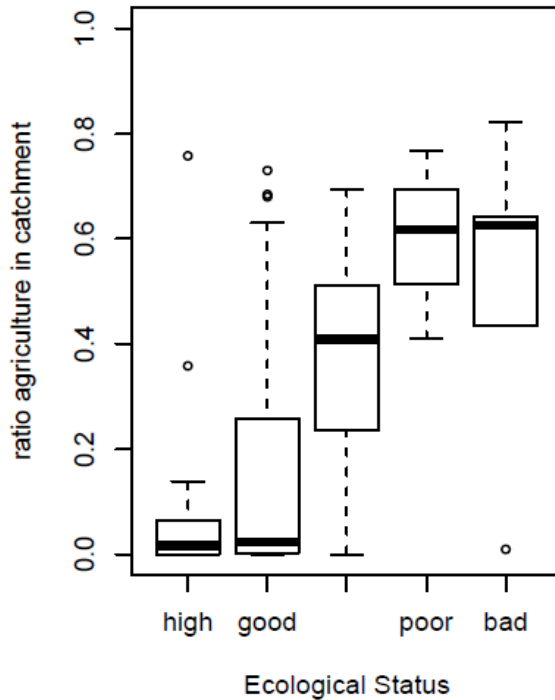
Correlation between river bed morphology and fish at different spatial scales



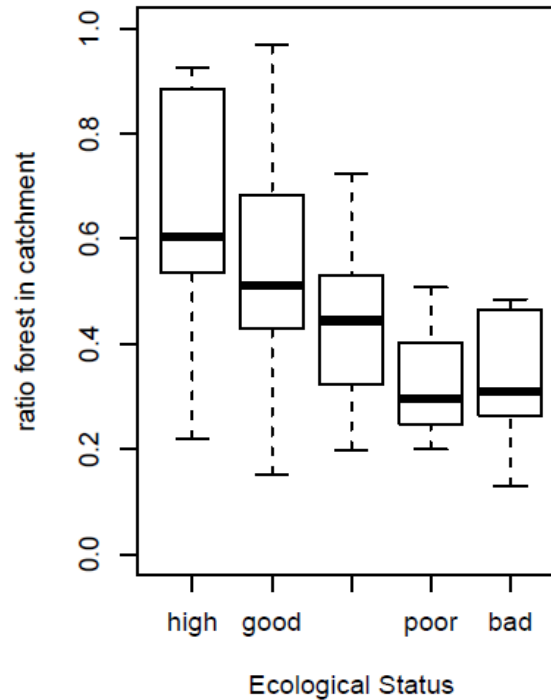
N=433 sites

Effects of land use on fish (Austria)

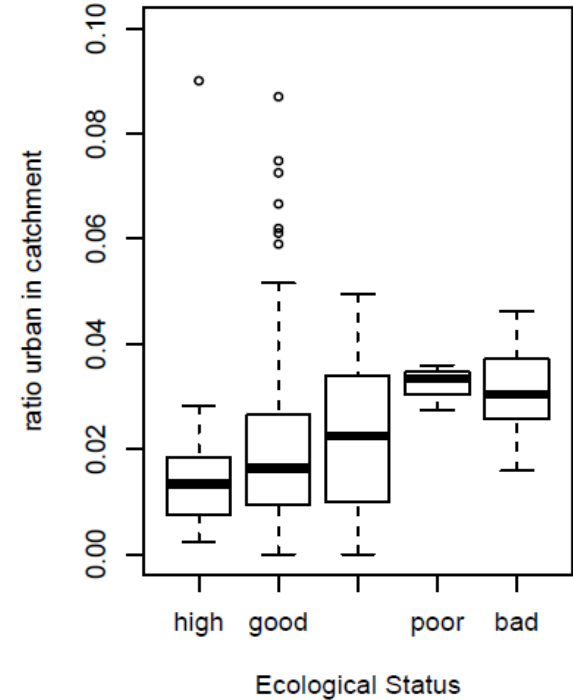
a) EFI and agriculture



b) EFI and forest



c) EFI and urban

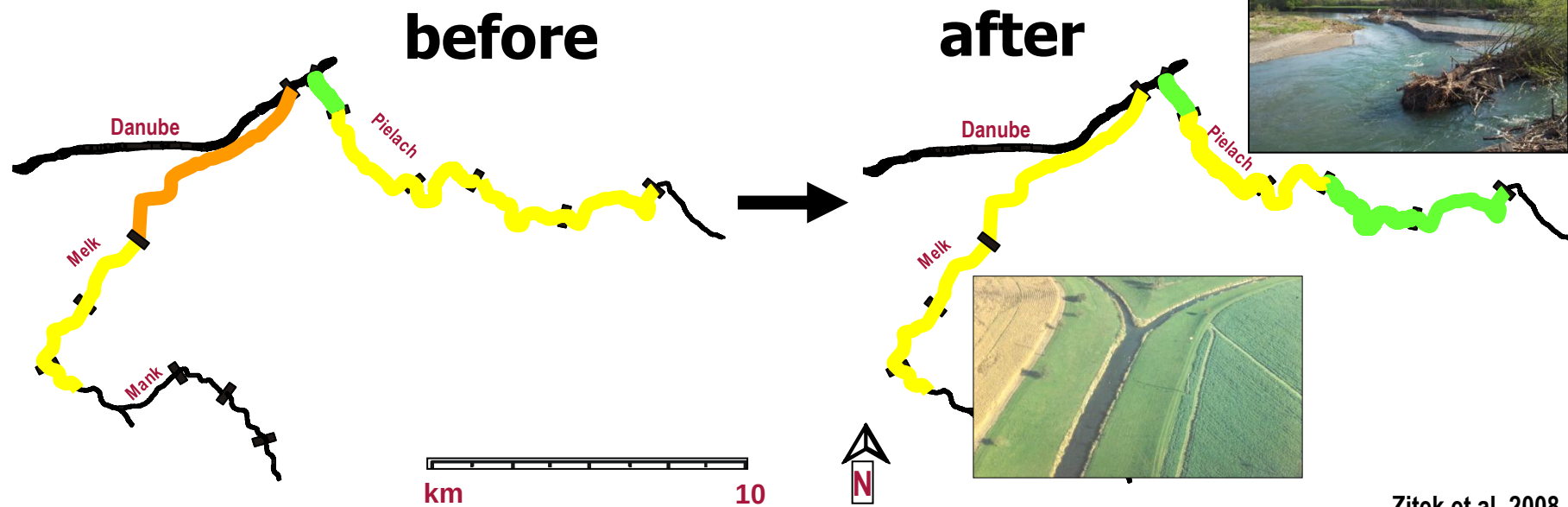


Abschätzung der Wirkung von Kontinuumsanierungen

Ecological quality – Fish Index



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Zitek et al. 2008

River
Pielach
River
Melk

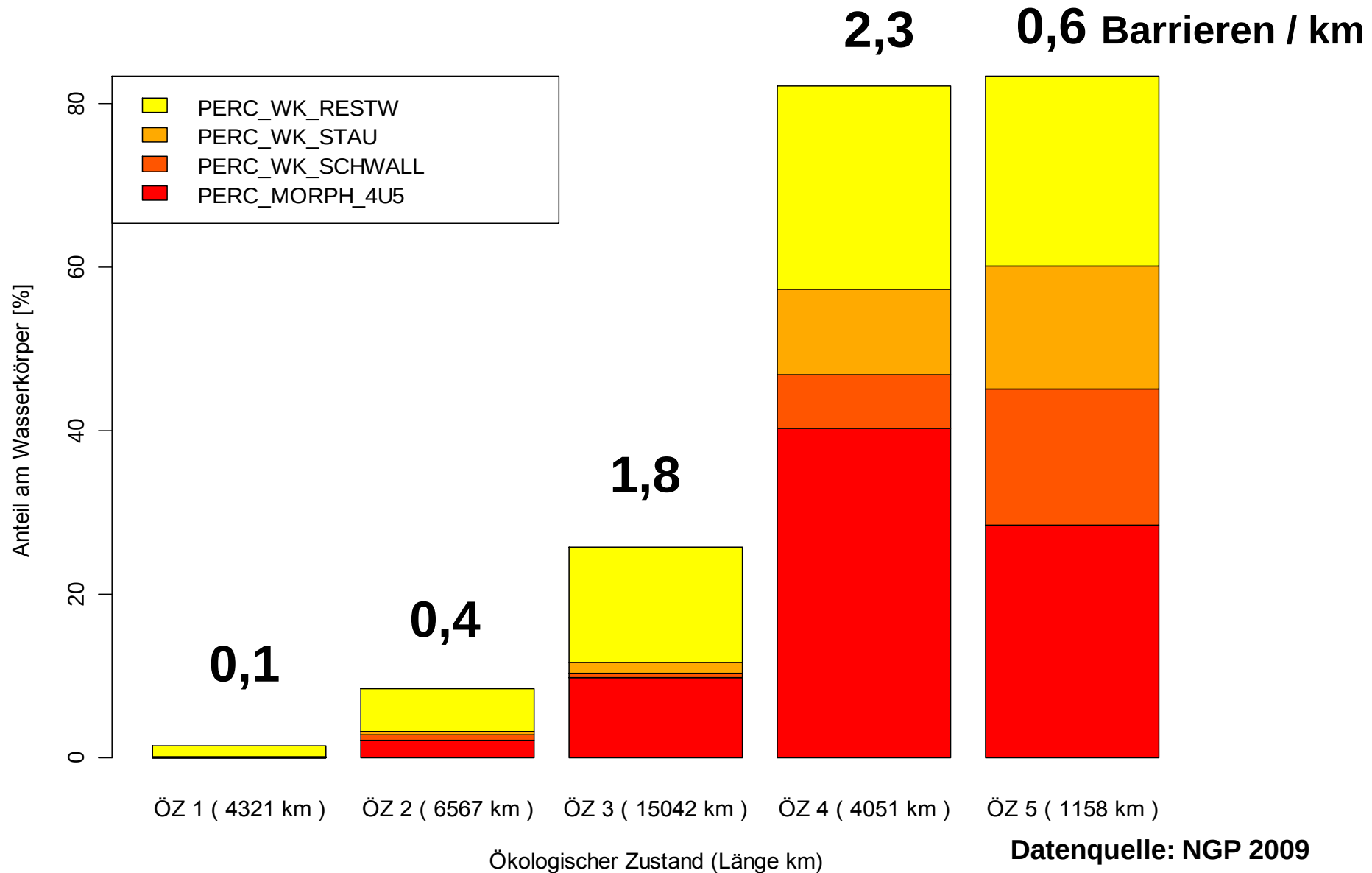
2.6 = moderate quality

3.2 = moderate quality

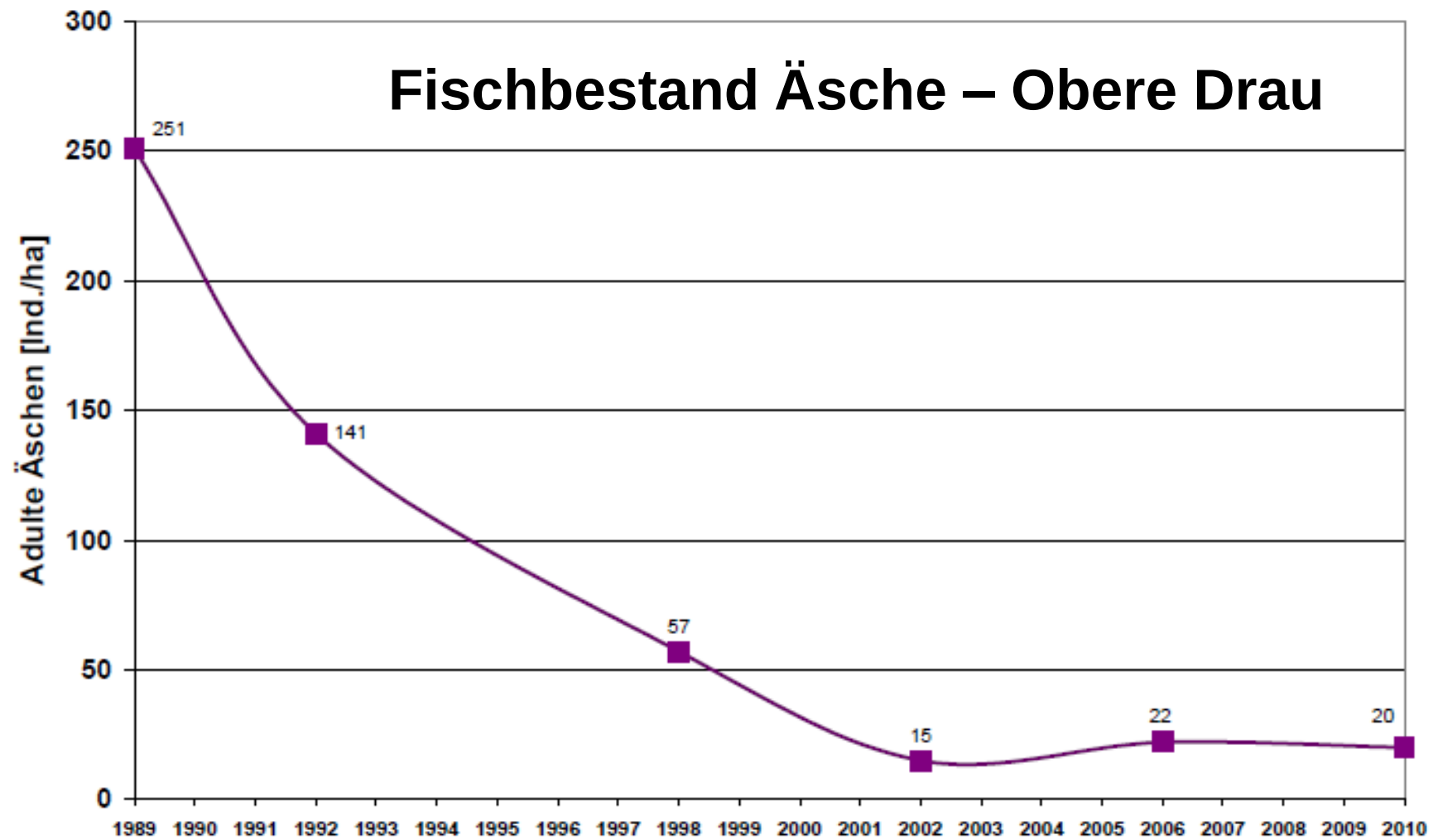
2.4 = good quality

3.0 = moderate quality

Belastungen in WK u. Barrieren / km



Situation der Fischbestände in Österreich



Unfer et al. 2011

Schlussfolgerungen

Zusammenfassung und offene Fragen

Abwärtswanderung

- Fischabwanderung spielt bei wahrscheinlich allen heimischen Fischarten eine wesentliche Rolle
 - Larvendrift im Frühsommer, Jungfischwanderung im Herbst
- Verbessertes Wissen notwendig über:
- Ökologie der Abwärtswanderung
 - Rolle im Lebenszyklus, Quantifizierung, räumlich-zeitliche Variabilität
- Wieweit ist ein Fischabstieg wiederherstellbar? Welchen Beitrag liefert der Fischabstieg zur Lebensfähigkeit von Populationen?

Schlussfolgerungen

- Wo es keine Fische gibt, können auch keine wandern.
- Es sind umfassende Sanierungen zur Rettung der Fischbestände notwendig.
- Insbesondere die Kontinuumsfrage bedarf einer einzugsgebietsbezogenen Betrachtung.

Schlussfolgerungen

Neben dem Kontinuum sind auch andere Belastungen zu sanieren. Beispiel Österreich

- Wo der ÖZ heute mäßig ist, trägt die Kontinuumssanierung sehr effizient zur Zielerreichung bei.
- Wo der ÖZ unbefriedigend oder schlecht ist, wird sich bei alleiniger Kontinuumssanierung kaum ein Effekt zeigen.