



# - LIFE Potamo Fauna -

Age, growth and demography of several populations of *Unio mancus* and *U. ravoisieri* in northeast of Catalonia.

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1:



2:



3:



4:



Generalitat de Catalunya  
Departament de Territori  
i Sostenibilitat



# AREA OF STUDY







# AREA OF STUDY



Olot

Banyoles

Girona

Torroella de Montgrí



# 4 naiad species in Fluvià and Ter watersheds

- Endangered species with a great reduction of their populations



*Unio mancus*



*Potomida littoralis*



*Anodonta anatina*



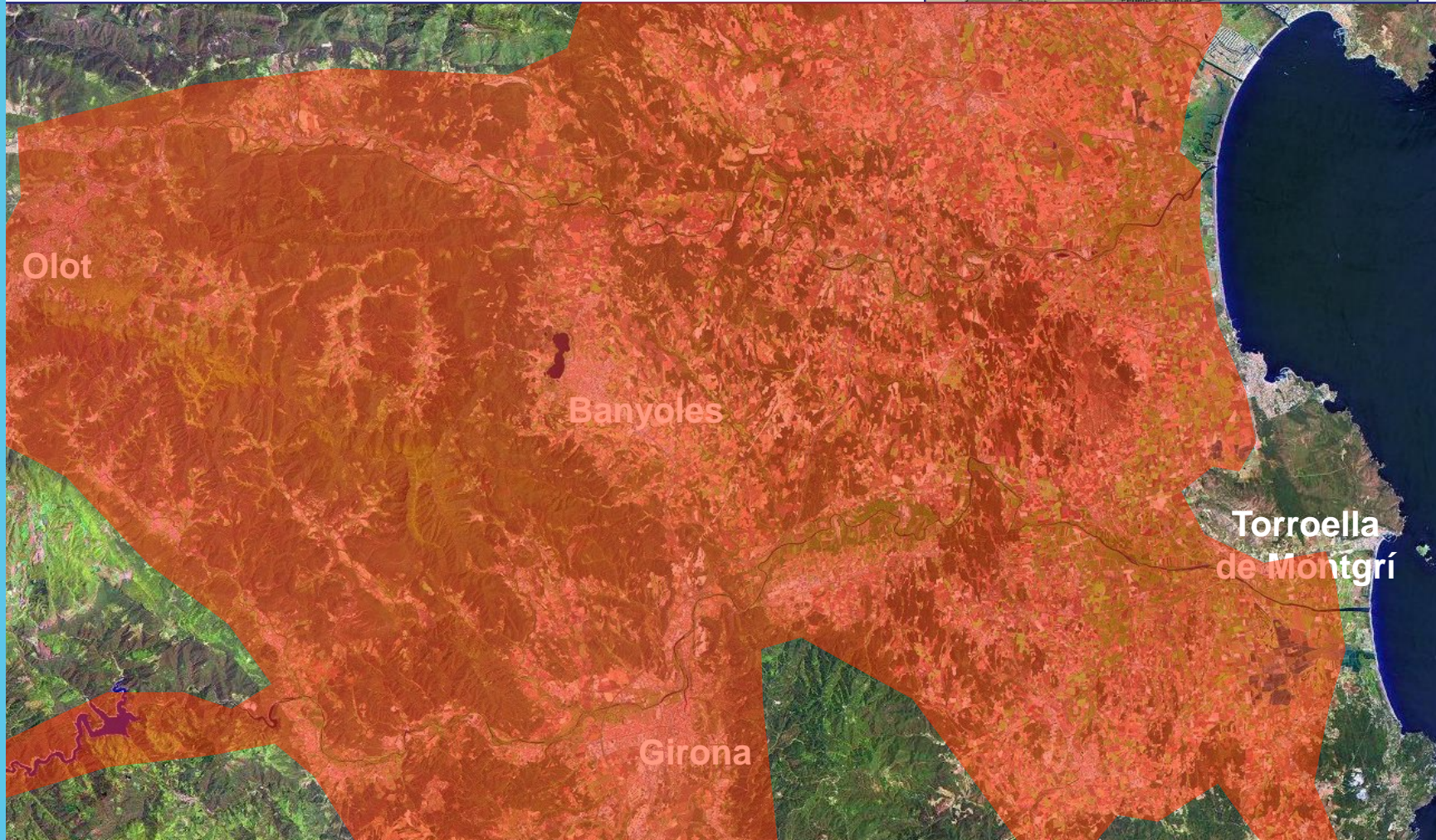
*Unio ravoisieri*





# AREA OF STUDY

Probable former distribution of *Unio*



Olot

Banyoles

Girona

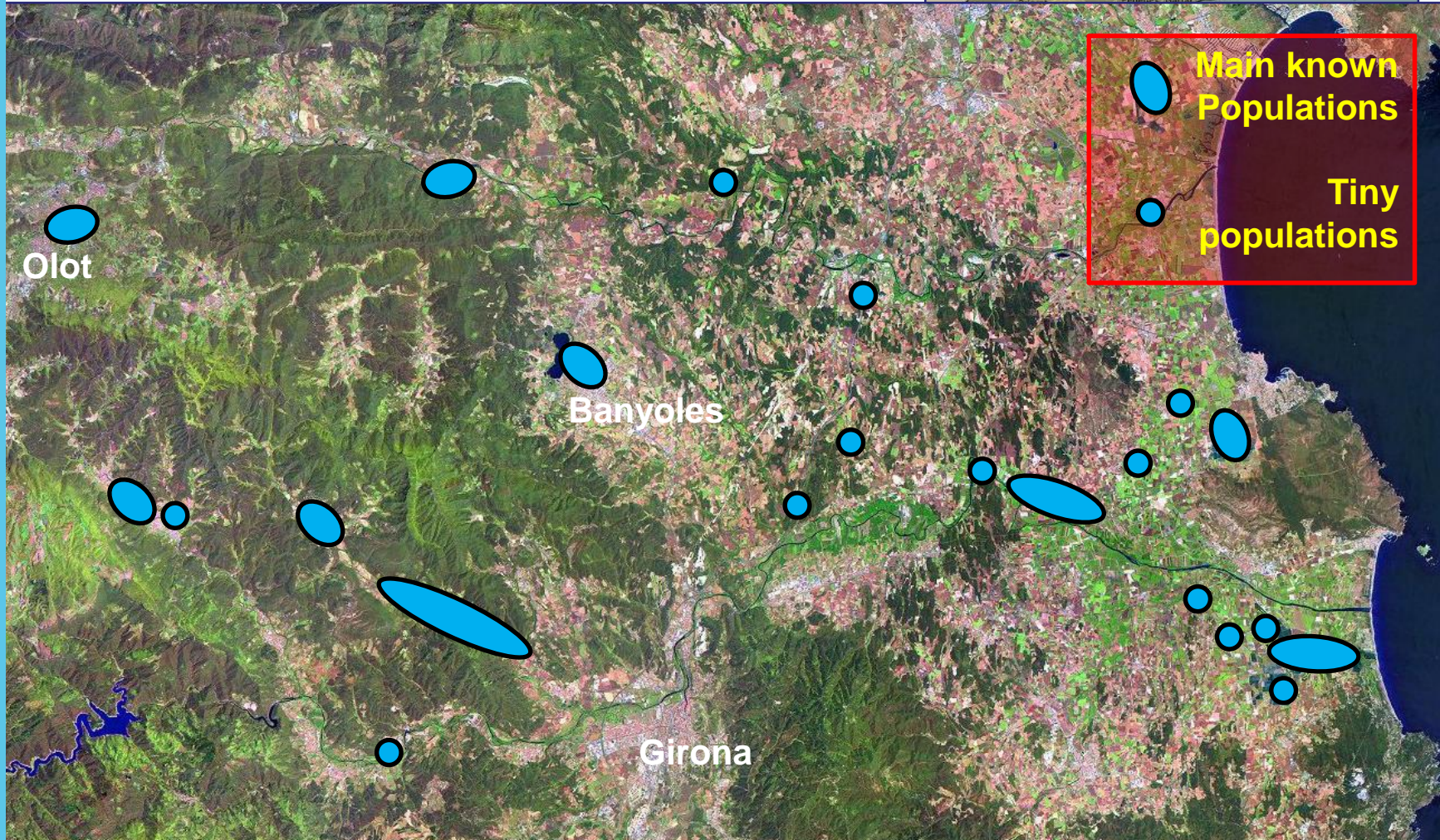
Torroella de Montgrí





# AREA OF STUDY

Current situation:  
*Unio mancus*



Olot

Banyoles

Girona

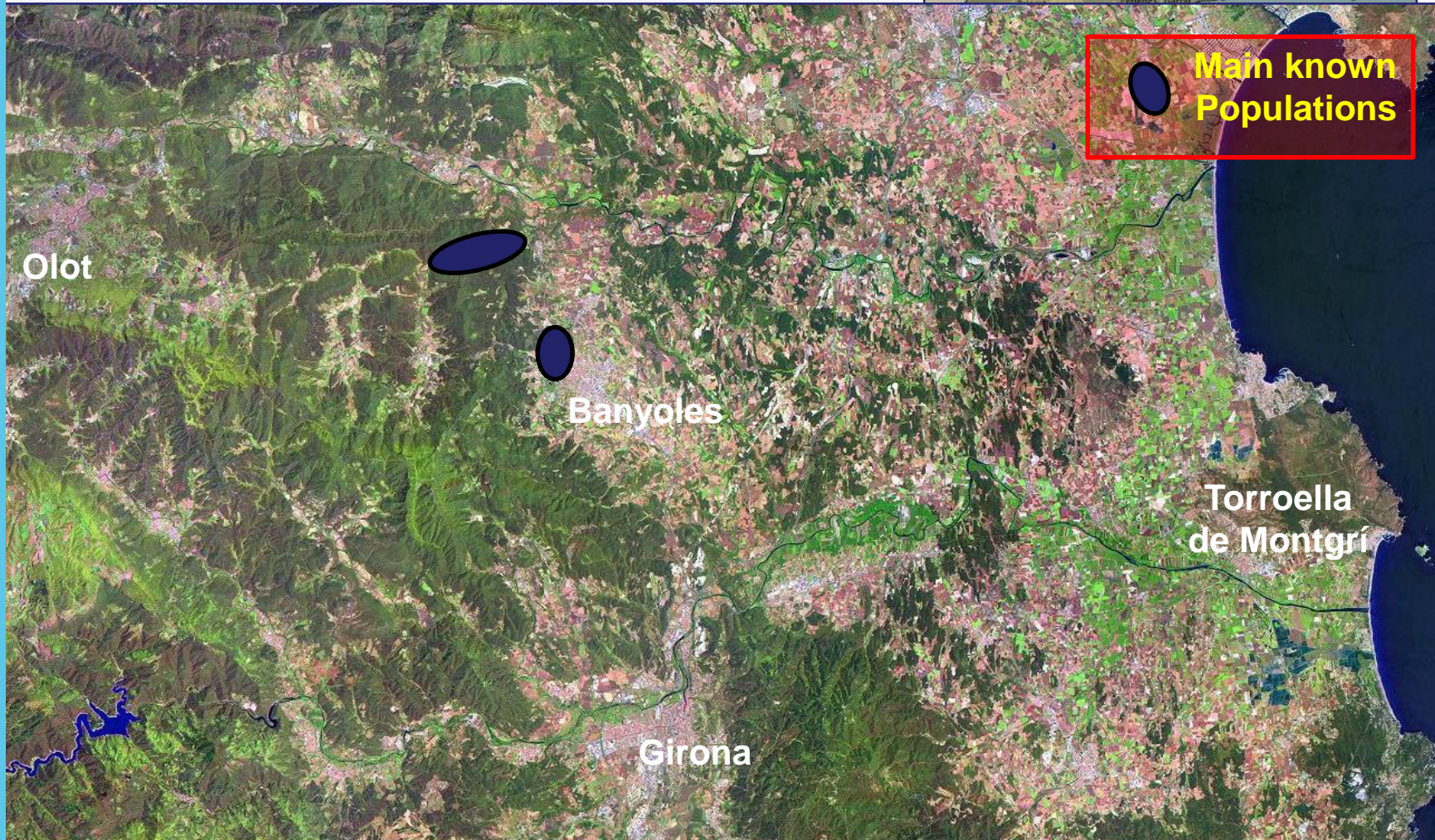
Main known  
Populations

Tiny  
populations



# AREA OF STUDY

Current situation:  
*Unio ravoisieri*







# Main threats and causes of regression in the area

(In order of importance ... in the past):

- 1) Water pollution
- 2) Habitats loss & fragmentation
- 3) Hydromorphological modifications
- 4) Invasive alien species
- 5) Direct collection





# Main threats and causes of regression in the area

(In order of importance ... nowadays):

- 1) Invasive alien species
- 2) Hydromorphological modifications
- 3) Habitats loss & fragmentation
- 4) Water pollution
- 5) Direct collection



# Known host fishes of *Unio* (...in the area)

Native in the area



Freshwater blenny  
*Salaria fluviatilis*



Catalan chub  
*Squalius laietanus*



Mediterranean barbel  
*Barbus meridionalis*



# Known host fishes of *Unio* (...in the area)



Freshwater blenny  
*Salaria fluviatilis*



Catalan chub  
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Mediterranean barbel  
*Barbus meridionalis*

Native in the area



Ebro barbel  
*Luciobarbus graellsii*

Non native in the area



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Main functional hosts of *Unio* in the area



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Main functional hosts of *Unio* in the area



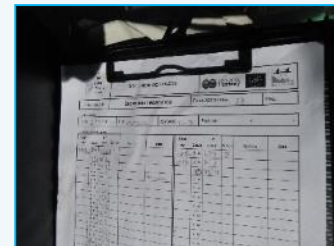


# Objectives

- Demographic characterisation
- Analysis of current population trends
- Diagnosis of conservation status

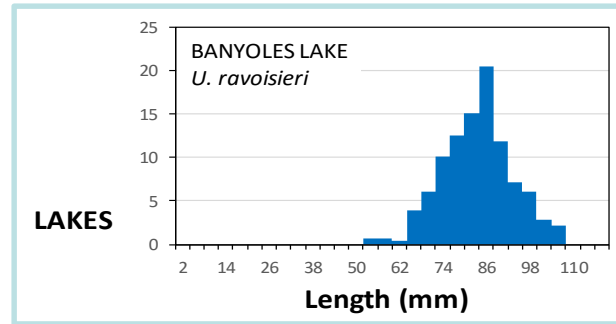
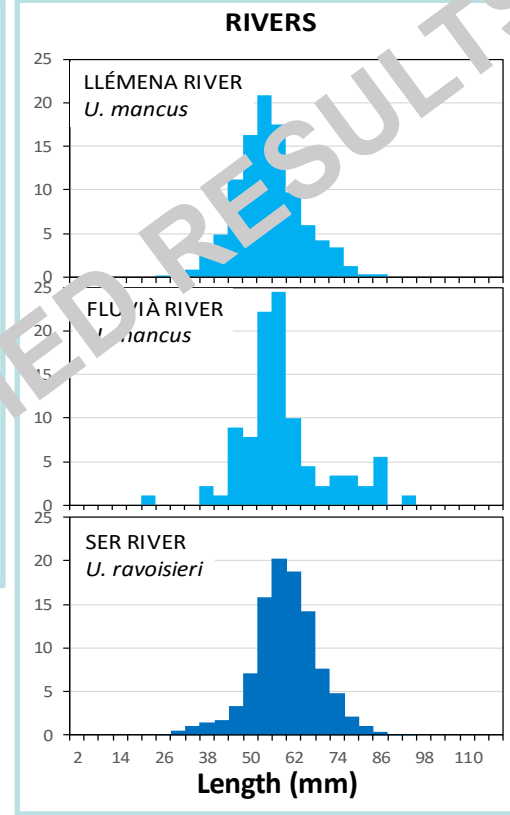
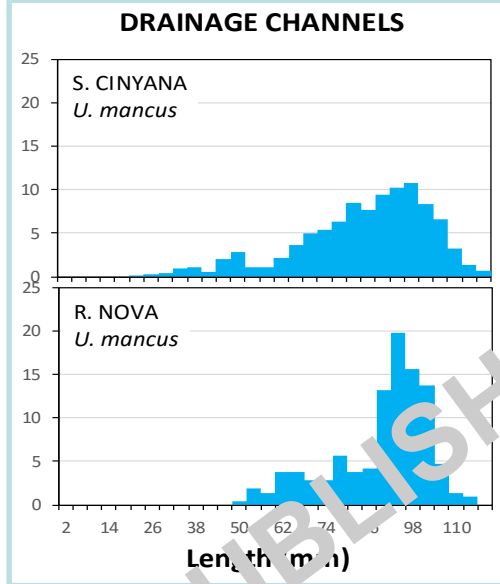
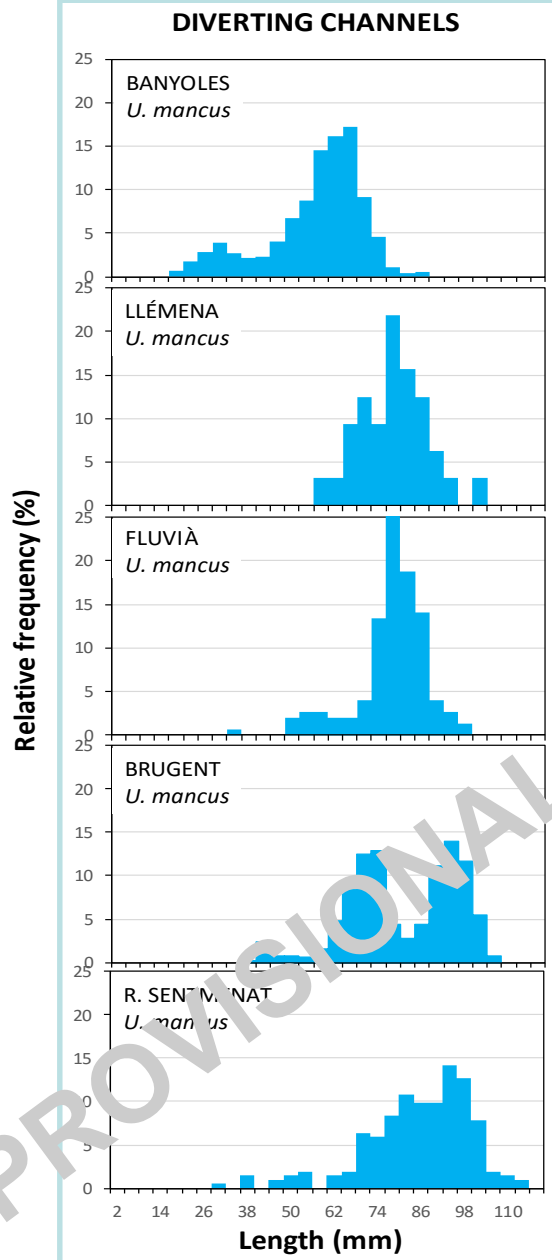


# Sampling of populations



LIFE Potamo Fauna		NATURA 2000		LIFE	
LIFE Potamo Fauna		NATURA 2000		LIFE	
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60
61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78
79	80	81	82	83	84
85	86	87	88	89	90
91	92	93	94	95	96
97	98	99	100	101	102

# Size structures

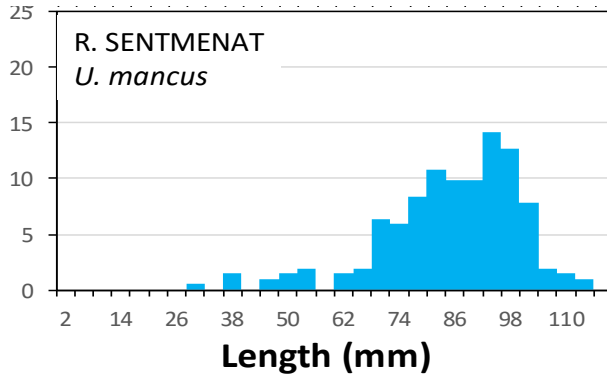


PROVISIONAL UNPUBLISHED RESULTS

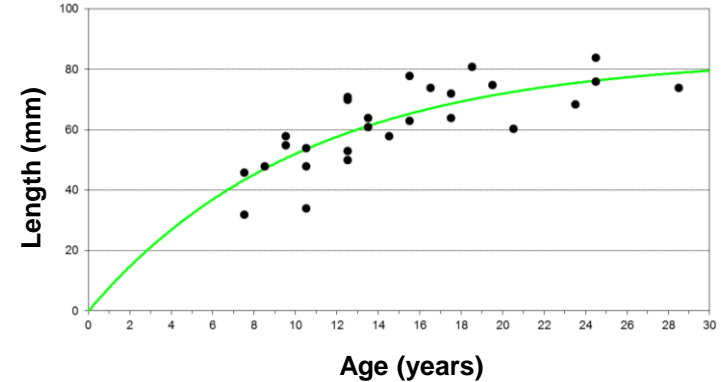


# Demographic characterization

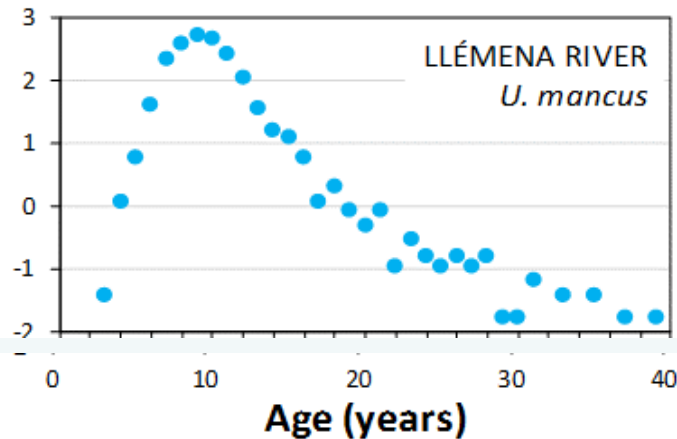
## Observed size structures



## Adjusted growth curves



## Inferred age structures



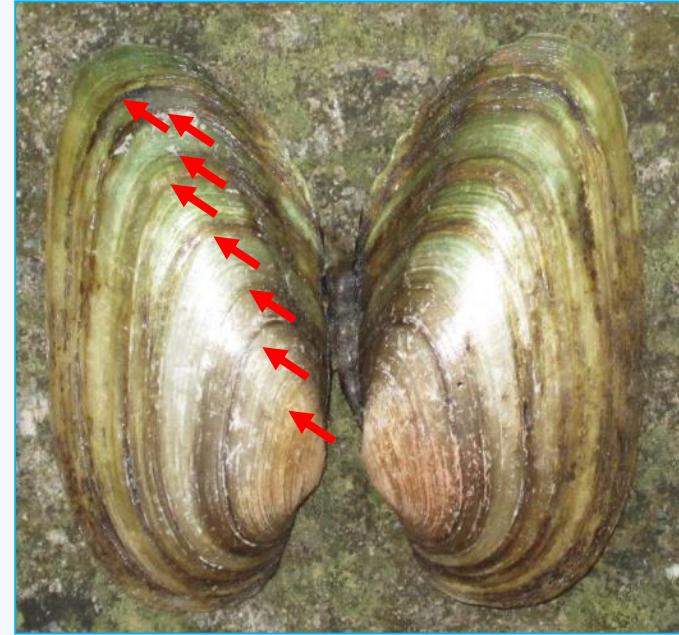
# Age determination

Reading of external rings:



Younger

(Under 5-7 years old, approx.)





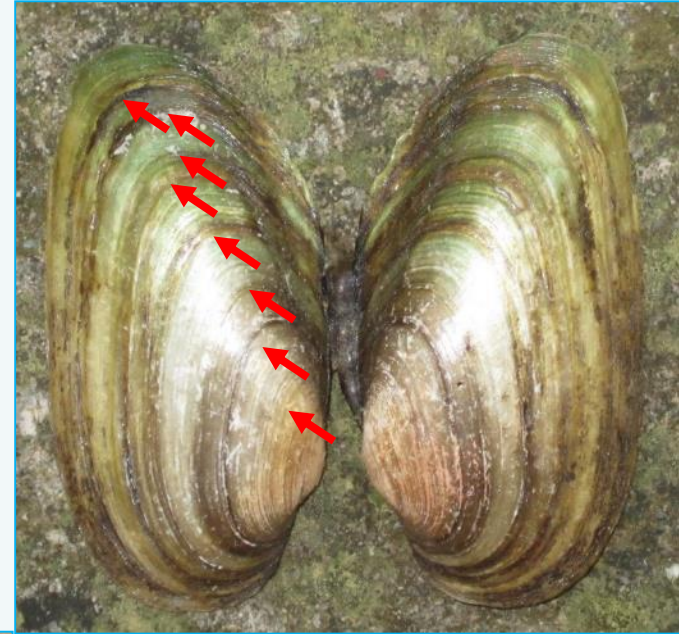
# Age determination

Reading of external rings:



Younger

(Under 5-7 years old, approx.)



Fail for older

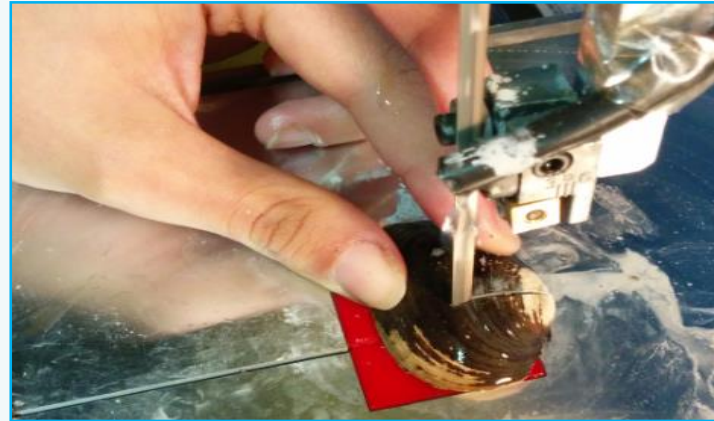
Many overlapping (“invisible”) rings

# Age determination

## Reading of internal rings:



CUTTING

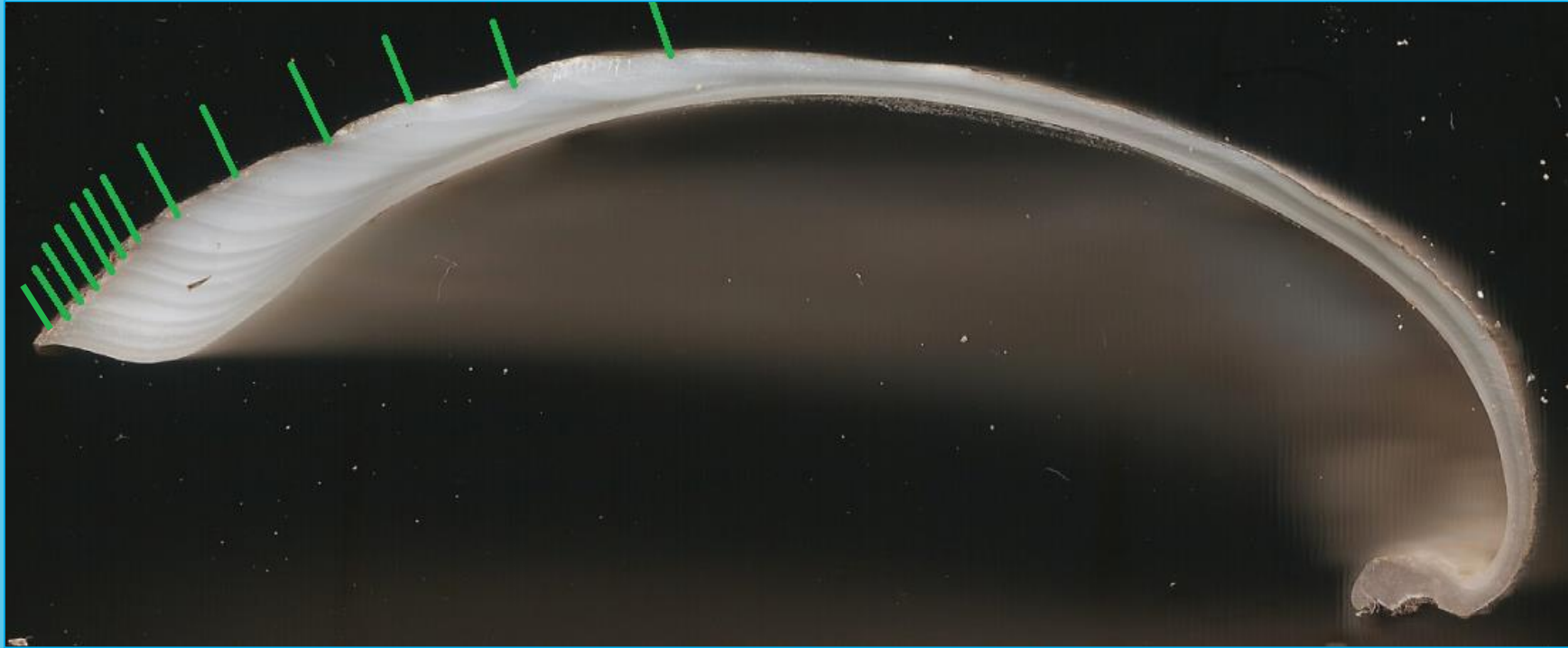


POLISHING



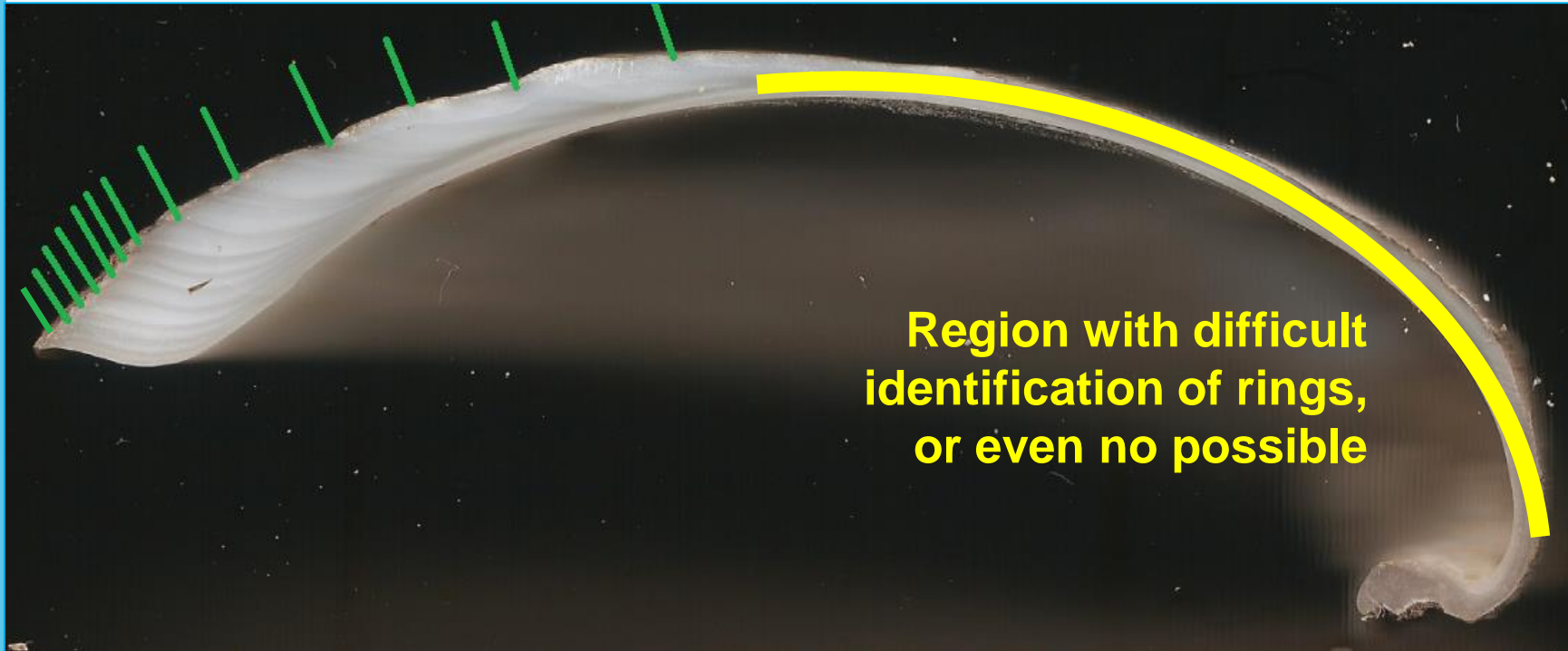
# Age determination

Reading of internal rings:



# Age determination

Reading of internal rings:

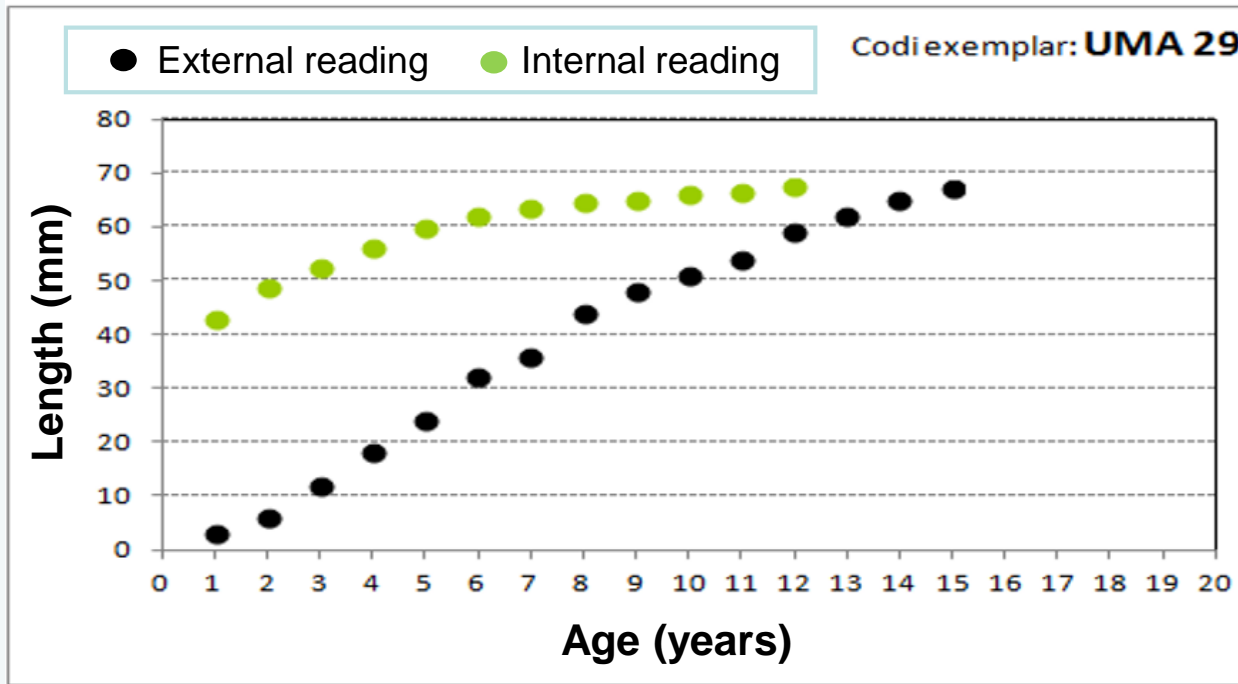


**✗** Fail completely for younger  
(Under 5-7 years old, approx.)

**✓** Partially, for older



# Age determination



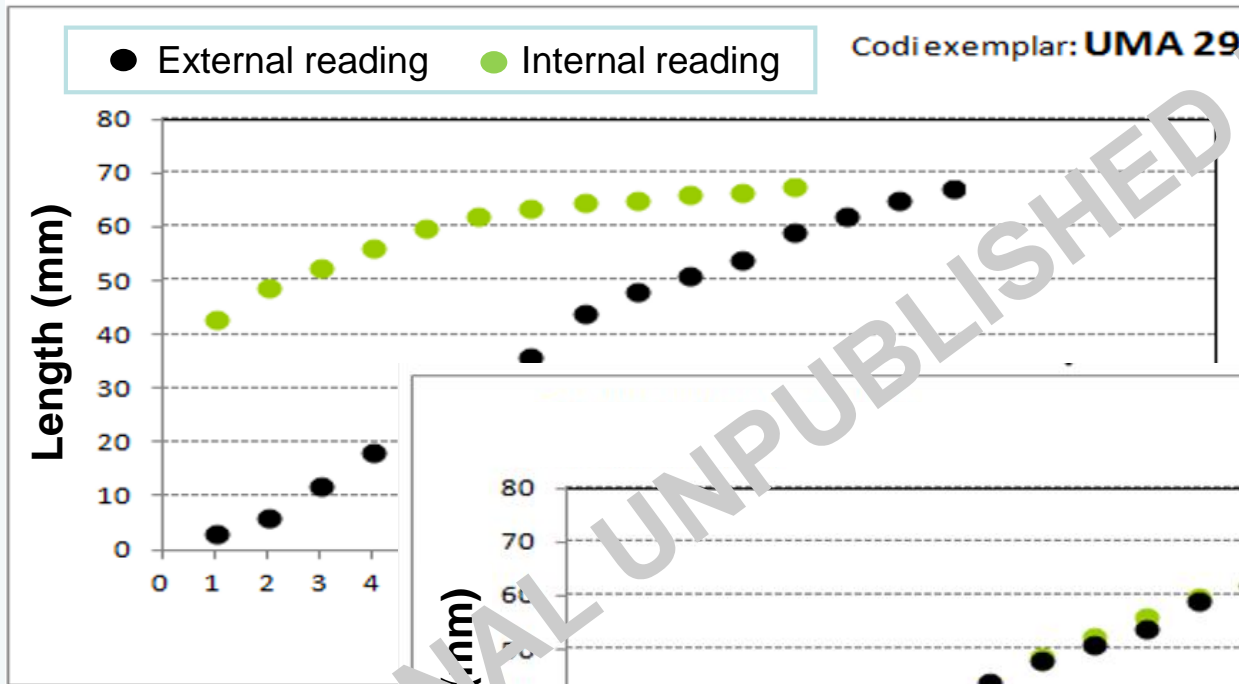
External reading:  
15 years

Internal reading:  
12 years

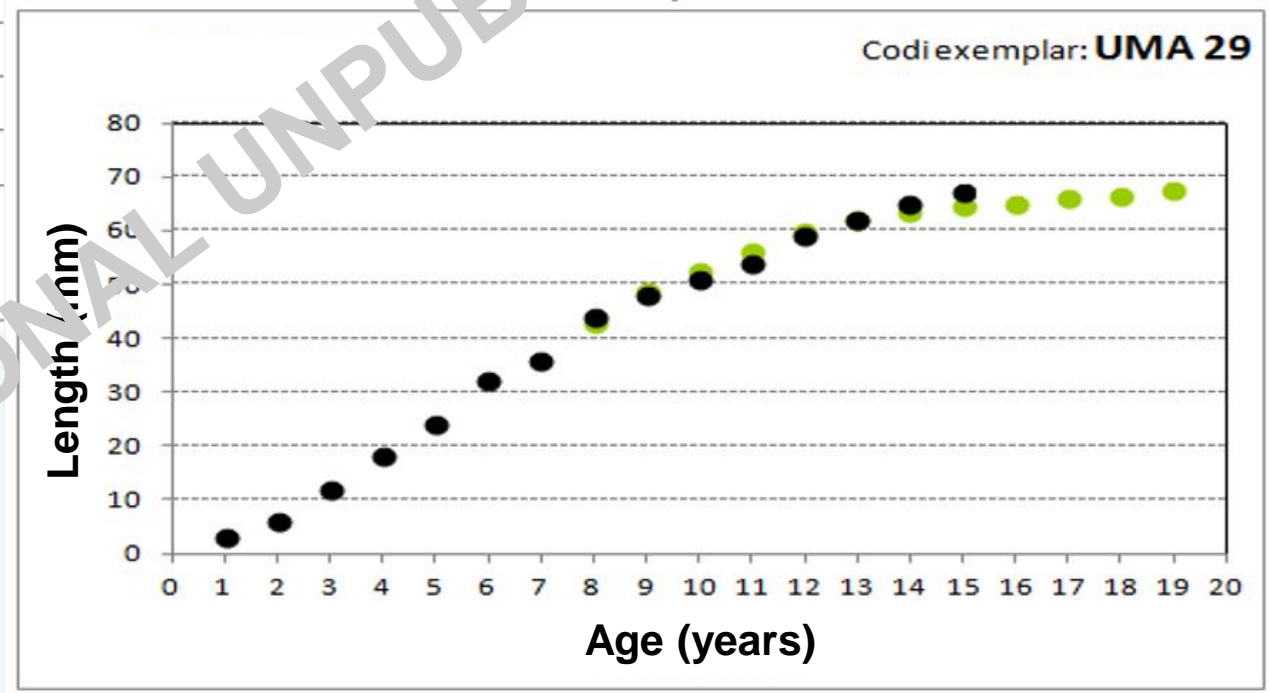
# Age determination

- Final option -

## Combined reading of internal and external rings:



~~External reading:  
15 years~~  
~~Internal reading:  
12 years~~



Final age:  
20 years

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# Age validation

Mark-release-recapture:



# Growth: length at age adjustments

Von Bertalanfy Growth model:

## VBMG

$$L_t = L_\infty(1 - e^{-K(t-t_0)})$$

VARIABLES:

$L_t$  = length at age  $t$  [mm]

$t$  = age [year]

PARAMETERS:

$L_\infty$  = asymptotic length [mm]

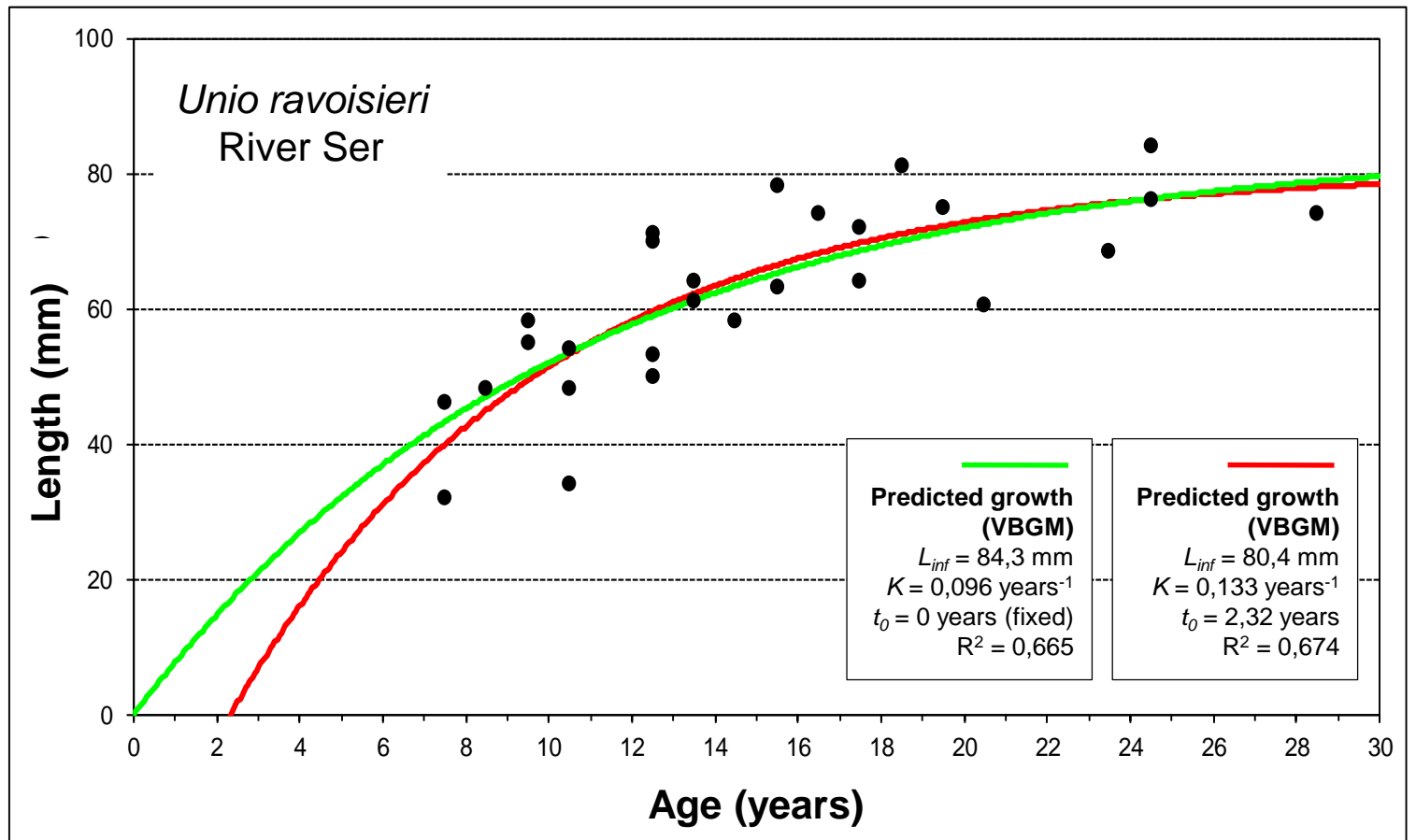
$K$  = growth rate [year<sup>-1</sup>]

$t_0$  = “theoretical” age at length 0

(Adjustments through Non Linear Regression)



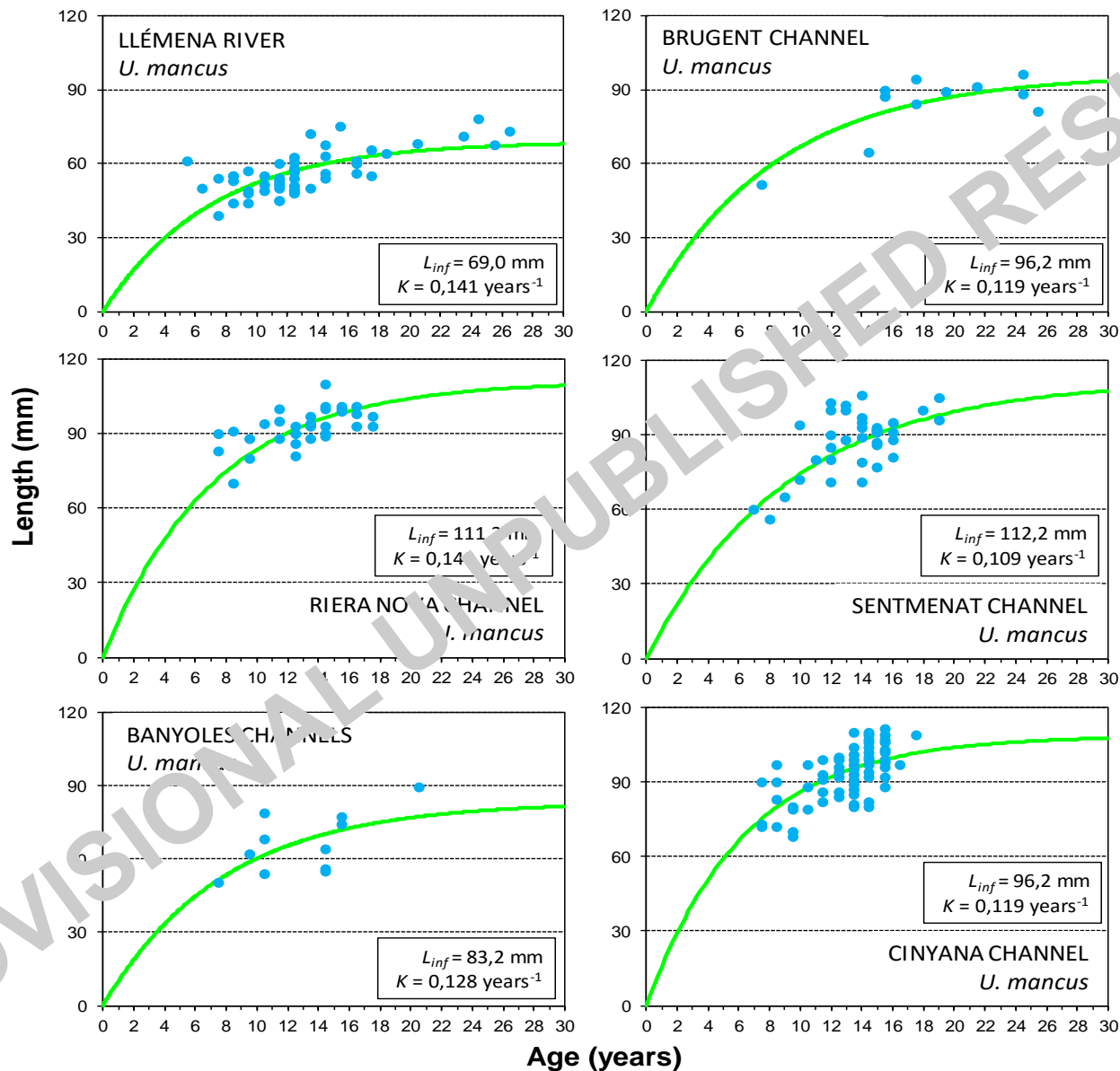
# Growth: length at age adjustments



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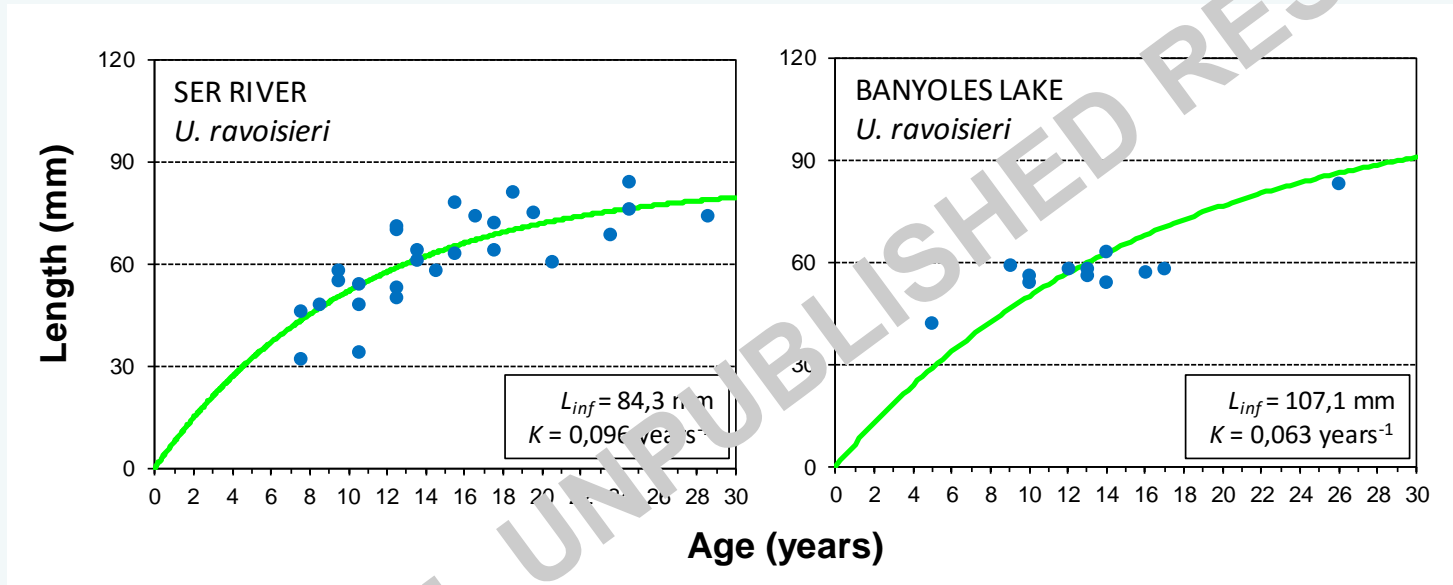


LIFE  
Potamo Fauna





# Growth: length at age adjustments



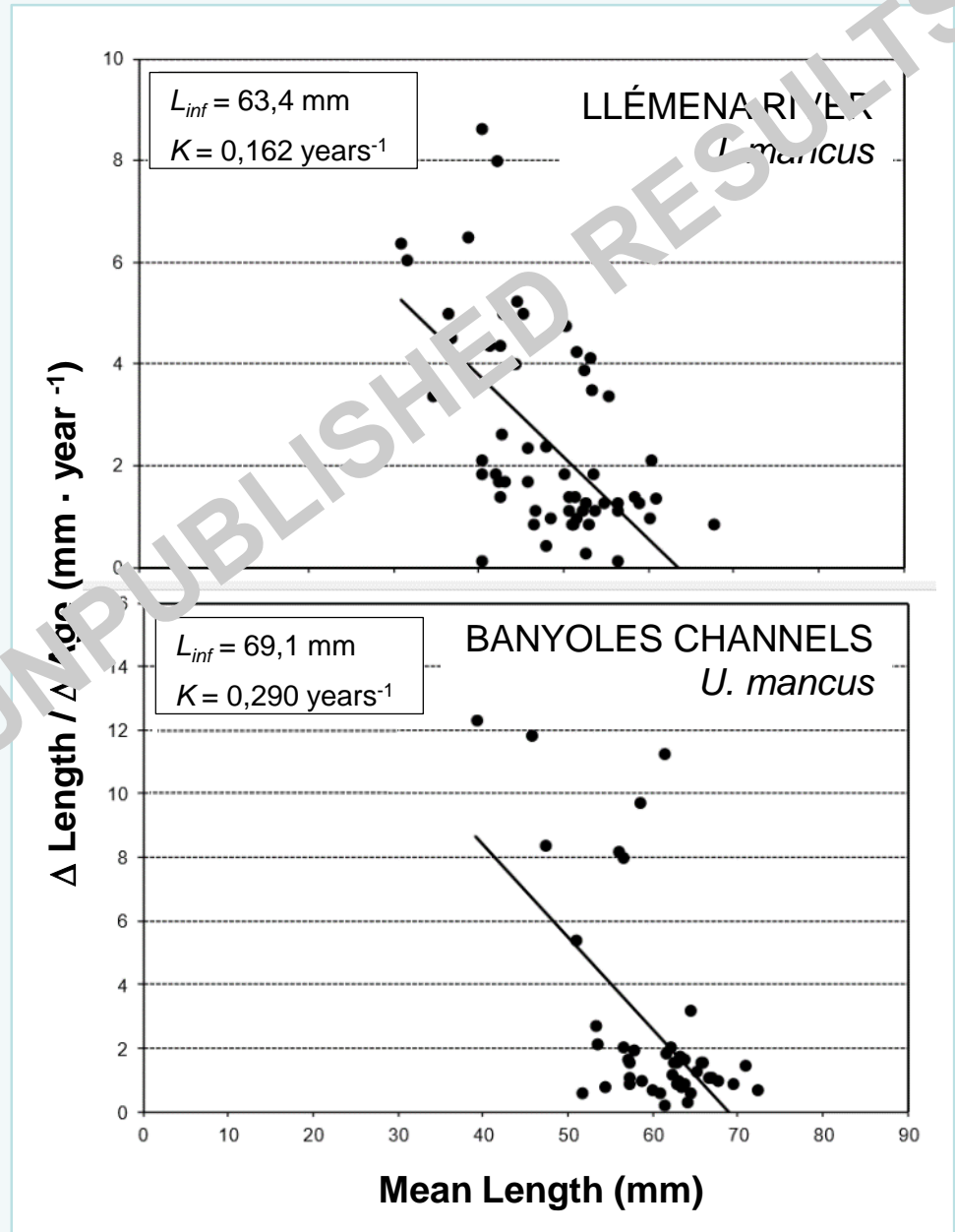
PROVISIONAL UNPUBLISHED RESULTS

# Growth: direct growth increment adjustments

VBMG reformulation:

$$\frac{\Delta L}{\Delta t} = K \cdot L_{\infty} - K \cdot \bar{L}$$

(Adjustments through Linear Regression)



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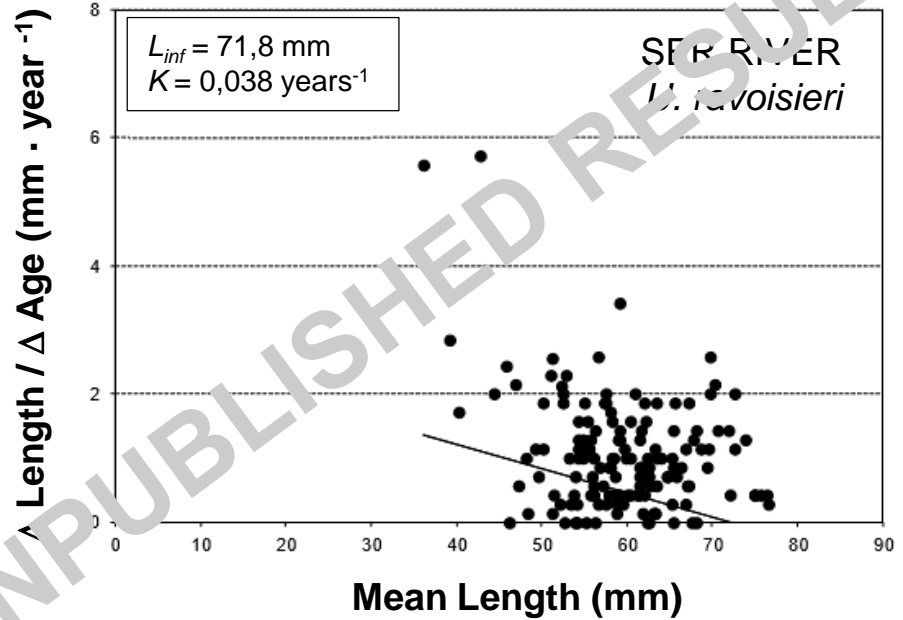


## Growth: direct growth increment adjustments

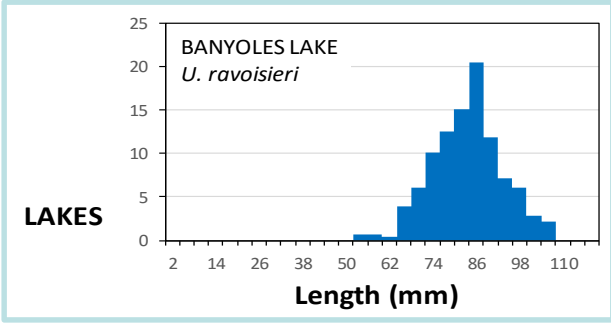
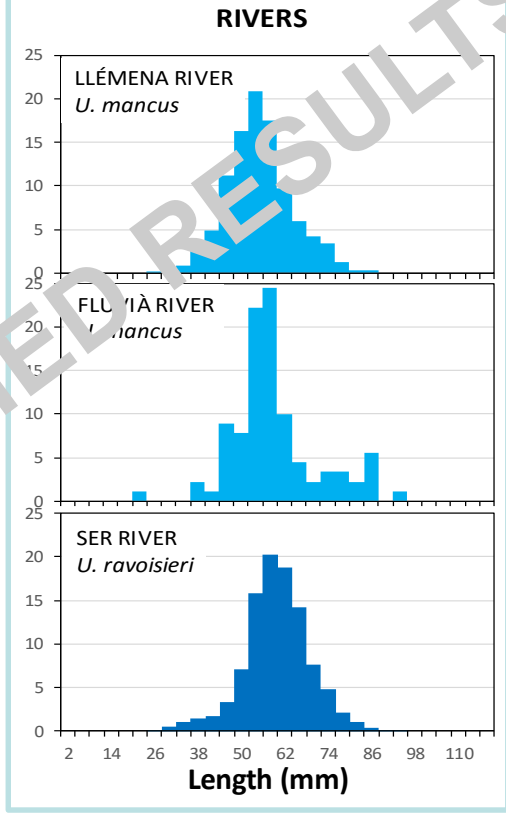
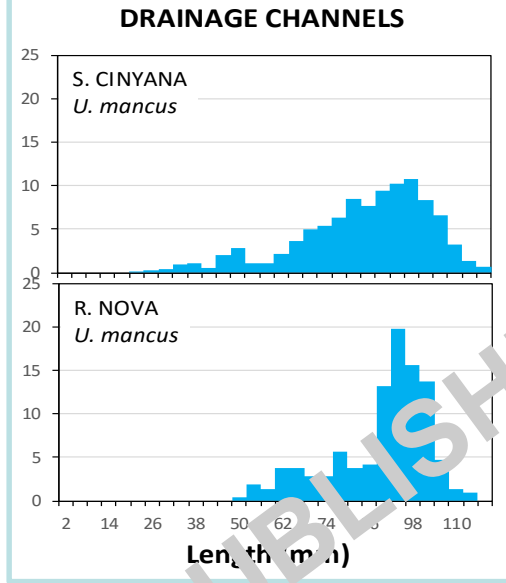
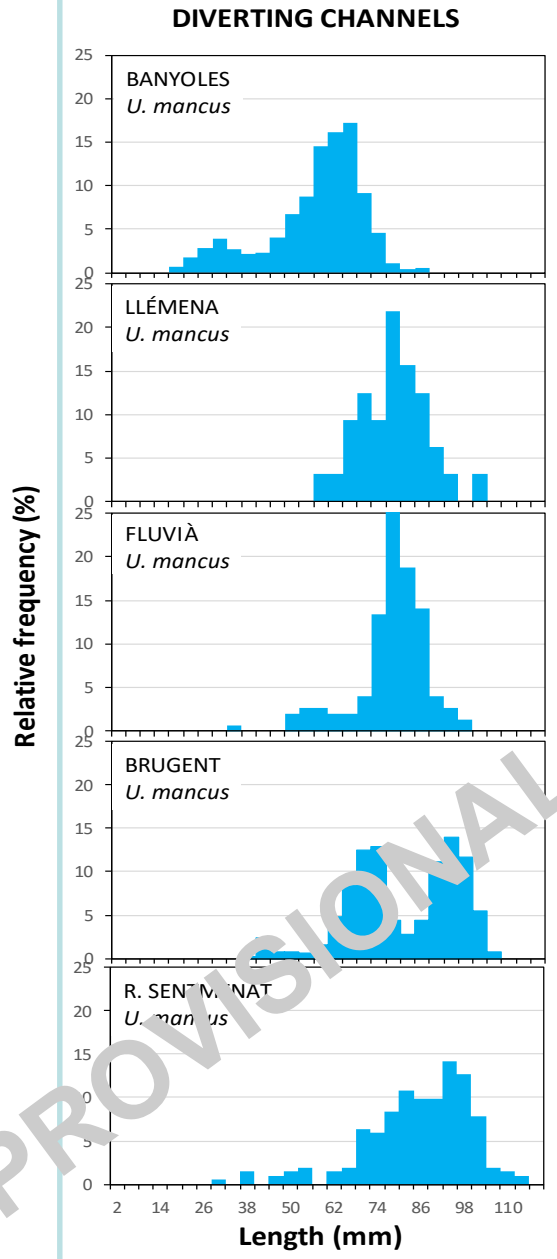
VBMG  
reformulation:

$$\frac{\Delta L}{\Delta t} = K \cdot L_{\infty} - K \cdot \bar{L}$$

(Adjustments through  
Linear Regression)

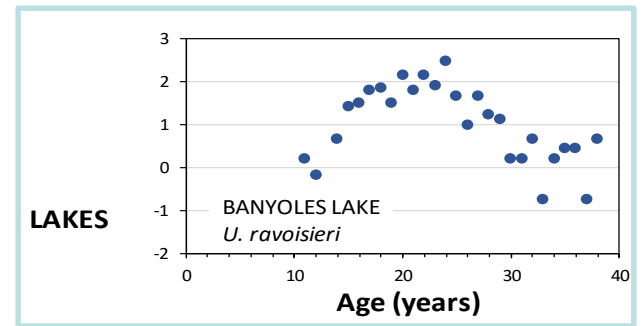
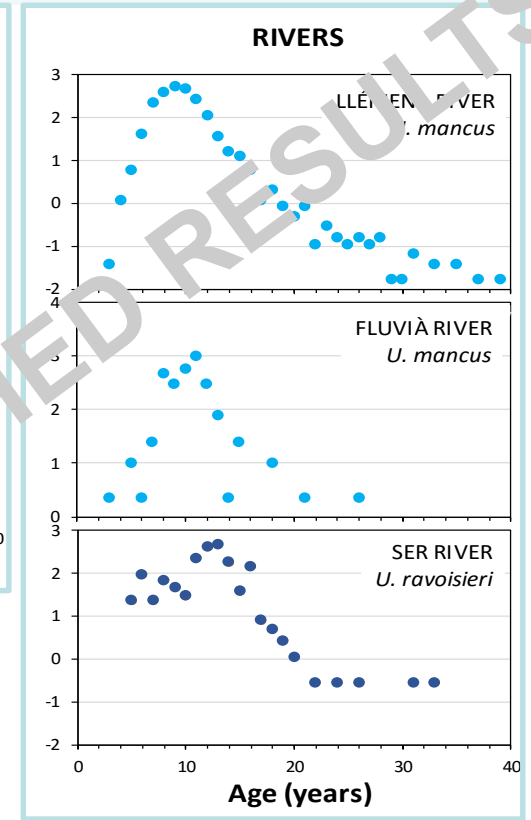
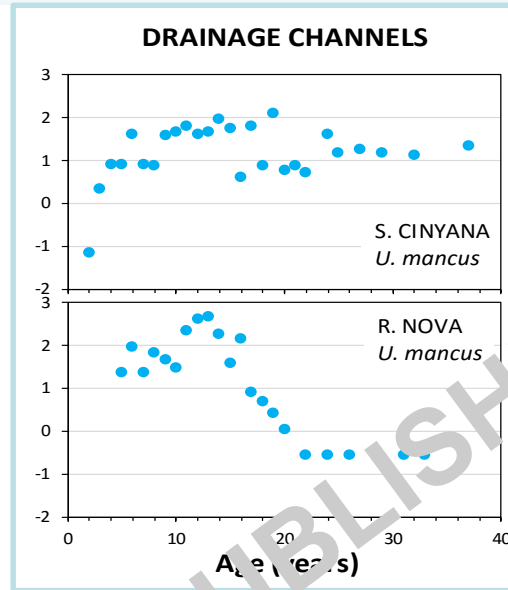
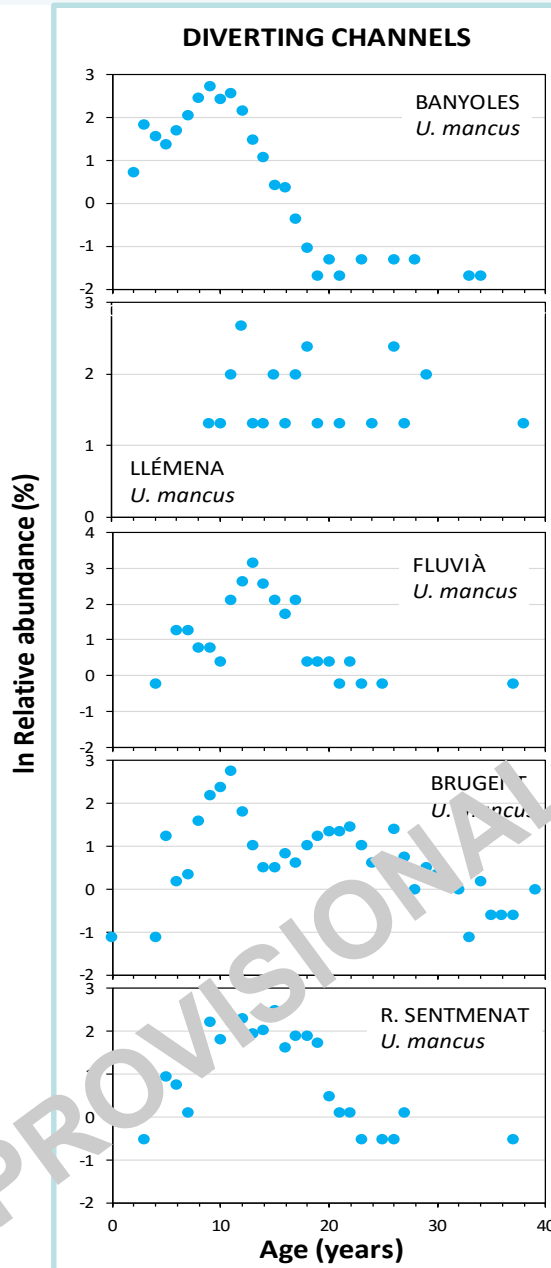


# Size structures



PROVISIONAL UNPUBLISHED RESULTS

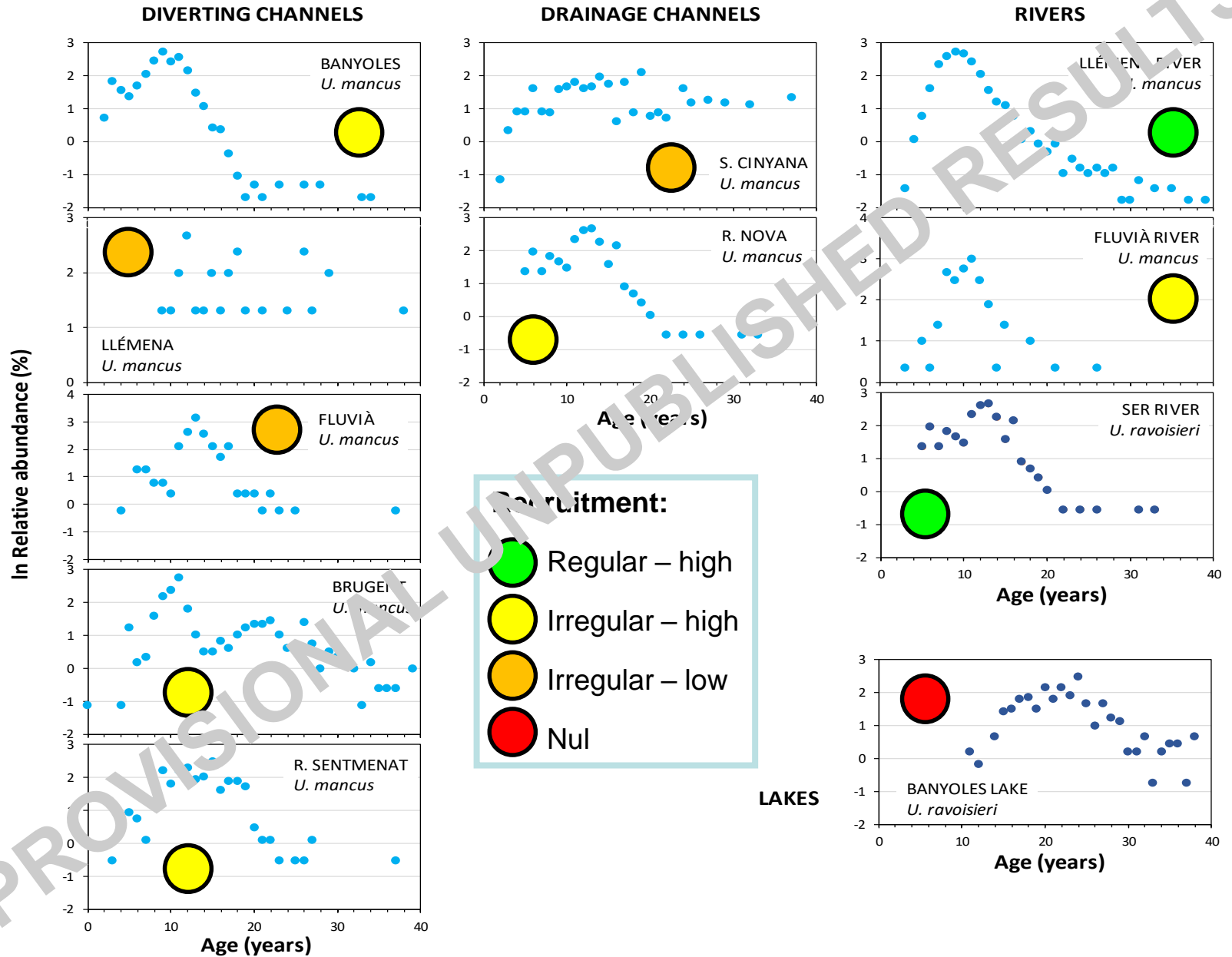
# Age structures



PROVISIONAL UNPUBLISHED RESULTS

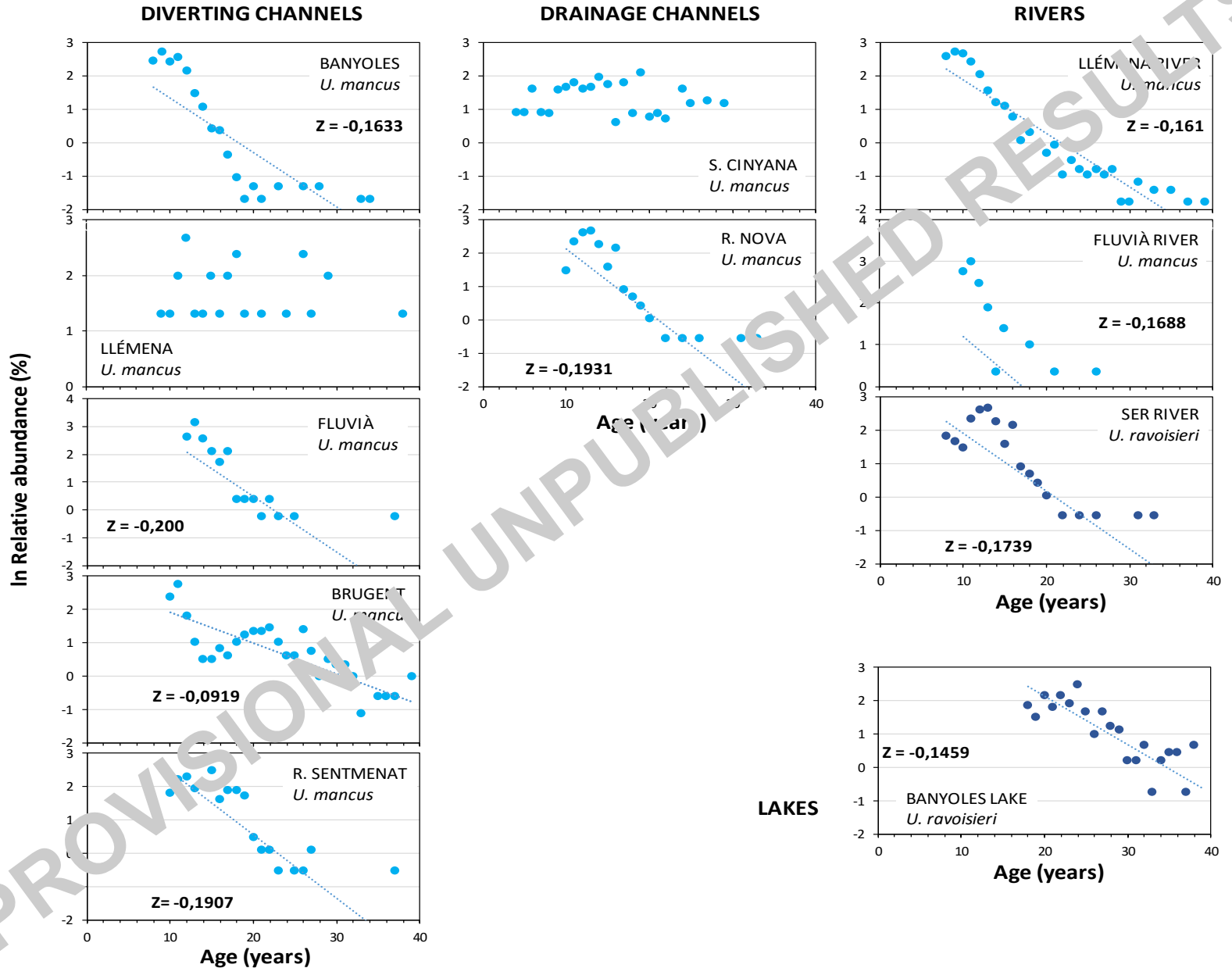


# Demography: recruitment



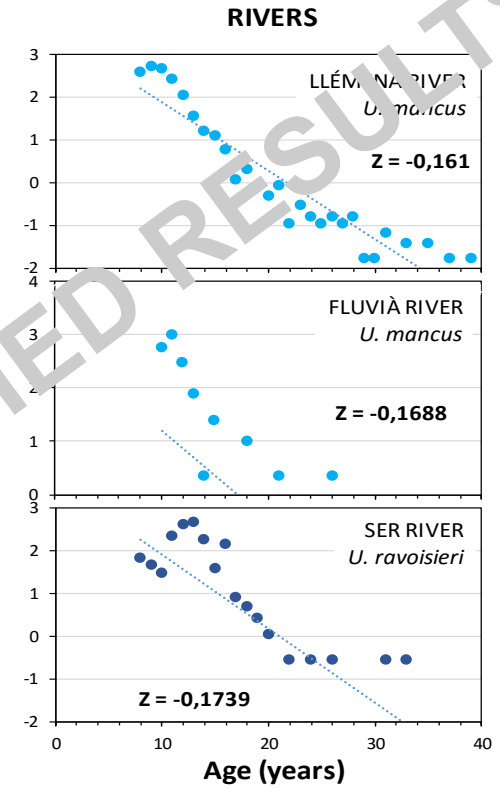
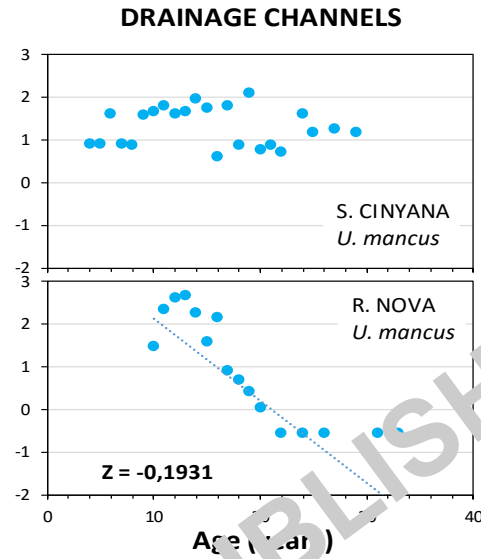
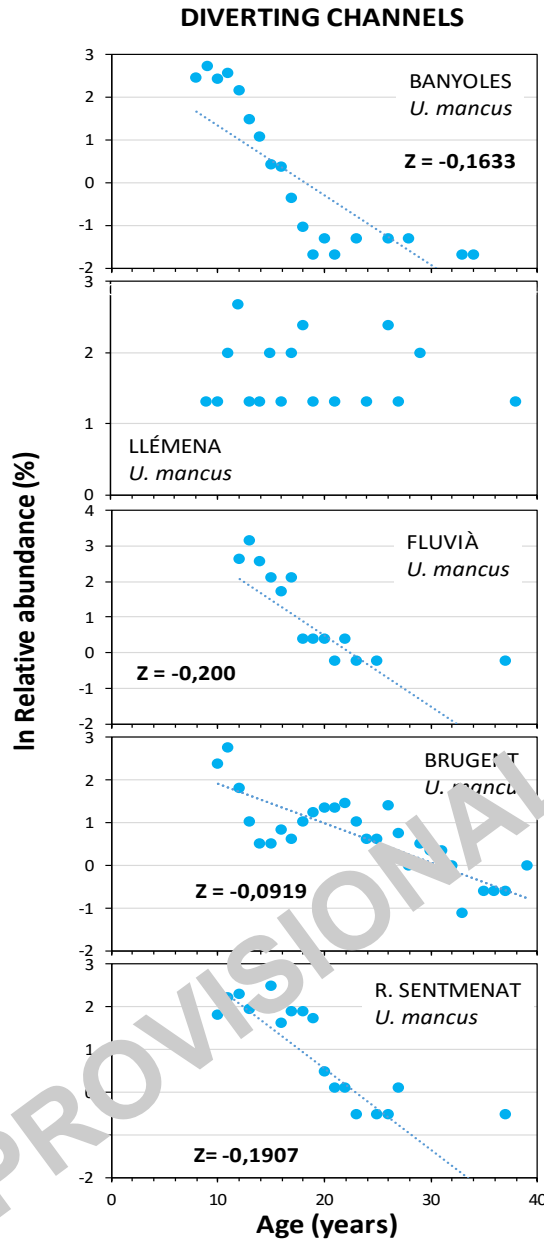
PROVISIONAL UNPUBLISHED RESULTS

# Demography: terminal mortality



PROVISIONAL UNPUBLISHED RESULTS

# Demography: terminal mortality

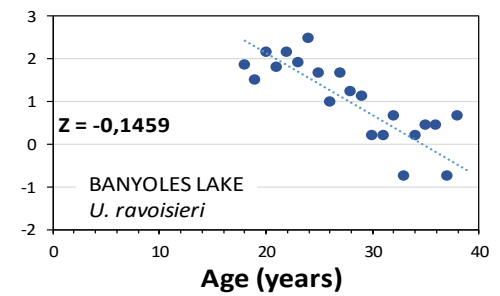


**Median (0) mortality rate Z**

<i>U. manicus</i>	<i>U. ravoisieri</i>
0,1688 year <sup>-1</sup>	0,1599 year <sup>-1</sup>

**Median Survival rate**

<i>U. manicus</i>	<i>U. ravoisieri</i>
84,5% (year <sup>-1</sup> )	85,2% (year <sup>-1</sup> )



PROVISIONAL UNPUBLISHED RESULTS





# Provisional conclusions

- In *Unio*, to properly determine the age it is necessary to combine readings of internal and external rings; anyway is still possible a further improvement of transversal sections.
- Growth patterns differ substantially between populations, specially on asymptotic length, but not so much growth rate ( $K$ ), which is quite stable.
- Terminal mortality of adults fraction is highly stable between populations.
- Many of the *Unio* populations analysed are severely aged, with scarce and/or irregular recruitment, so that their viability is not ensured.
- All remaining populations are in stable habitats, with no drastic natural or artificial disruptions, mainly rivers with very good hydromorphological and ecological status, or in channels with constant flow and no direct flood incidence.

# LIFE Potamo Fauna



**Merci!**