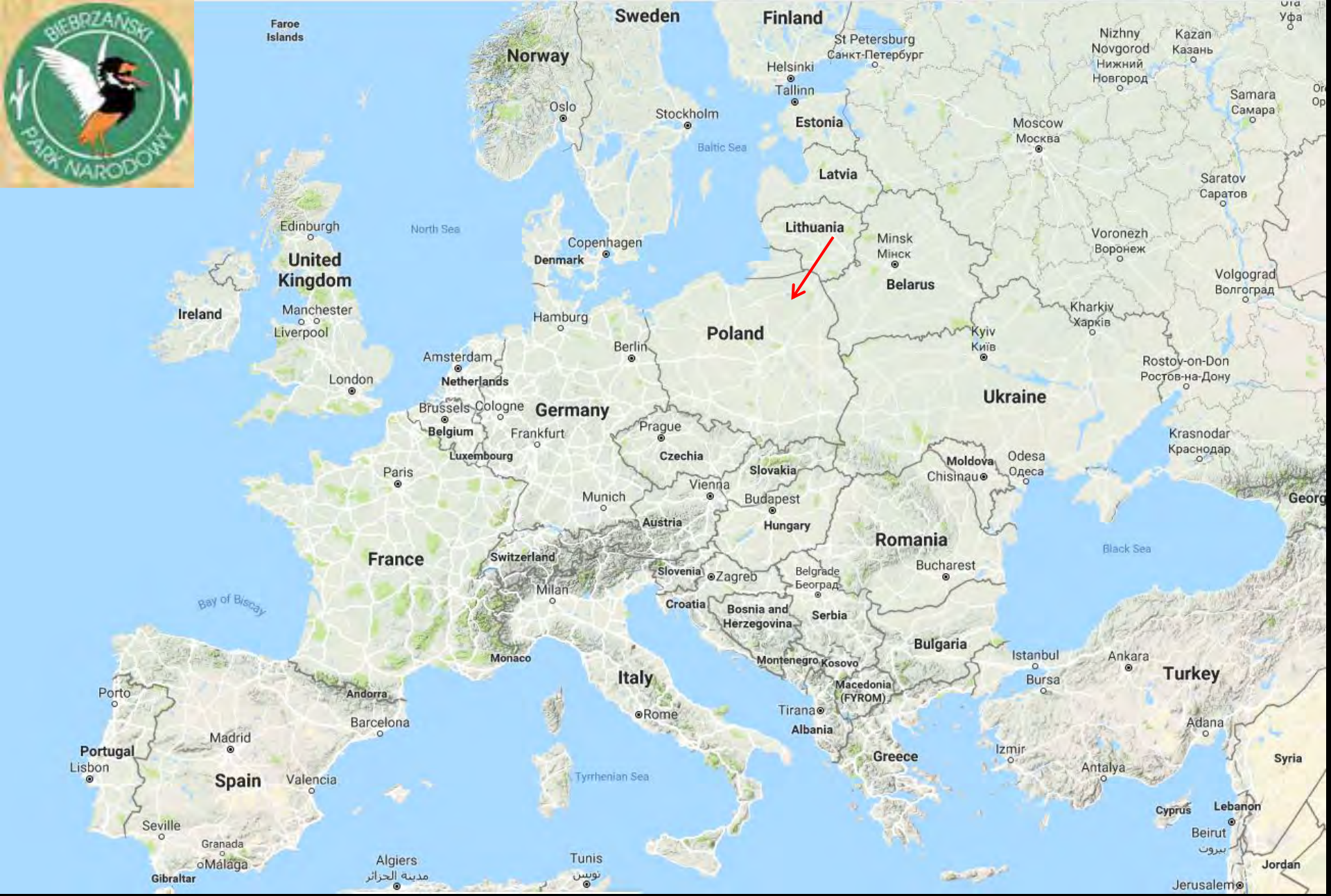
# A case study in the assessment of mussel re-location as a conservation and management strategy

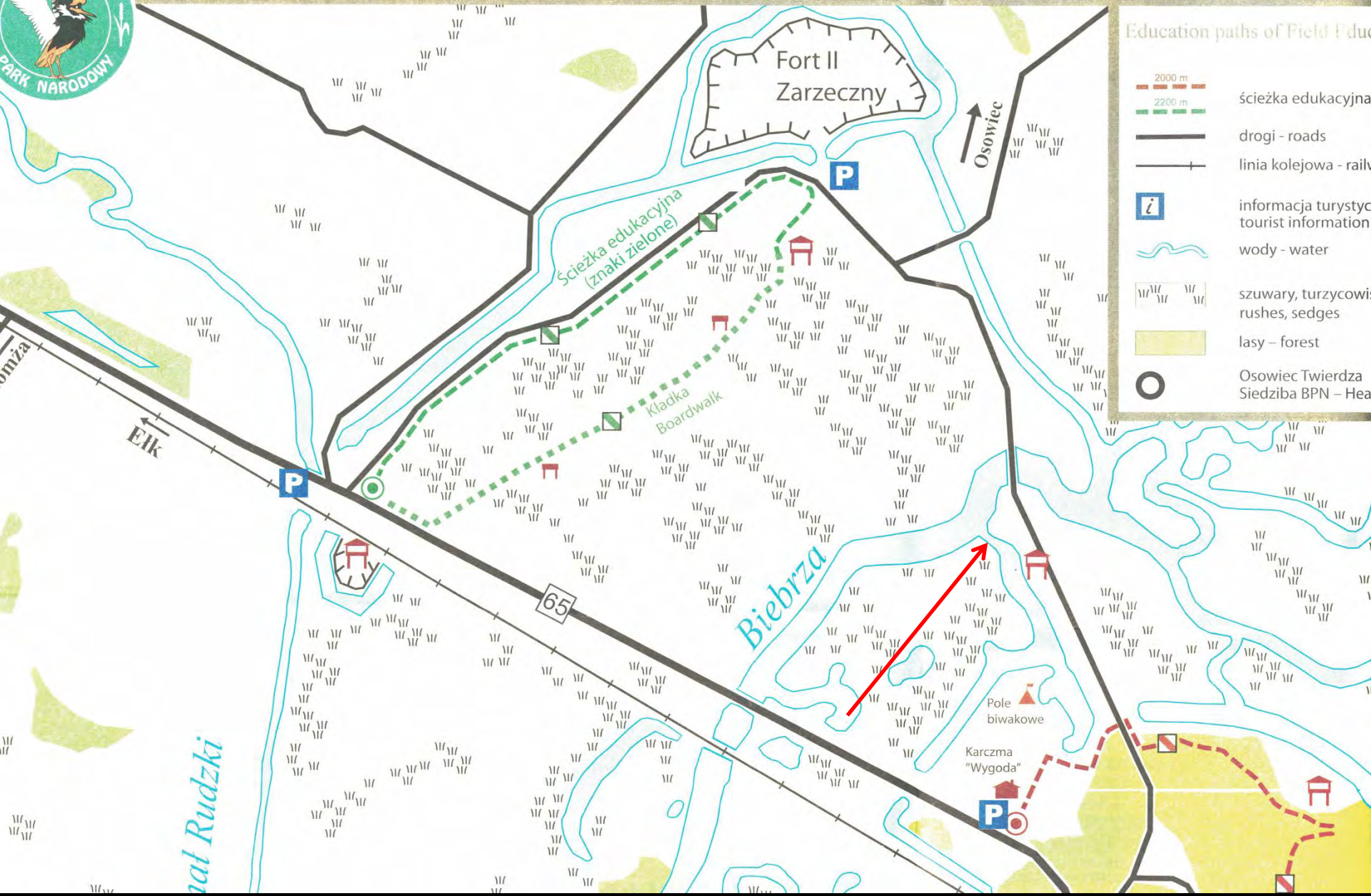
Małgorzata Ożgo
Maria Urbańska
Urszula Bierezżnoj-Bazille
Karolina Tarka
Piotr Maraszkiewicz
Andrzej Kamocki

Summary:

Mussel relocation is commonly used in conservation programmes, but relatively little is known about the long-term results of such actions. This study was carried out in response to the plans of the deepening of a 75 m long channel in the Biebrza National Park (Northeast Poland). Prior to the excavation works, we divided the channel into 15 sections, collected all unionid mussels we were able to find, individually marked them, and released them to the same sections of the deepened channel from which they were collected. For three following years, we monitored the survival, growth and movements of the salvaged mussels, and the recruitment of new individuals. 71% of the mussels survived the first year, and after 3 years we still recaptured 41% of them. The patterns of re-colonisation and recruitment point to the importance of retained connectivity with the undisturbed habitat. Our results show that such rescue actions can secure the survival of mussel populations, but should not be regarded as sufficient compensation for degradation of habitats.


BIEBRZAŃSKI PARK NARODOWY
Faroe Islands
Sweden
Finland
Norway
Oslo
Stockholm
Helsinki
Tallinn
St Petersburg
Санкт-Петербург
Nizhny Novgorod
Нижний Новгород
Kazan
Казань
Samara
Самара
Moscow
Москва
Estonia
Latvia
Baltic Sea
Saratov
Саратов
Edinburgh
North Sea
Lithuania
Minsk
Мінск
Voronezh
Воронеж
Copenhagen
Denmark
United Kingdom
Belarus
Volgograd
Волгоград
Ireland
Manchester
Liverpool
Hamburg
Kharkiv
Харків
Poland
Kyiv
Київ
Amsterdam
Berlin
Rostov-on-Don
Ростов-на-Дону
London
Netherlands
Ukraine
Brussels
Cologne
Germany
Krasnodar
Краснодар
Belgium
Prague
Frankfurt
Luxembourg
Czechia
Moldova
Odesa
Одеса
Paris
Slovakia
Chisinau
Vienna
Munich
Budapest
Austria
Hungary
Romania
France
Switzerland
Black Sea
Bucharest
Slovenia
Zagreb
Belgrade
Београд
Milan
Bay of Biscay
Croatia
Bosnia and Herzegovina
Serbia
Bulgaria
Monaco
Montenegro
Kosovo
Istanbul
Ankara
Turkey
Italy
Bursa
Porto
Andorra
Macedonia (FYROM)
Rome
Tirana
Albania
Barcelona
Madrid
Adana
Portugal
Izmir
Greece
Syria
Lisbon
Spain
Valencia
Tyrrhenian Sea
Antalya
Cyprus
Lebanon
Seville
Beirut
بيروت
Granada
Málaga
Jordan
Gibraltar
Algiers
مدينة الجزائر
Tunis
تونس
Jerusalem

# Ścieżki edukacyjne Terenowego Ośrodka Edukacyjnego Biebrzańskiego Parku




2015












CAT







2015

392 live mussels  and 136 dead ones

*Anodonta anatina n* = 242

*Anodonta cygnea n* = 105

*Unio pictorum n* = 20

*Unio tumidus n* = 25






CAT


320B






2015
POLE BIWAKOWE






2015


2016


2016

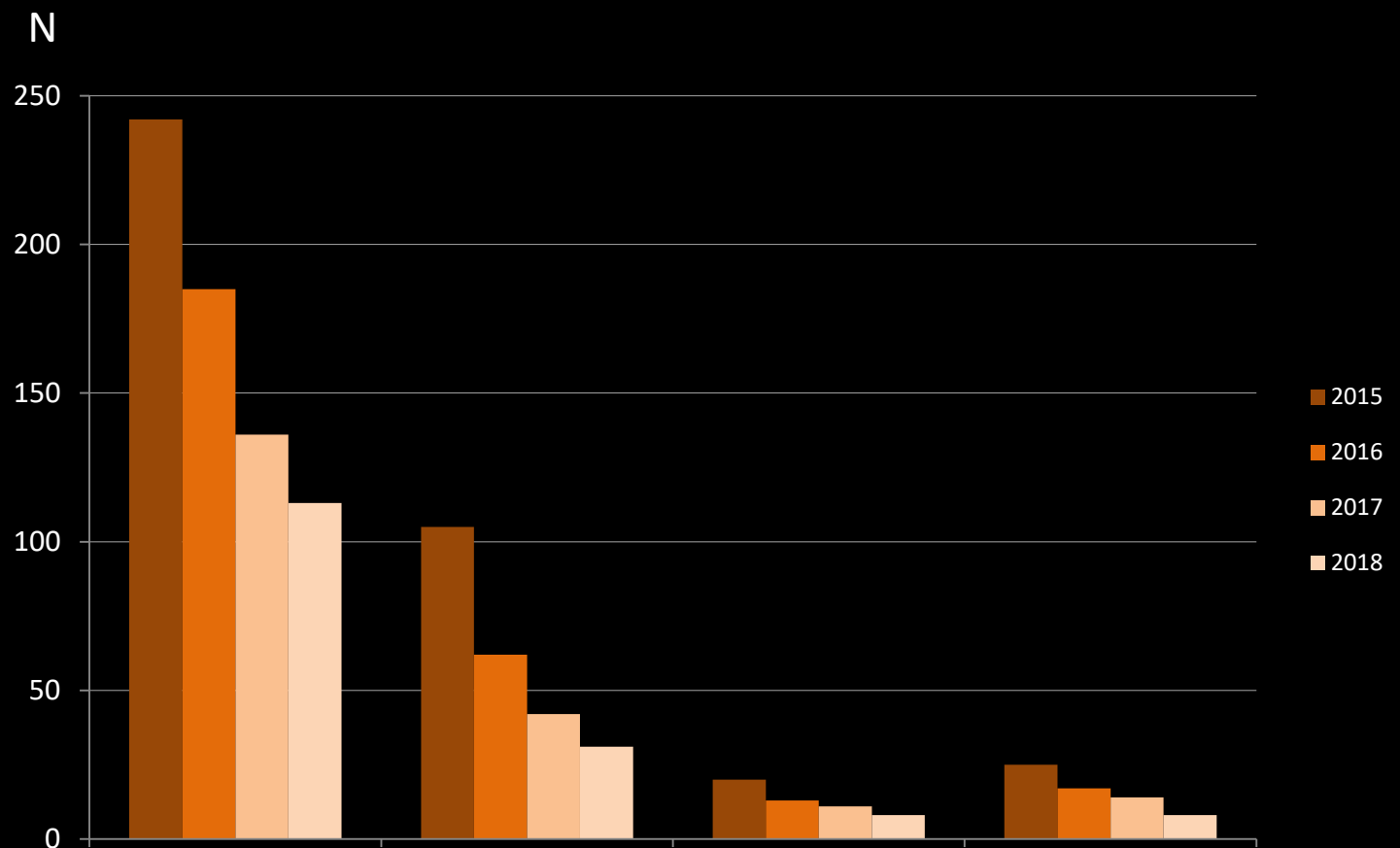
# 2016

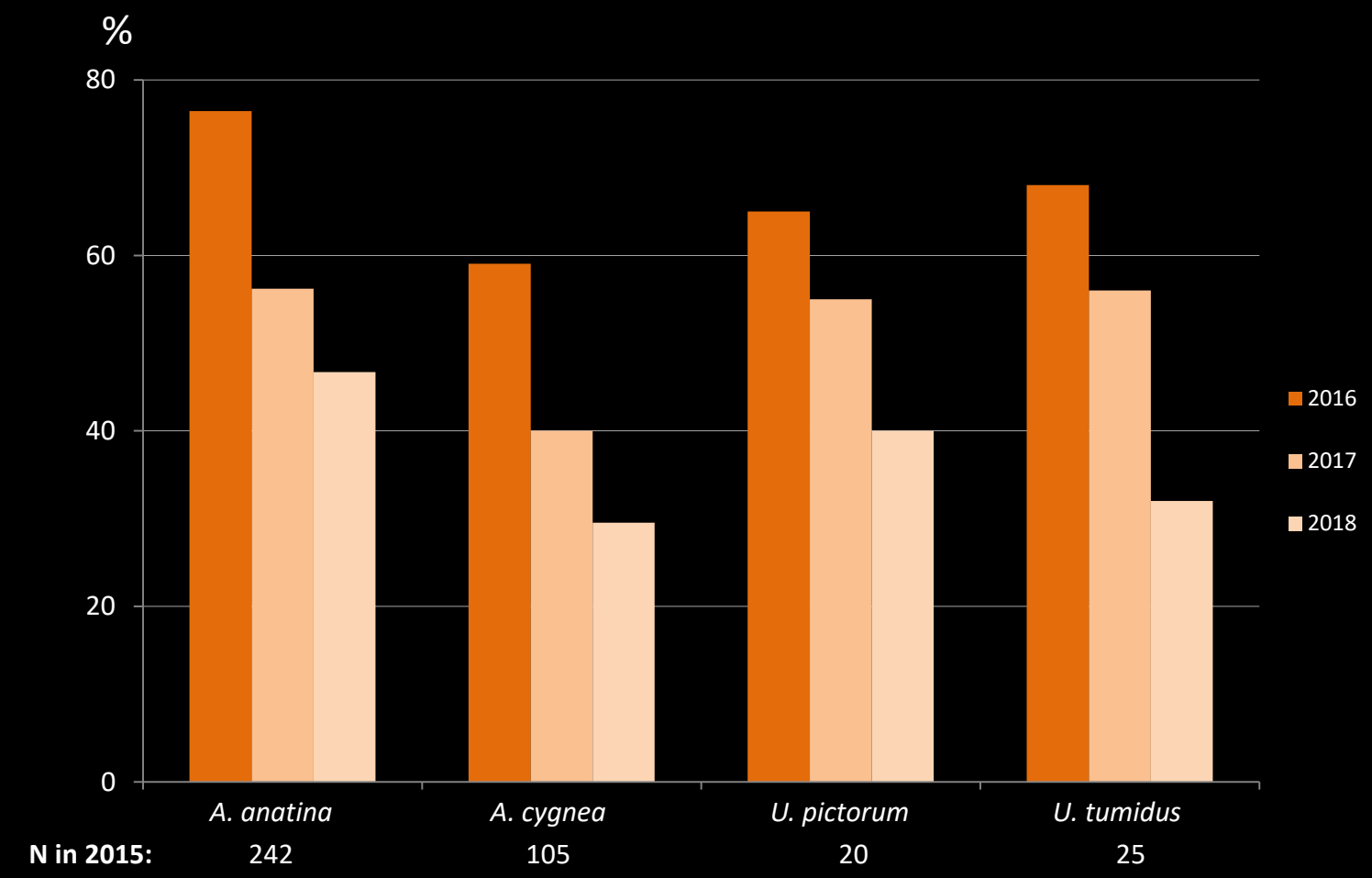


# 2016



# Survival of mussels tagged and released in 2015 (N = 392)





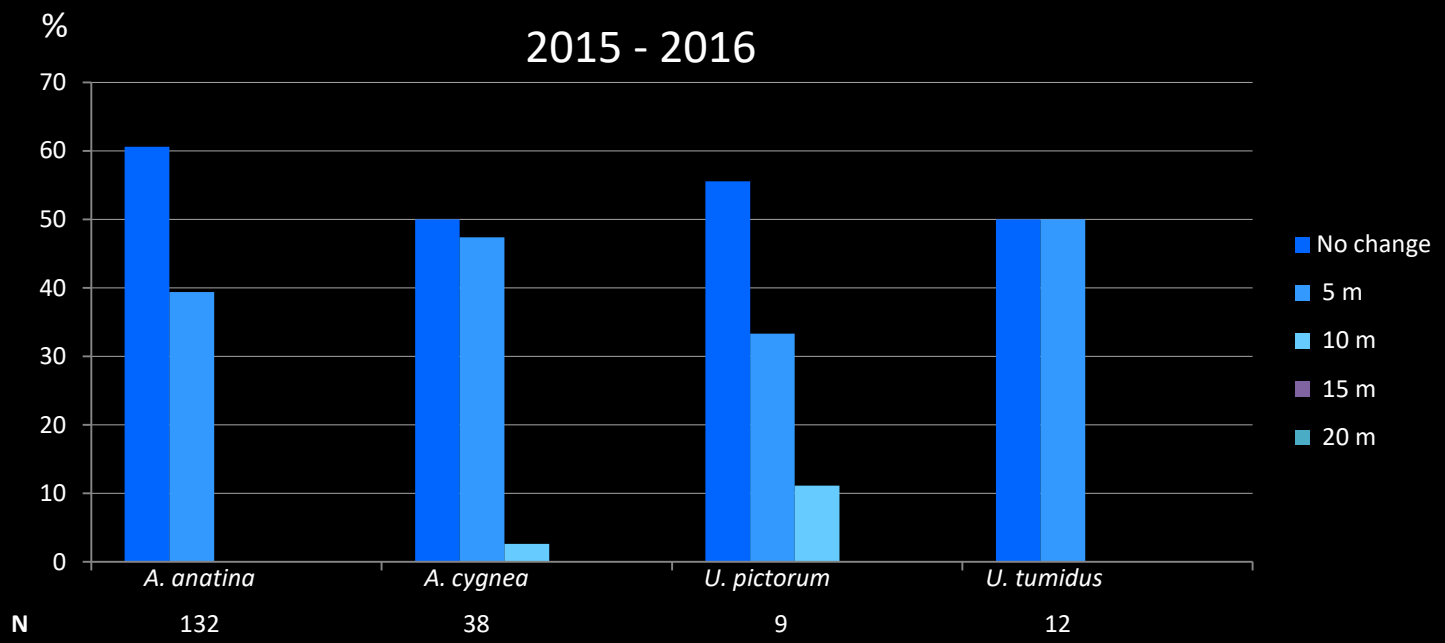

## Survival

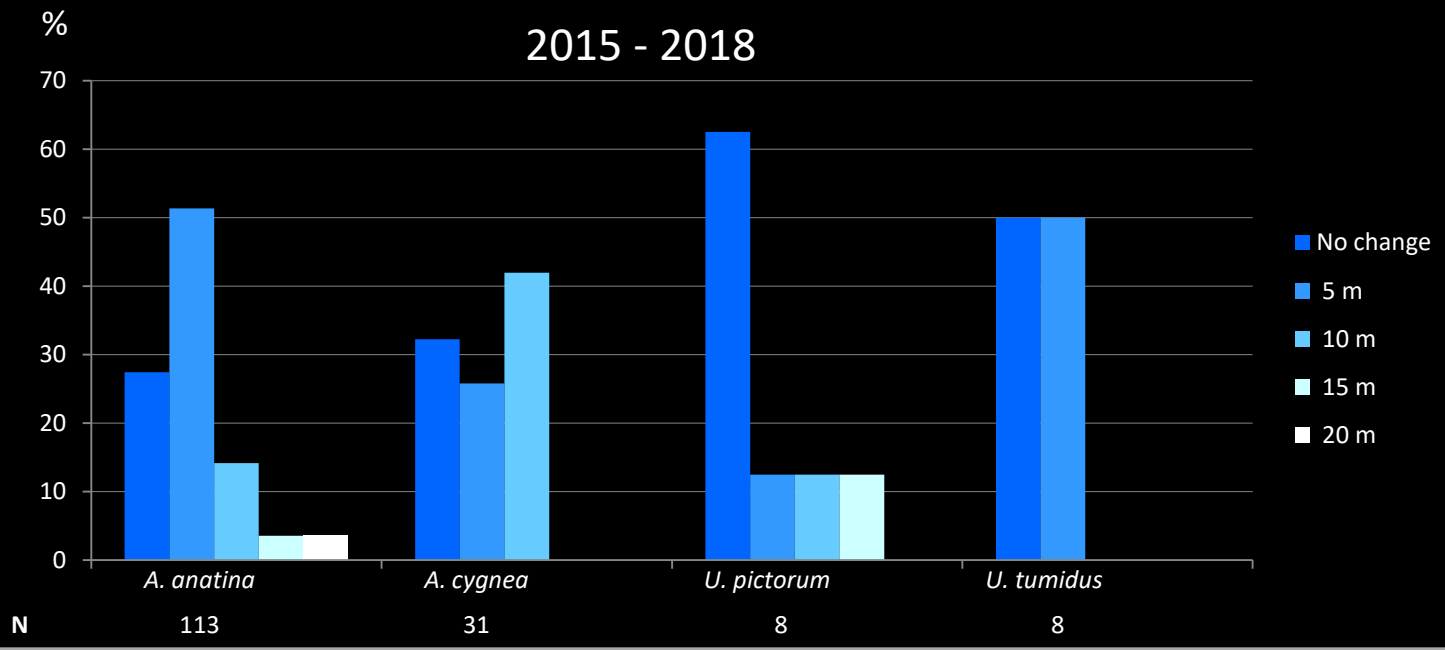
71% of mussels survived until the following year.
After 3 years, 41% was recaptured.

## Detectability

In 2016 we found 69% of mussels that survived (were recaptured later).
In 2018, 10 % of collected mussels were found for the first time since 2015.

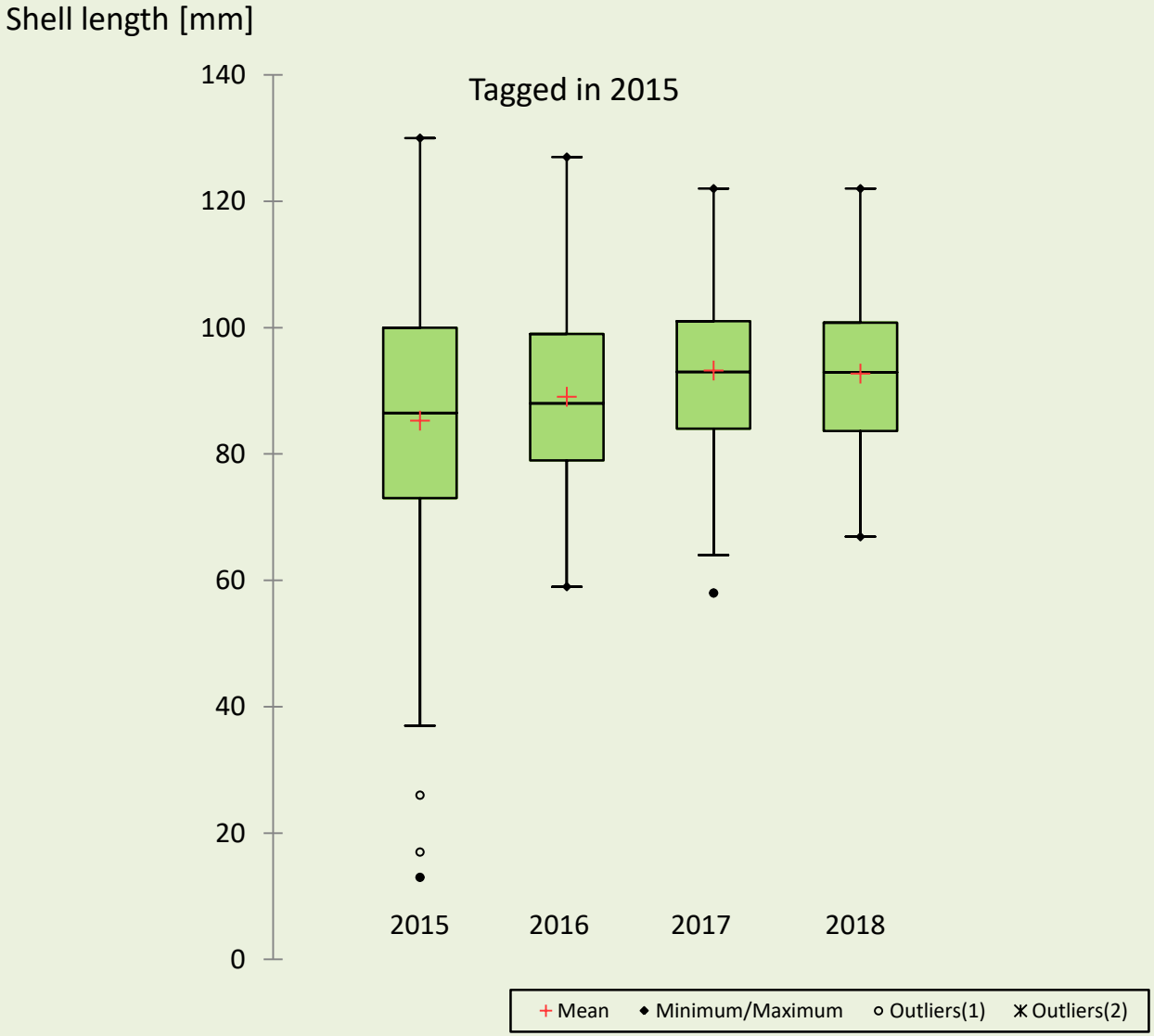
# Movement of individual mussels



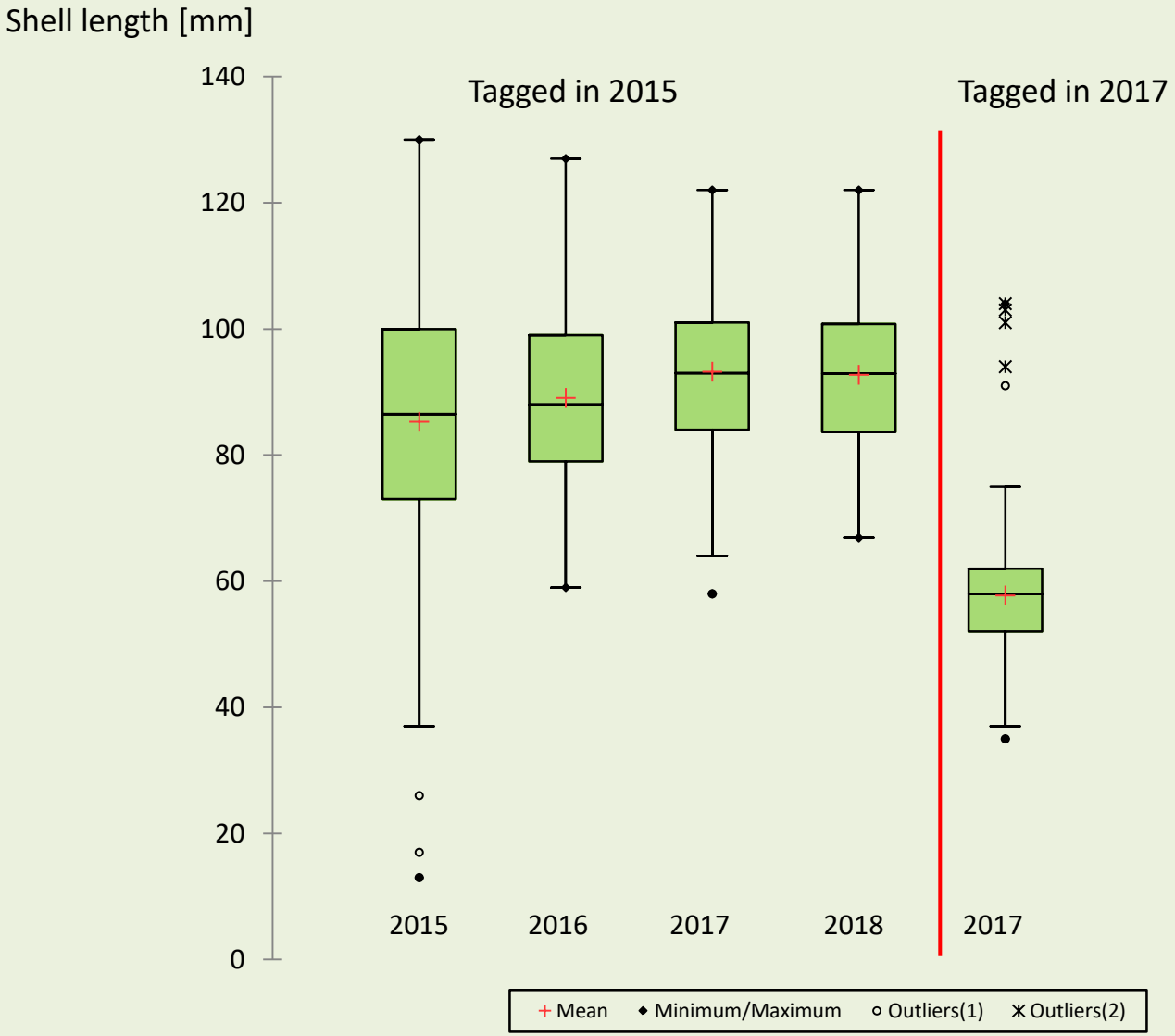

2015

# Age – length relationship
## *Anodonta anatina*



# Age estimation

## *Anodonta anatina*

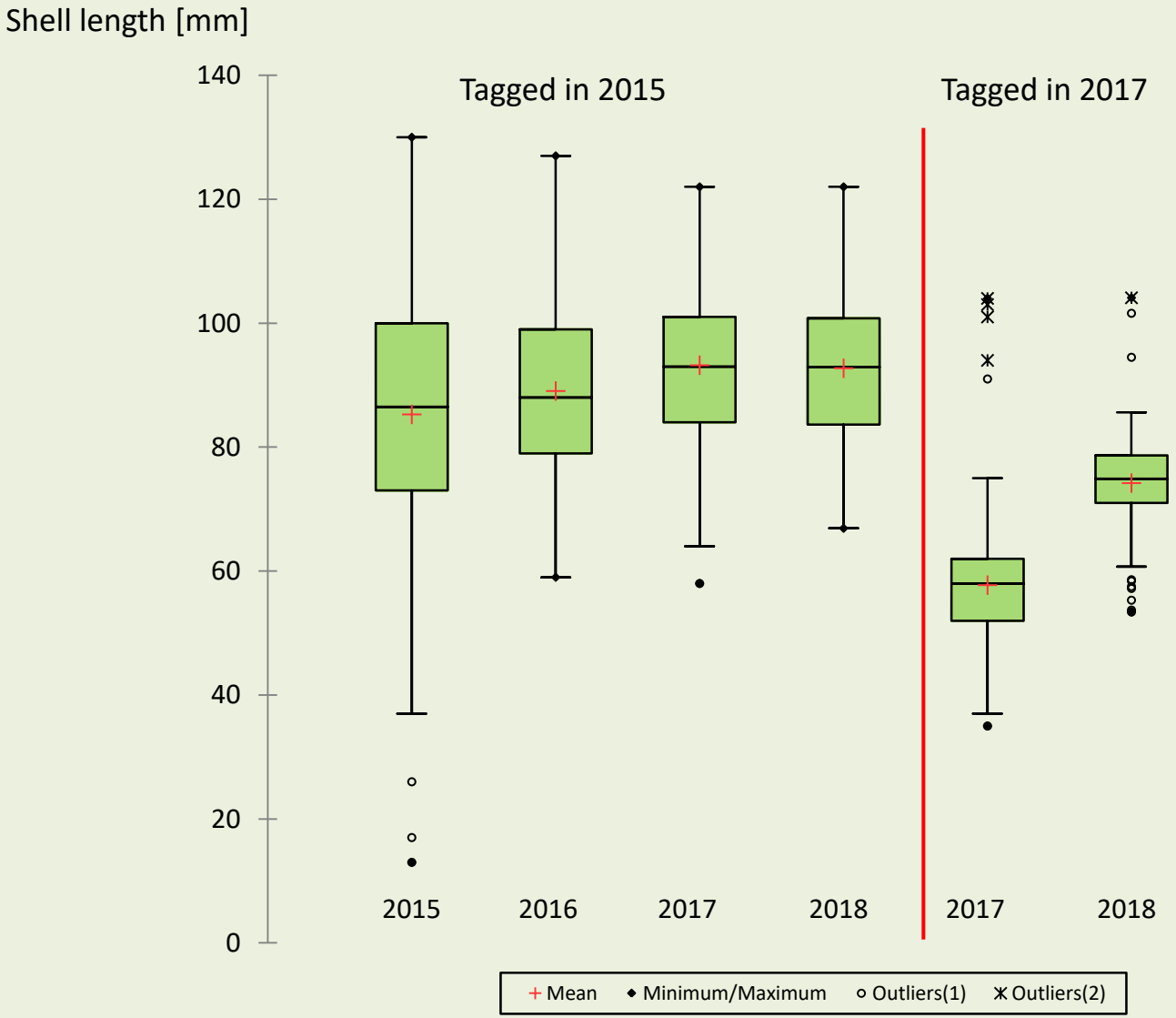



2017


2017
D071
D064
D066
D061
D069
D067
D062
D065
D068
Helios
155.14
MODE
SET
IP 65

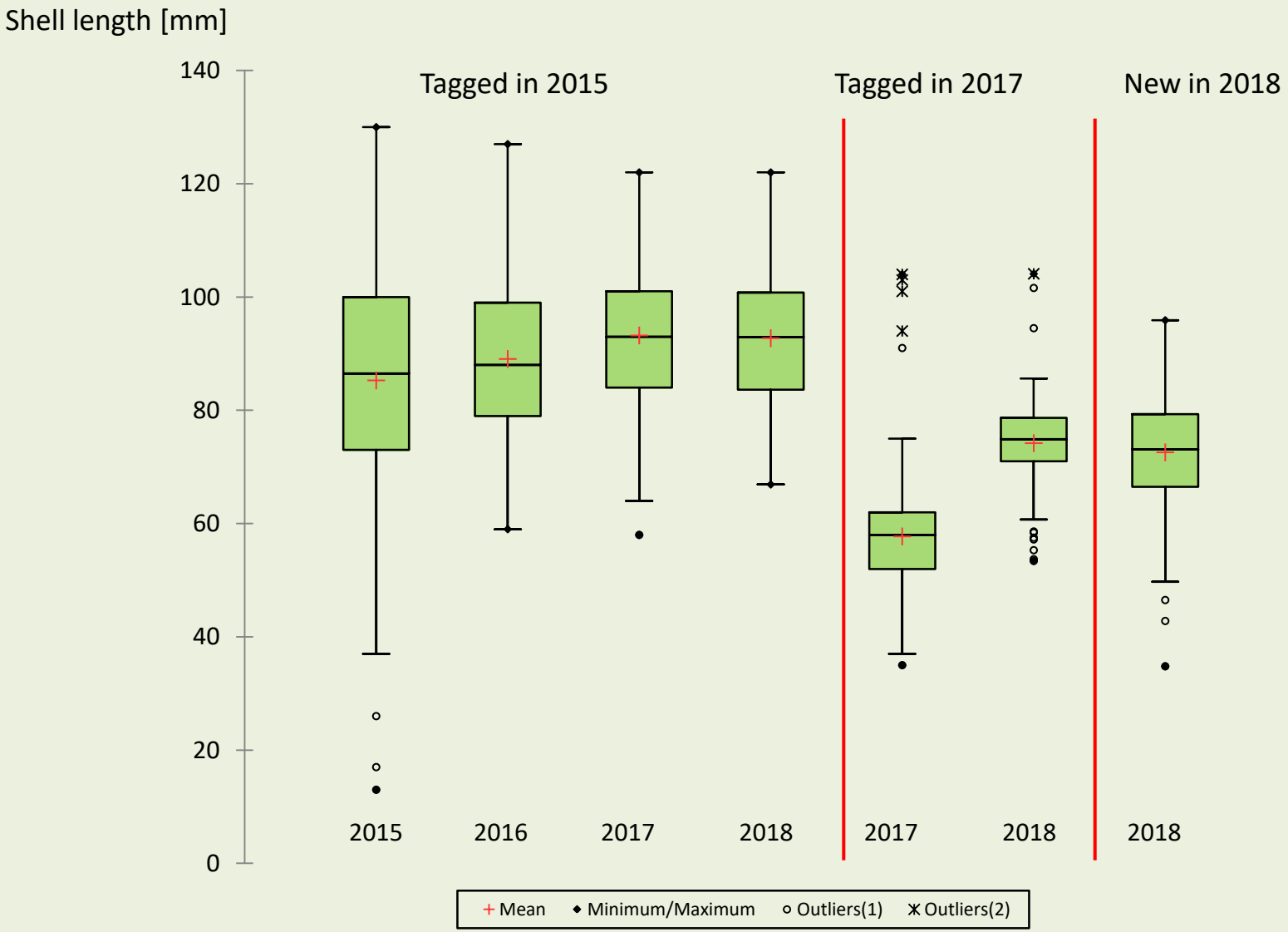
# Age estimation

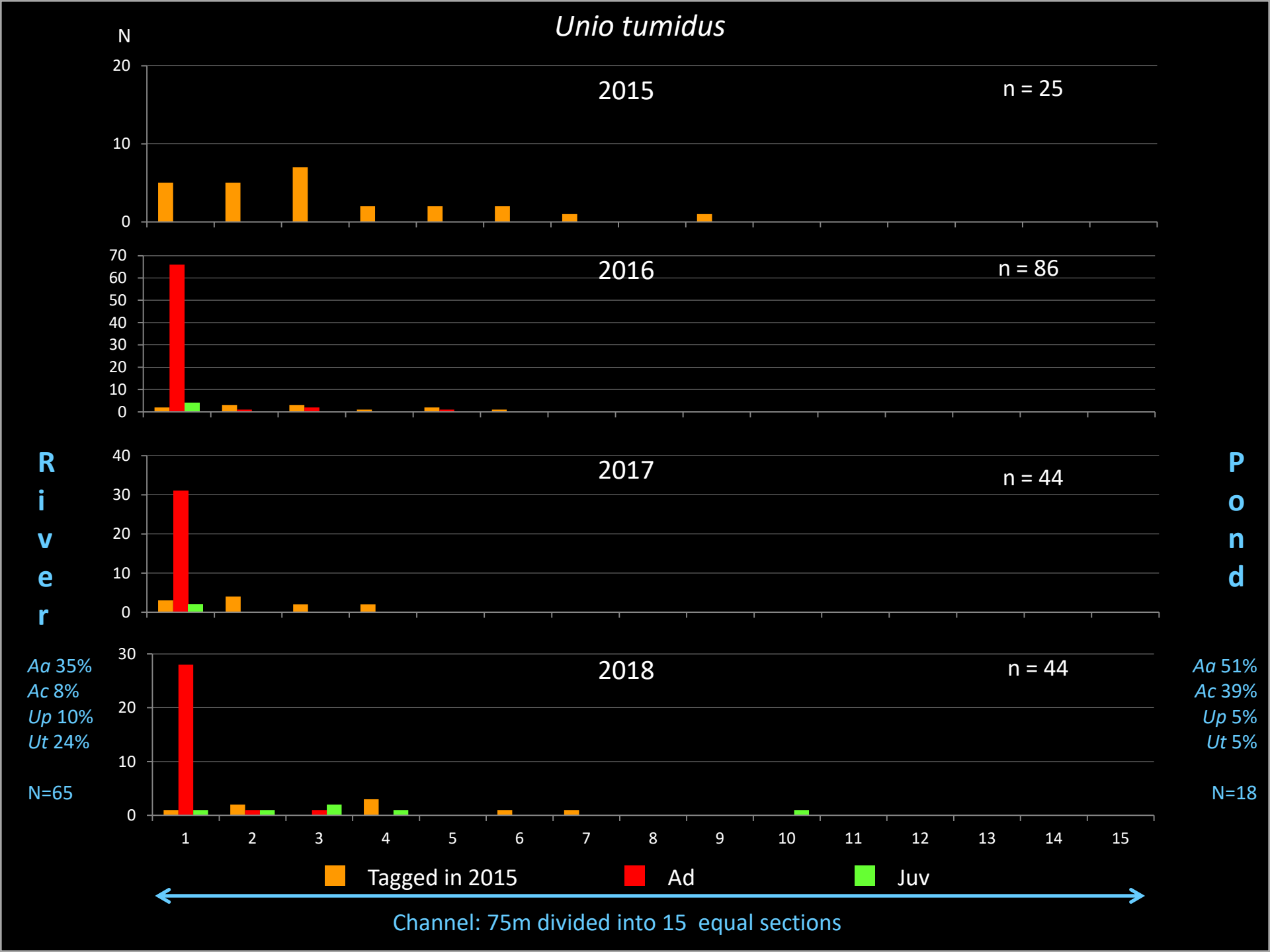
## *Anodonta anatina*

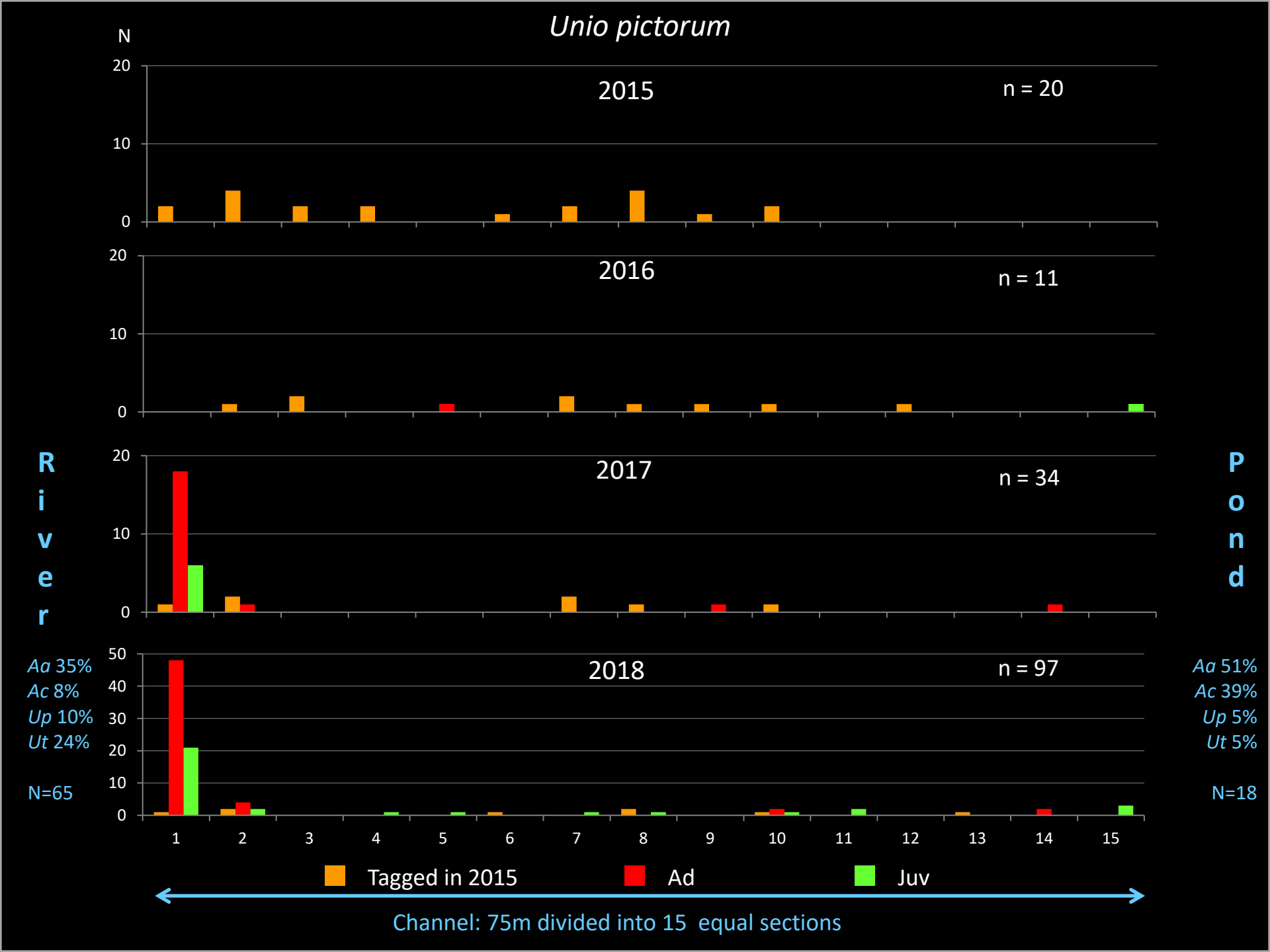


# Age estimation

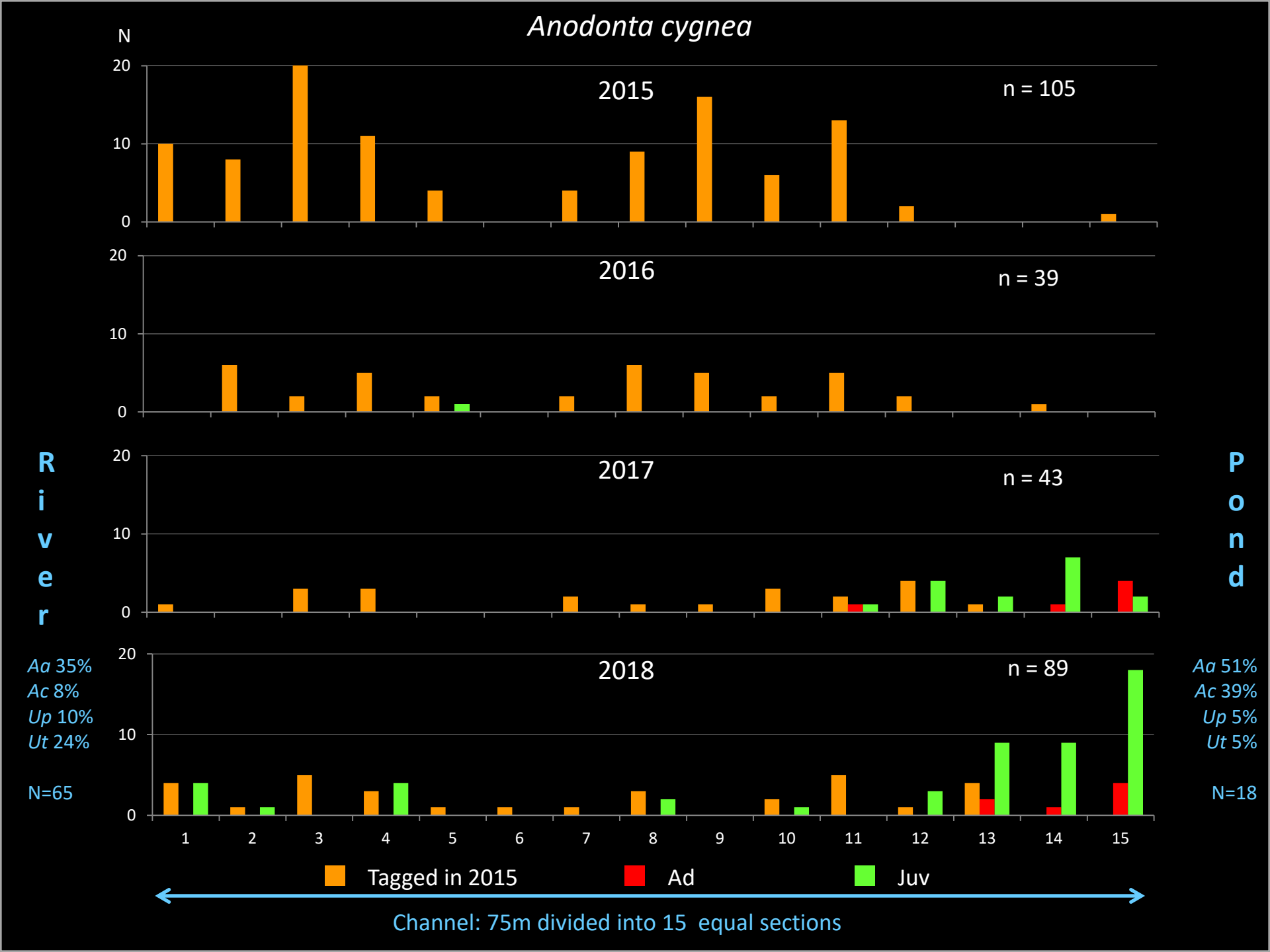
## *Anodonta anatina*

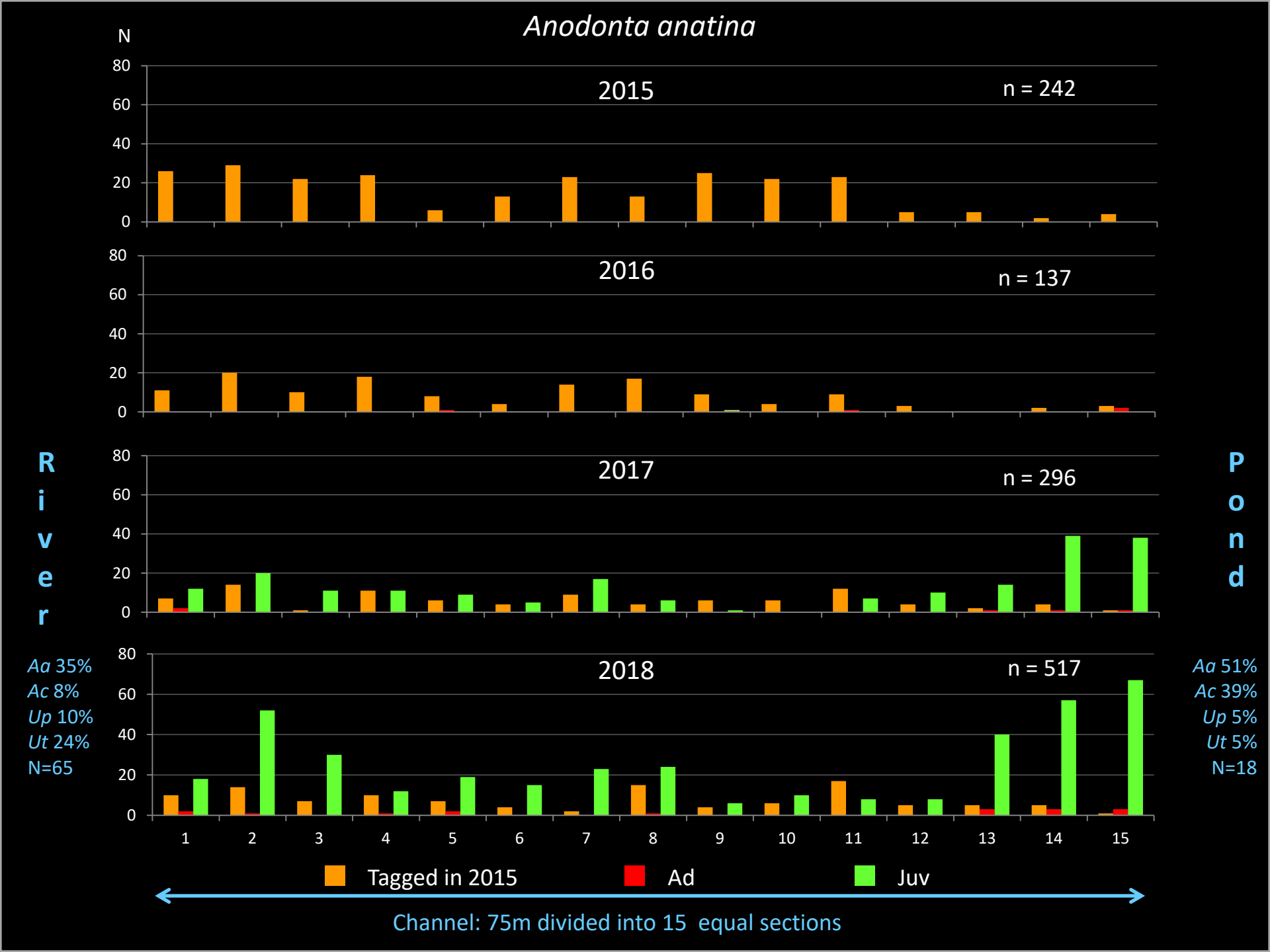


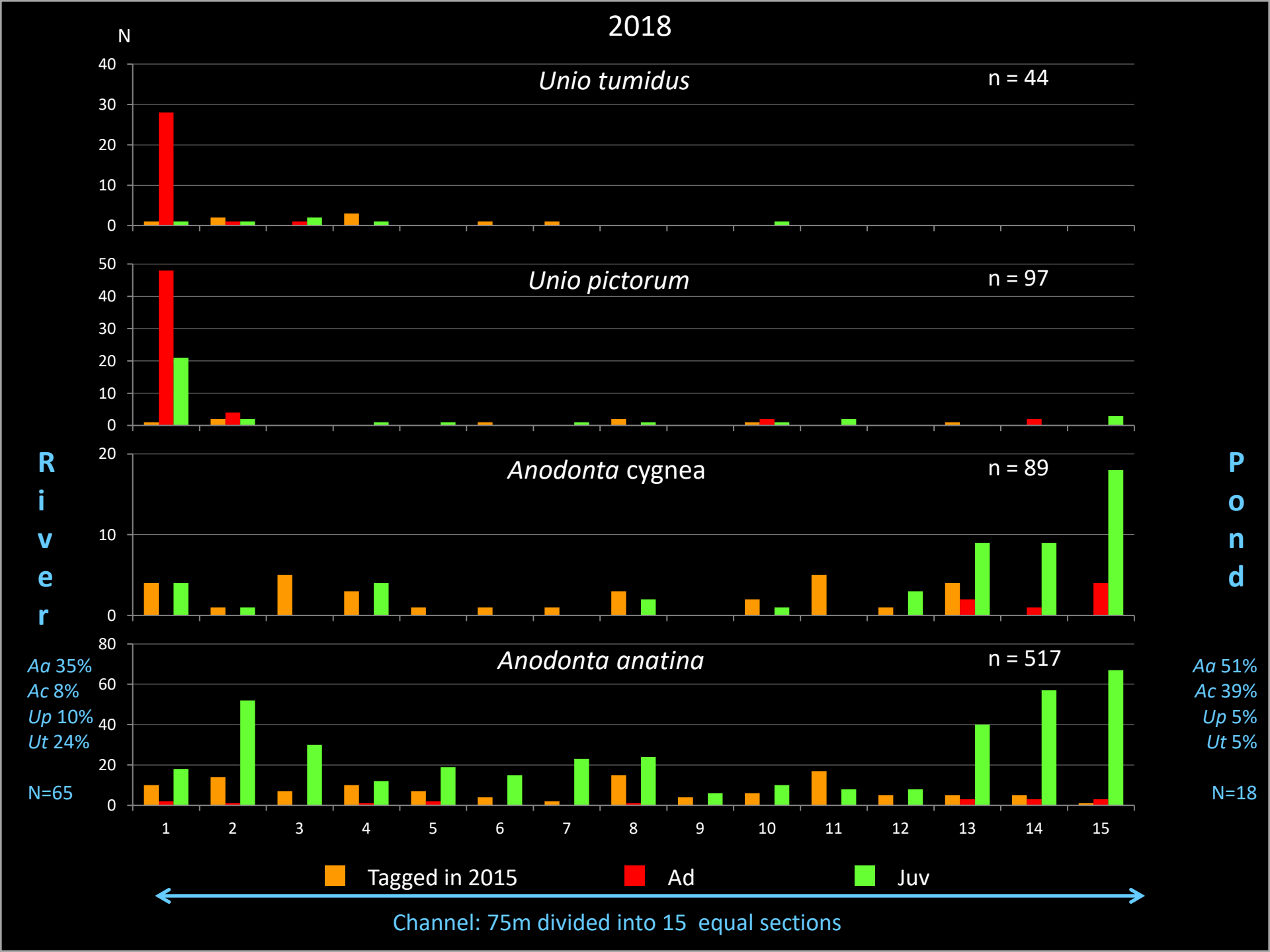

Unio tumidus
N
2015
n = 25
2016
n = 86
2017
n = 44
2018
n = 44
River
Pond
Aa 35%
Ac 8%
Up 10%
Ut 24%
N=65
Aa 51%
Ac 39%
Up 5%
Ut 5%
N=18
Tagged in 2015
Ad
Juv
Channel: 75m divided into 15 equal sections


Unio pictorum
N
2015
n = 20
2016
n = 11
2017
n = 34
2018
n = 97
River
Pond
Aa 35%
Ac 8%
Up 10%
Ut 24%
N=65
Aa 51%
Ac 39%
Up 5%
Ut 5%
N=18
Tagged in 2015
Ad
Juv
Channel: 75m divided into 15 equal sections


3
4
5
6
in
70
80
90
100
110
120
130
140
150
mm


Anodonta cygnea
N
2015
n = 105
2016
n = 39
2017
n = 43
2018
n = 89
River
Pond
Aa 35%
Ac 8%
Up 10%
Ut 24%
N=65
Aa 51%
Ac 39%
Up 5%
Ut 5%
N=18
Tagged in 2015
Ad
Juv
Channel: 75m divided into 15 equal sections


Anodonta anatina
N
2015
n = 242
2016
n = 137
2017
n = 296
2018
n = 517
River
Pond
Aa 35%
Ac 8%
Up 10%
Ut 24%
N=65
Aa 51%
Ac 39%
Up 5%
Ut 5%
N=18
Tagged in 2015
Ad
Juv
Channel: 75m divided into 15 equal sections


2018
N
Unio tumidus
n = 44
Unio pictorum
n = 97
Anodonta cygnea
n = 89
Anodonta anatina
n = 517
River
Pond
Aa 35%
Ac 8%
Up 10%
Ut 24%
N=65
Aa 51%
Ac 39%
Up 5%
Ut 5%
N=18
Tagged in 2015
Ad
Juv
Channel: 75m divided into 15 equal sections

# Thank you




**Photos: the authors**