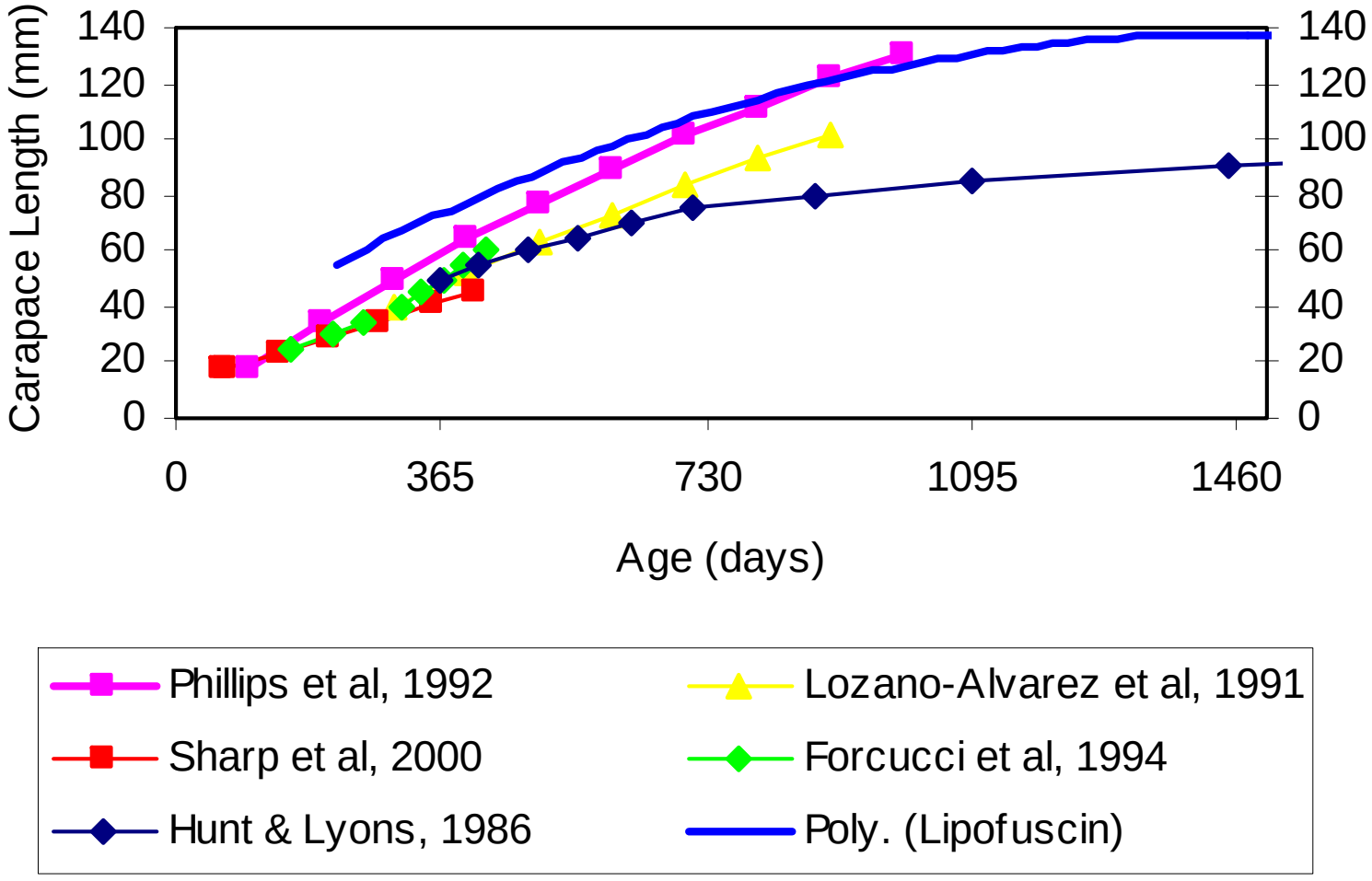
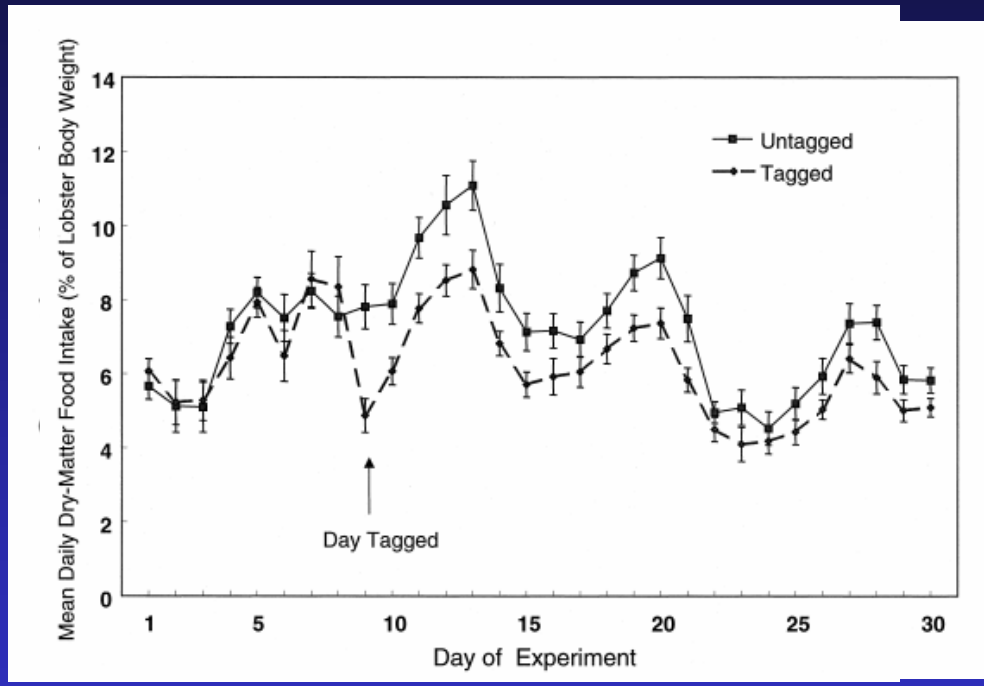
Age and Growth of the Caribbean Spiny Lobster, *Panulirus argus*

Growth Estimates for *P. argus*



Tagging Studies for *P. argus* in Florida – Microwire Tags

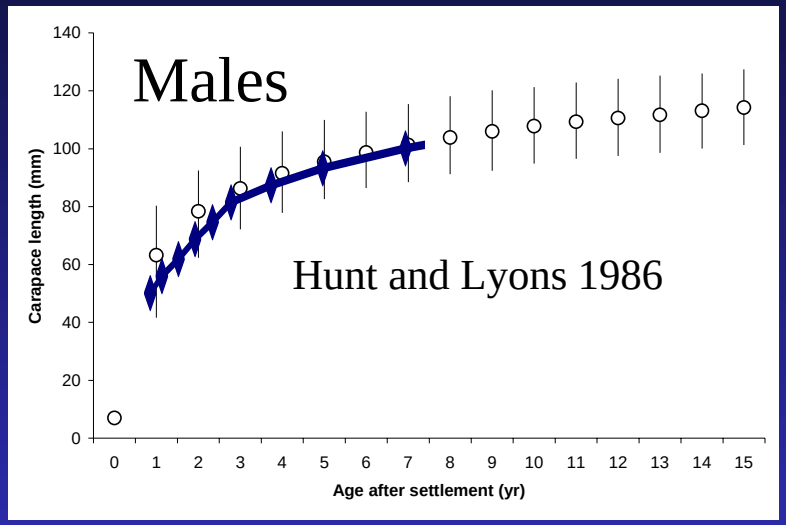
- Sharp et al. 2001, 65 recaptures
- first-stage-tagged juveniles had lower growth rates than untagged lobsters
- 25% post-tagging mortality

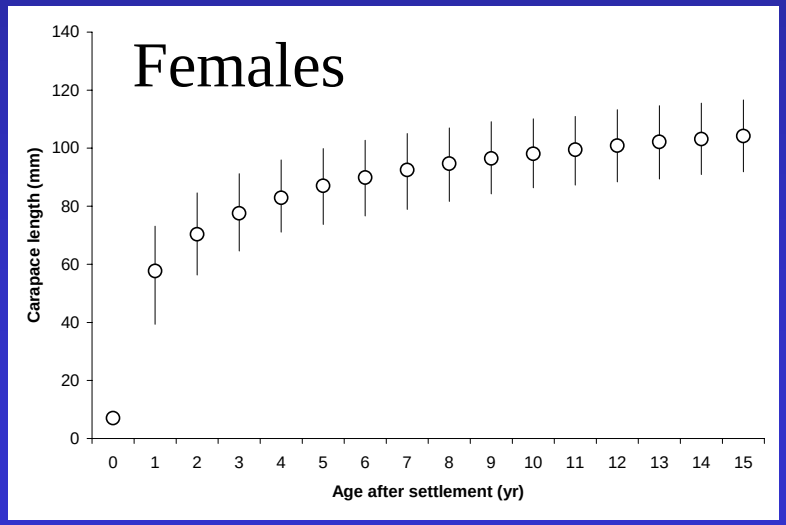


Tagging Studies for *P. argus* in Florida – Spaghetti Tags

- Little (1972) tagged 2415 lobsters, 118 recaptures, 69 with size data
- Warner et al. (1977) and Gregory and Labisky (1986) tagged 6362 lobsters, 2081 recaptures, 3026? with size data
- Lyons et al. (1981) tagged 19,180 lobsters, 3364 recaptures, 3372? with size data
- Cox and Hunt (current) 330 recaptures
- Gregory (current) 47 recaptures

Growth from Tagging Studies

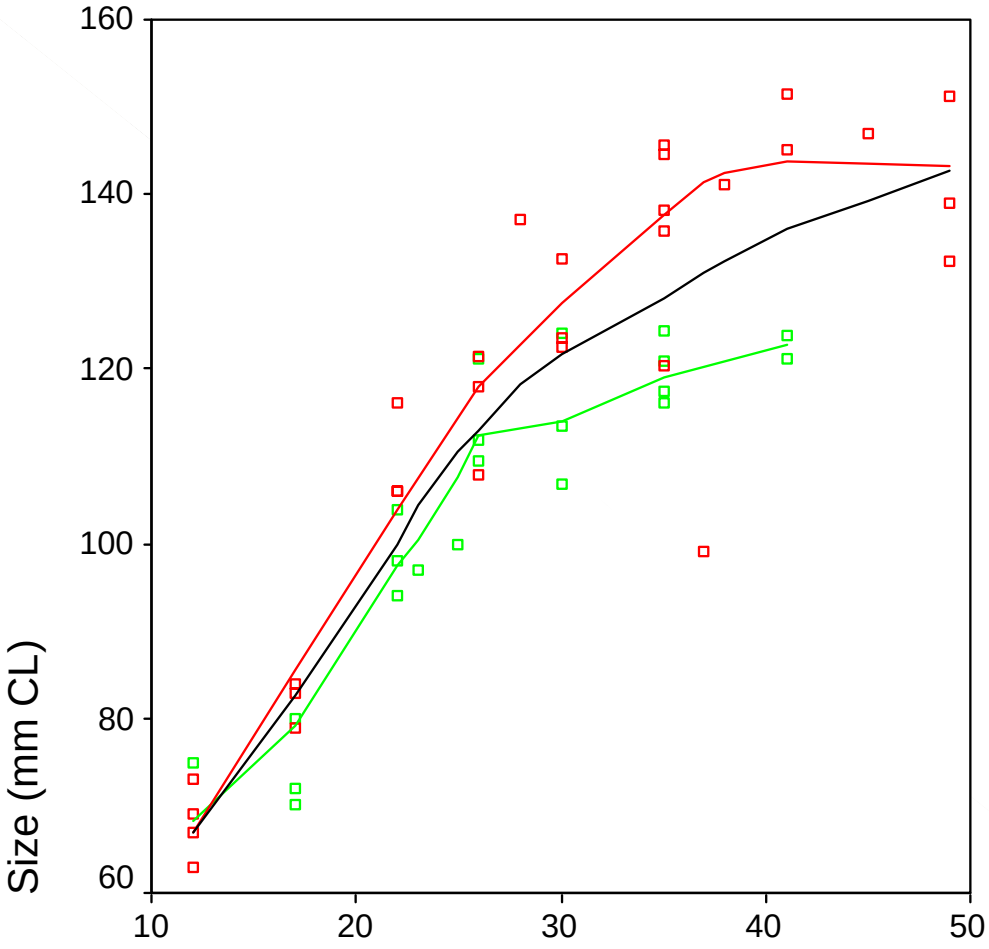




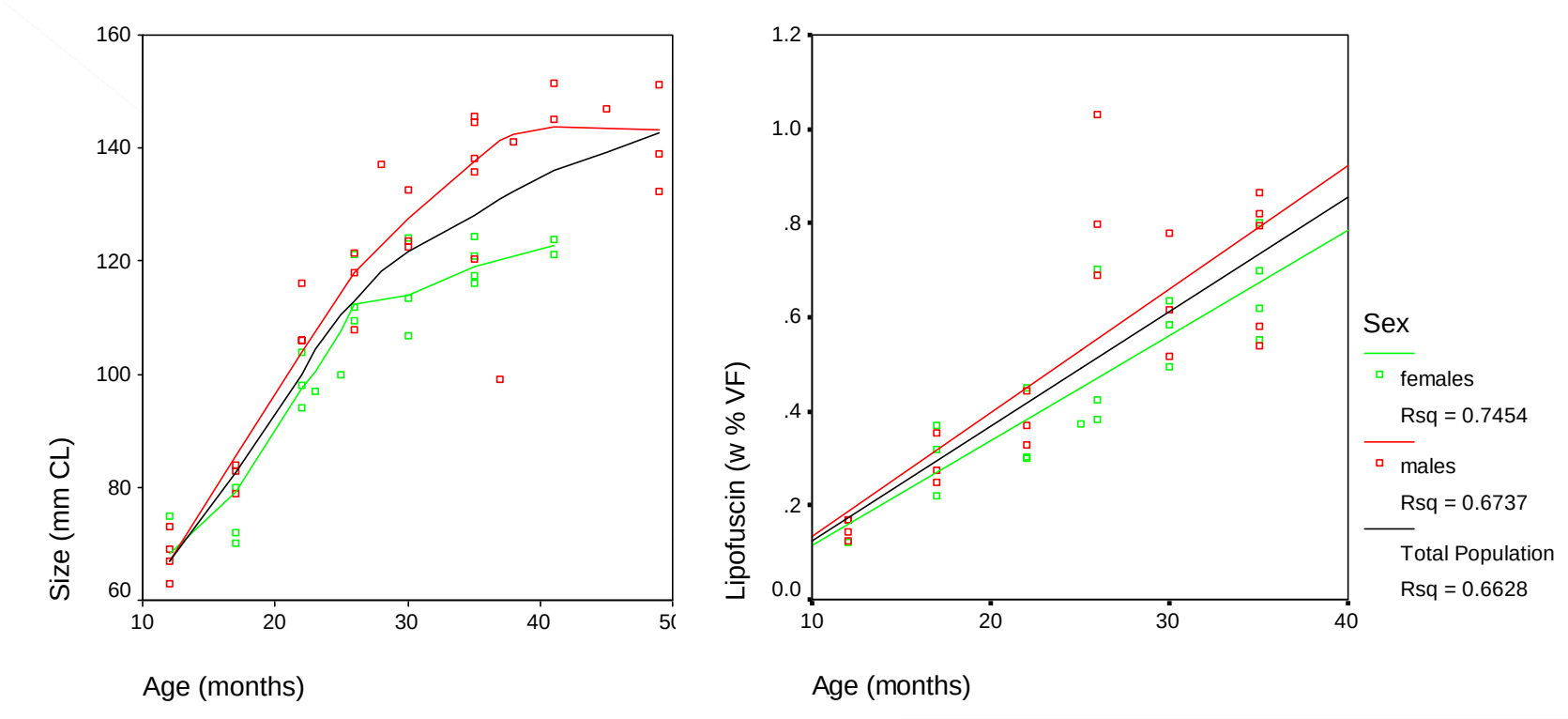
Growth was modeled as two processes:

1) the probability of molting during a 30-day period and,
2) the change in carapace length for those lobsters that molted

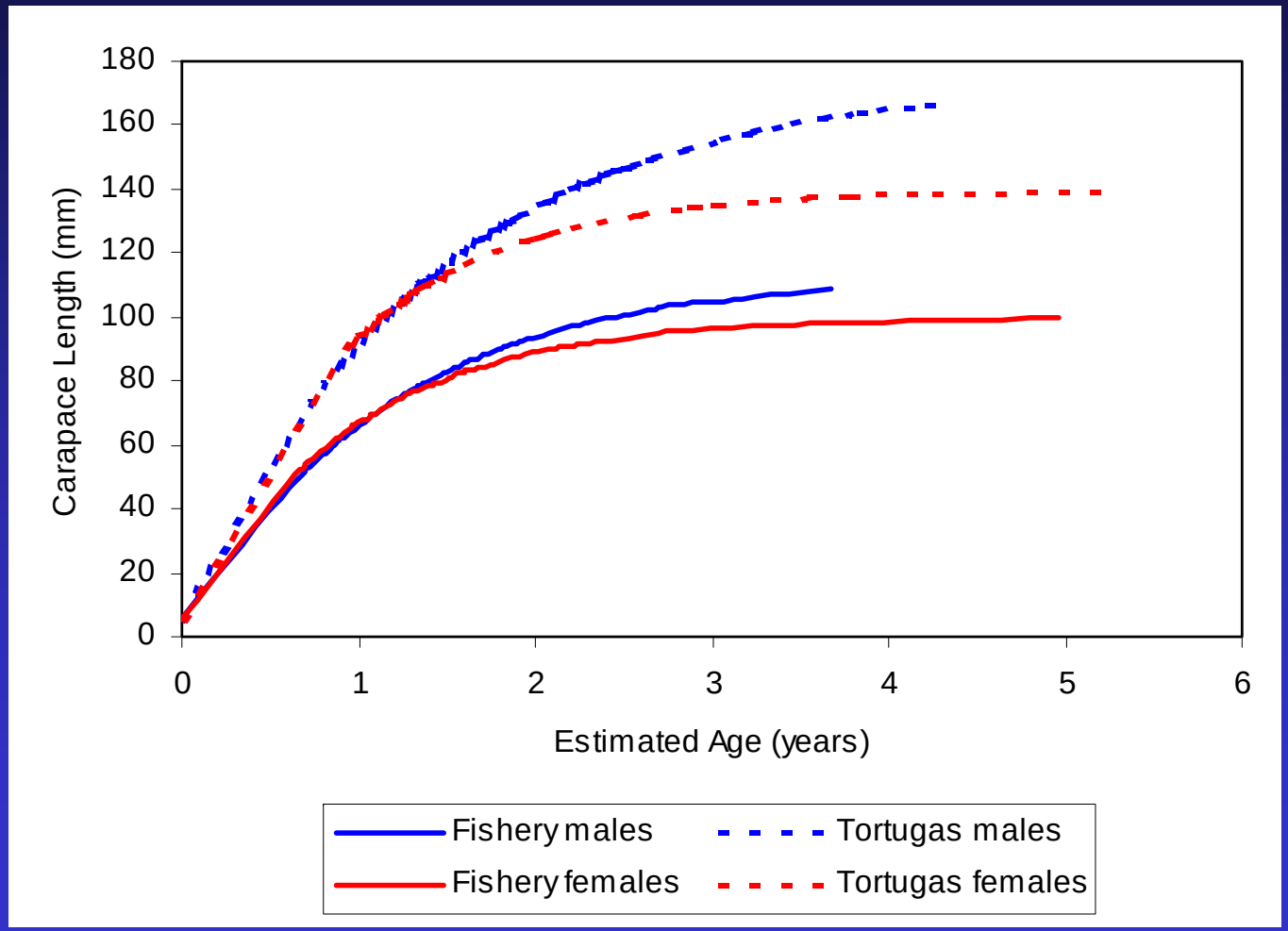
Growth in Laboratory Studies



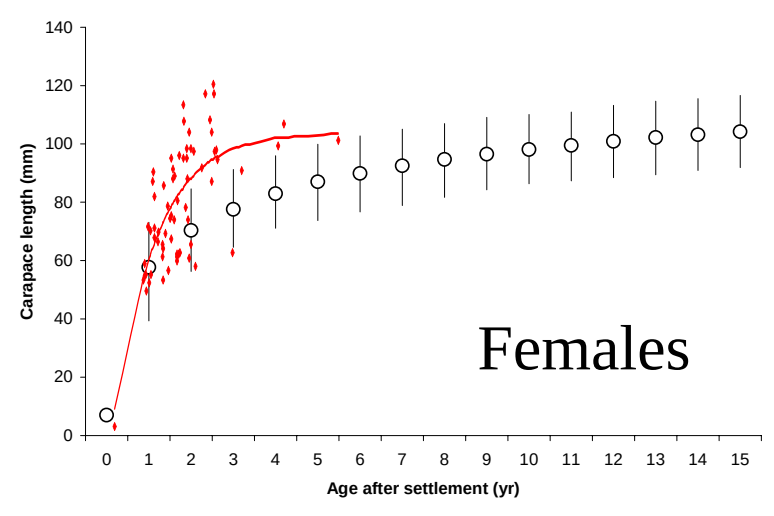
Age Estimation: Size or Lipofuscin

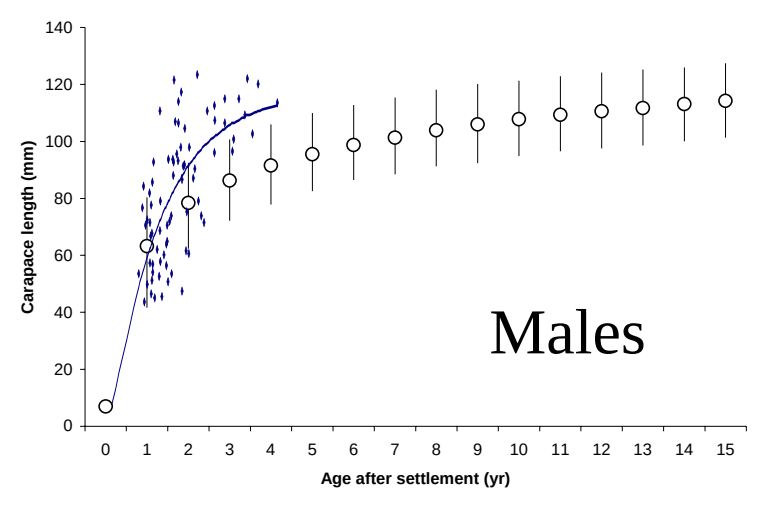


Age Estimation using Lipofuscin to determine von Bertalanffy growth equations



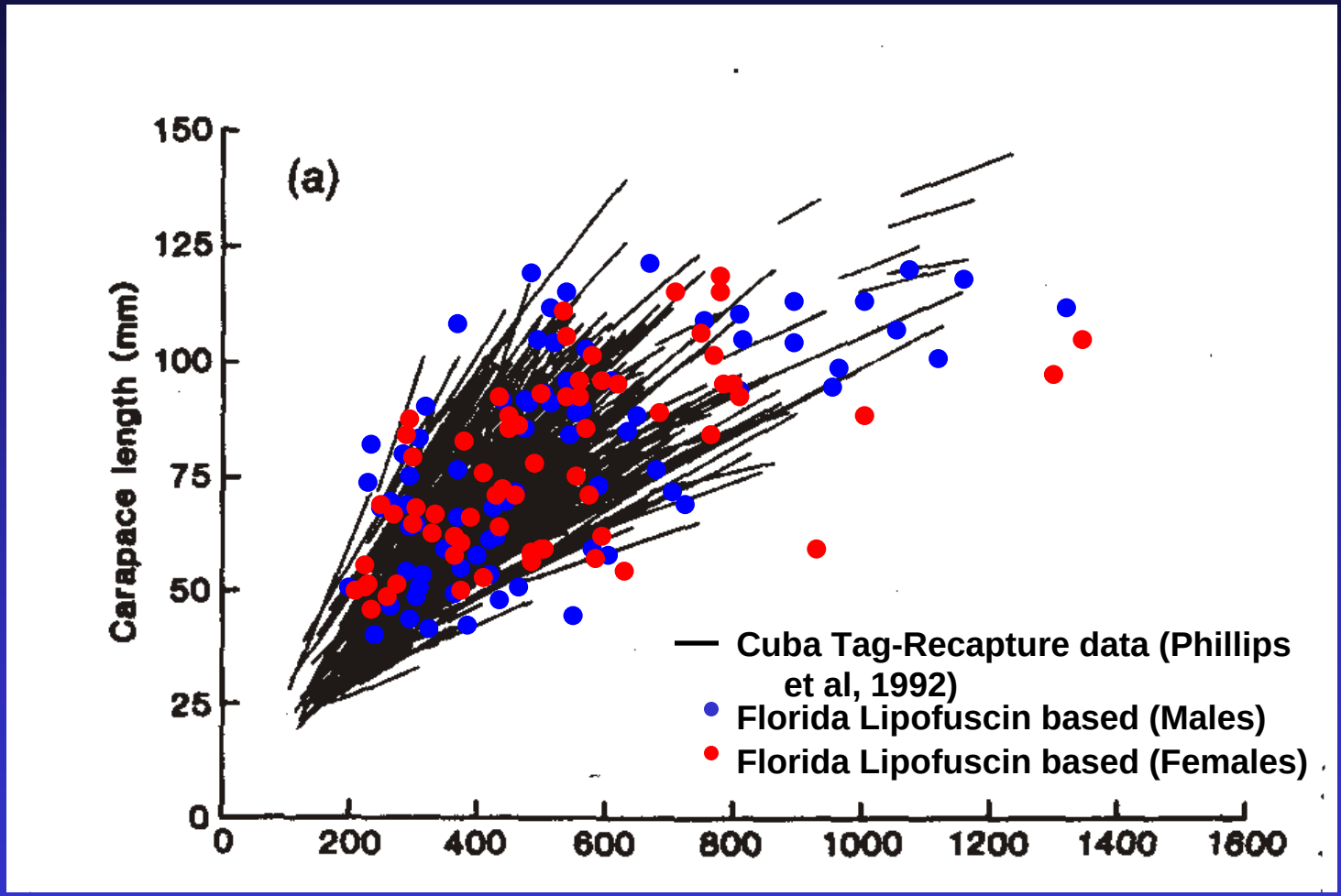
Lipofuscin vs Tag-recapture Age Estimation



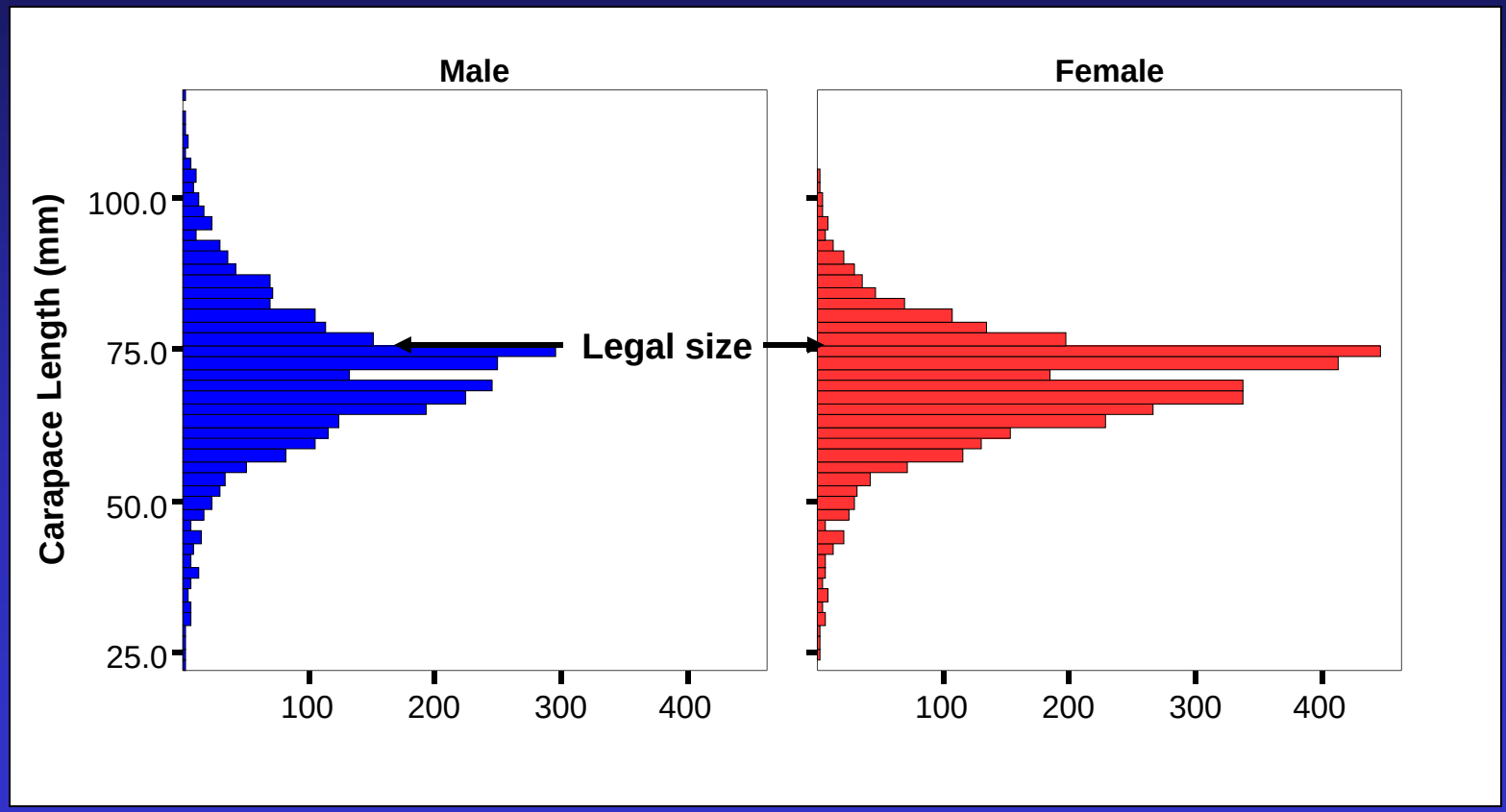


- Similar growth at 1 year
- Similar asymptotic growth
- Different growth curves

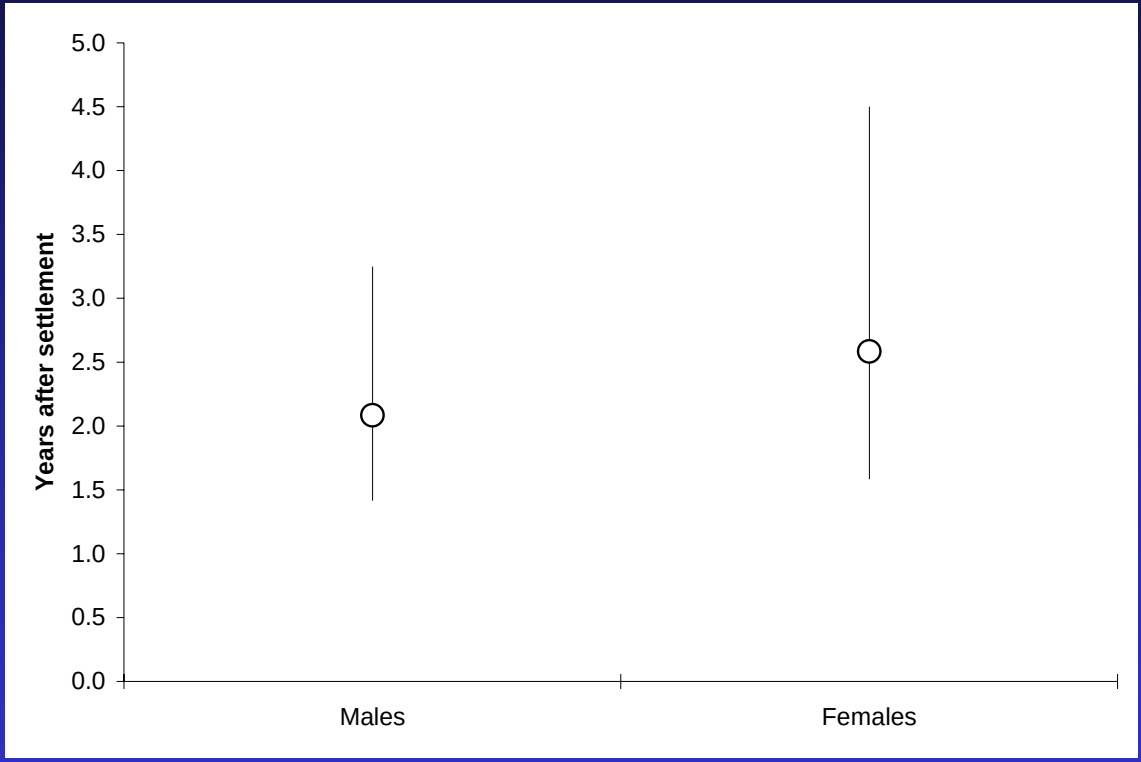
Lipofuscin vs Phillips *et al* 1992



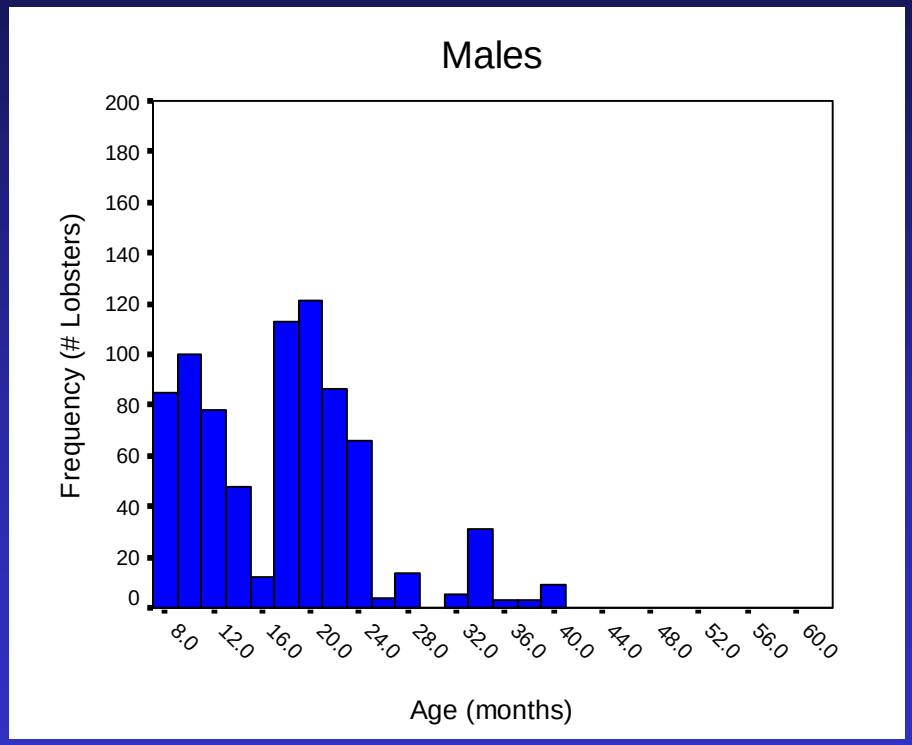
Length Frequency of Trap Caught Lobsters in Florida (January and February 2001)

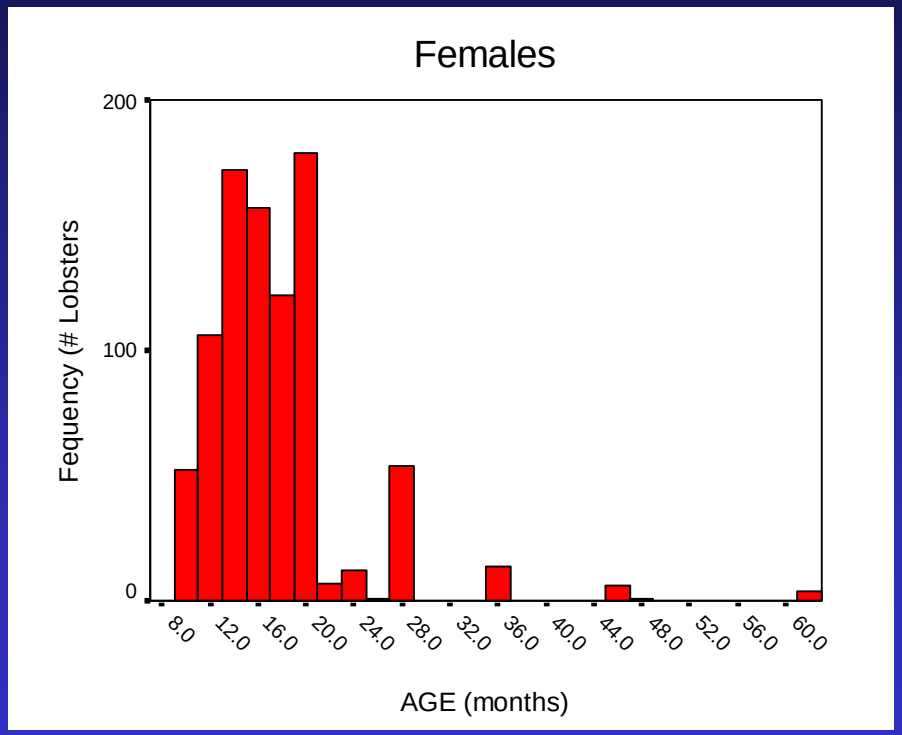


Age at entry to Keys Fishery from tag-recapture data



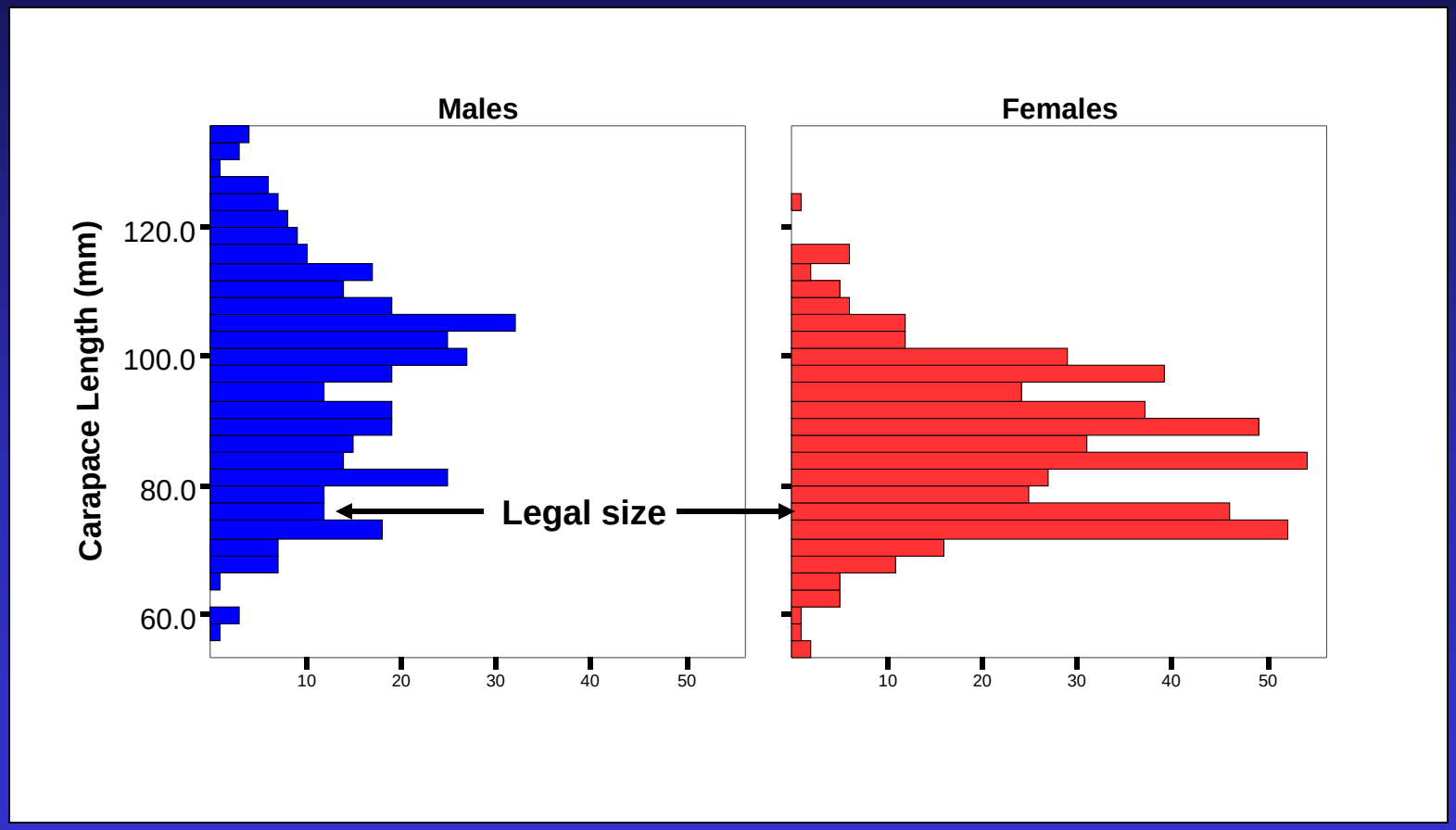
Lipofuscin-based Age Frequency of Lobsters from the Keys (January and February 2001)



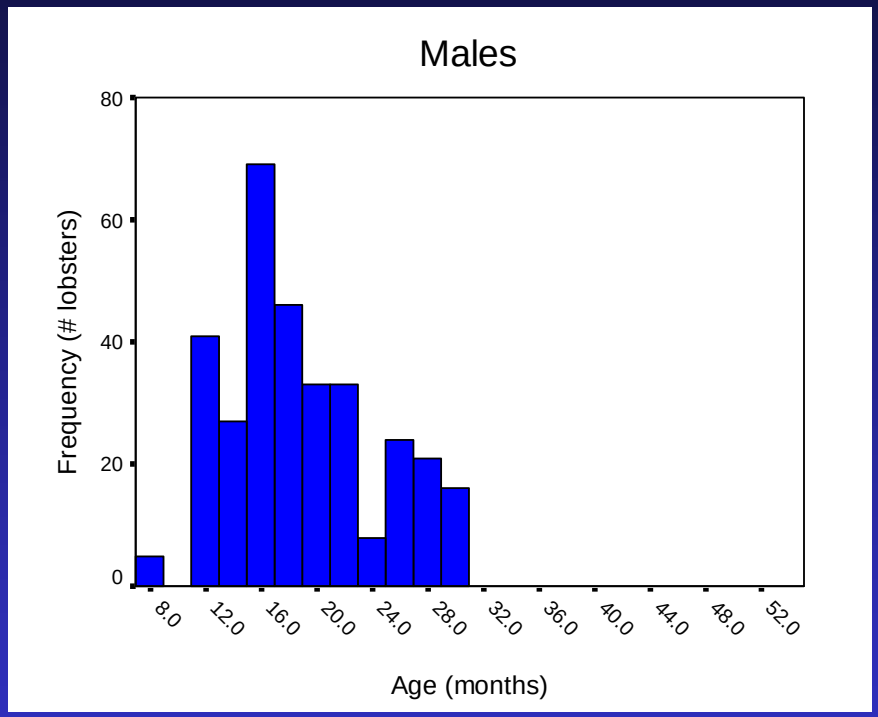


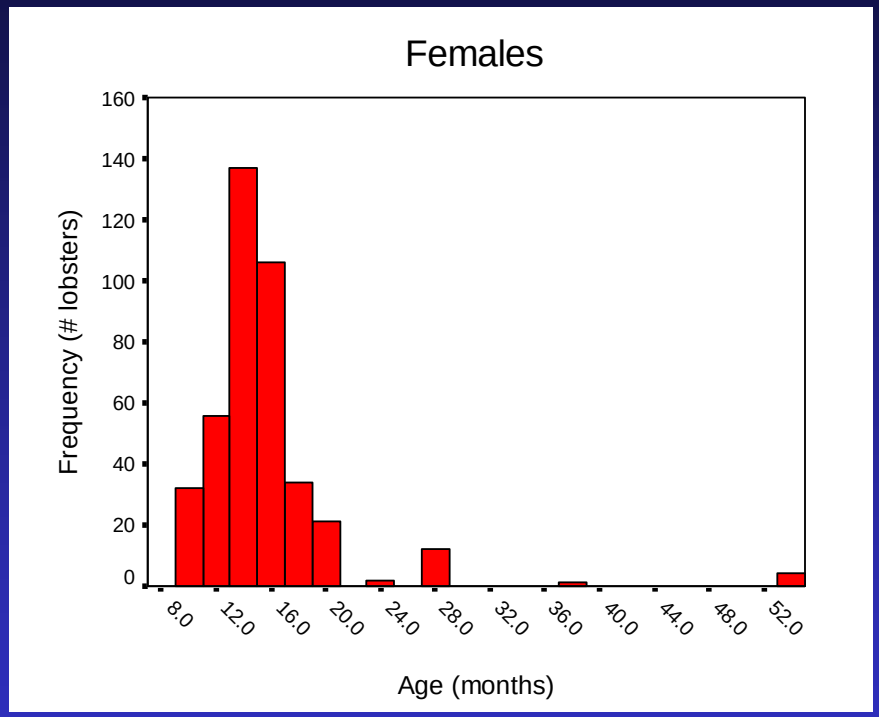
Only lobsters > minimum legal size included (76.2 mm CL)

Length Frequency of Trap Caught Lobsters in Dry Tortugas (January and February 2001)



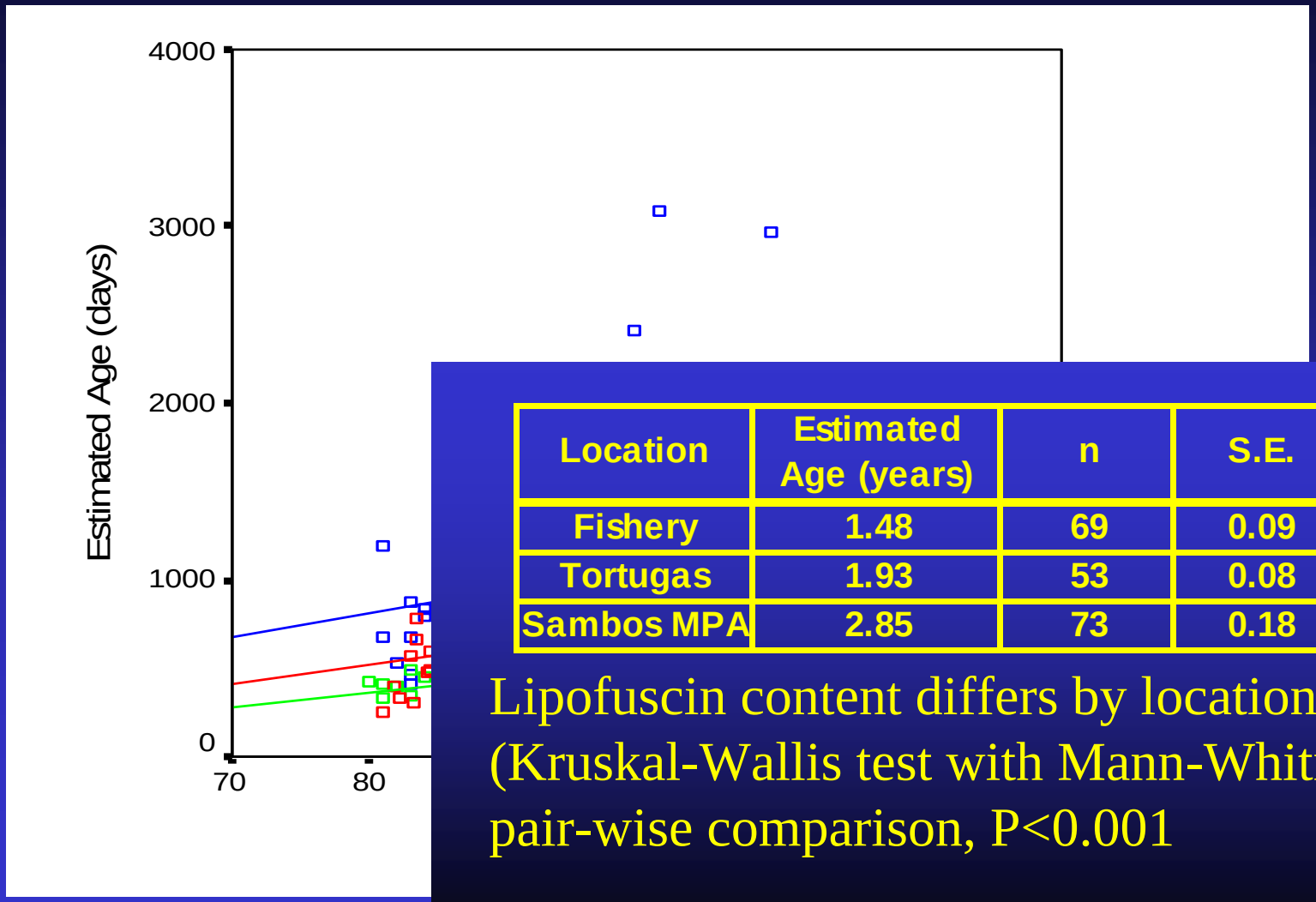
Age Frequency of Trap Caught Lobsters from the Dry Tortugas





Only lobsters > minimum legal size included (76.2 mm CL)
Size structure data obtained in January and February 1998 (n = 728)
Age structure data obtained in January and February 2002 (n = 98)

Length-Age Comparison by Location

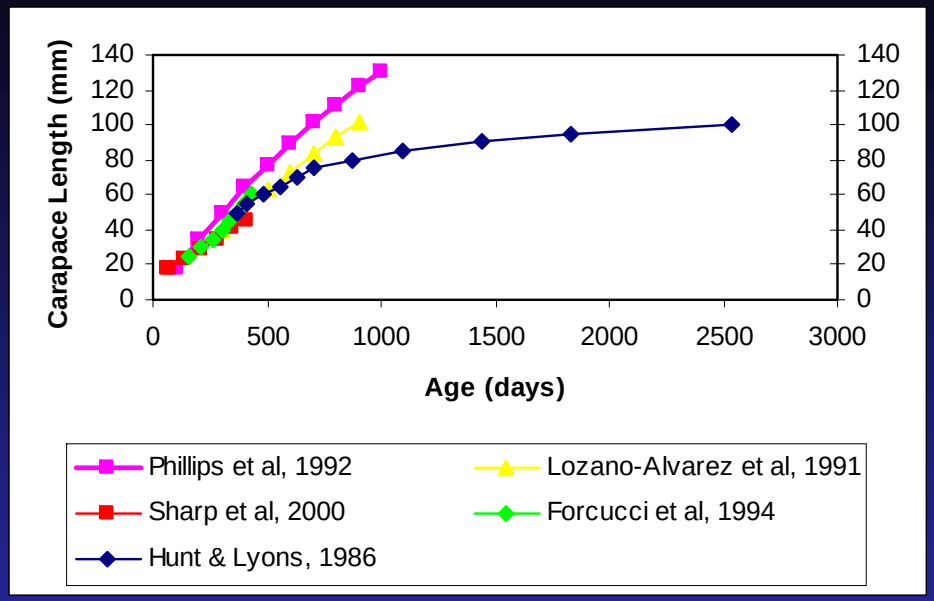


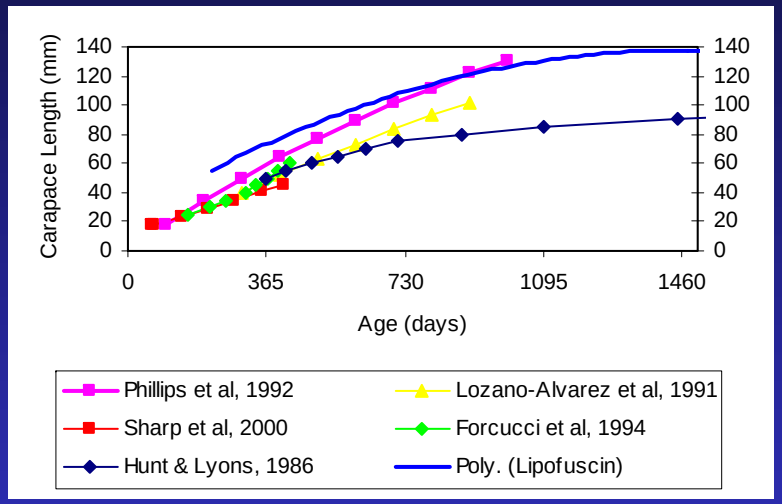
Location	Estimated Age (years)	n	S.E.
Fishery	1.48	69	0.09
Tortugas	1.93	53	0.08
Sambos MPA	2.85	73	0.18

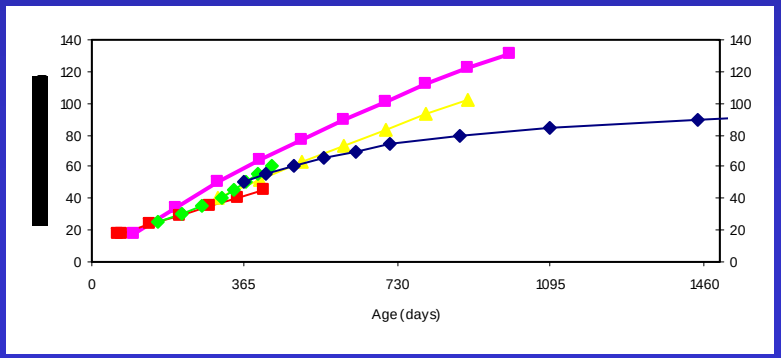
Lipofuscin content differs by location (Kruskal-Wallis test with Mann-Whitney pair-wise comparison, $P<0.001$

Potential Data Limitations

- Accumulation of lipofuscin from in laboratory lobsters might be higher than under natural conditions causing under estimation of the age of wild lobsters.
- Lipofuscin may not accumulate linearly after 3- 4 years
- Tagging lobsters may reduce natural growth rates
- Tags may be differentially retained by lobsters that do not molt or molt less frequently
- Phillips' et al. (1992) exclusion of non-molting lobsters may cause the overestimation of growth rates
- Muller's inclusion of non-molting lobsters may underestimate the probability of molting and underestimate growth


Carapace Length (mm)
140
120
100
80
60
40
20
0
0
500
1000
1500
2000
2500
3000
Age (days)
Phillips et al, 1992
Lozano-Alvarez et al, 1991
Sharp et al, 2000
Forcucci et al, 1994
Hunt & Lyons, 1986


Carapace Length (mm)
140
120
100
80
60
40
20
0
0
365
730
1095
1460
Age (days)
Phillips et al, 1992
Lozano-Alvarez et al, 1991
Sharp et al, 2000
Forcucci et al, 1994
Hunt & Lyons, 1986
Poly. (Lipofuscin)


140
120
100
80
60
40
20
0
0
365
730
1095
1460
Age (days)

Growth estimates for *P. Argus* using tags

- 6458 recaptured lobsters from multiple studies
- at large for less than 85 days and less than 15 mm