Use of otoliths to determine the age and growth of *Cyclopsetta querna* (Pleuronectiformes: Paralichthyidae), a tropical flatfish from the southeast coast of the Gulf of California, México

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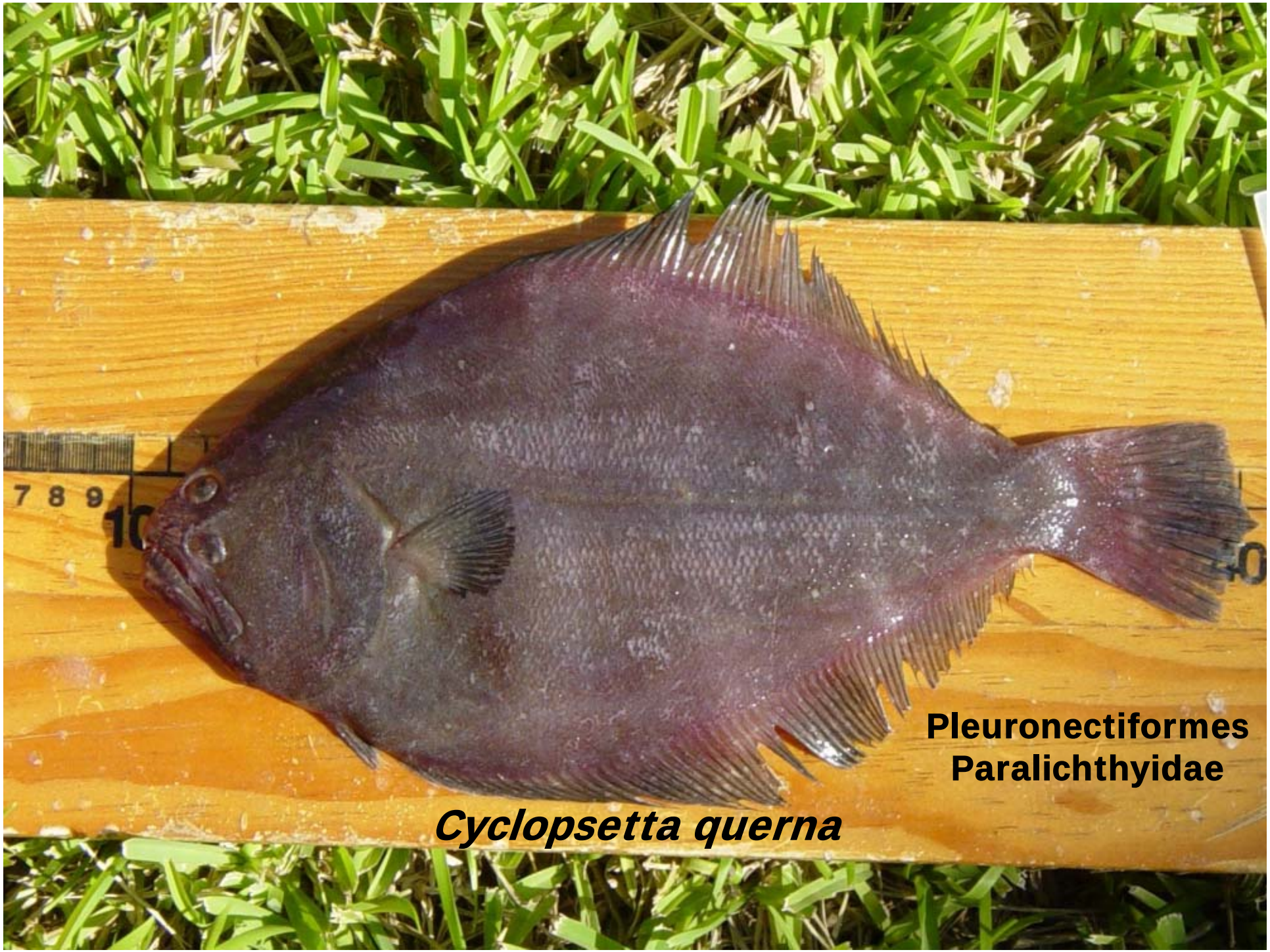
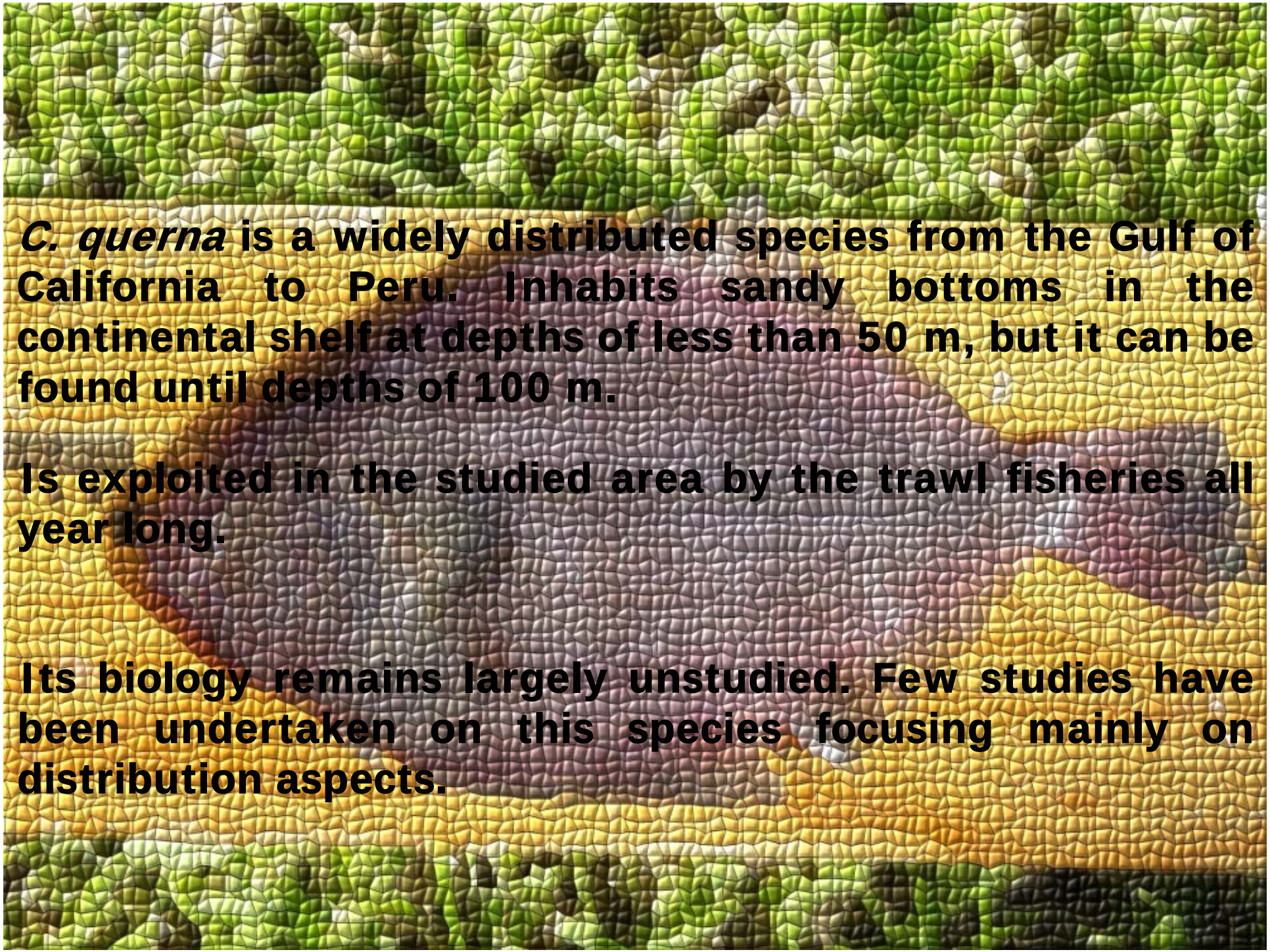
- The otoliths have been used to determine age and growth of flatfish species from temperate zones since the seventies.

- The use of otoliths to age subtropical and tropical flatfish species is not a common practice due to the lack of clearly annual growth zones.

Reichert (1998) estimated the age and growth of *Etropus crossotus*, a tropical flatfish species from the Paralichthyidae family, using these hard structures.

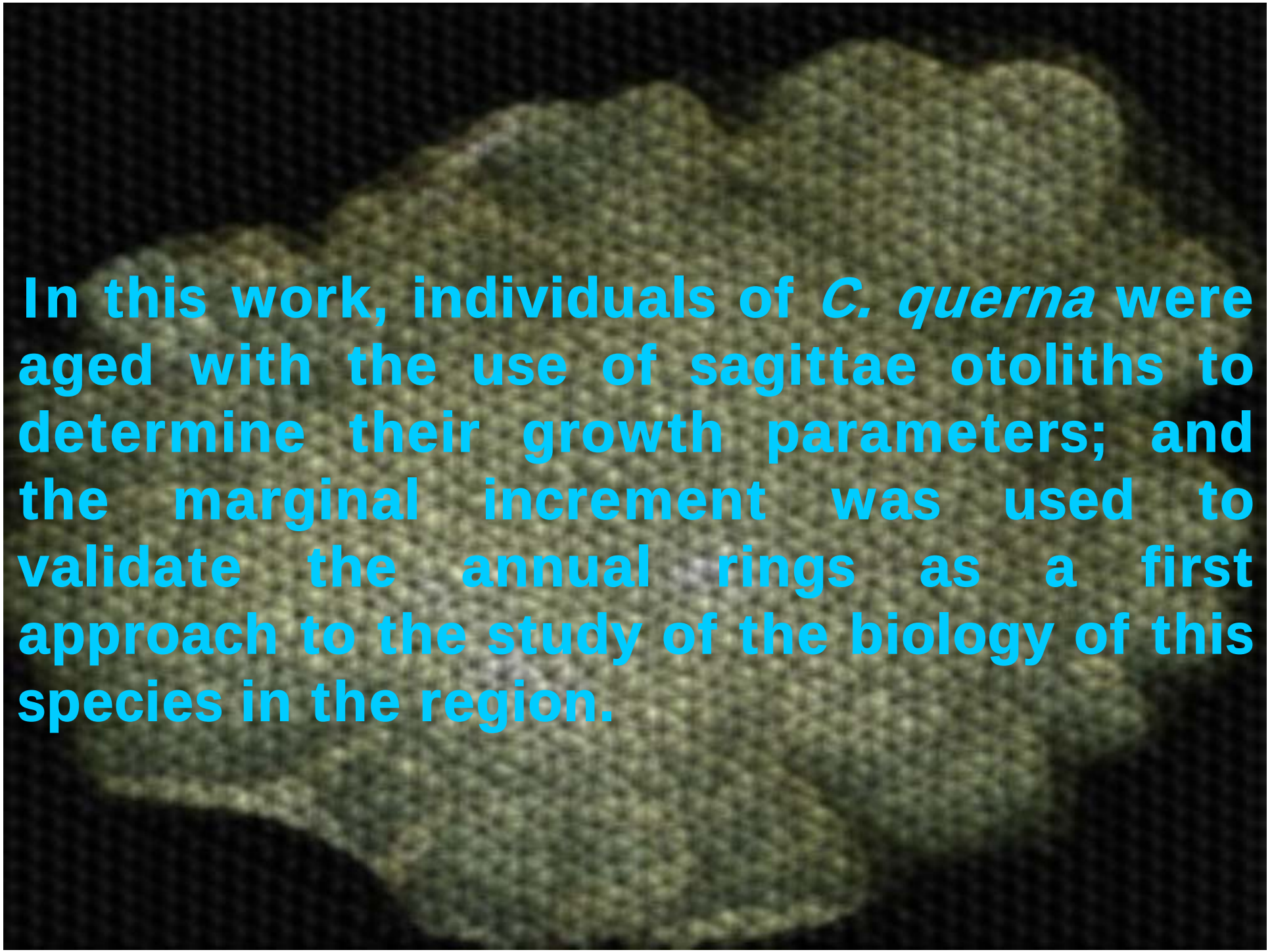

Pleuronectiformes
Paralichthyidae
Cyclopsetta querna



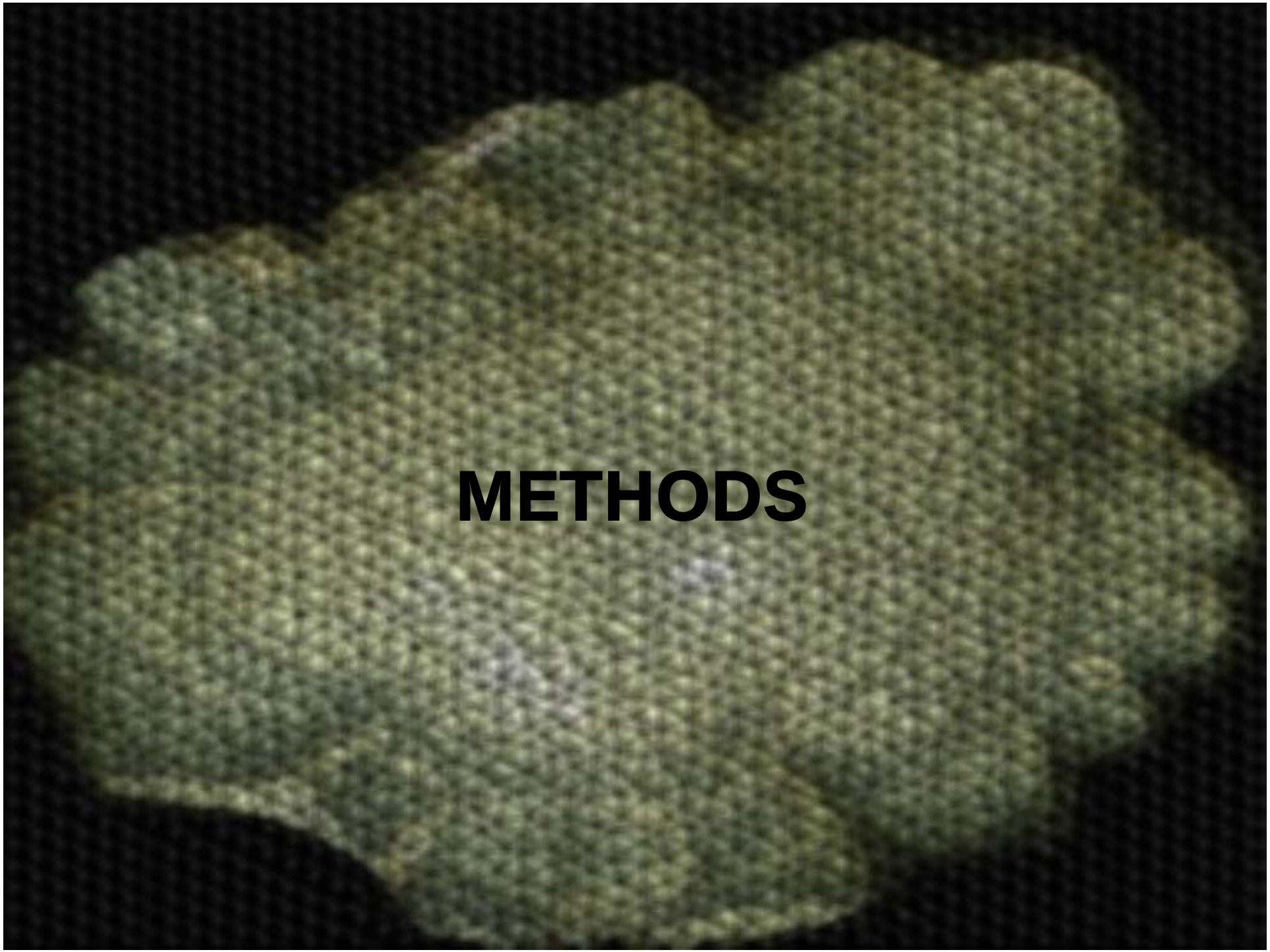
C. querna **is a widely distributed species from the Gulf of California to Peru. Inhabits sandy bottoms in the continental shelf at depths of less than 50 m, but it can be found until depths of 100 m.**

Is exploited in the studied area by the trawl fisheries all year long.

Its biology remains largely unstudied. Few studies have been undertaken on this species focusing mainly on distribution aspects.



In this work, individuals of *C. querna* were aged with the use of sagittae otoliths to determine their growth parameters; and the marginal increment was used to validate the annual rings as a first approach to the study of the biology of this species in the region.


METHODS

59 stations were sampled over a period of two weeks on board of commercial vessels. At each station, two commercial trawls fitted with a 30 mm liner in the cod end and an average door spread of 34.9 m were towed at 2.3 knots during one hour. A stratified survey design with fixed positions was employed.

After each tow the individuals of *C. querna* were collected and frozen on board. In the laboratory, total length (cm) and wet weight (g) were recorded.

Every individual was sexed, and sagittal otoliths were removed, cleaned and stored dry in paper envelopes.

The otoliths were cleaned in water, weighed (nearest 0.0001 g), and mounted on resin.

They were sanded and polished to facilitate the observation of the opaque and hyaline zones.

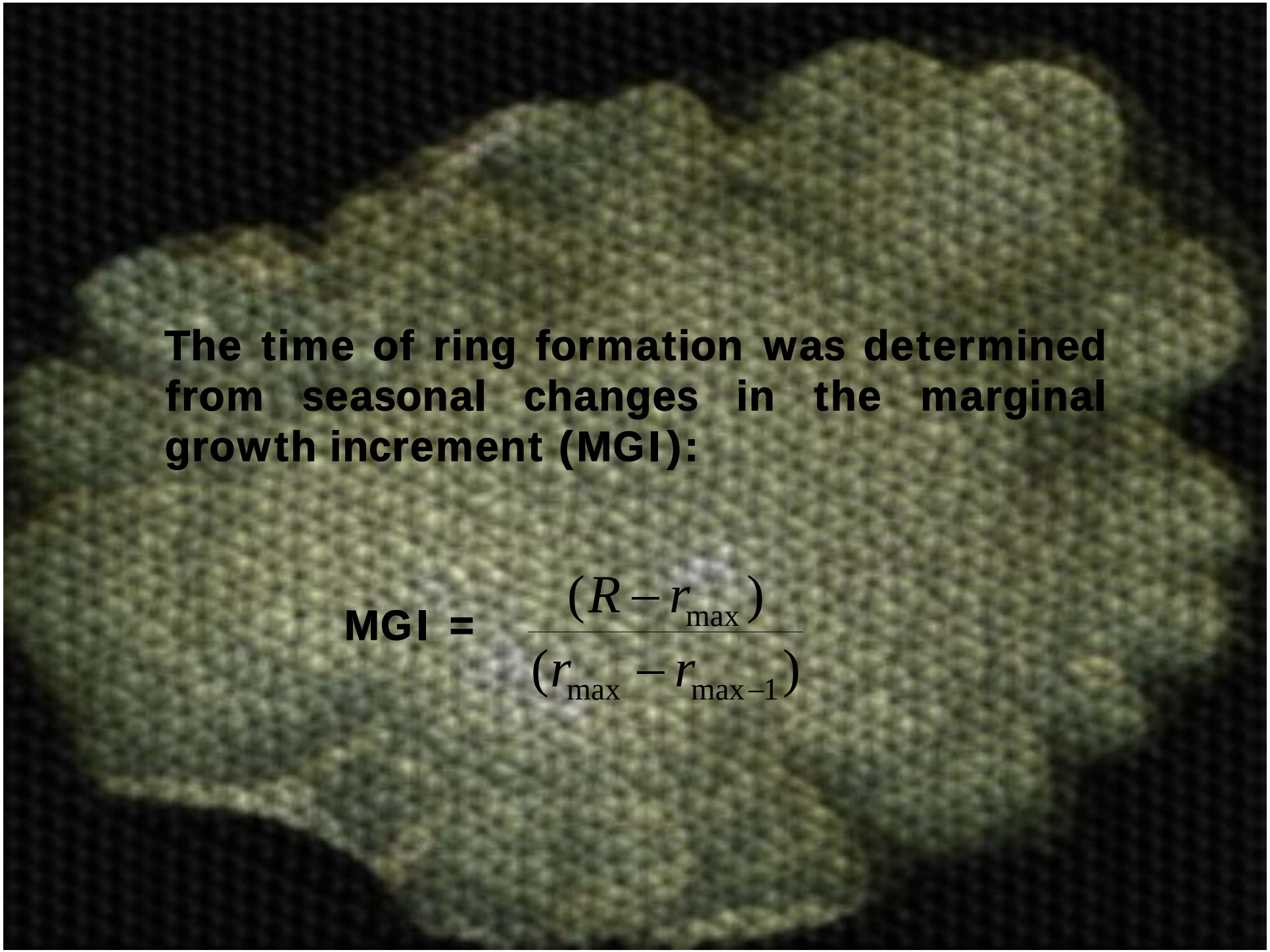
The otolith diameter and the length of the outermost annual ring were measured to determine the marginal increment. Opaque and hyaline zones were observed, and the age in years was assigned to every otolith; a year was assumed to be as a set of a hyaline and an opaque zones.

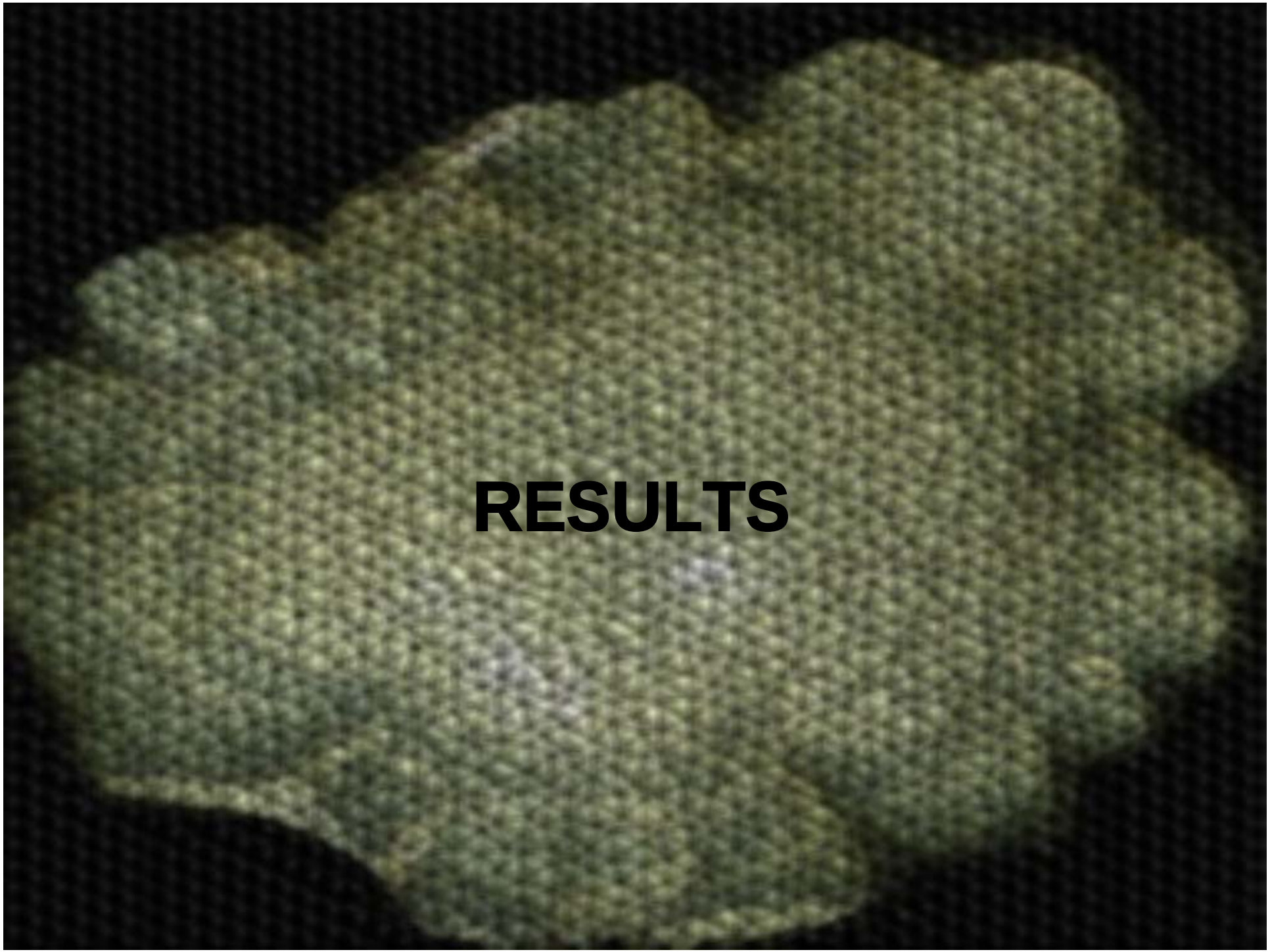
von Bertalanffy growth curve

$$L_t = L_\infty \, (1 - e^{-k(t-t0)})$$

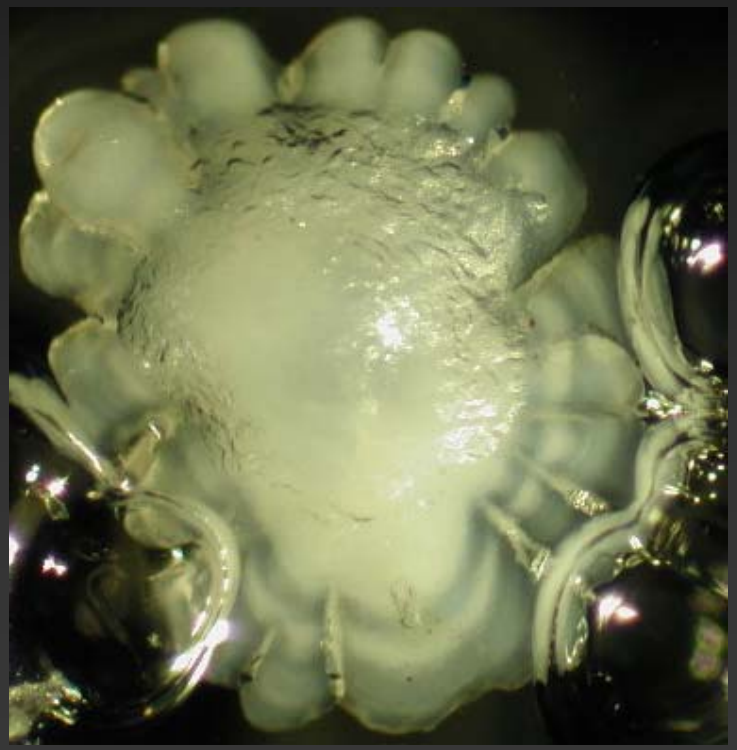
To determine growth differences in sex, an ANCOVA was performed with the linear form of the von Bertalanffy growth model for every sex

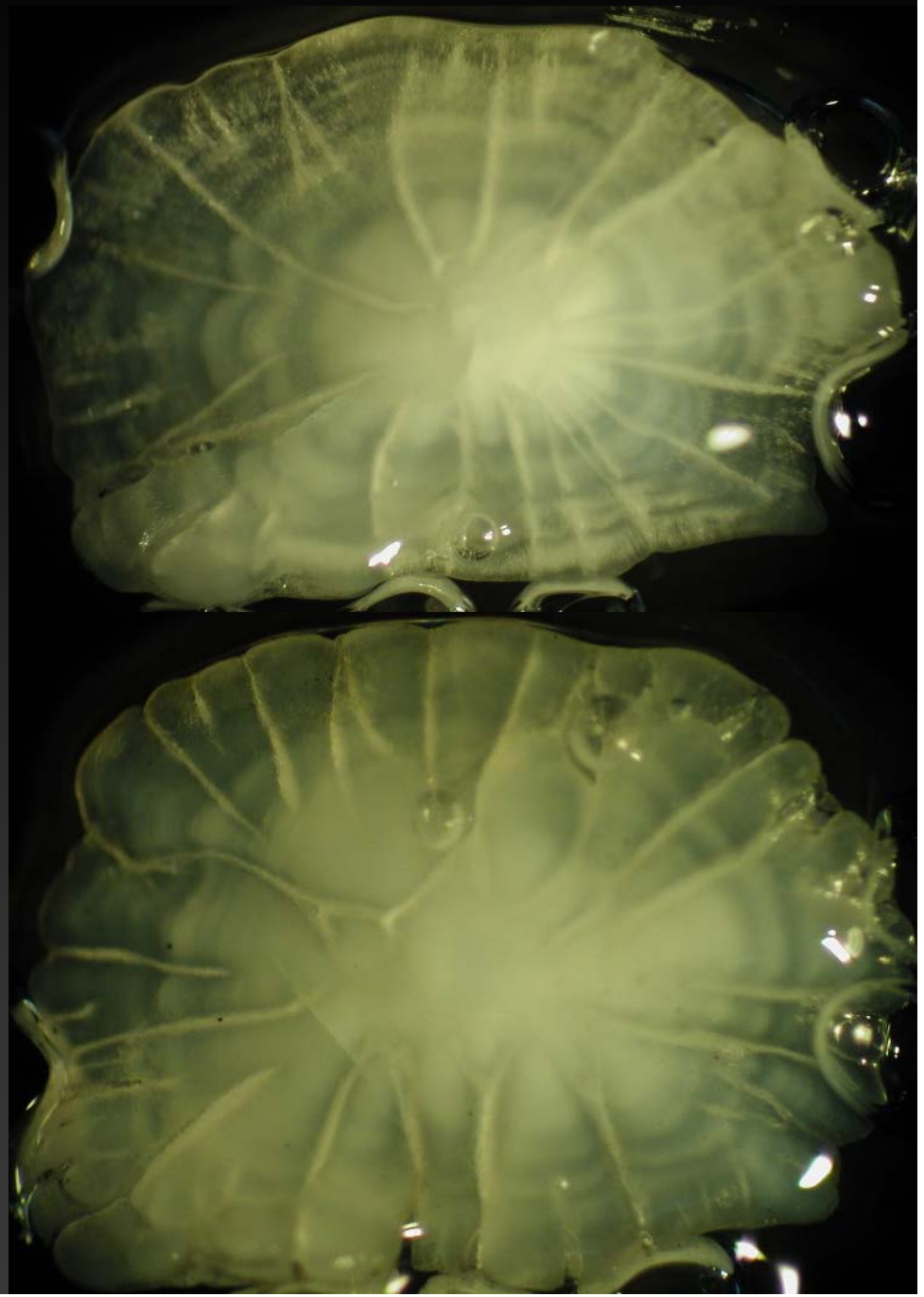
$$-ln(1-L(t)/L) = -kto + kt$$


The time of ring formation was determined from seasonal changes in the marginal growth increment (MGI):
MGI = $\frac{(R - r_{\max})}{(r_{\max} - r_{\max-1})}$


RESULTS

A total of 448 individuals were examined (314 males and 134 females)



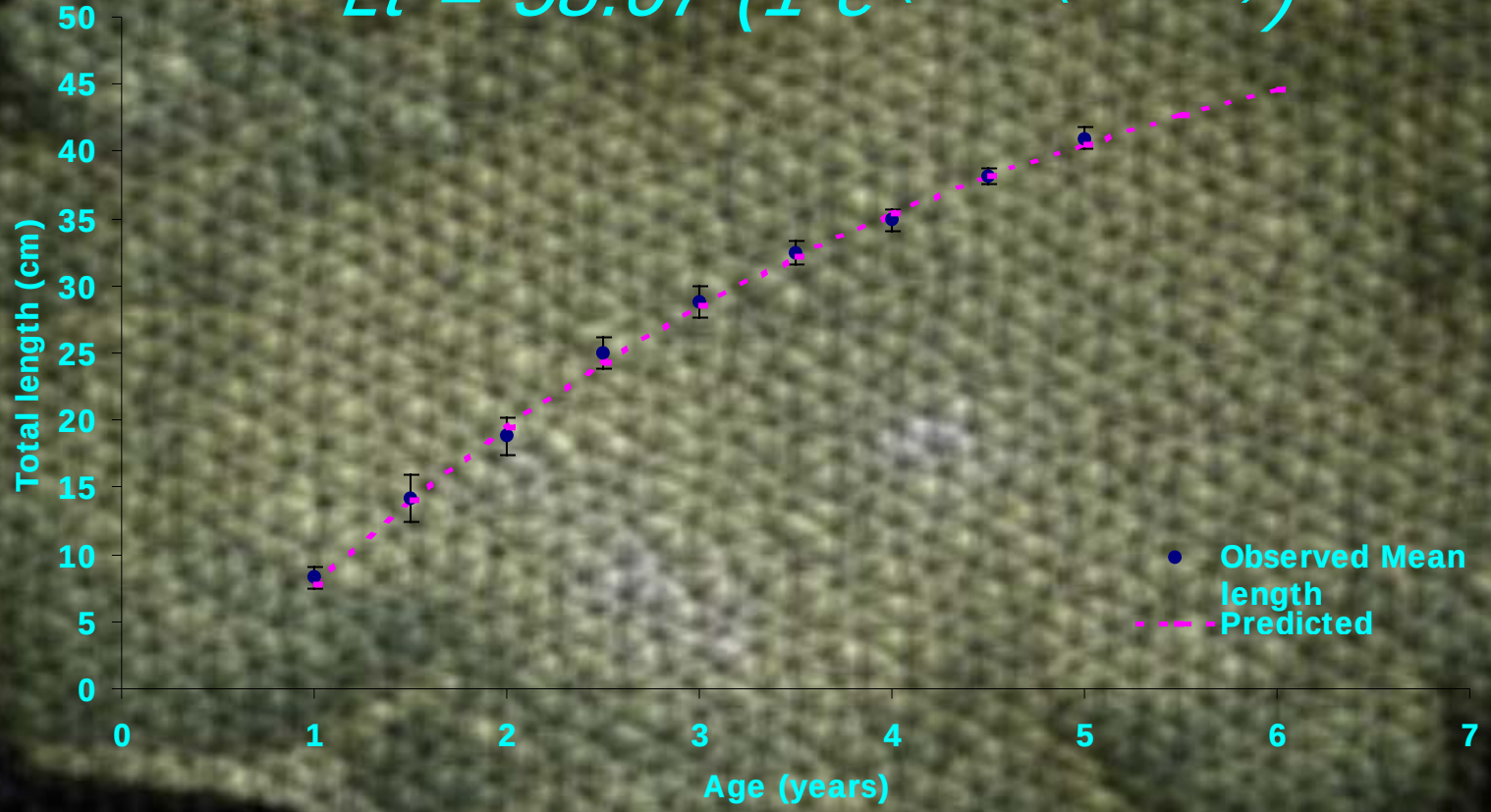


Females

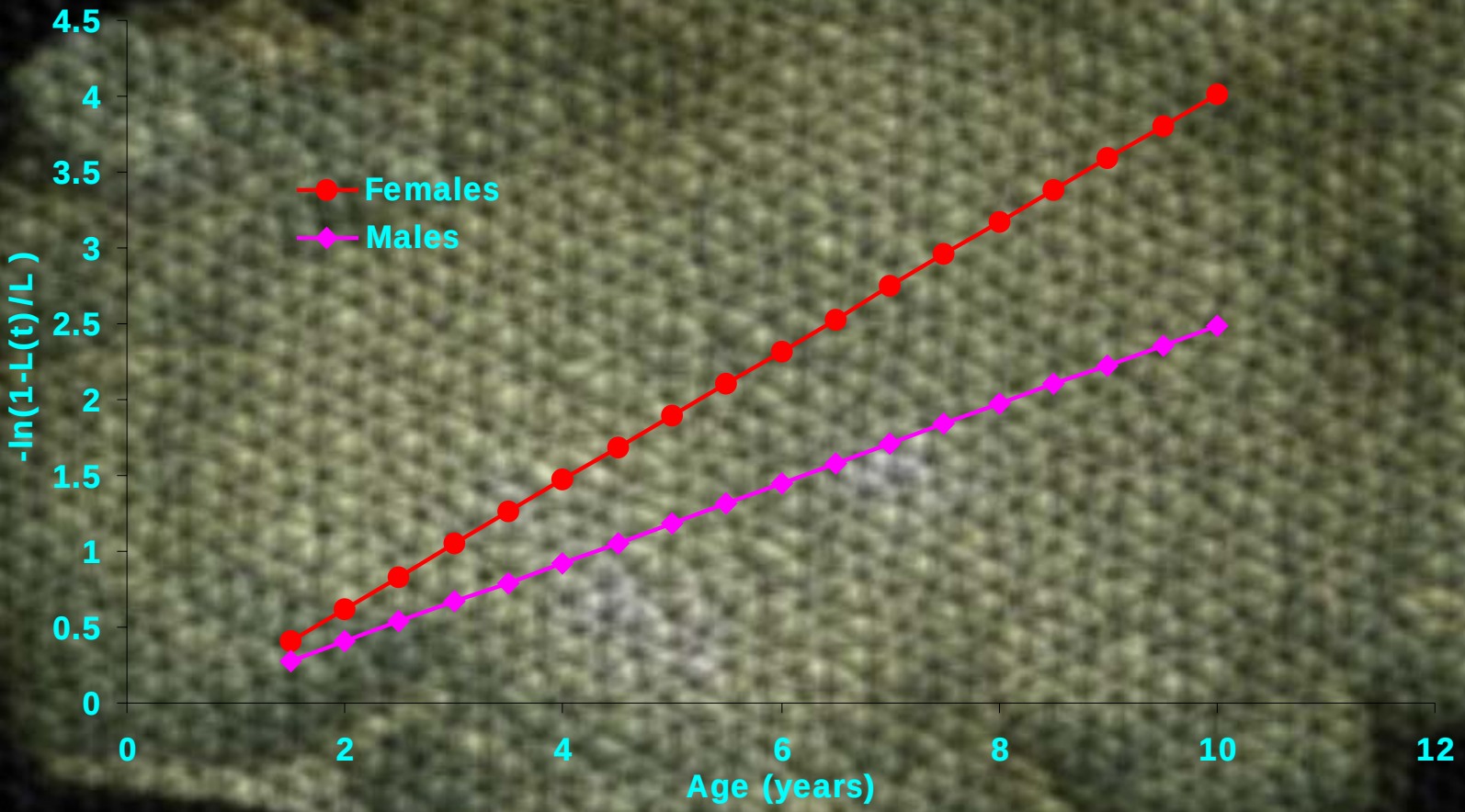
$$Lt = 44.29\,(1-e^{(-0.43\,(t\,-\,0.\,53))})$$

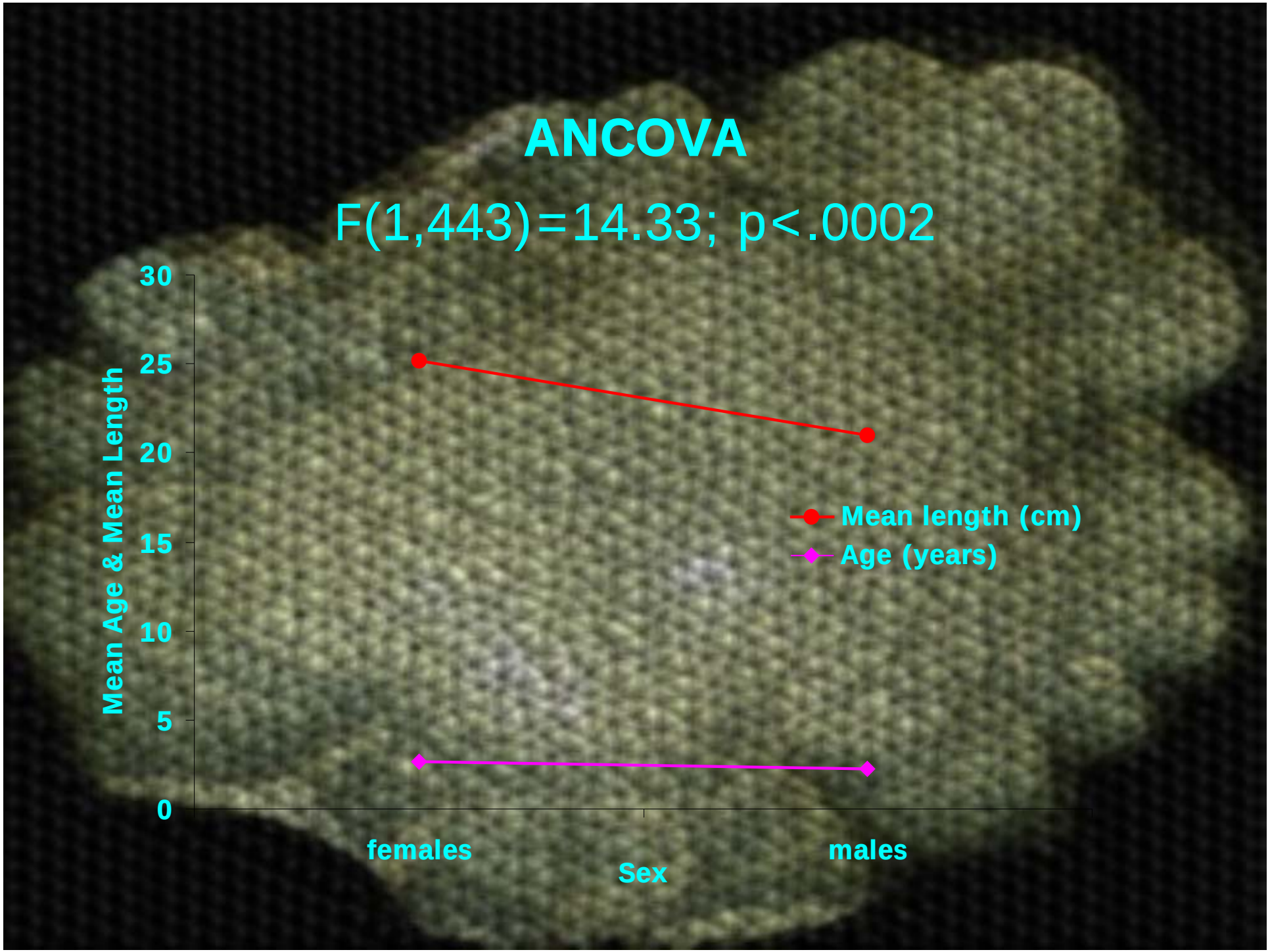
Males

$$Lt = 58.67\,(1-e^{(-0.26\,(t\,-\,0.\,45)\,)})$$

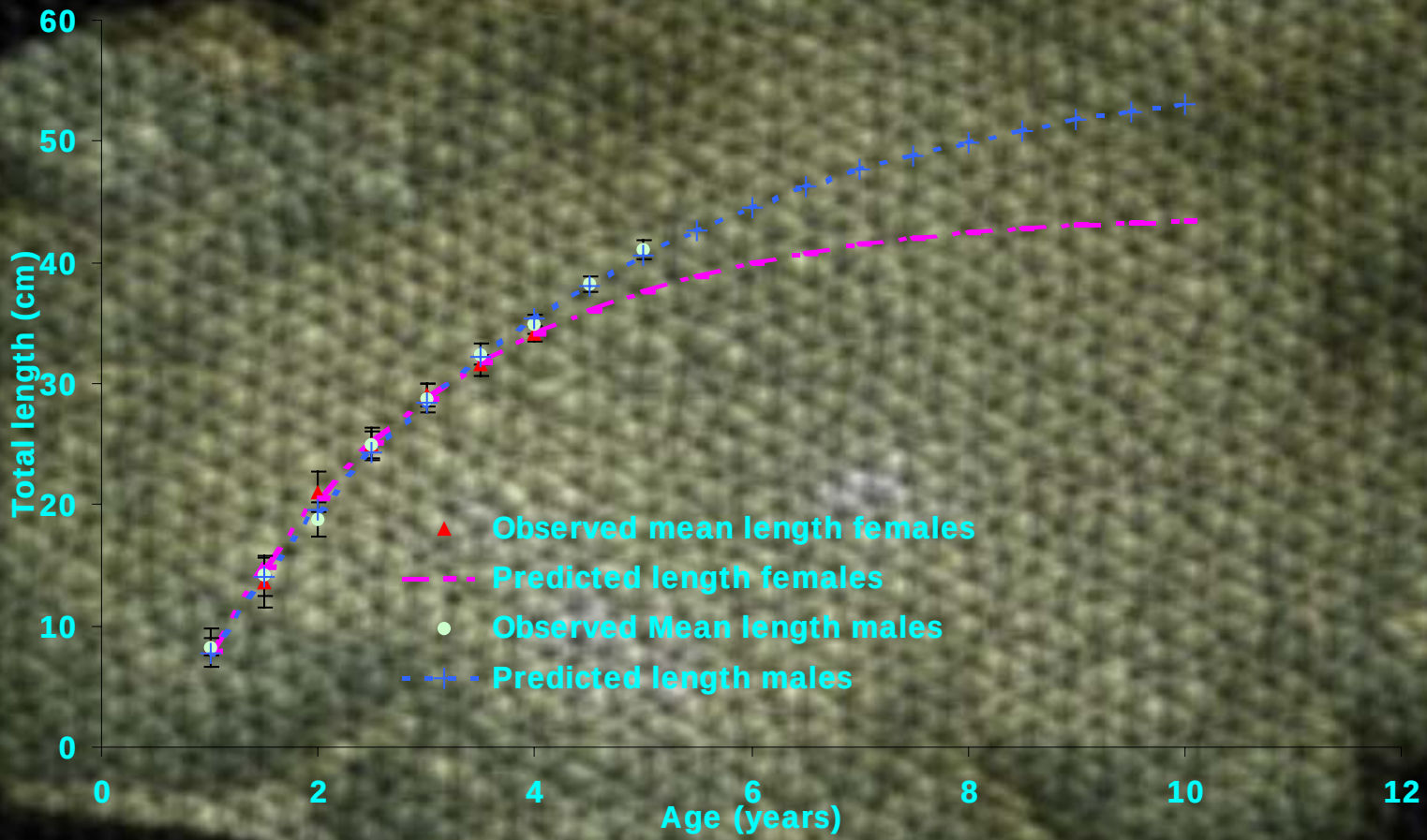


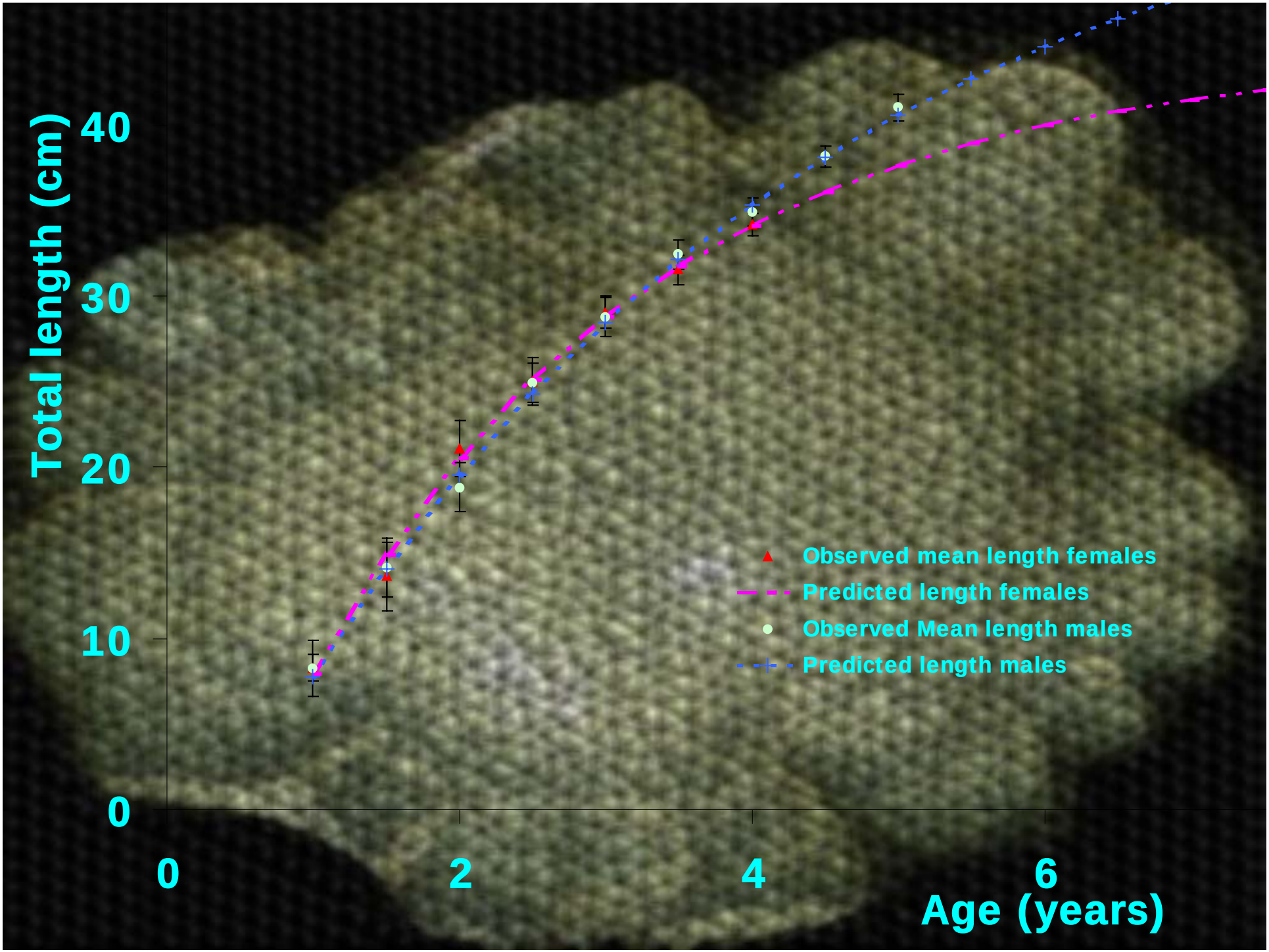
Estimated linear von Bertalanffy growth model for males and females of *C. querna*



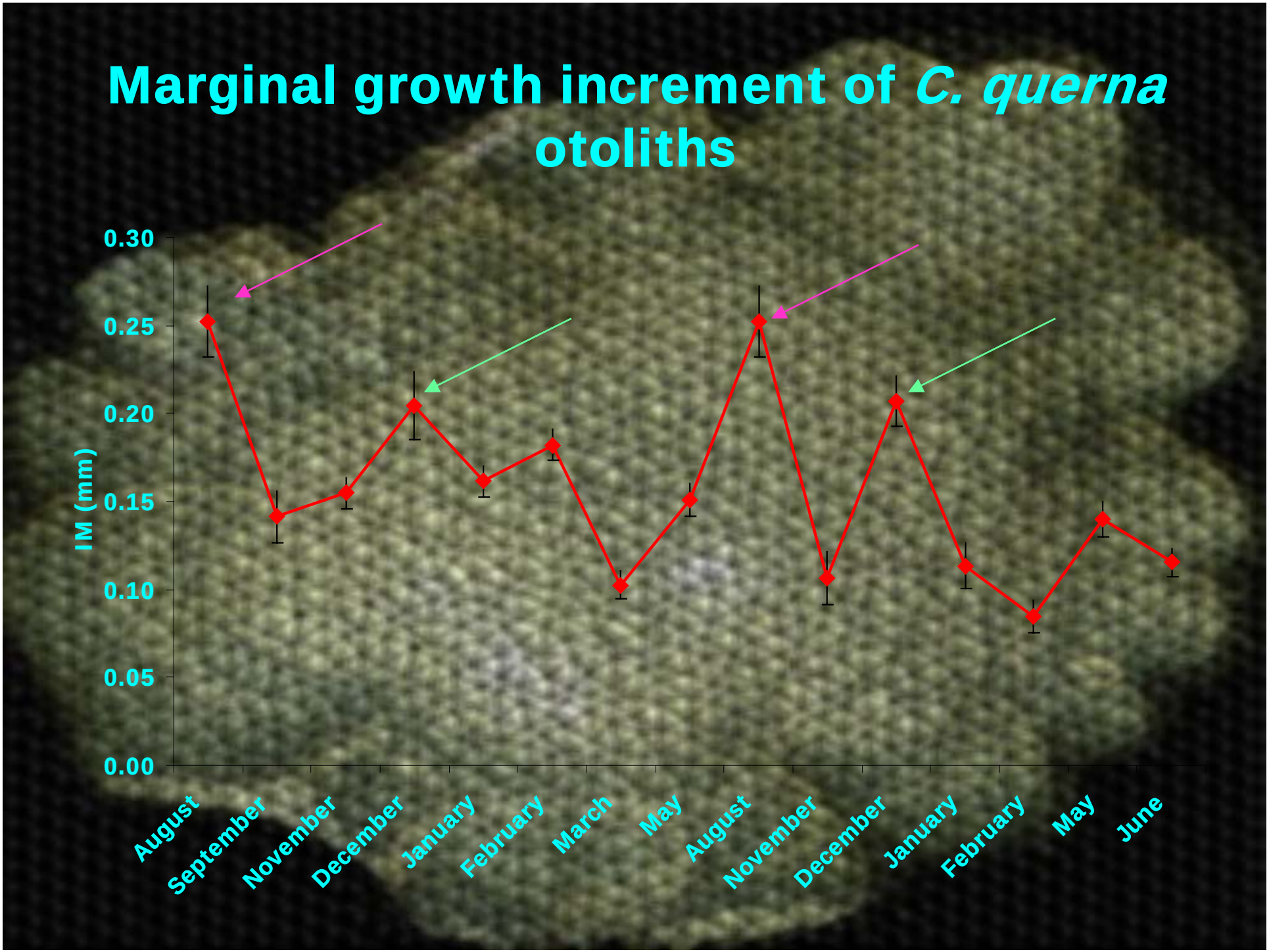

ANCOVA
F(1,443)=14.33; p<.0002
30
25
20
15
10
5
0
Mean Age & Mean Length
Mean length (cm)
Age (years)
females
Sex
males

Estimated von Bertalanffy growth curves of male and female *C. querna*




Total length (cm)
40
30
20
10
0
0
2
4
6
Age (years)
Observed mean length females
Predicted length females
Observed Mean length males
Predicted length males

Marginal growth increment of *C. querna* otoliths



Conclusions

- Otoliths are an adequate and reliable method to age *C. querna*, and should be used instead on methods based on length frequency, since the latter methods tend to under or overestimate the age
- Females of *C. querna* grow faster and are larger than males
- *C. querna* probably does not live beyond 6 years, so it is probably common among flatfish species from tropical environments to show such short life spans, opposite to flatfish species from temperate waters which can live to 30 years or more


Thank you!!!