



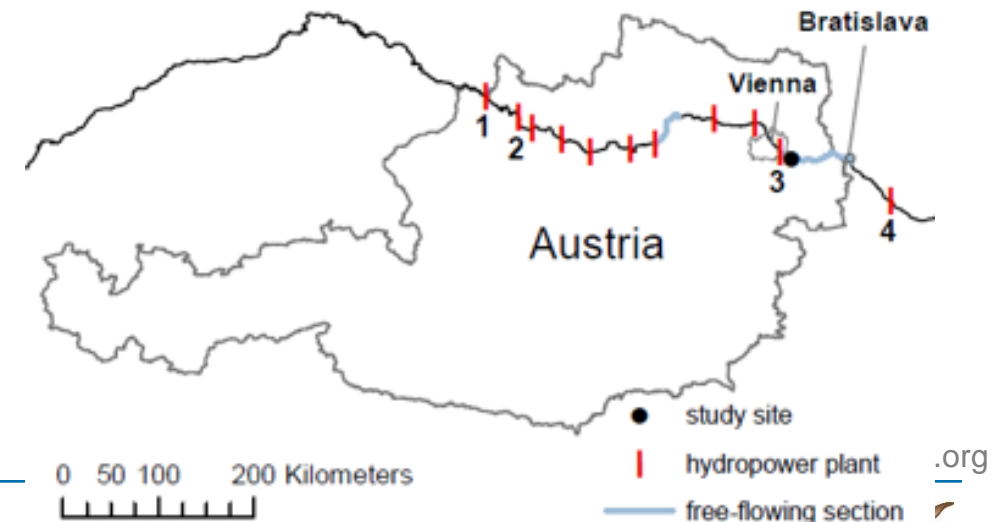
## **Case studies – Sterlet monitoring in eastern Austrian Danube**

- Large scale acoustic telemetry
- Small scale acoustic telemetry
- Population assessment

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# Introduction – Sterlet (*Acipenser ruthenus*)

- 100 cm, 6.5 kg, ~25 years
- **Potamodromous**
- **“critically endangered”** in AUT, <1000 individuals estimated
- Austrian Danube
  - Chain of **10 hydropower plants (HPP)**
  - One self-sustaining population left (Jochenstein)
  - A second known, no evidence for reproduction (Freudenau)
    - Encountered accidentally in 2014
- Lack of knowledge on habitat use, migrations and population status
  - LIFE Sterlet supportive stocking program





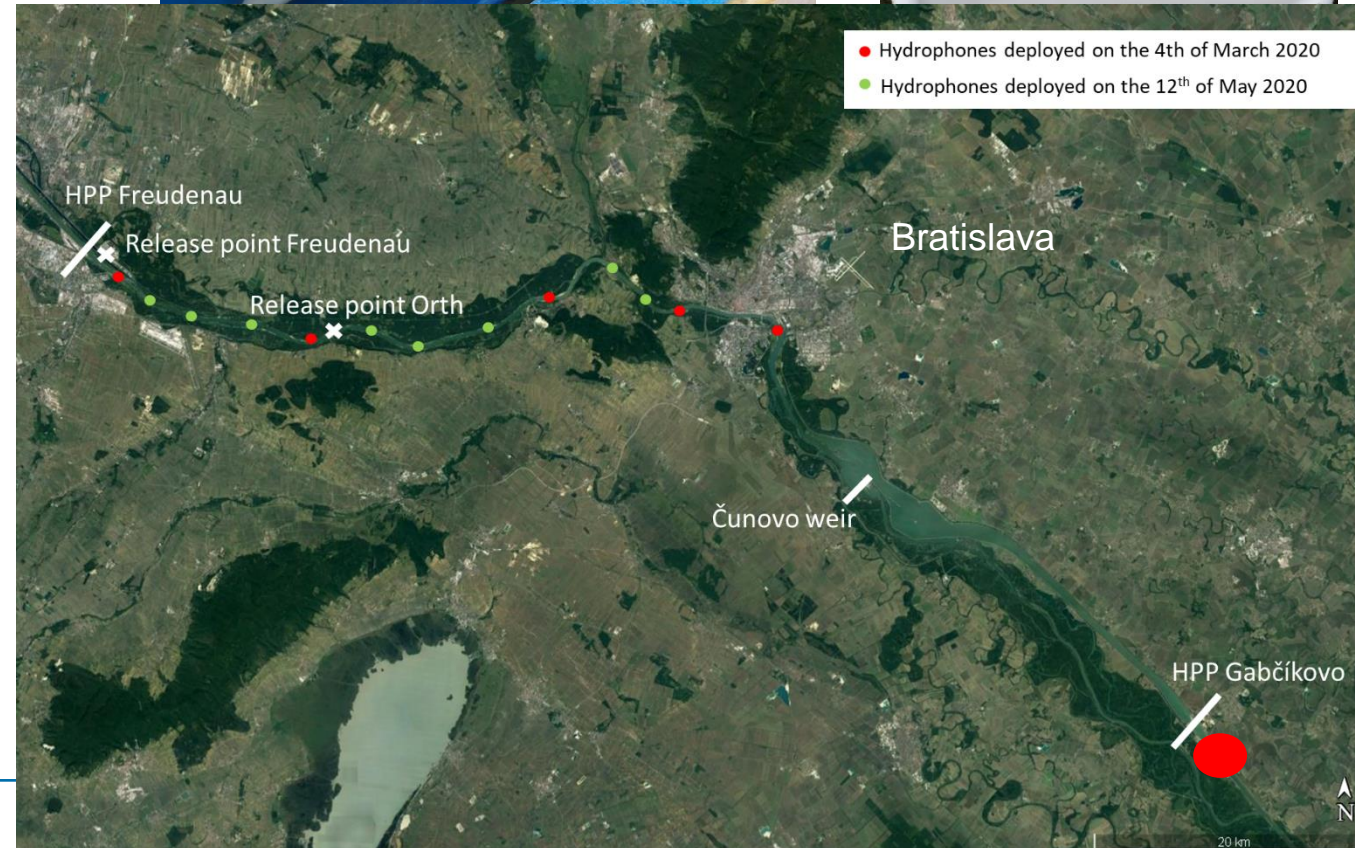
# Telemetry studies – large scale

- Array of 14 (16) **stationary hydrophones** in 2020
  - Lotek MAP (ID, temperature, pressure, tag life ~1 year)
- **Mobile tracking** once per month

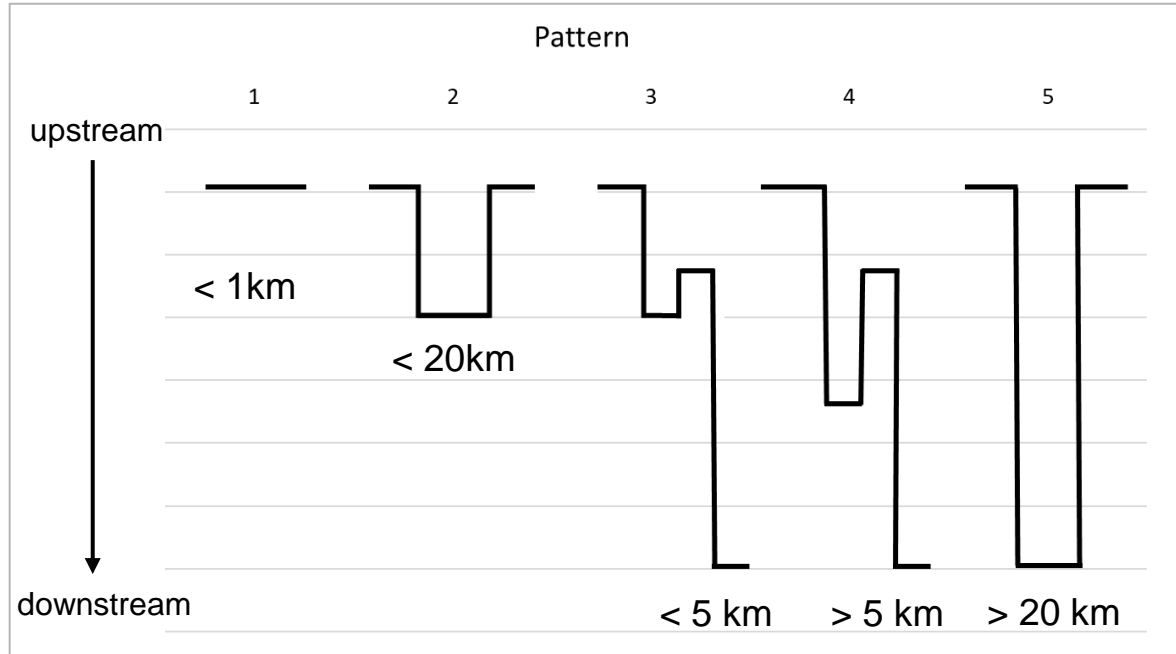


## Surgery:

- **33 stocked** sterlets (~600 mm mean TL)
- **5 wild** sterlets
- Anaesthesia with clove oil
- Tag implantation in abdominal cavity



# Migration patterns



- Detections along the whole free-flowing sections
- **Aggregation areas** below Vienna and in Bratislava
- **Variety of migration patterns**
  - Pattern 3 most abundant
- Post-stocking downstream migration
  - sterlets were held in ponds before their release

Origin	Pattern					Grand Total
	1	2	3	4	5	
stocked 4+		1	6	2	2	11
stocked 3+	2	2	8	1	2	15
stocked 2+			1			1
wild	3	1				4
<b>Grand Total</b>	5	4	15	3	4	31



# Telemetry study – small scale

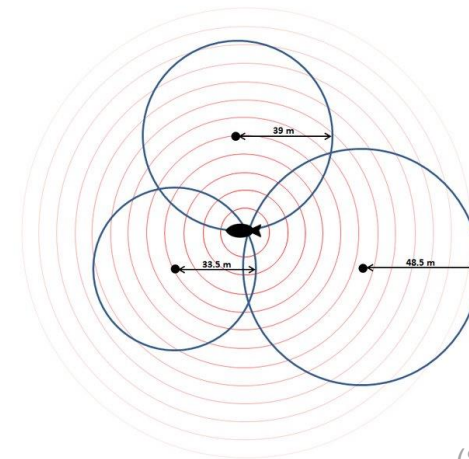
Array setup spring 2021

- 5 stationary hydrophones
- Deployment in predetermined positions
- Method: **Triangulation** → exact fish position



Data cleaning & analysis:

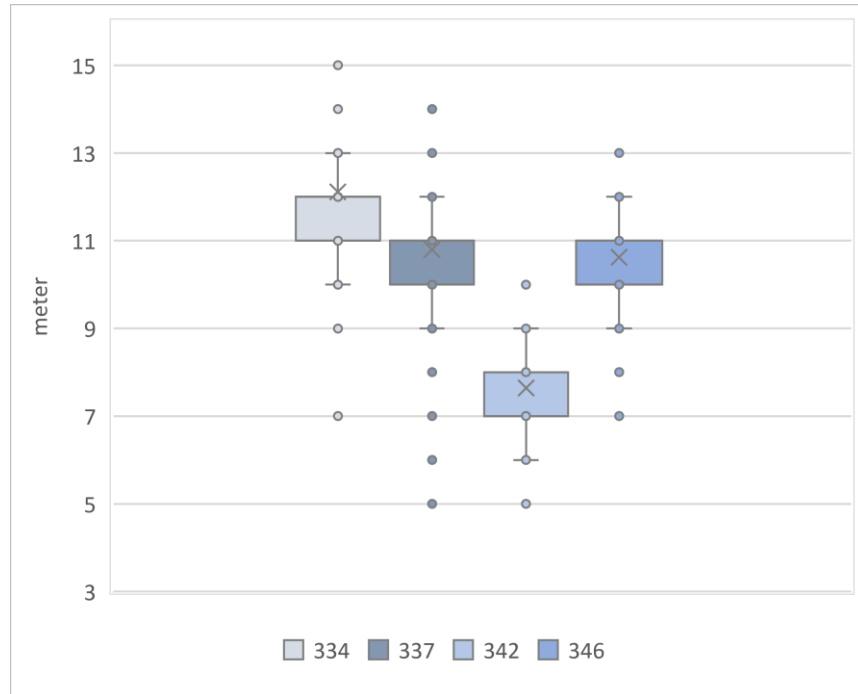
- Lotek Software: U-MAP & HOST
- ArcMAP, R Studio, Excel



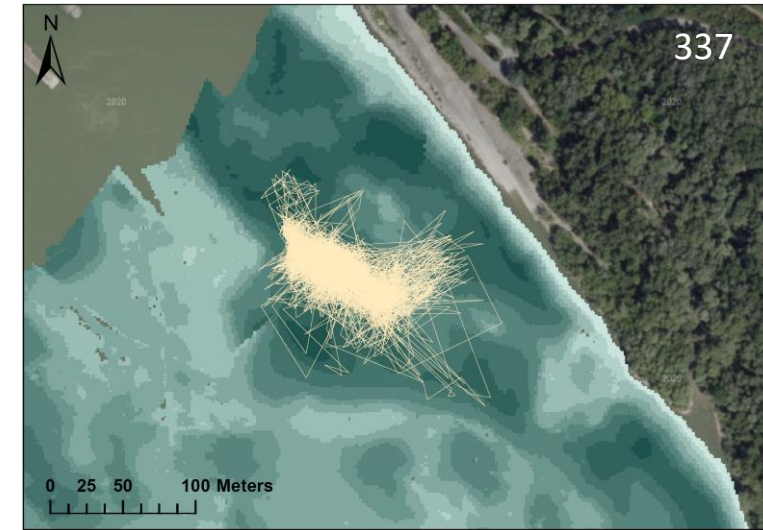
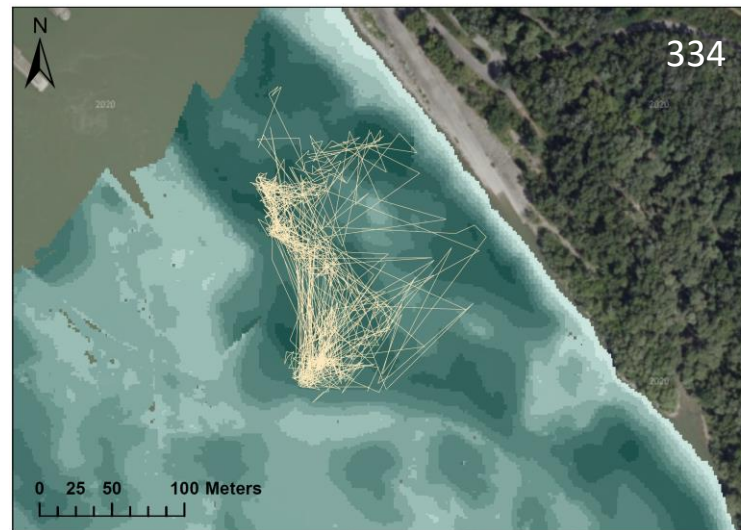
(Skerritt et al., 2015)

# Residence depth & movement

Residence depth



movement

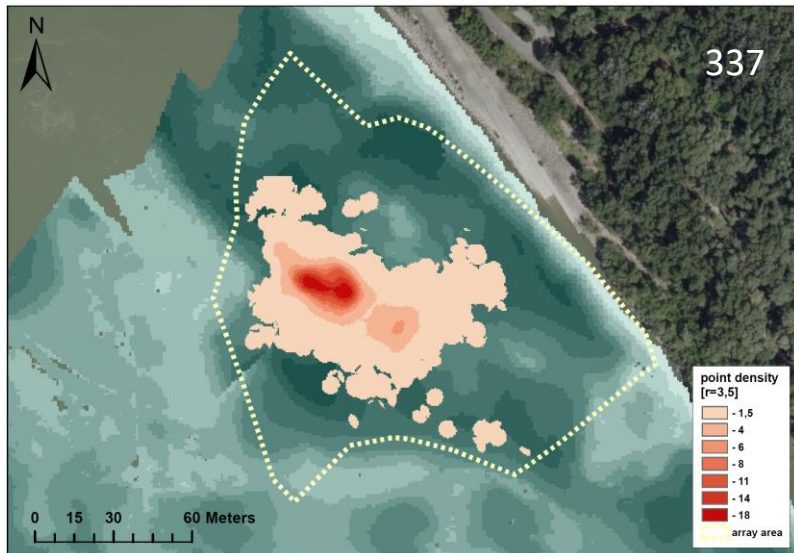
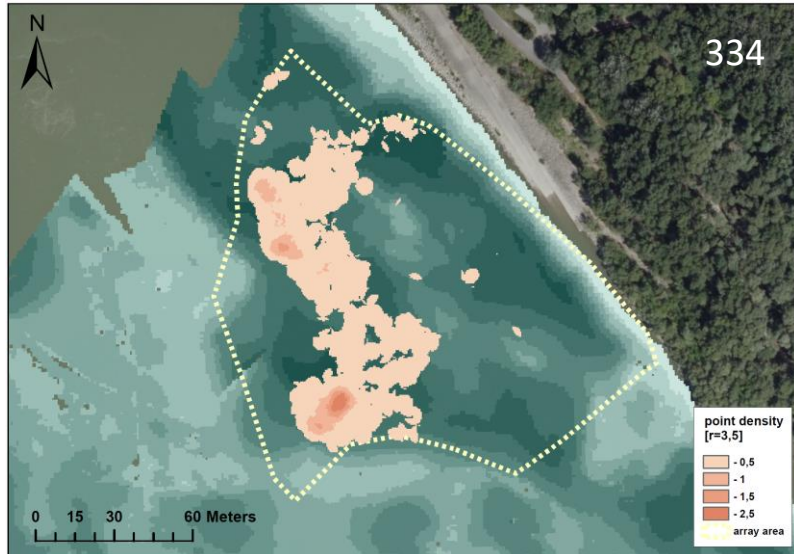


depth	334	337	342	346	total
min	7	5	5	7	5
max	15	14	10	13	15
average	11.4	10.7	7.5	10.2	9.7

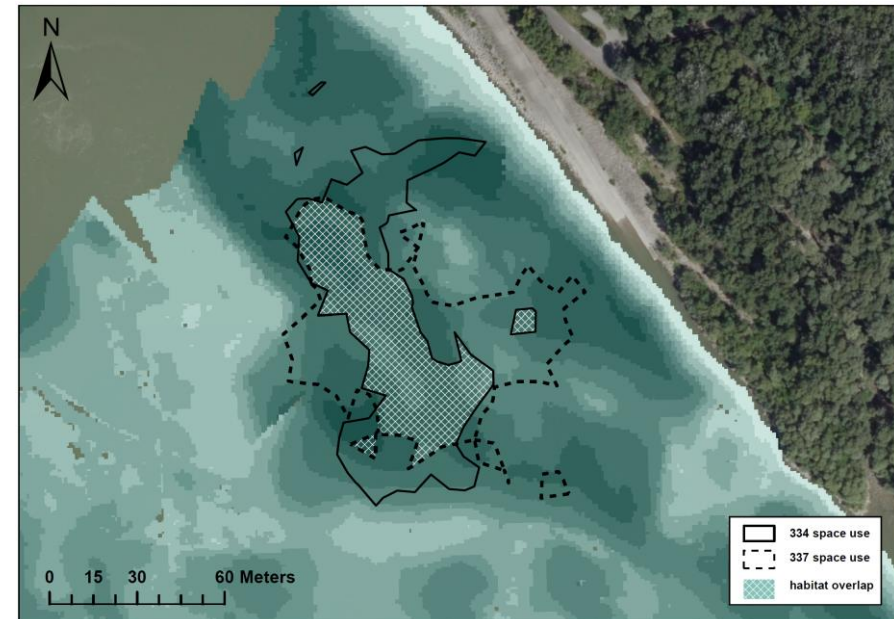
ID	∅ activity [m/d]
334	786
337	1,670
342	1,363
346	1,116



# Space use & habitat overlap

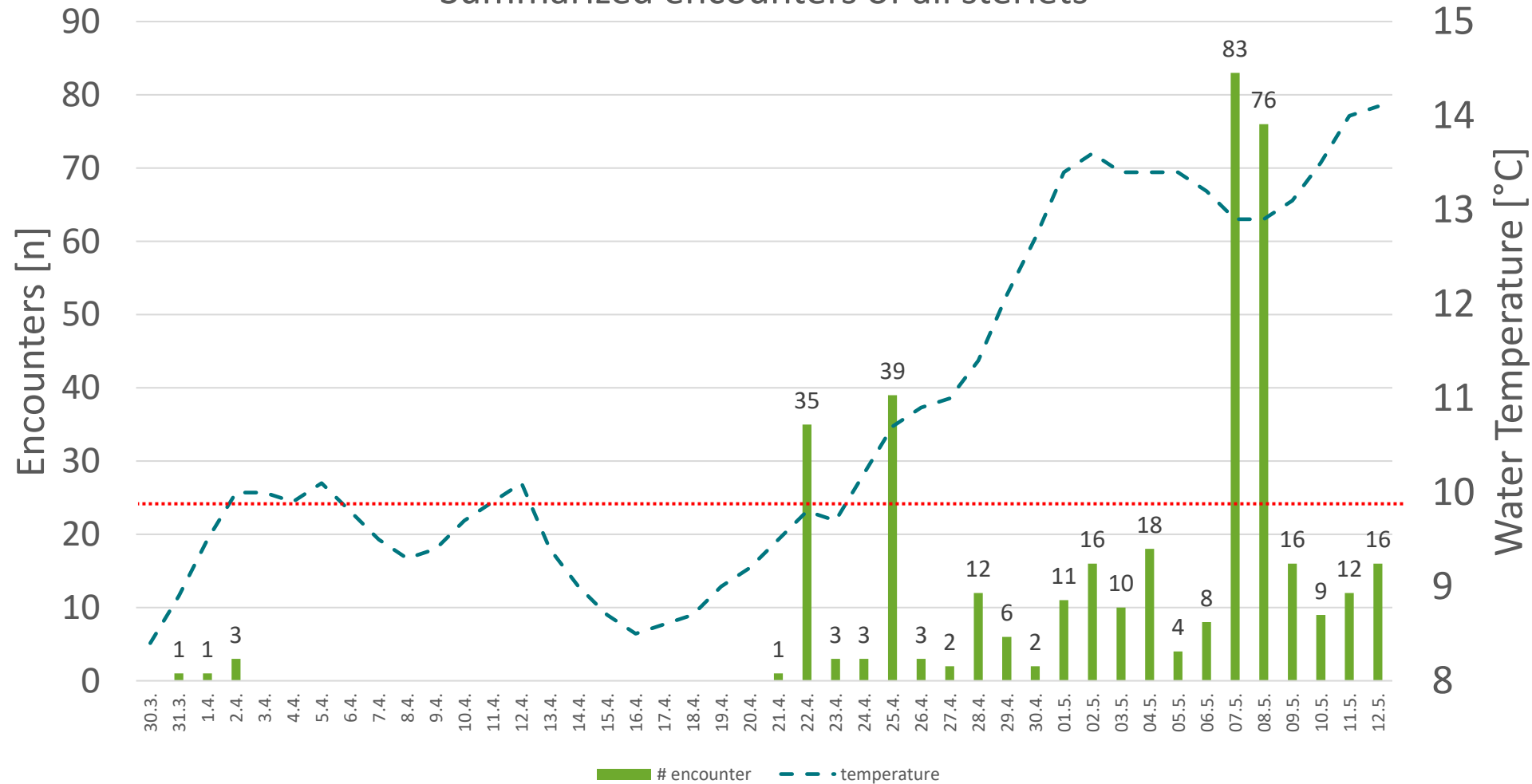


	Array	334	337	342	346
m <sup>2</sup>	16,978	4,063	4,739	3,734	3,732
%	100	23.9	27.9	22.0	22.0



# Spatio-temporal activity patterns

Summarized encounters of all sterlets



sterlets	nr. encounter
334 & 337	23
334 & 342	22
337 & 342	331
337 & 346	14
<b>Total</b>	<b>390</b>



# Population assessment

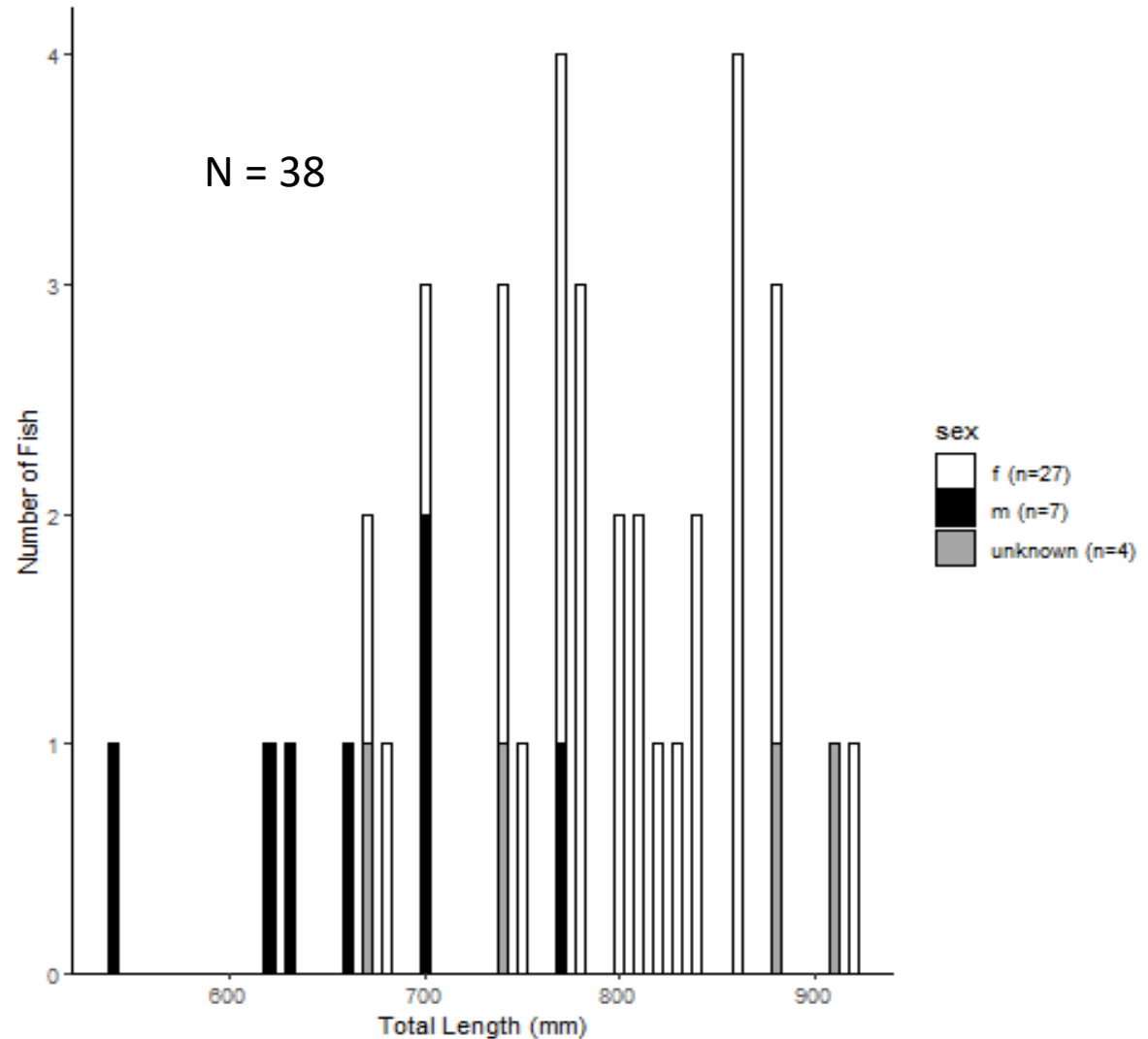
- **Benthic trammel nets**
  - Since 2018
  - Seasonal
- **Length/weight** measurement
- **Sex** determination
- **PIT** tagging, Capture-Mark-Recapture (CMR)
- Genetic samples
- Aim to:
  - **Description of sterlet population**
  - **Assessment of population size**
  - Effect of LIFE Sterlet stocking program



# Population structure Freudenau

- 68 captures of 38 individuals
- 2/3 females
- Females larger and heavier than males
- **Missing captures of juveniles**
- 7 females with eggs in resorption

sex	TL (in mm)				W (in g)			
	min	max	mean	n	min	max	mean	n
f	670	920	800 ( $\pm$ 62.4)	27	1 200	6 300	3 294 ( $\pm$ 1324)	25
m	540	770	660 ( $\pm$ 73.3)	7	750	1 700	1 350 ( $\pm$ 358)	7
unknown	670	910	800 ( $\pm$ 114)	4	1 500	4 000	2 850 ( $\pm$ 1196)	4



# Population assessment

	Genetics <small>Friedrich et al., 2022</small>		CMR	
	Random mating	Non-random mating	POPAN	Closed Mt
<b>Jochenstein</b>	99 (74-136)	60 (41-85)		
<b>Freudenau</b>	75 (46-146)	57 (34-110)	53 (43-80)	48 (42-63)

- Jochenstein population slightly larger
- Estimates of both CMR models similar
- **All population estimates very low**
- **Seasonal effect** on capture probability
  - Highest in spring



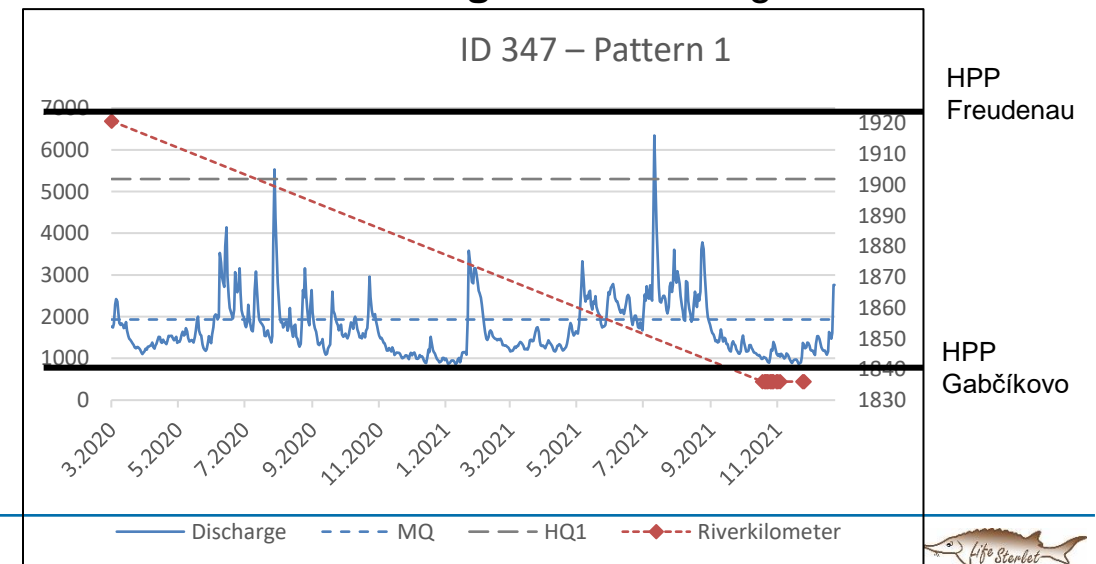


## Conclusions

- Stocked sterlets showed **great variability in migrations**
  - Individual adaptation?
  - Post-stocking reaction?
- Migration behaviour
  - No relation to temperature changes or discharge observed
- **Aggregation below HPP** (comp. Jochenstein (Ratschan et al. 2017) & Gabčíkovo)
- **No information on natural spawning or spawning grounds**
- Domination of **old individuals** in population
- Estimated **population size is low**

## Outlook

- **Re-establishment of connectivity!**
- Basis for **evaluation** of LIFE Sterlet **stocking** program
- Need for **habitat identification, protection and restoration**
  - Juvenile habitat
- **Standardized monitoring in Danube region**





THANK YOU!



@sturgeon\_conservation