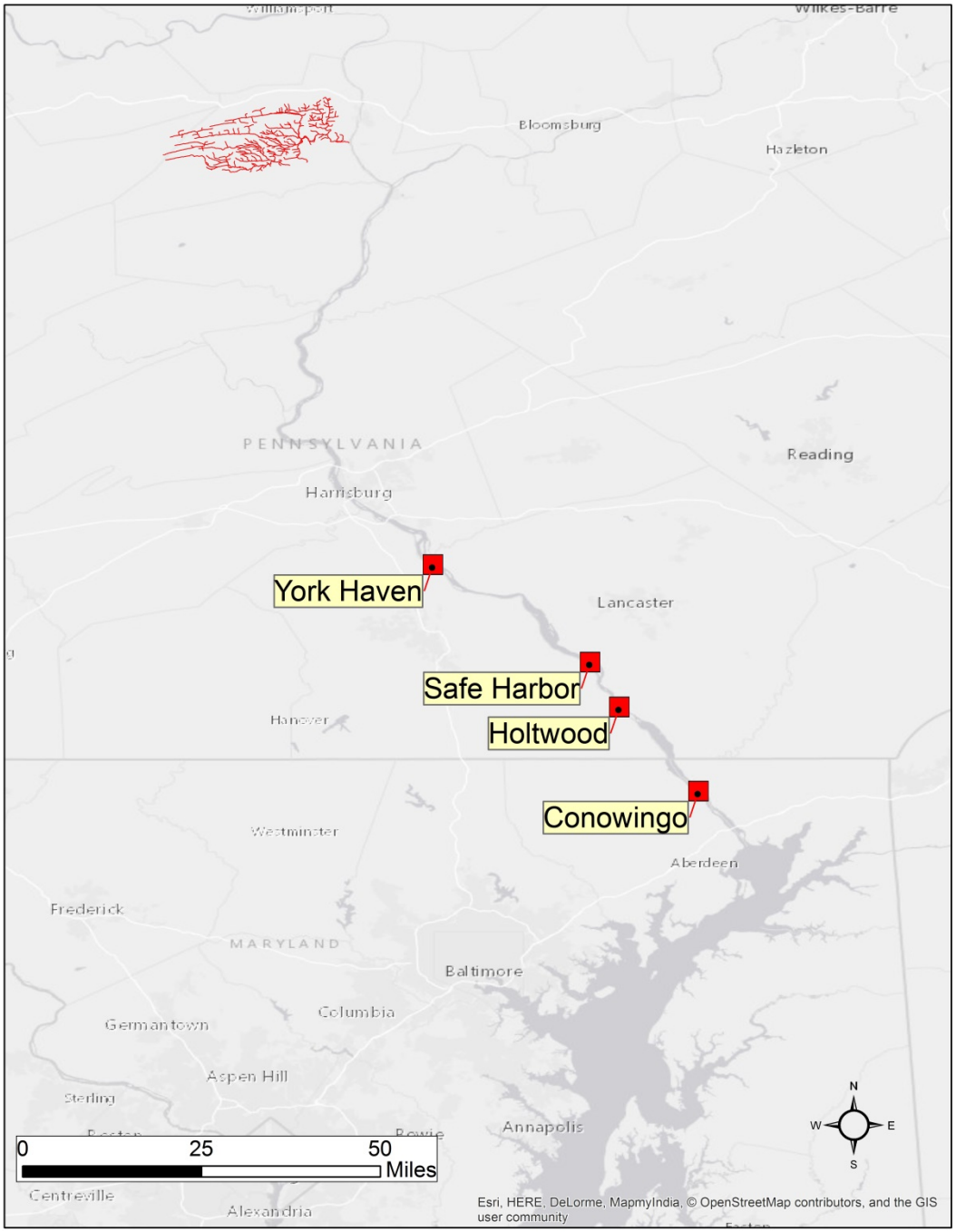
Sexual differentiation and growth of reintroduced American eels in the Susquehanna River watershed

Josh Newhard and Julie Devers
Maryland Fish & Wildlife Conservation Office
Annapolis, MD
joshua_newhard@fws.gov

Background

- Major dam construction in lower Susquehanna watershed in early 20th century
- Largely precluded eels from the watershed until large scale stocking efforts in 2008


Williamsport
Wilkes-Barre
Bloomsburg
Hazleton
PENNSYLVANIA
Reading
Harrisburg
York Haven
Lancaster
Safe Harbor
Hanover
Holtwood
Conowingo
Westminster
Aberdeen
Frederick
MARYLAND
Baltimore
Columbia
Germantown
Aspen Hill
Sterling
Annapolis
Centreville
Alexandria
0
25
50
Miles
N
W
E
S
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

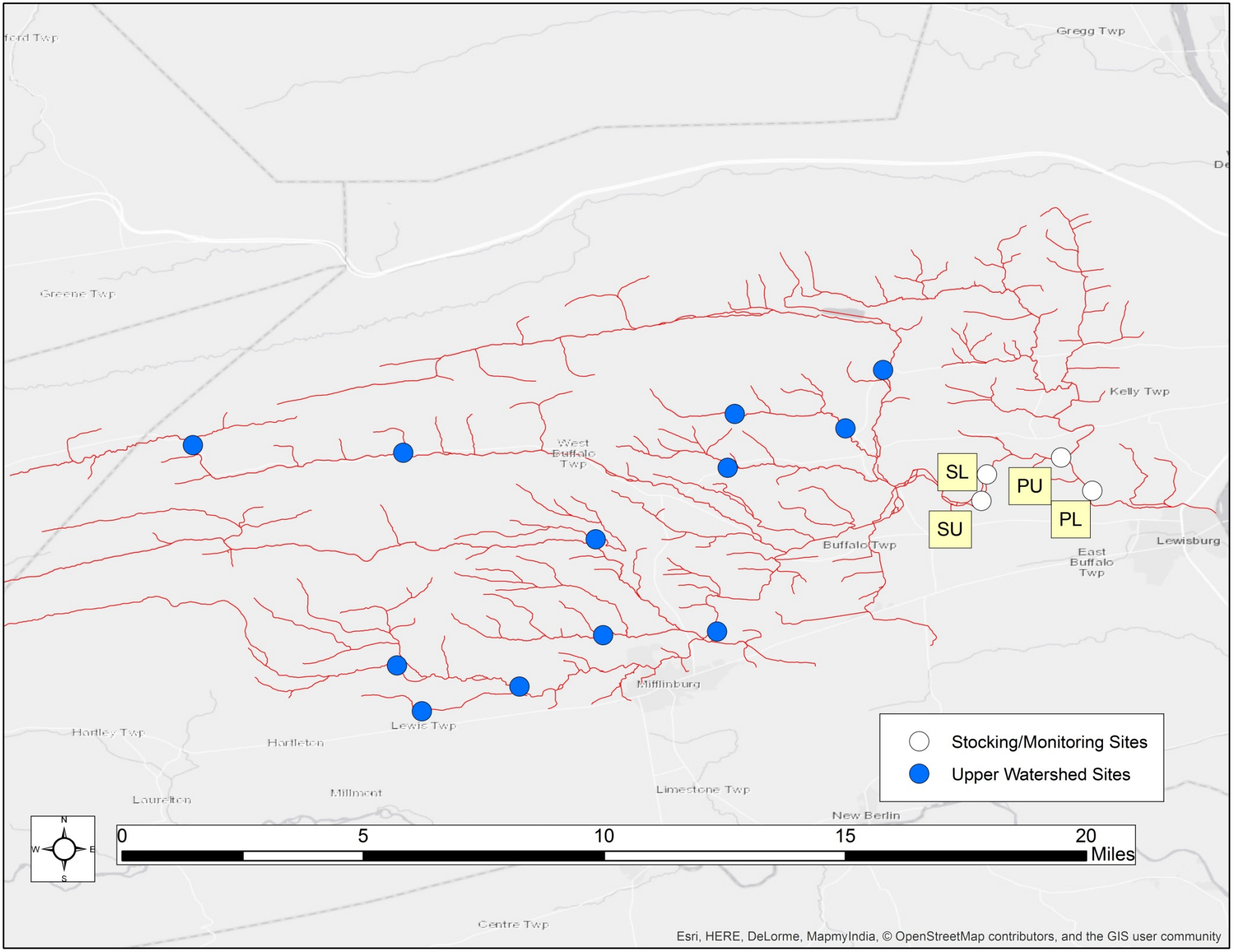
Buffalo Creek Elver Stocking

- Experimental stocking on known Eastern elliptio mussel beds to see if eels would increase recruitment of mussels
- Buffalo Creek stocked 2010-2013 with 118,642 elvers

Buffalo Creek Study

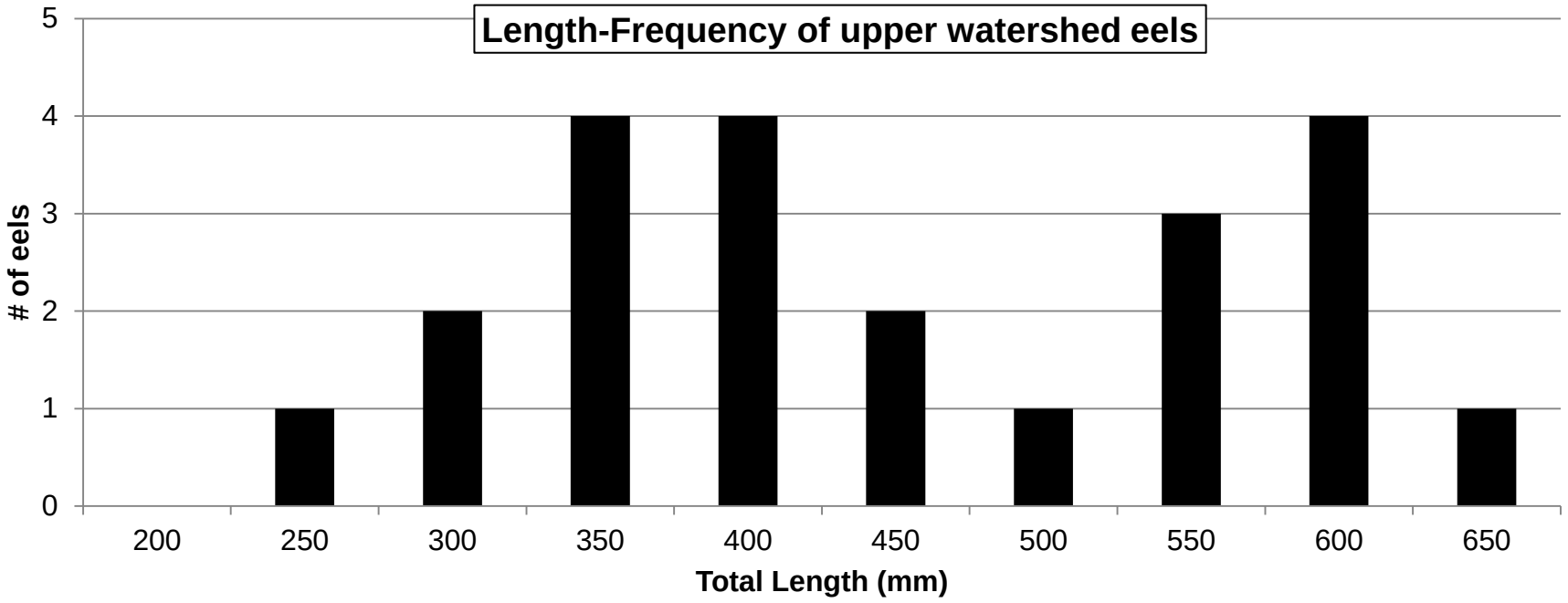
- PIT tagged eels >200 mm to monitor growth over time
- Sampled two sites within creek with backpack electrofishers from 2012-present
- In 2017, sampled 12 upper Buffalo Creek sites for eel presence and PIT tagged eels >200 mm
  - Electrofished for 20 min per site for upper watershed



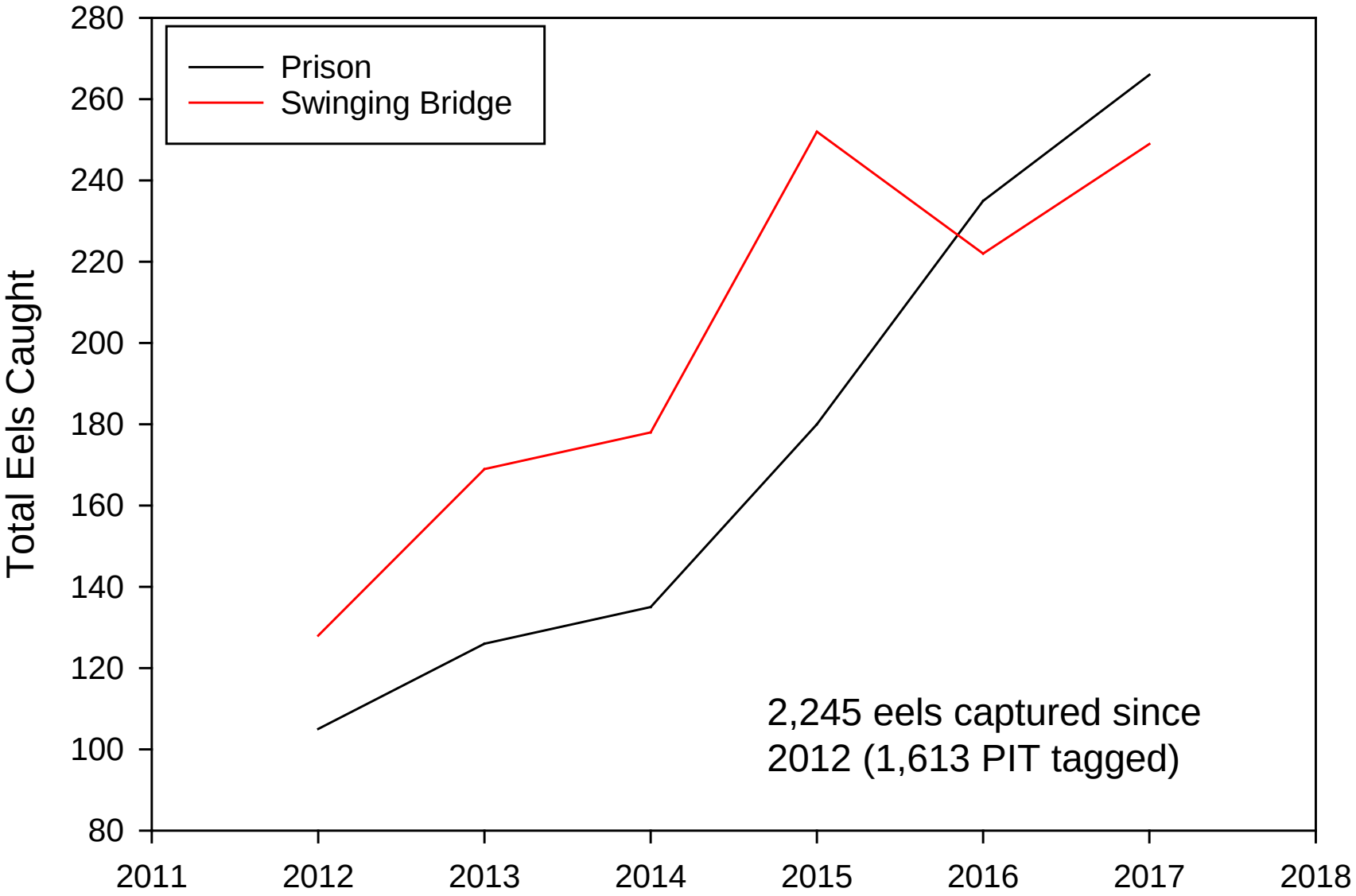

Gregg Twp
Greene Twp
Kelly Twp
West Buffalo Twp
Buffalo Twp
East Buffalo Twp
Lewisburg
Mifflinburg
Lewis Twp
Hartley Twp
Hartleton
Laurelton
Millmont
Limestone Twp
New Berlin
Centre Twp
SL
PU
PL
SU
Stocking/Monitoring Sites
Upper Watershed Sites
N
W
E
S
0
5
10
15
20
Miles
Esri, HERE, DeLorme, MapmyIndia, © OpenStreetMap contributors, and the GIS user community

Upper watershed eels

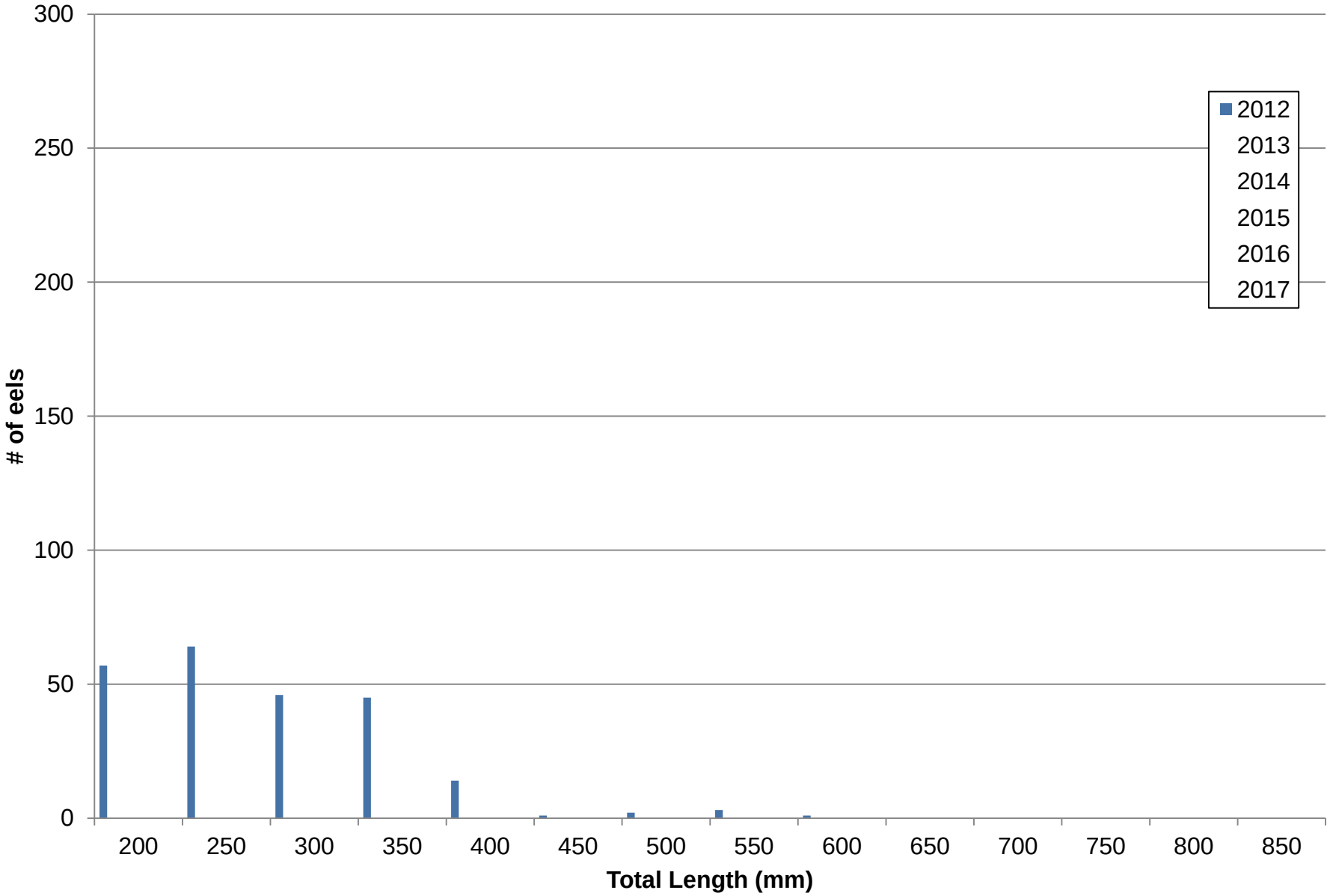
- 22 eels captured at 9 of 12 sites
- Lengths ranged from 232-621 mm
- No eels captured in 1st order stream
- 10 of 22 eels were female (based on external maturity stage and length; TL of females was 436-621)



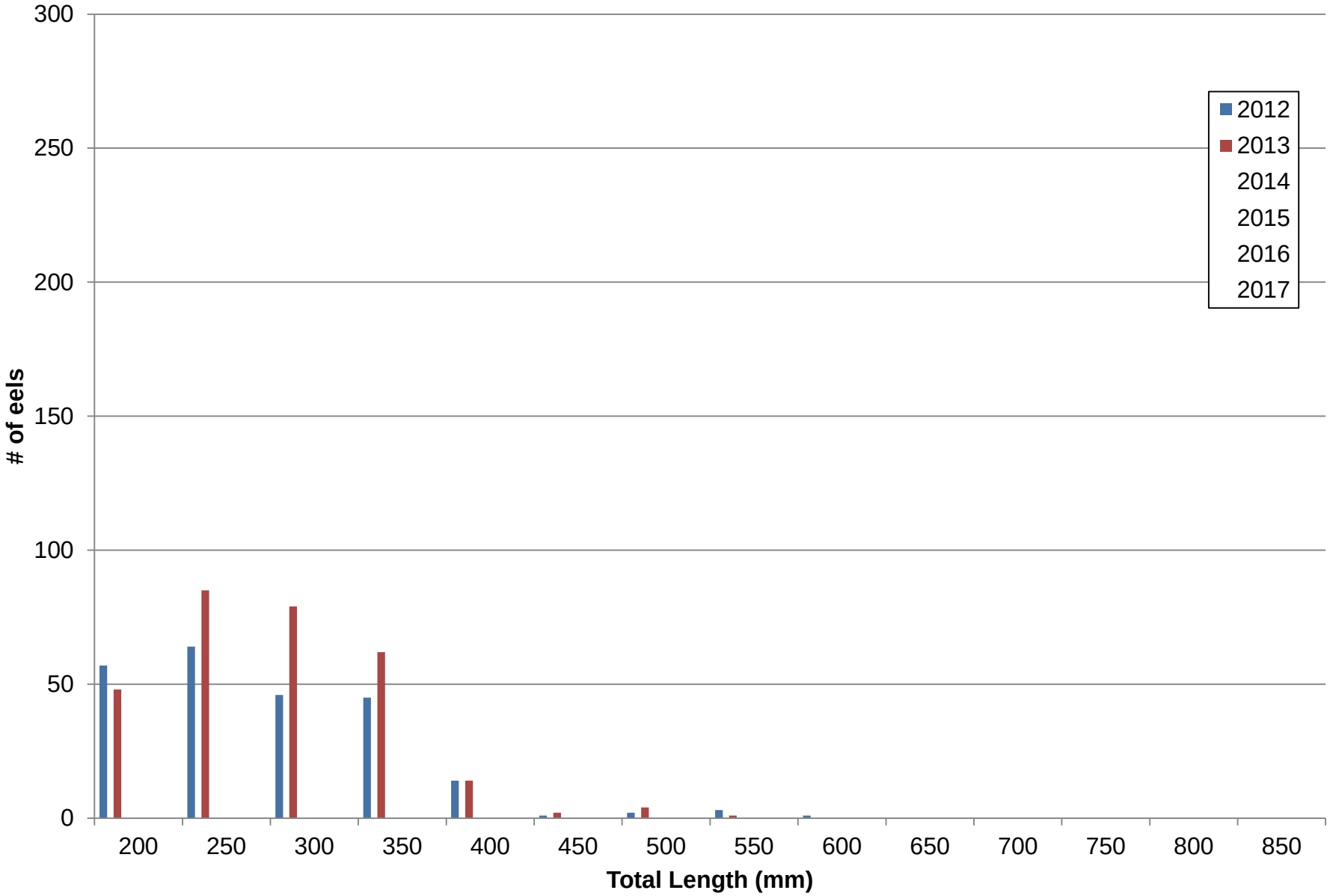
Stocking Site Monitoring



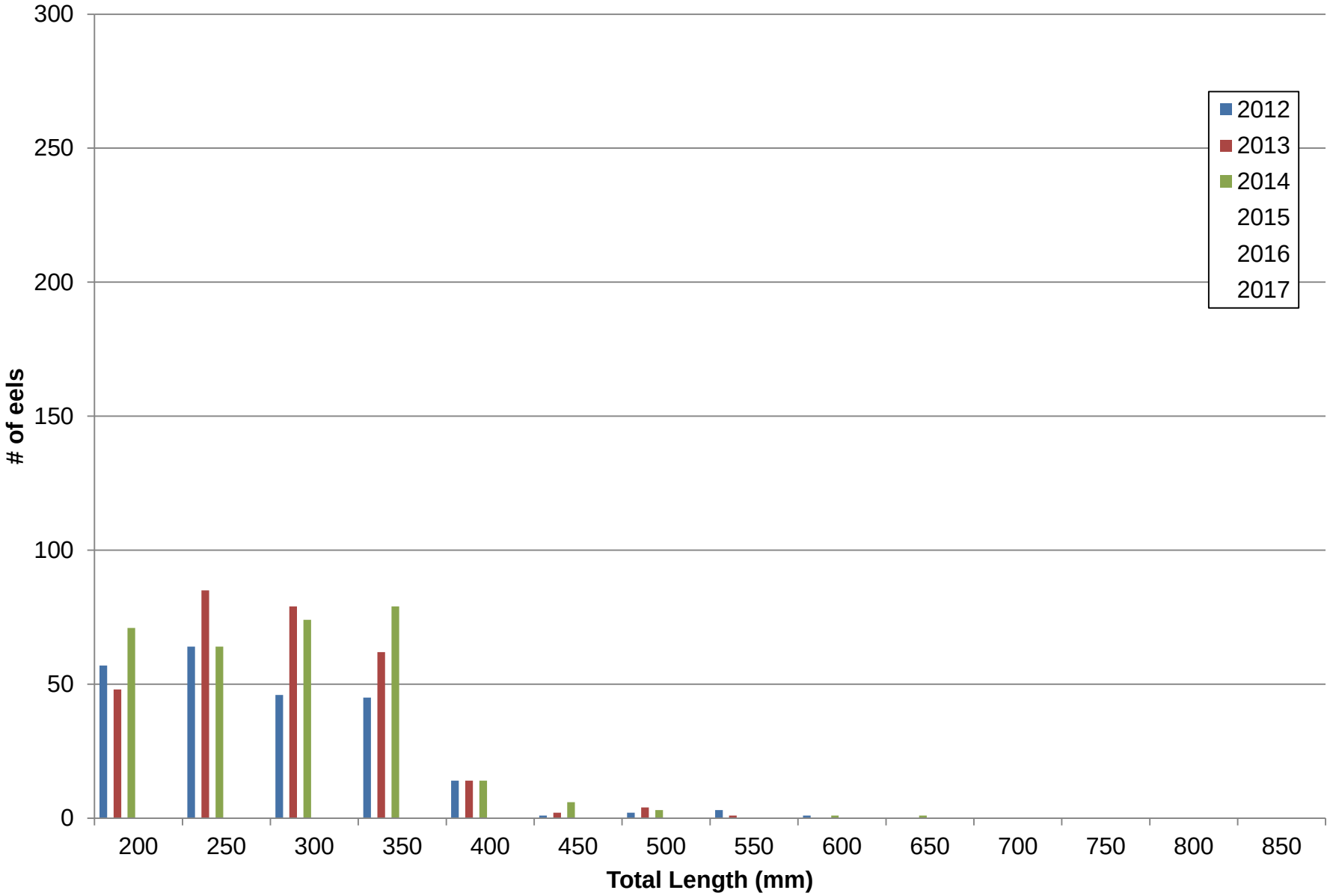
Length-frequency of all eels



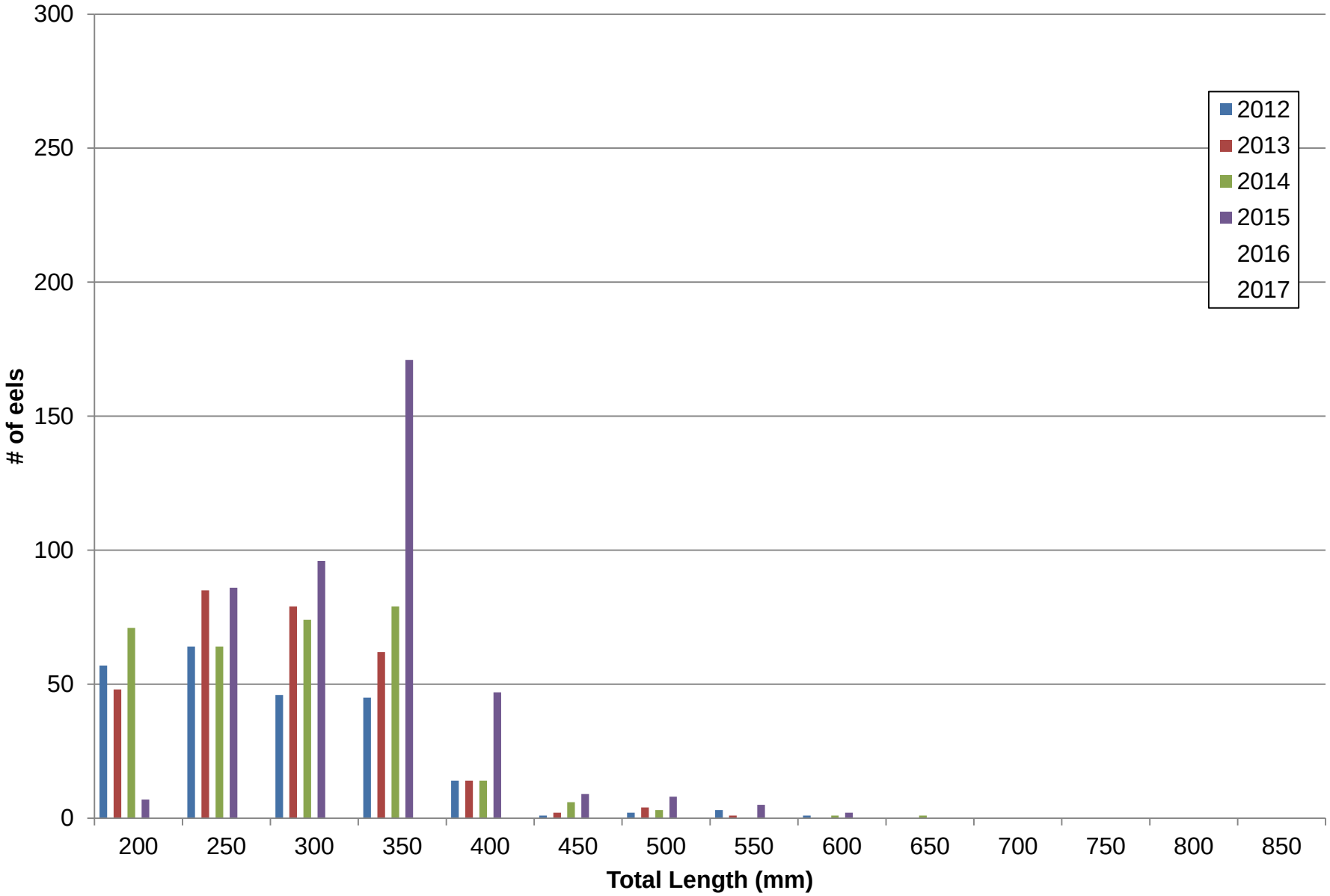
Length-frequency of all eels



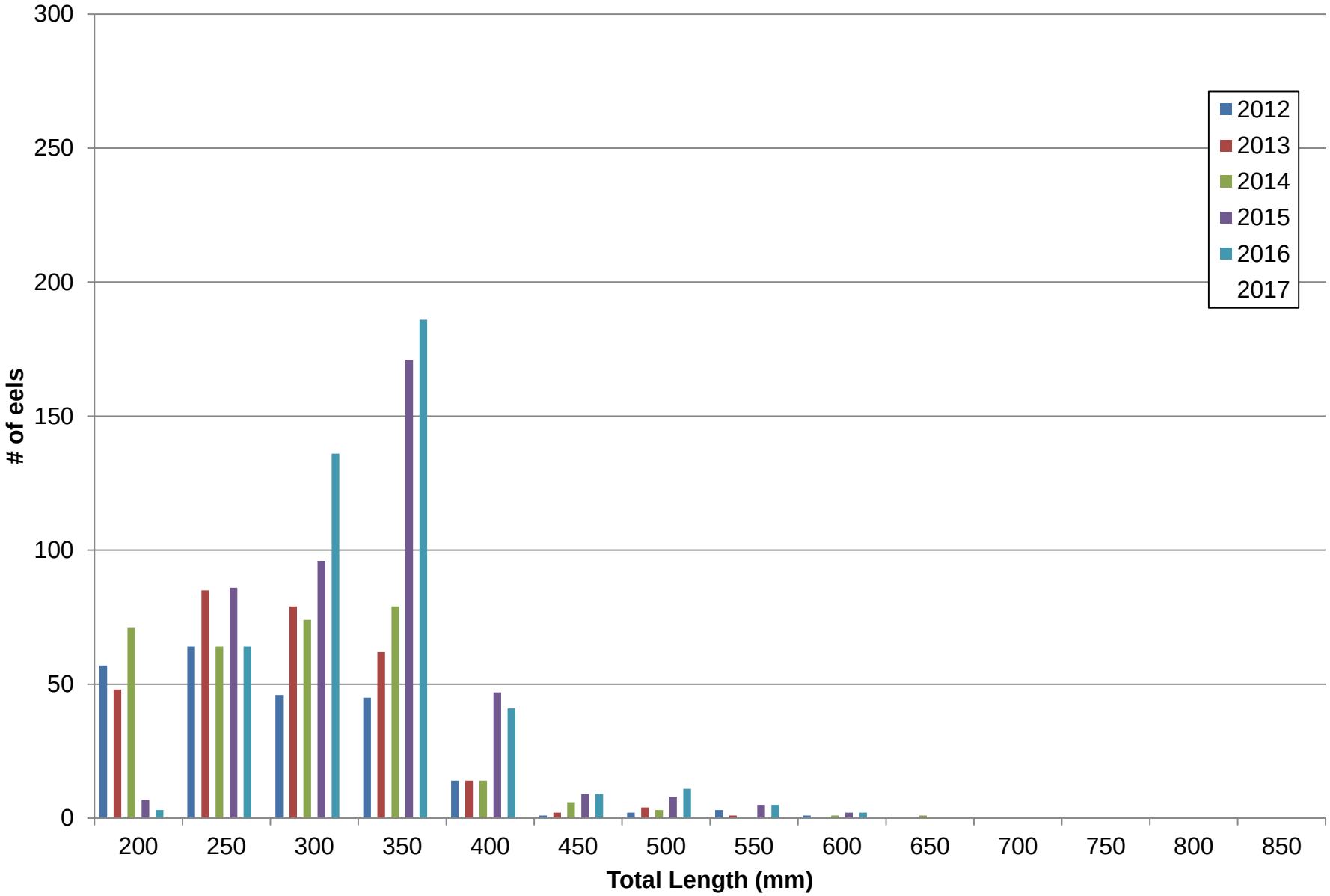
Length-frequency of all eels



Length-frequency of all eels

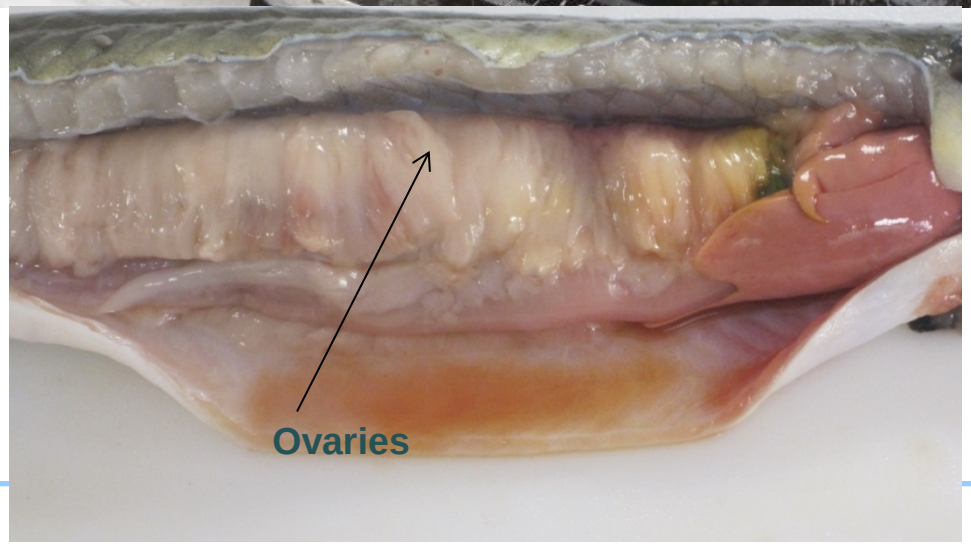


Length-frequency of all eels



Length-frequency of all eels

Sexual Differentiation-Females



Male/Female or Silver & Yellow Male

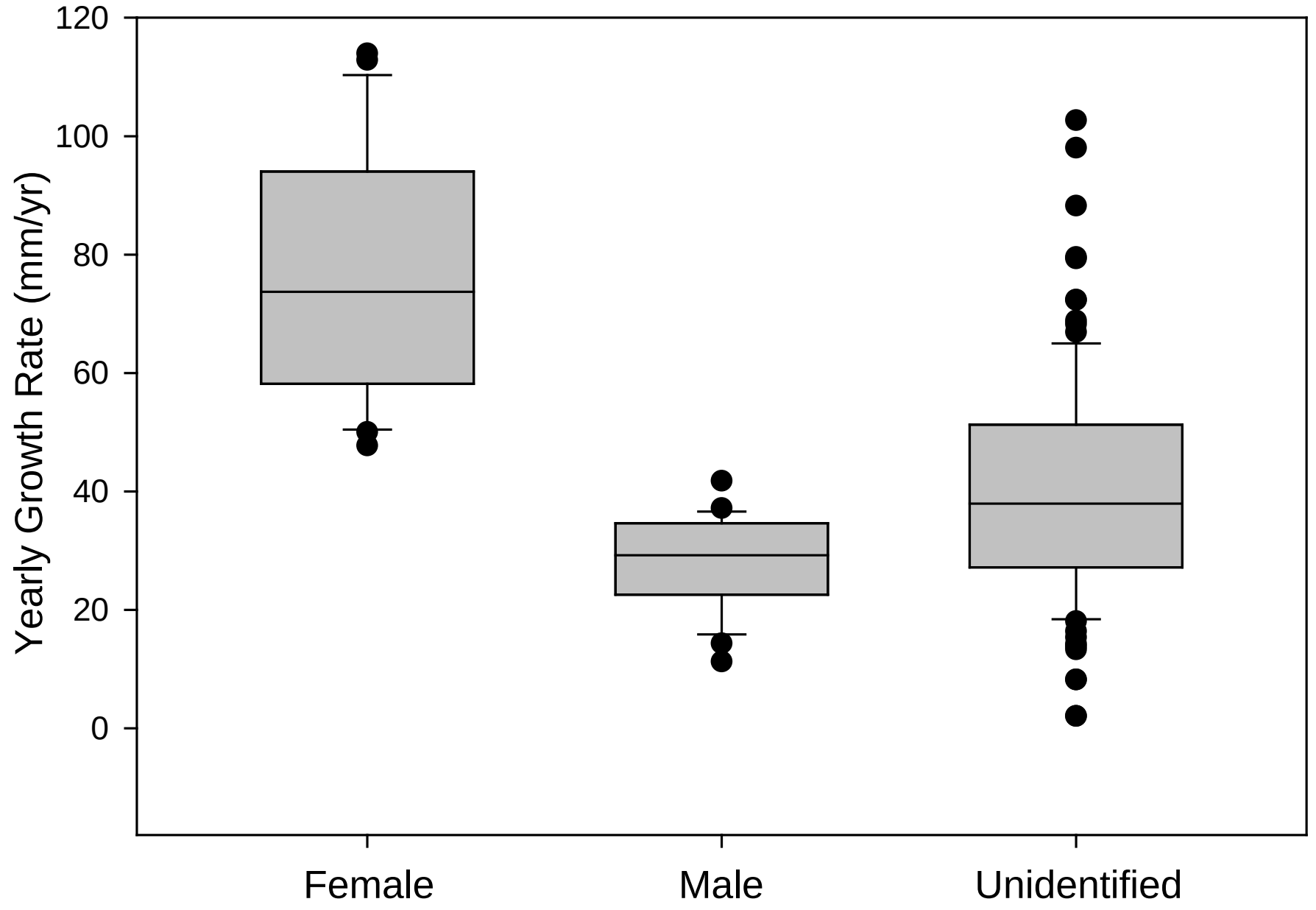

www.fishtrough.com

Tagging and Growth

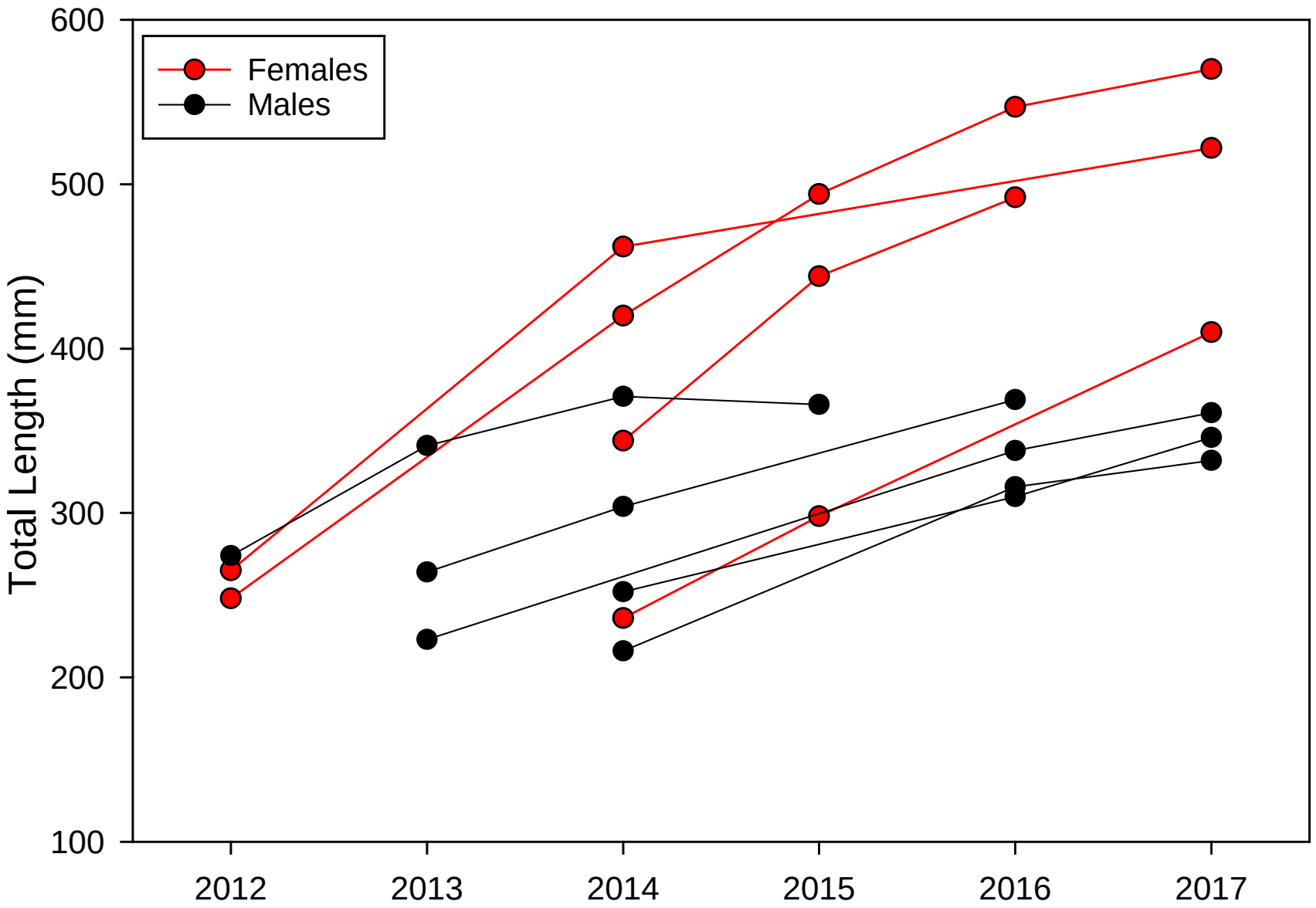
- 1,613 eels tagged since 2012
  - 150 individuals recaptured
  - 11 of those 3x, 2 of them 4x, and 1 5x

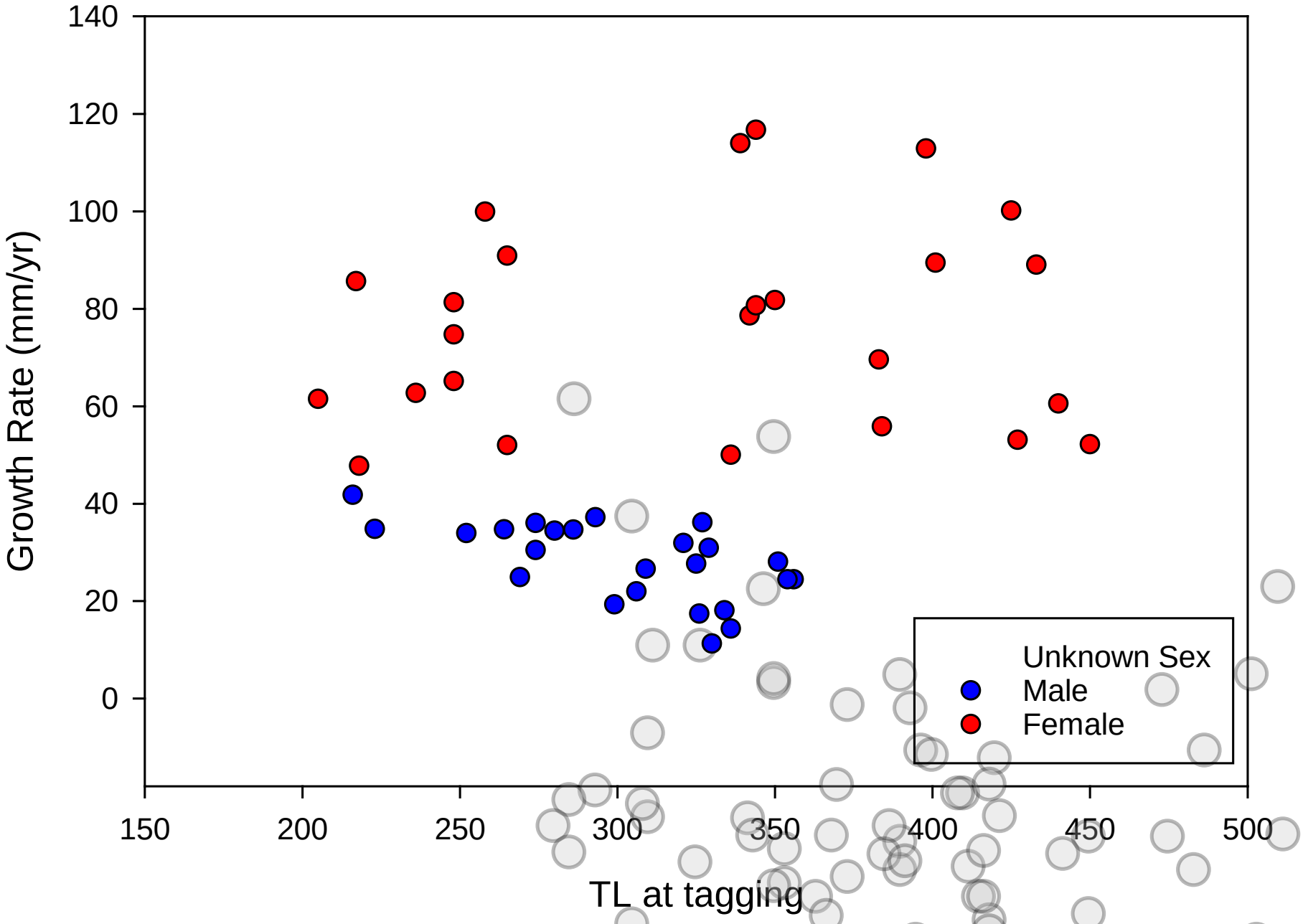
Male vs female growth rates

Sex	N	GR Avg (mm/yr; ±SD)	GR Min	GR Max
M	24	28.1 (±7.8)	11.3	41.8
F	25	77.0 (±20.7)	47.7	116.7
Unidentified	112	40.6 (±19.2)	2.1	102.7


120
100
80
60
40
20
0
Yearly Growth Rate (mm/yr)
Female
Male
Unidentified

Male vs Female lengths over time




Growth Rate (mm/yr)
140
120
100
80
60
40
20
0
150
200
250
300
350
400
450
500
TL at tagging
Unknown Sex
Male
Female

Conclusions/Discussion

- Stocked eels are surviving, growing well, and slowly distributing throughout the Buffalo Creek watershed
- Female growth much higher than males
  - Larger prey base?
  - “New” environment leading to reduced competition?
  - Still relatively early, trend may change in coming years
- Males are entering silver phase earlier

Acknowledgments

- R. Bourdon
- H. Devine
- C. DeVore
- D. Drake
- S. Eyler
- R. Guderian
- J. Malavasi
- M. Mangold
- S. Minkkinen
- I. Park
- D. Savage
- W. Stoker
- Many, many others

- Funding for this project was provided through City of Sunbury, Riverbank Stabilization Project, DA Permit Application Number NAB 20--05-02860-PO5

Questions?