

Jun 23rd, 2:45 PM - 3:00 PM

## Session B5: The Danube Fish Bypass System of Vienna/Freudenau and its Importance as a Lifecycle Habitat

Paul Meulenbroek  
*University of Natural Resources and Life Sciences*

Silke-Silvia Drexler  
*University of Natural Resources and Life Sciences*

Pablo Rauch  
*University of Natural Resources and Life Sciences*

Michael Geistler  
*University of Natural Resources and Life Sciences*

Herwig Waidbacher  
*University of Natural Resources and Life Sciences*

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Meulenbroek, Paul; Drexler, Silke-Silvia; Rauch, Pablo; Geistler, Michael; and Waidbacher, Herwig, "Session B5: The Danube Fish Bypass System of Vienna/Freudenau and its Importance as a Lifecycle Habitat" (2015). *International Conference on Engineering and Ecohydrology for Fish Passage*. 14.

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University of Natural Resources  
and Life Sciences, Vienna  
Dept. Water, Atmosphere & Environment

# The Danube Fish bypass system of Vienna/Freudenau and its importance as a lifecycle habitat

Meulenbroek Paul, Drexler Silke-Silvia, Geistler Michael,  
Rauch Pablo, Waidbacher Herwig

## Hydro Power Plant "Vienna/Freudenau"



Construction Period 1992 -1998  
Installed Capacity 172.000 kW  
Rated Head 6.8 m  
Rated Flow 3.000m<sup>3</sup>/s  
Backwater area approx. 28 km

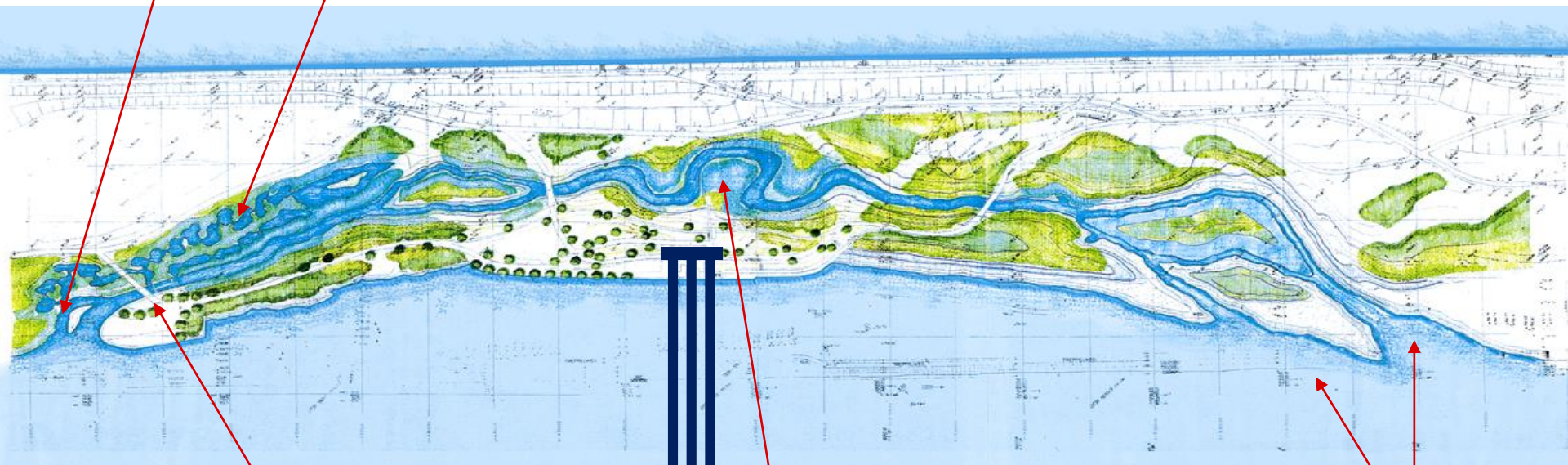
Turbines 6 Kaplan bulb turbines  
Nominal flow each 500 m<sup>3</sup>/s  
Nominal speed 65.2 rpm  
Wheel diameter 7.5m

## Fish bypass system



Pool-Pass Entrance/Outlet

Pool-Pass



Dotation-Weir  
for bypass stream

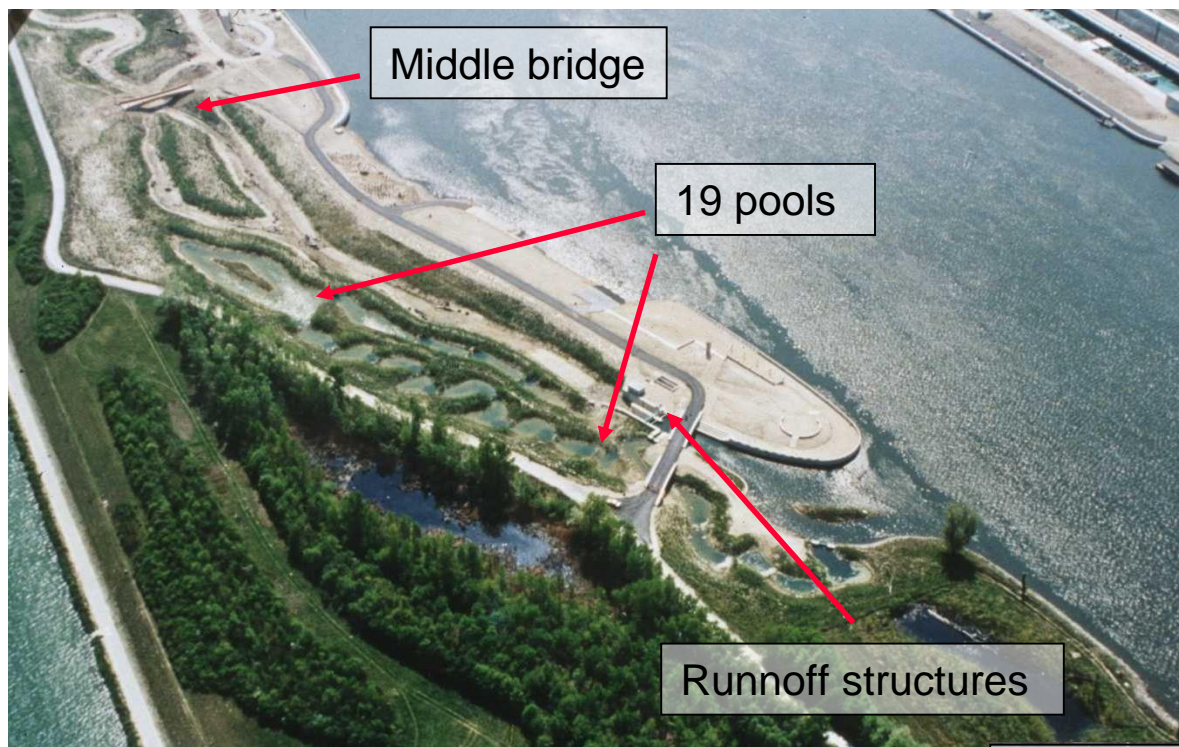
Bypass Stream

Delta

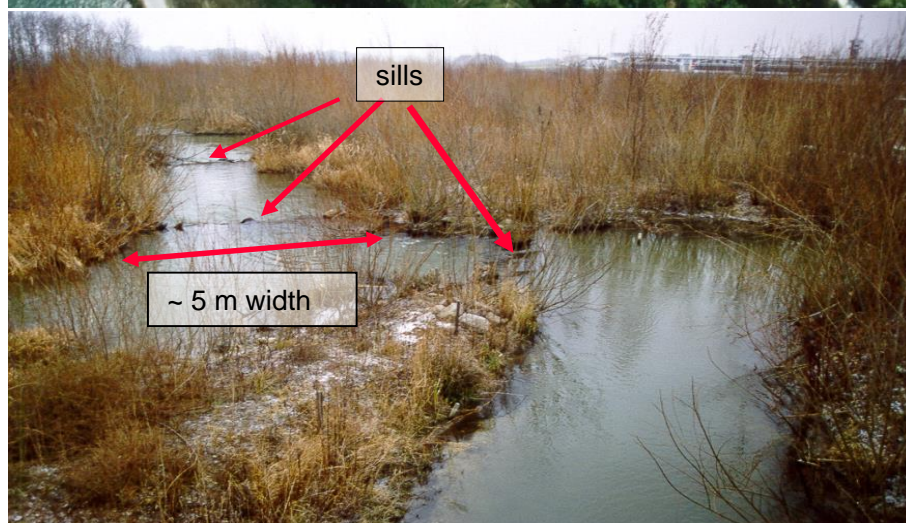
1600m

## Fish Bypass system under construction (1996)

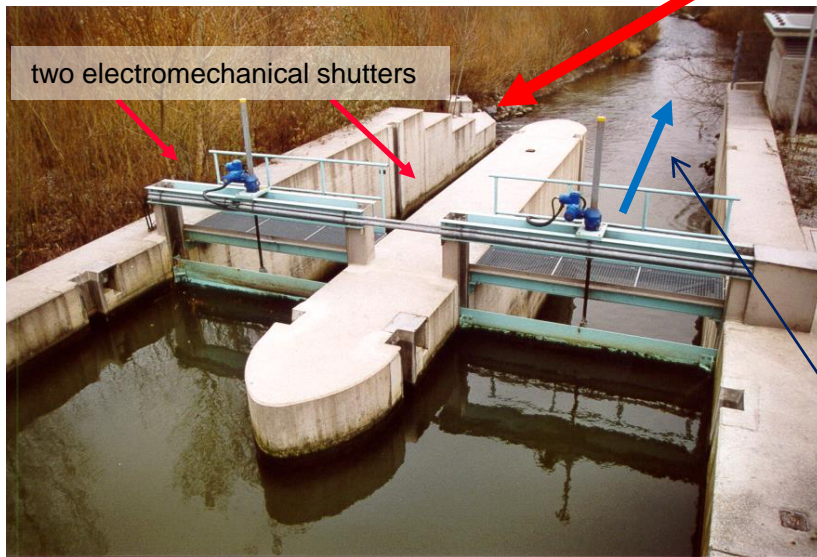




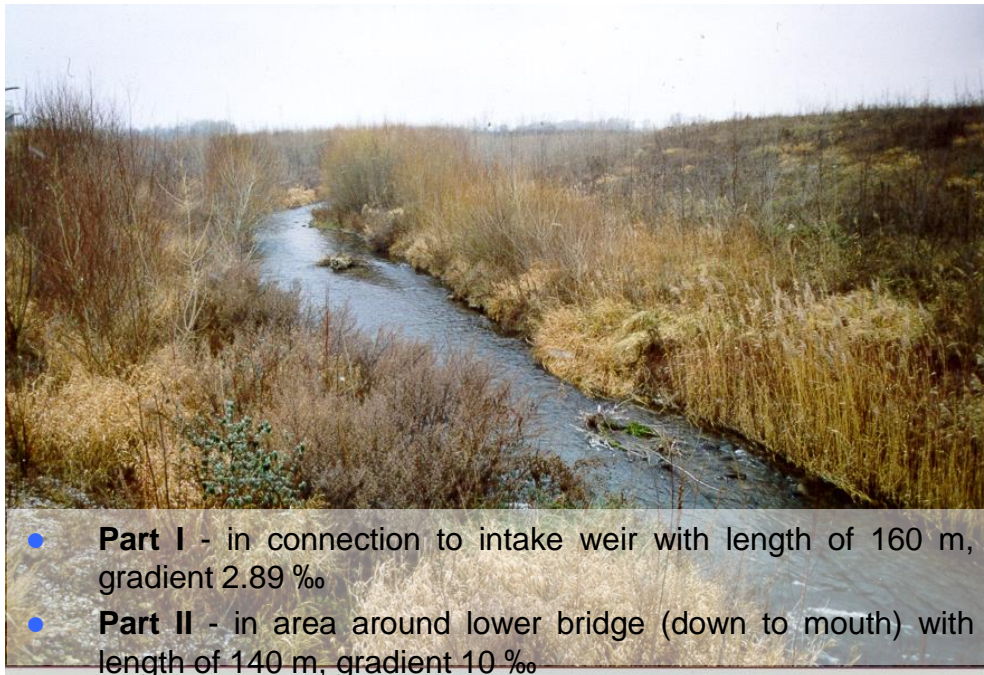
## Pool pass section



## Entrance of poolpass section



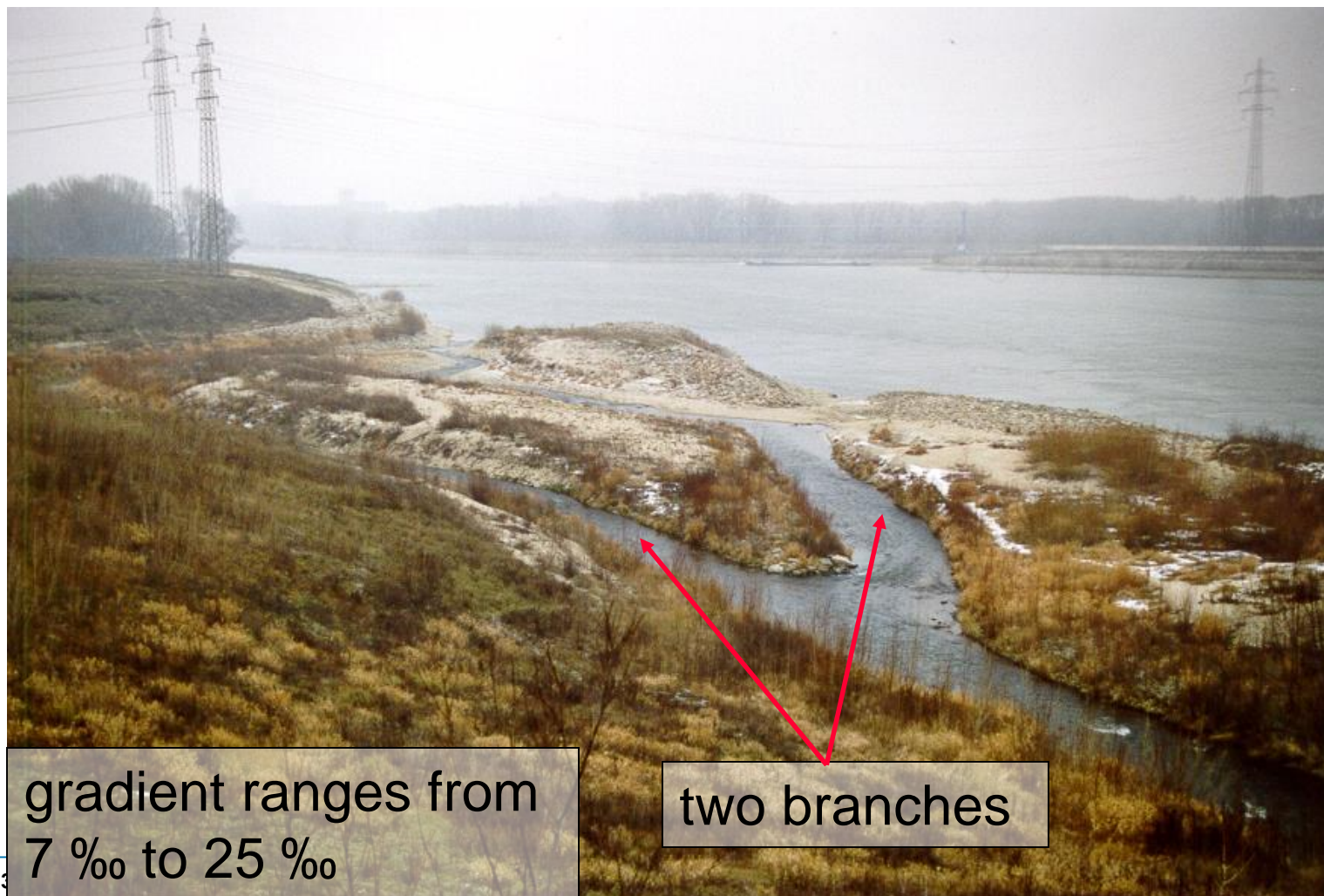
## Bypass stream after construction (1999)



- length 370 m - gradient 9,7 ‰ - 10,2 ‰



## „Delta“ area after construction (1999)



gradient ranges from  
7 ‰ to 25 ‰

two branches

● **Variable Discharge in the Fish Bypass system:**

- 1,2 to 3,6 m<sup>3</sup>/s, it depends on the discharge of the Danube in different times of the year

	Weir- flow	Pool-pass	∑ bypass stream	Q-Donau
Winter (Dec. – Feb.)	<600 l/s	>900 l/s	1.500 l/s	< 3.000 m <sup>3</sup> /s
	<3.100 l/s	>500 l/s	3.600 l/s	>3.000 m <sup>3</sup> /s
Spawning season (March – May)	<900 l/s	>900 l/s	1.800 l/s	< 2.000 m <sup>3</sup> /s
	<3.100 l/s	>500 l/s	3.600 l/s	>2.000 m <sup>3</sup> /s
Summer (Juni –Nov.)	<900 l/s	>900 l/s	1.800 l/s Normaldotation	< 3.000 m <sup>3</sup> /s
	<3.100 l/s	>500 l/s	3.600 l/s	>3.000 m <sup>3</sup> /s

- Fish Bypass system should serve as:
  - possibility of permanent fish-migration ✓
  - migration of fish populations during spawning season to tributaries of Danube ✓
  - improvement of genetic transmission from downstream areas to upstream areas ✓
  - **Function of bypass as new and/or alternative habitat with spawning grounds**

- **Periode of investigation and major trends:**
  - March 2014 to Mai 2015 is the actual investigation periode
  - 39 species detected in the bypass system (59 theoretically existing in the area, 53 verified in the last 2 years)
  - High fluctuations in abundance and species composition
  - At least 2/3 of the species are rare in frequent catches
  - Low abundances of fish in winter

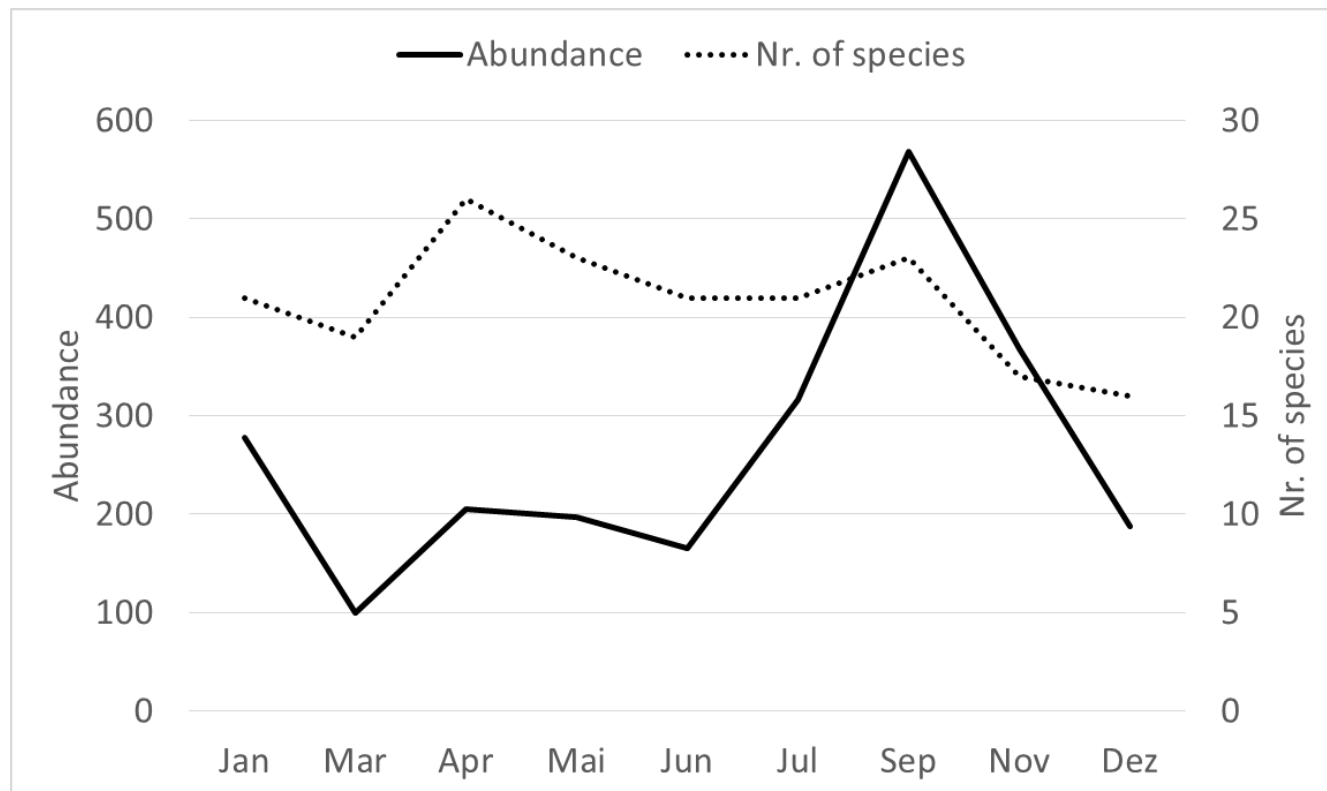
- **Periode of investigation and major trends:**
  - 23 species of young of the year fish classes inhabited the system in 2014
  - The most abundant species ( 1138 of 5476 ) was the red listed indicator species of the free flowing Danube, the **nase** (*Chondrostoma nasus*) followed by chub and invasive gobies.
  - In the bypass system rheophilic species (nase, barbel, trout ect.) coexist with stagnophilic species (stickleback, bitterling, common carp and wels) in adult and YoY classes.



# Total abundances and number of species during the year

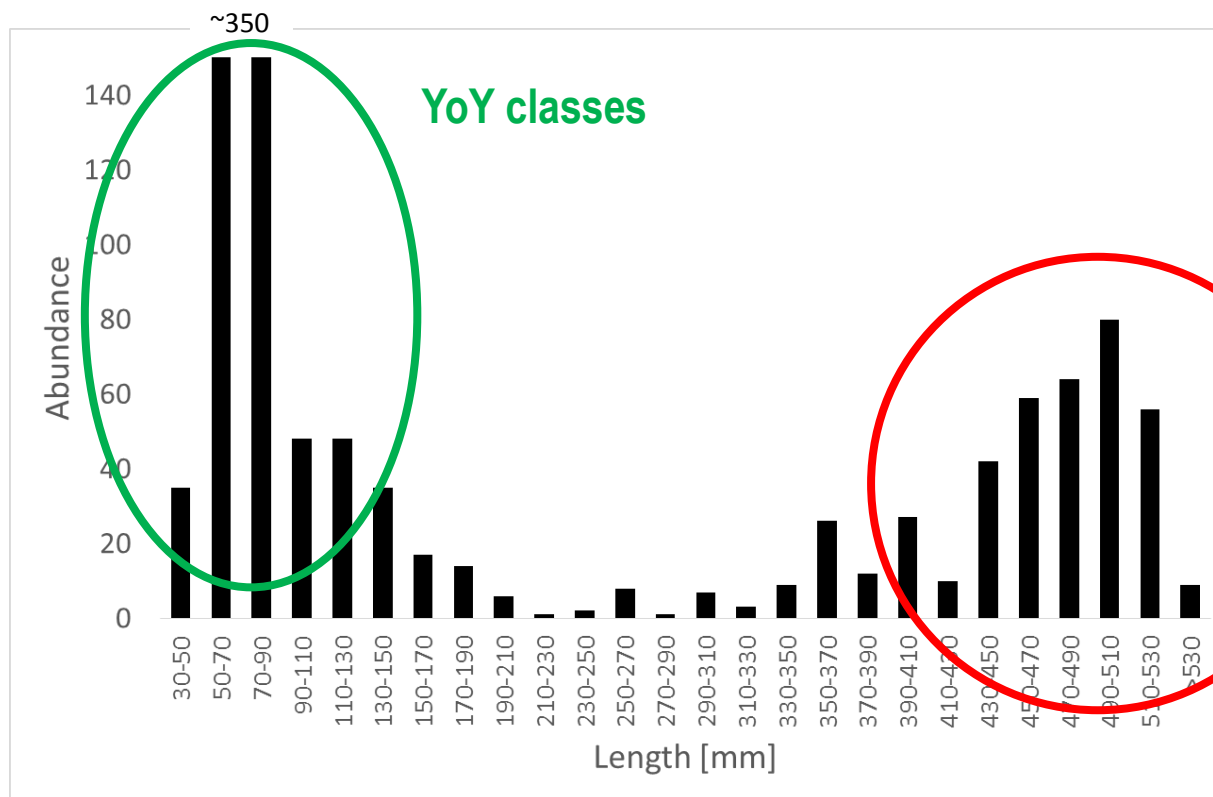
11 species occur around the whole year

In total 39 species were recorded.



# Length-frequency distribution

Nase:



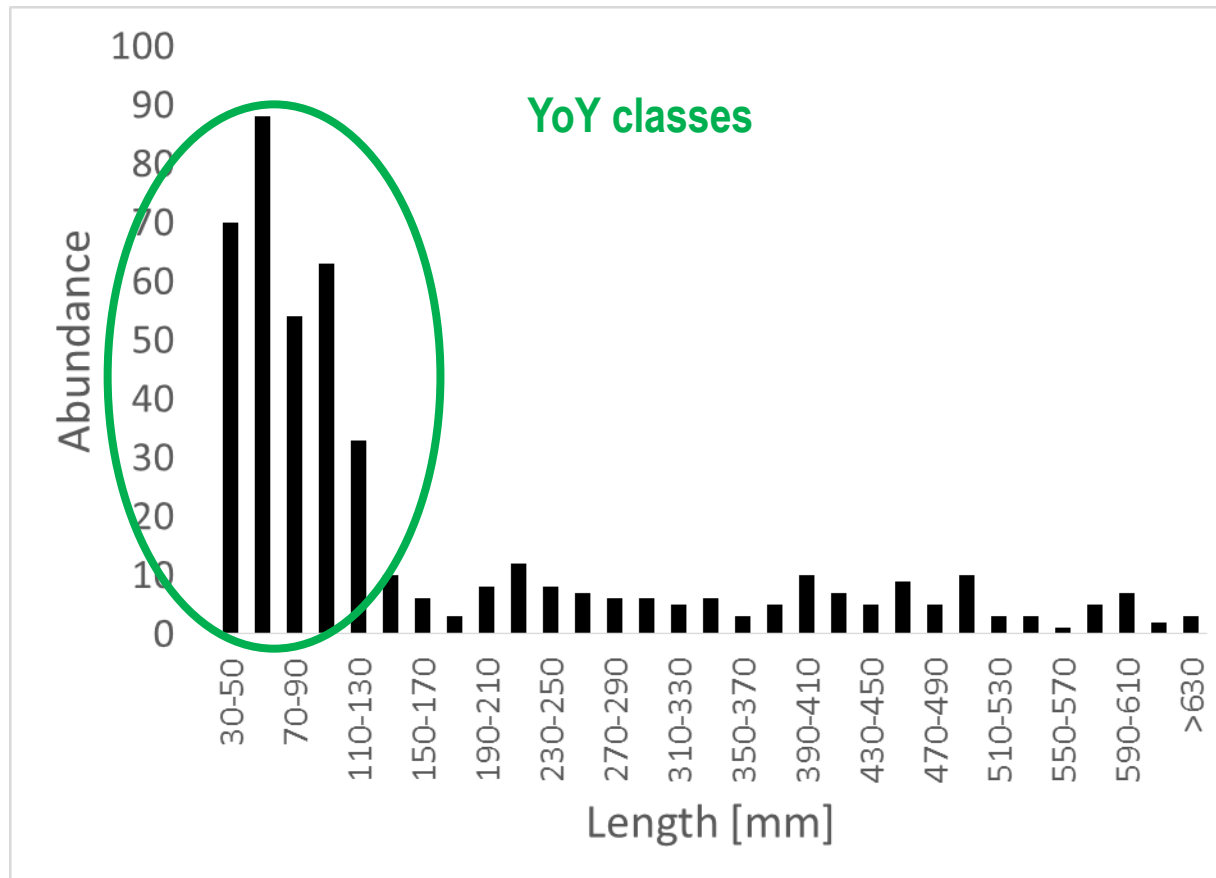
10 - 15 year classes



# Length-frequency distribution

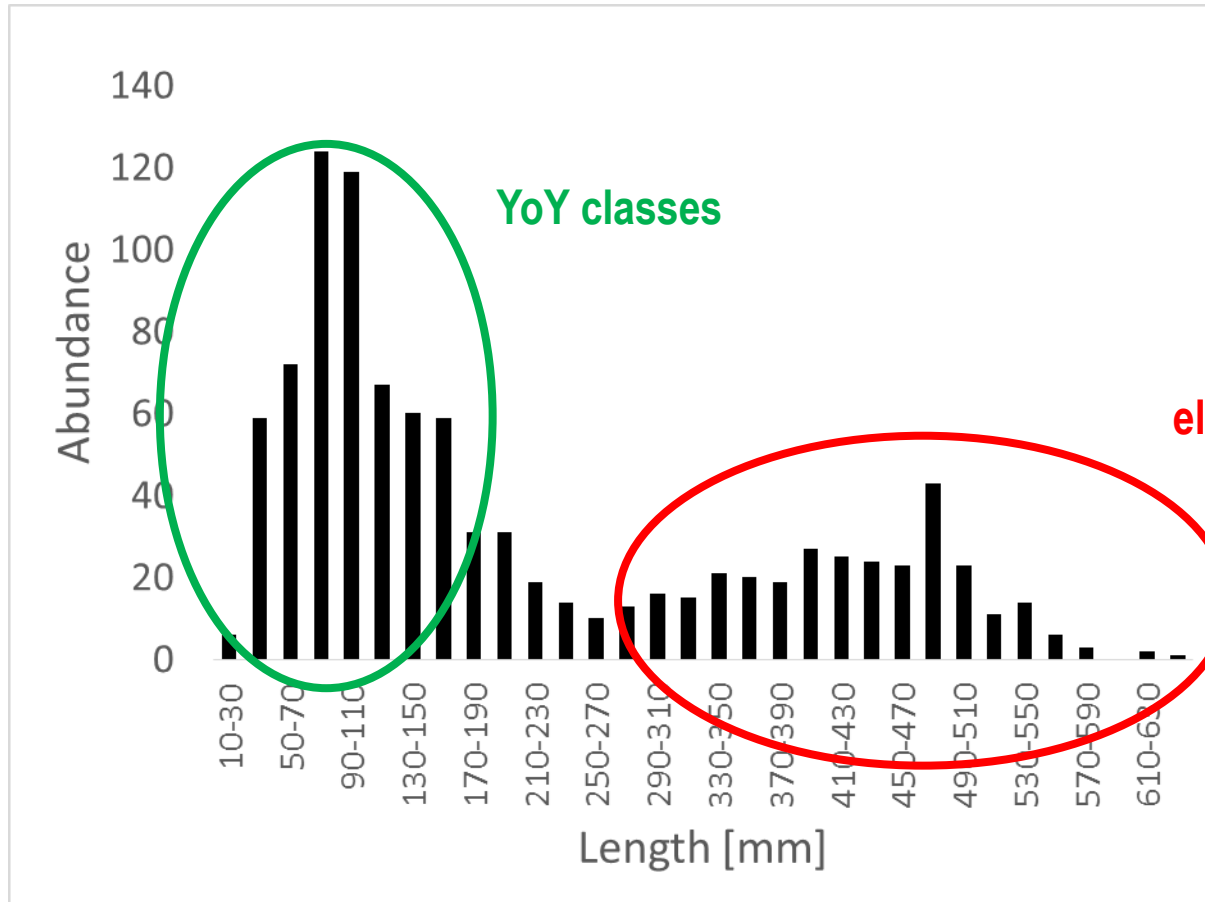


Barble:



# Length-frequency distribution

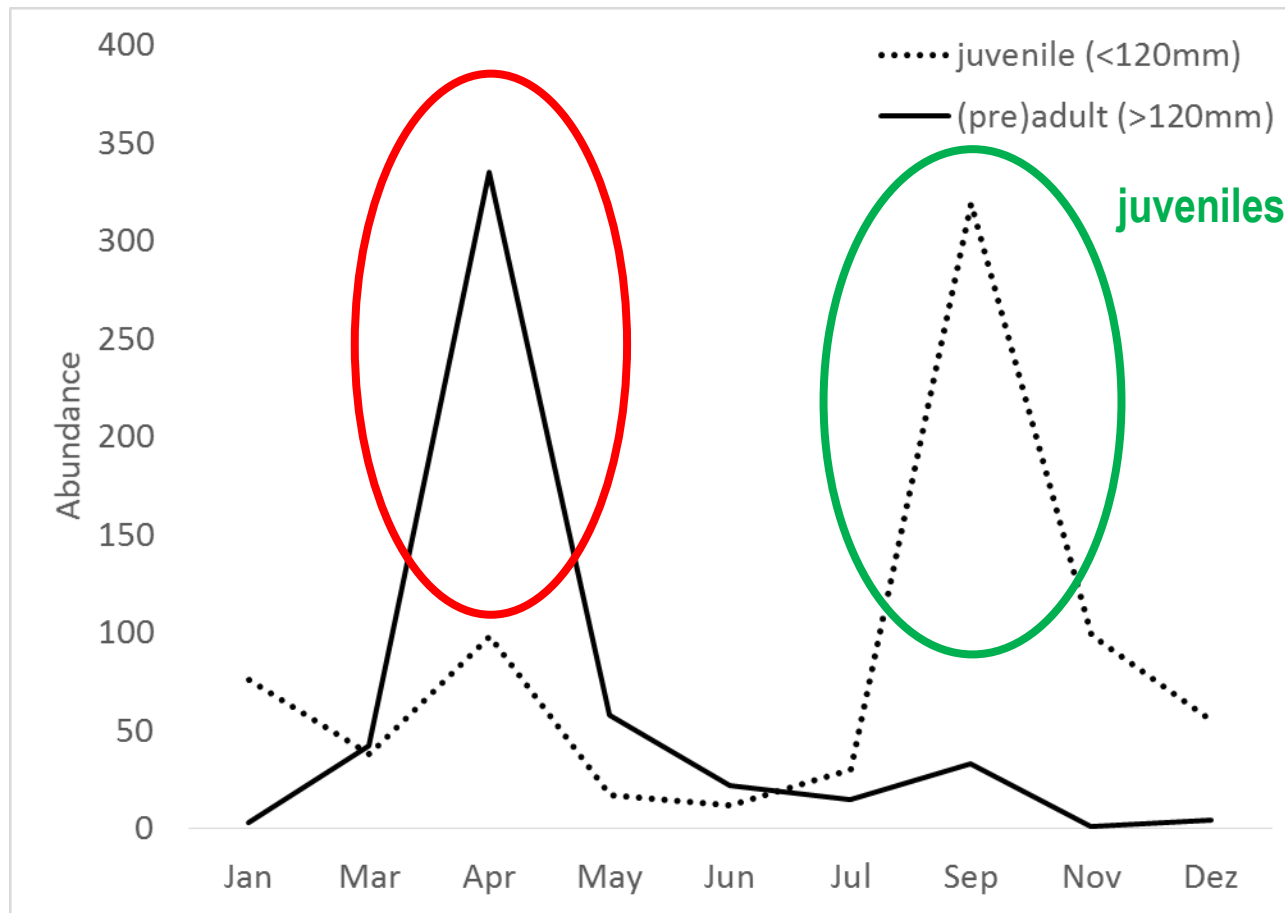
Chub:



# Juvenile and (pre)adult occurrences



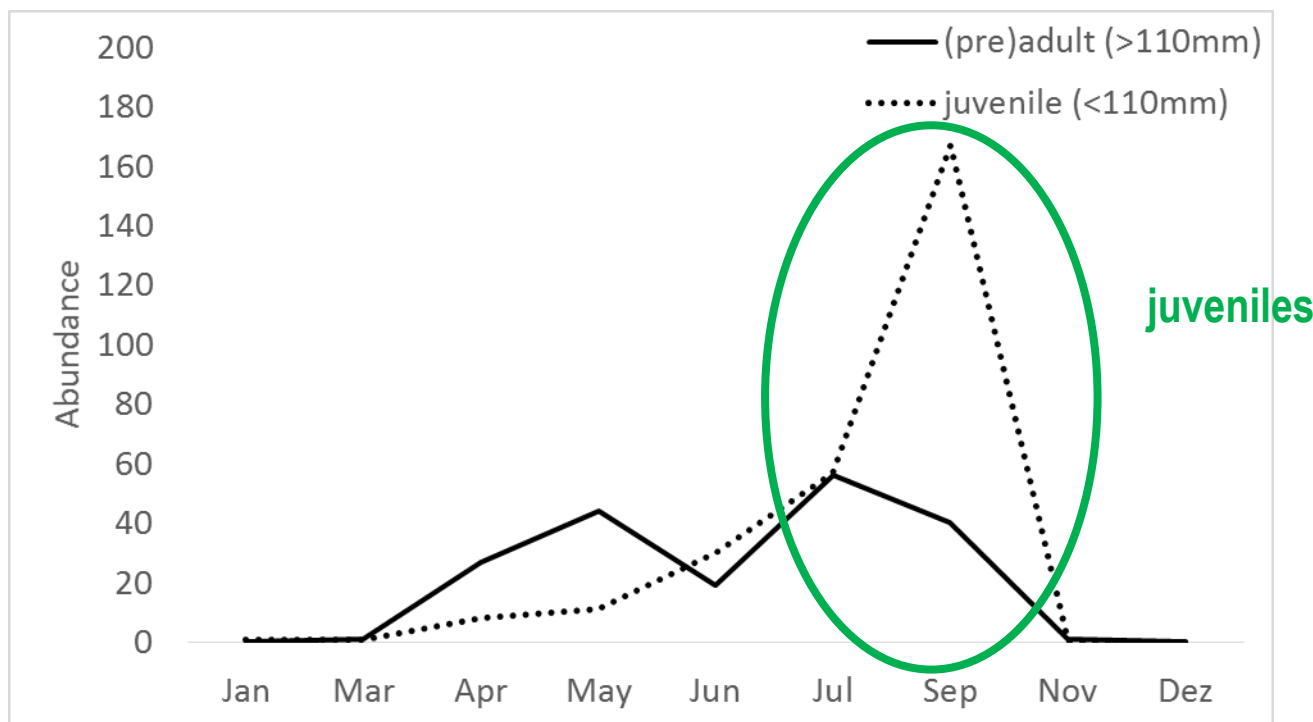
**Nase:**



# Juvenile and (pre)adult occurrences

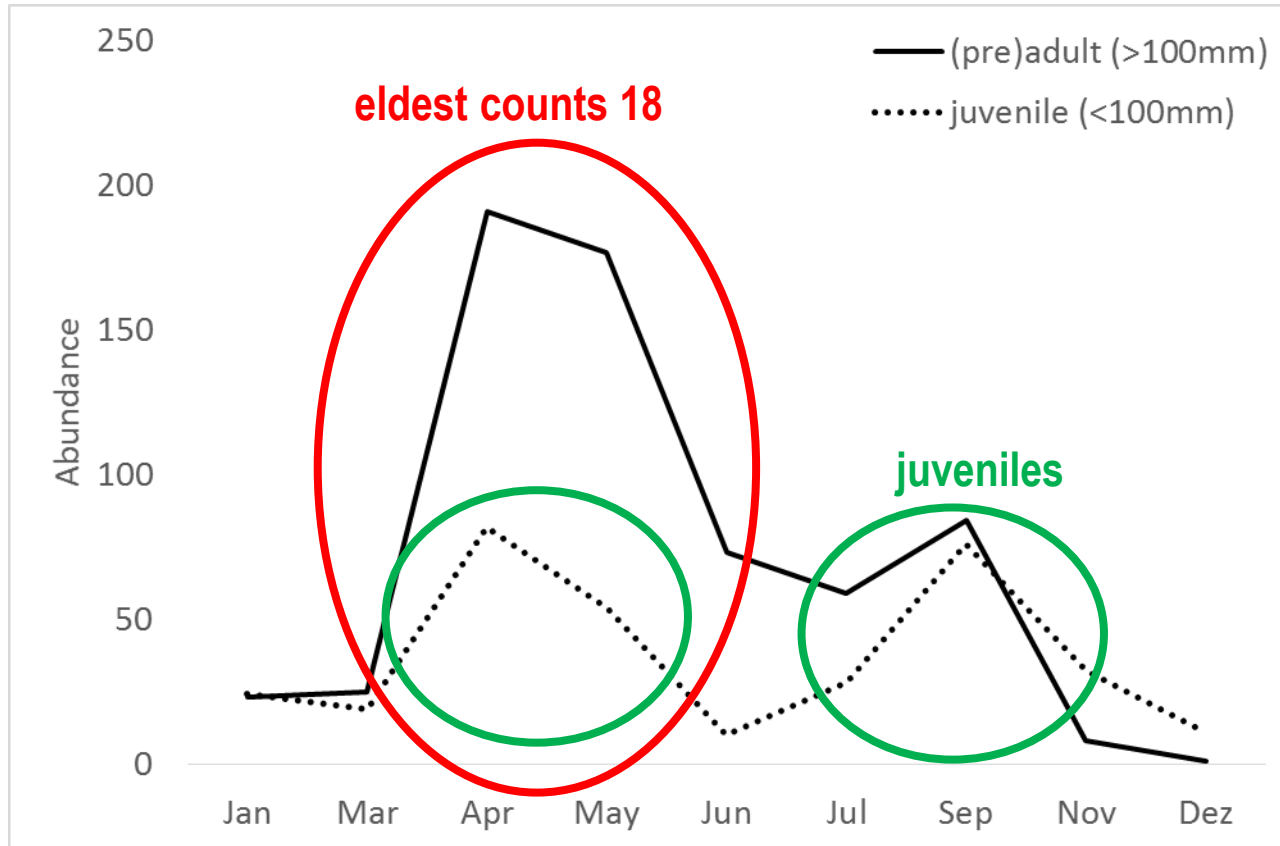


## Barble:



# Juvenile and (pre)adult occurrences

Chub:

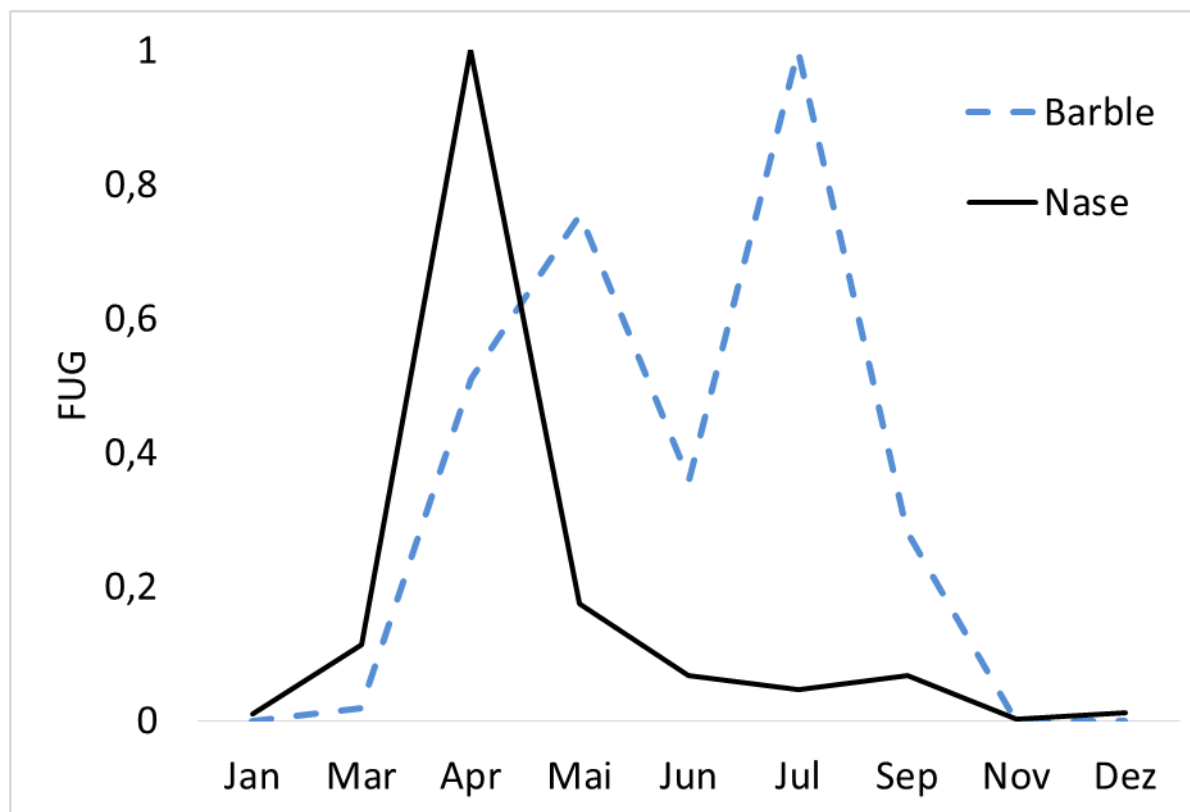


## FUG for (pre)adult barble, nase, chub and bleak

FUG=frequency-of-use graphs (Raleigh et al. 1986)

Normalized probability function ranging from 0 to 1

$$FUG_i = \int_i / \int_{[max]}$$

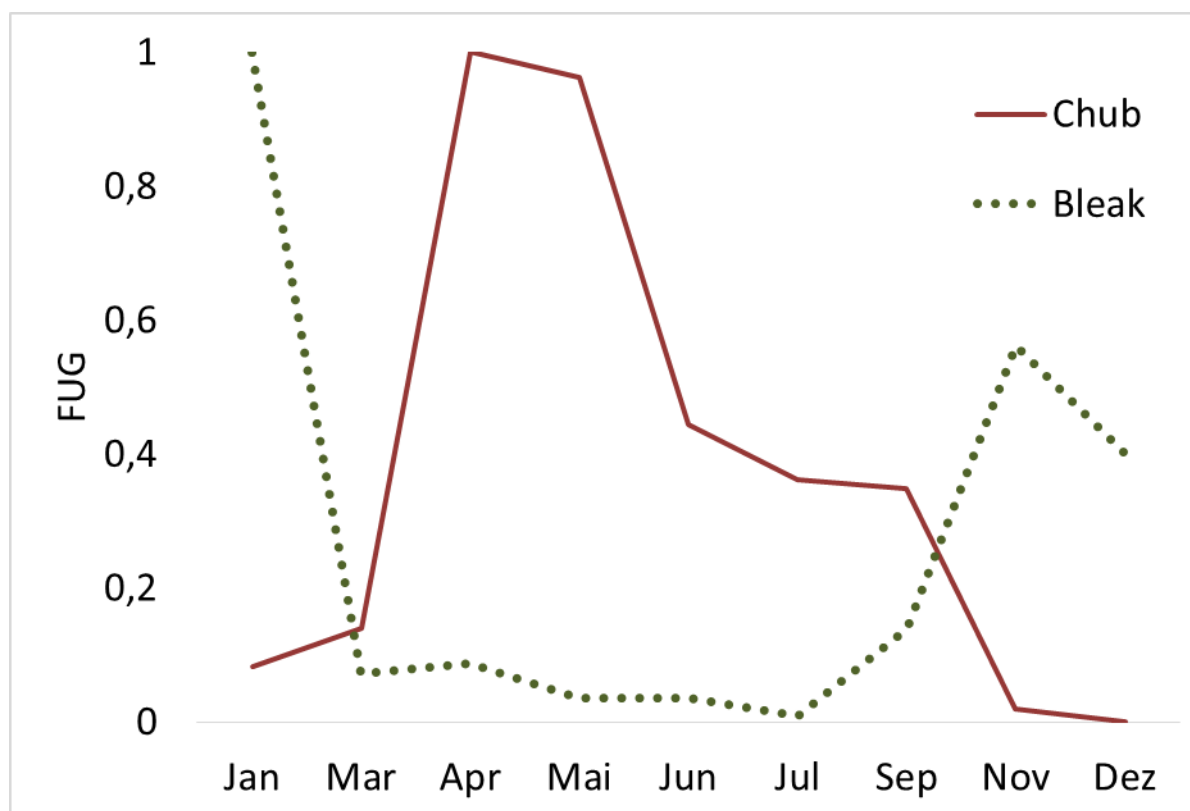


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Normalized probability function ranging from 0 to 1

$$FUG_i = \int_i / \int_{[max]}$$



- Summarized Message:
  - The natural like solution of the bypass system “Freudenau” serves in contrast to a hard technical construction, - additionally to its migration function - like a adequate Danube tributary.
  - The importancy of such habitat-chains increases dramatically in times of the **WaterFrameworkDir**.
  - Continuous adaptations and management have to be implemented for a good result and sustainable ecological response!



**THANK YOU FOR YOUR ATTENTION**



