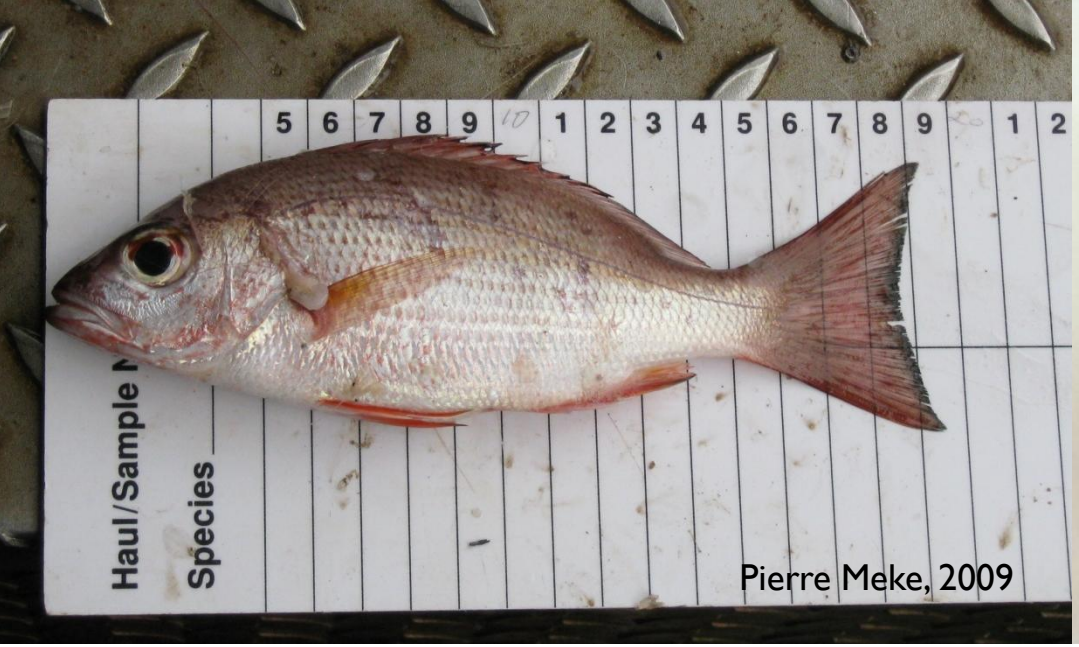
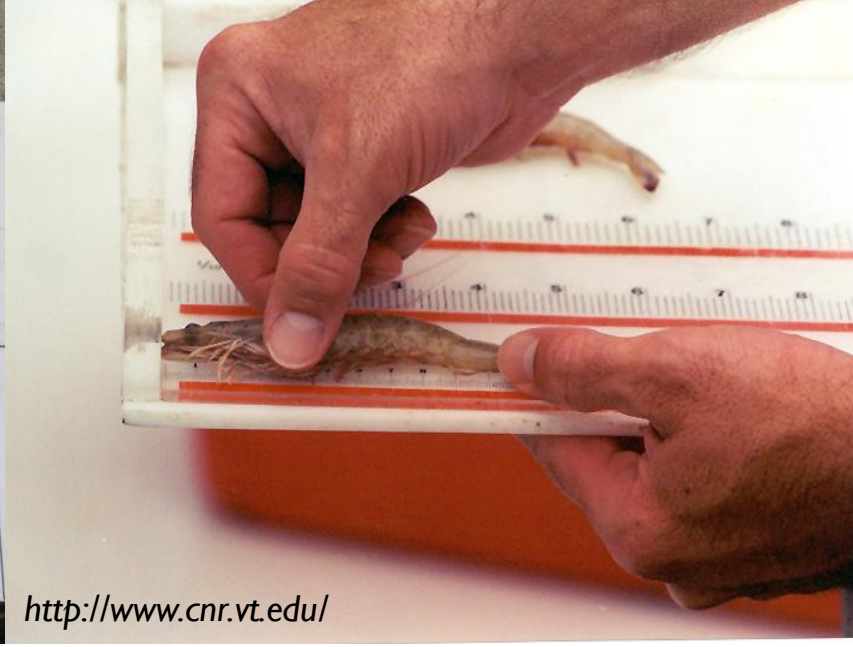
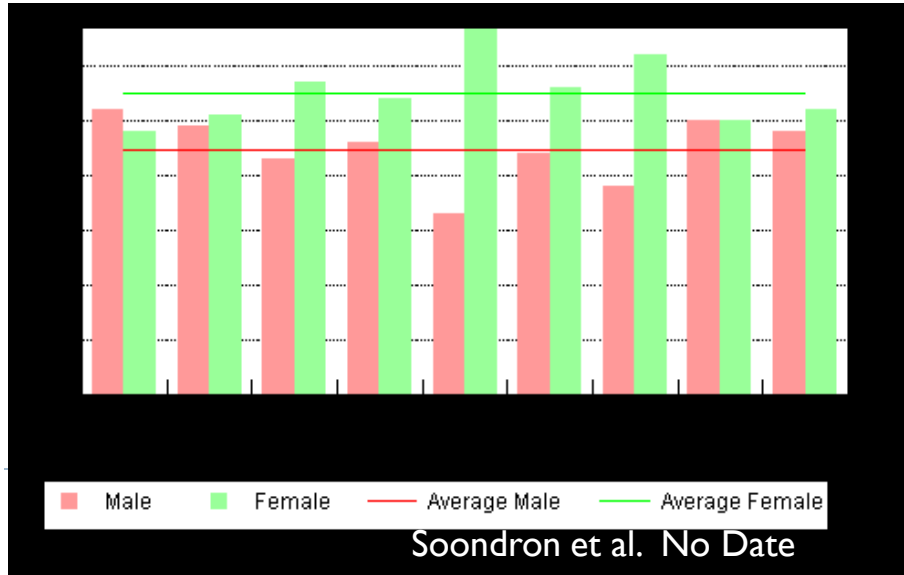




Biological Data – Length Frequency Sampling

Introduction

- Biological data
  - Sex
  - Length
  - Weight
  - Age structure
- Stock assessment needs:
  - Age composition of population
  - Length to age ratio
  - Spawning population
  - Sex ratios



Soondron et al. No Date

Objectives

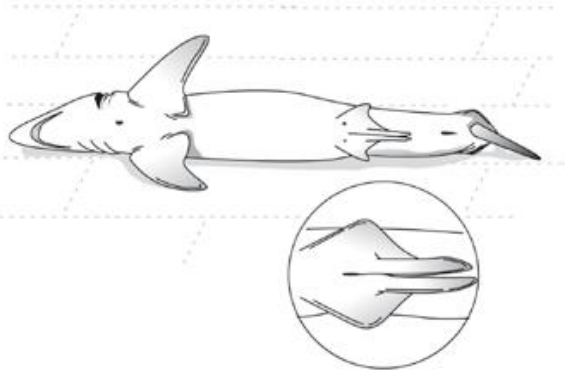
- Explain how length frequency data are utilized.
- List the 2 most common measurement types
- Describe the primary measurements for various fish and invertebrates
- Describe the primary differences between male & female fish, crab and shrimp
- Demonstrate your ability to complete the Fish/Invertebrate Length Frequency Form

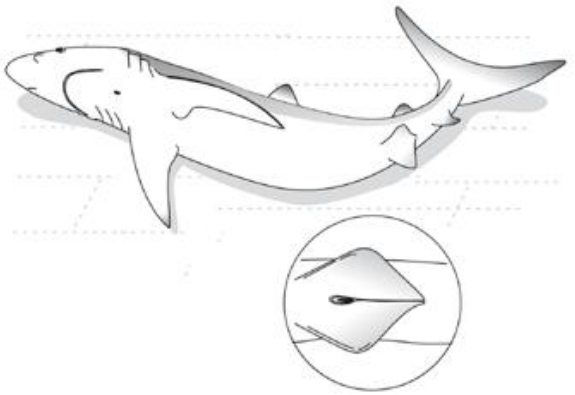
Selecting individuals to measure

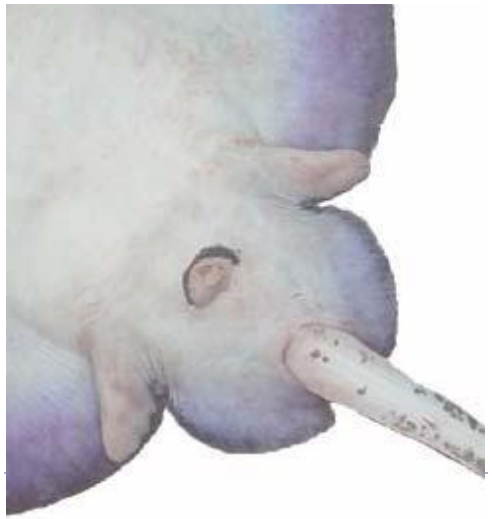
- Species – depends on assignment
  - E.g., Butternose (*Galeoides decadactylus*) – 10/haul
  - *Arius* spp. (catfish) – 3/haul
- Individuals – random sample from catch composition
  - Unsorted vs. sorted samples
- Record damaged individuals as length = 0

Determining gender - fish

- **External** vs internal



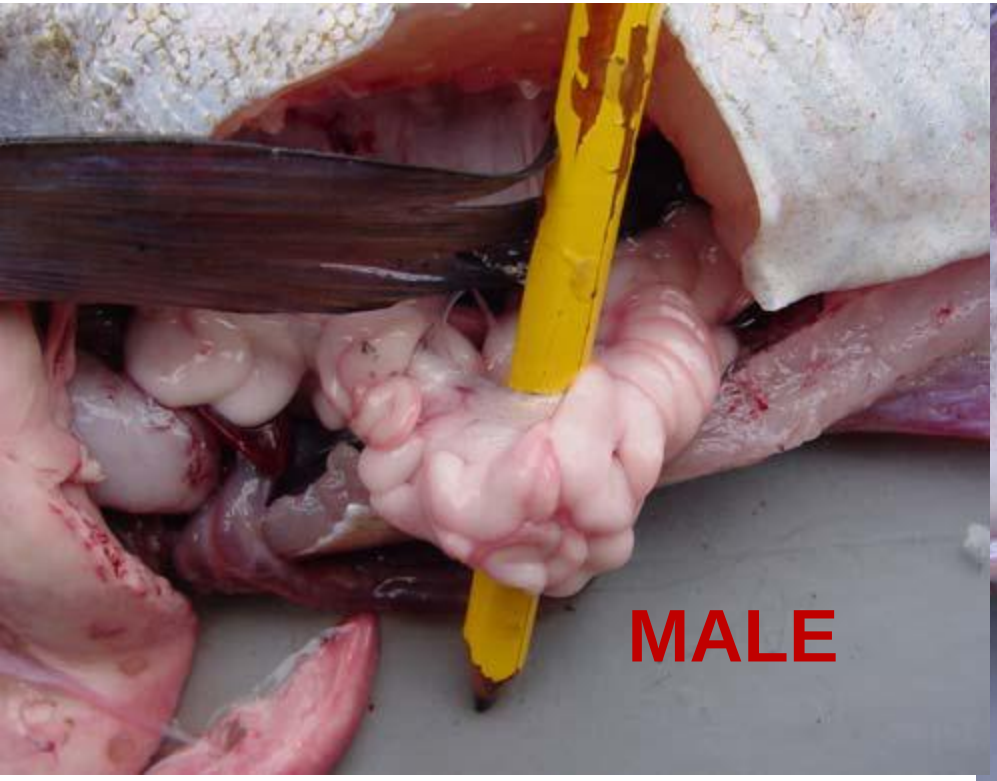




Drawings: Brogan et al. (2006); Photos: Alaska Fisheries Science Center (2009)

Determining gender - fish

- External vs. **internal**
- Round fish



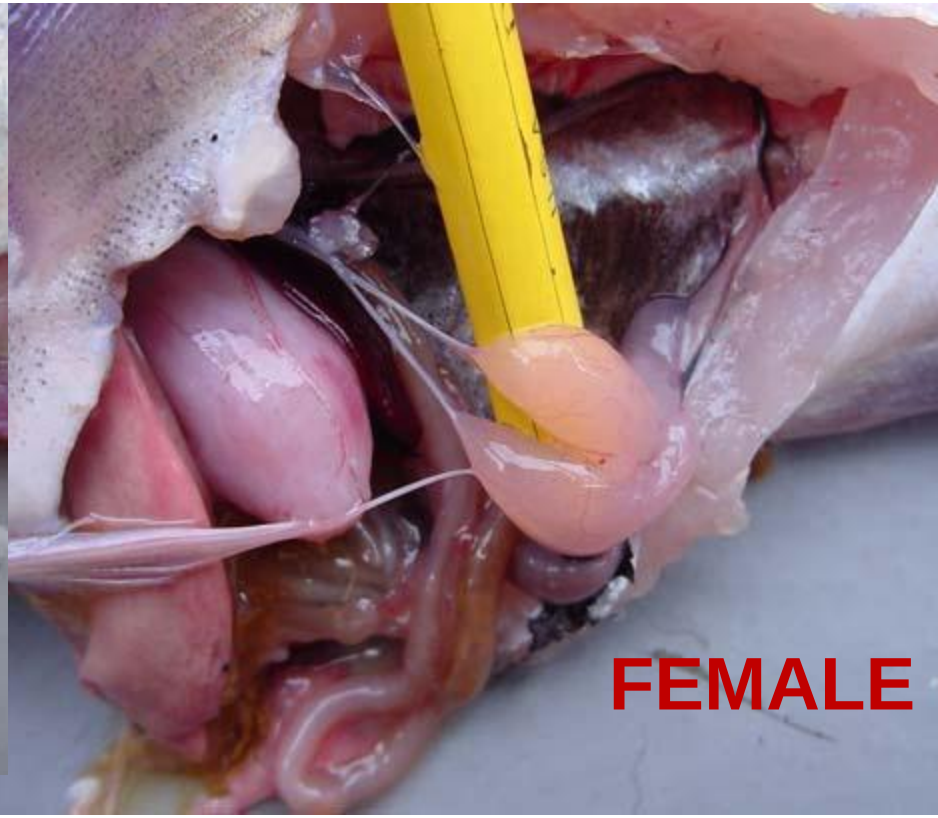
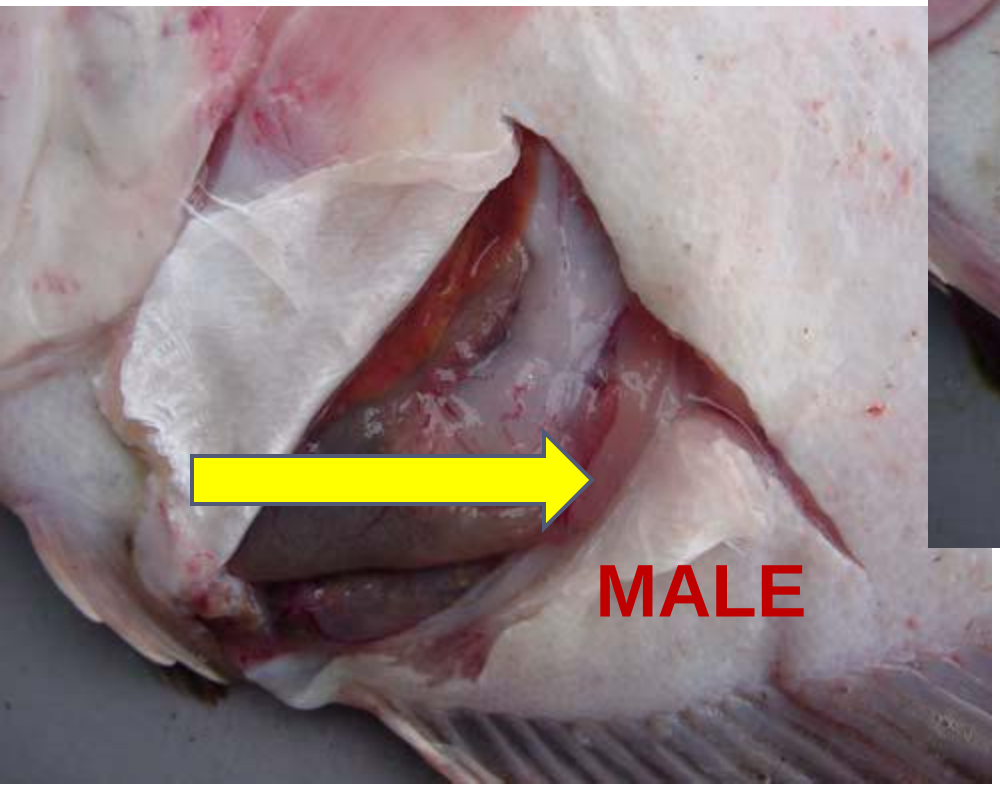


Photo: AFSC 2009

Determining gender - fish

- External vs. **internal**
- Flatfish



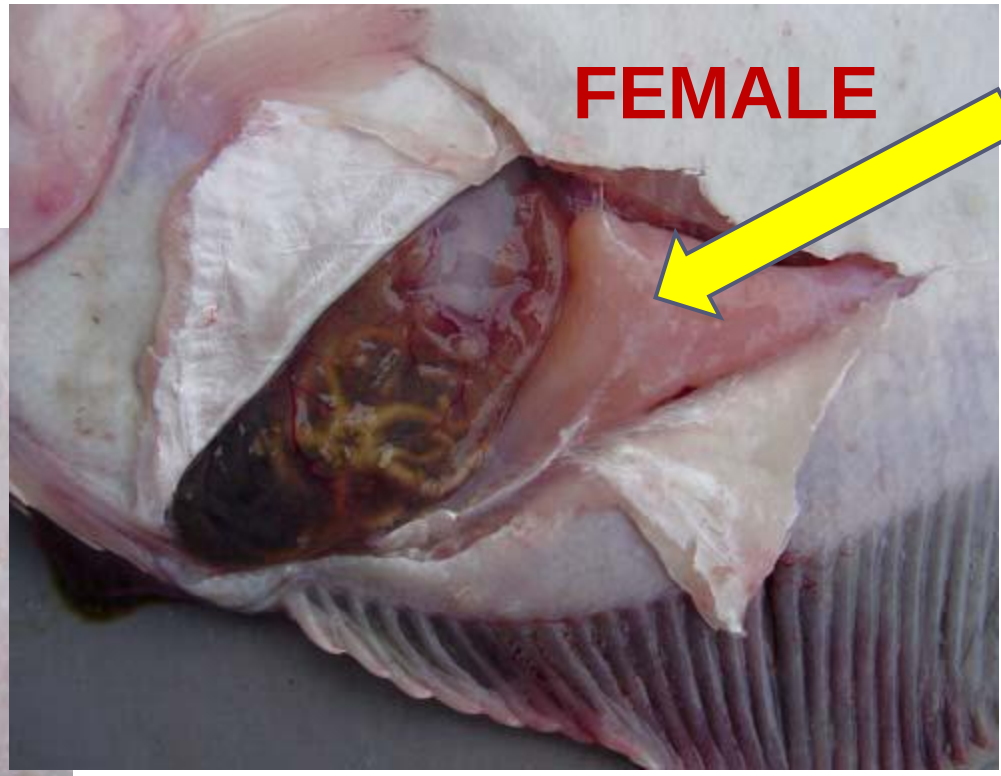
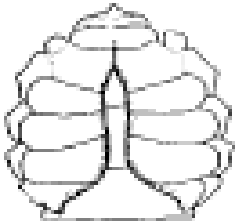


Photo: AFSC 2009

Determining gender – invertebrates - crab

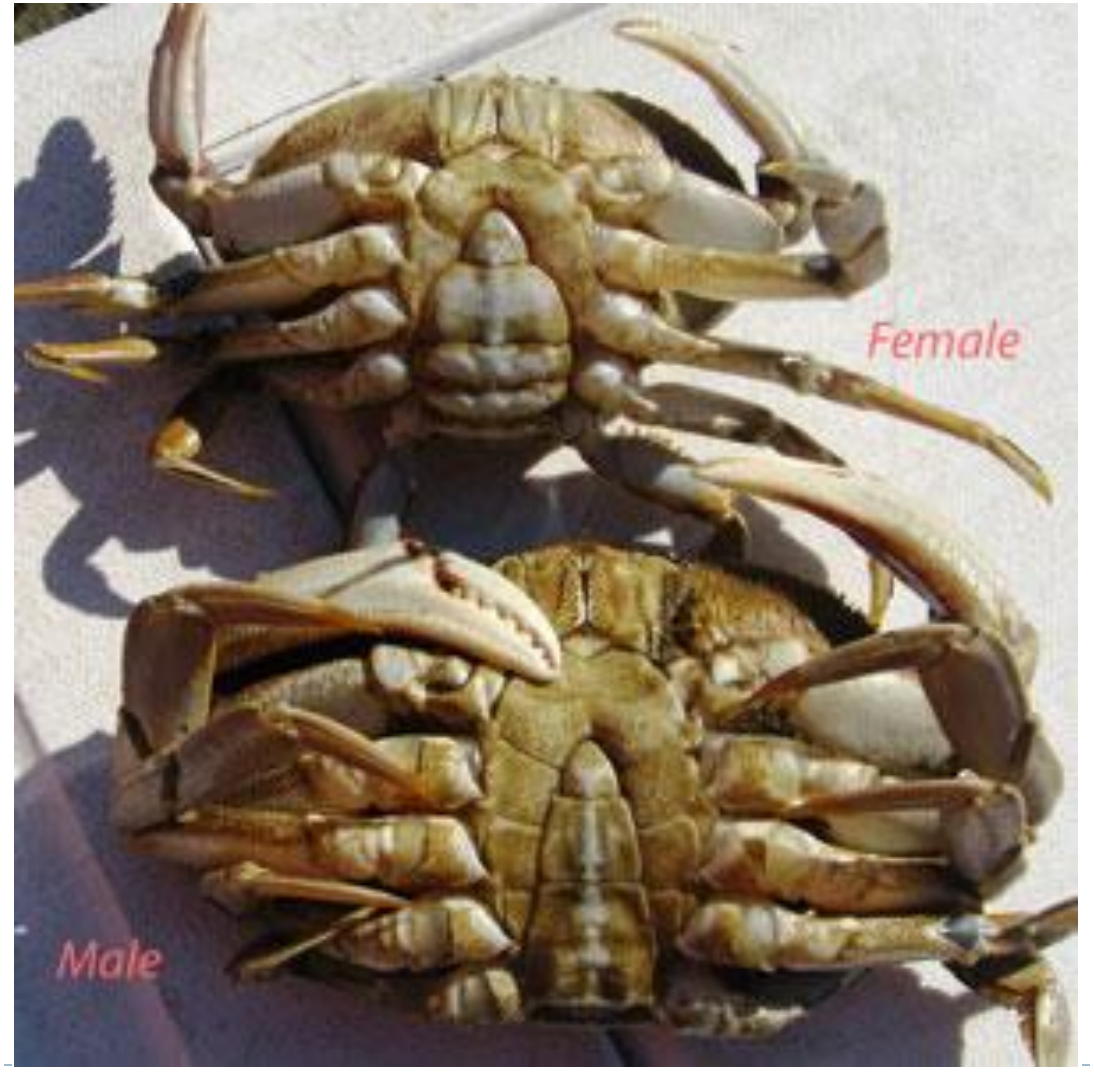
Male



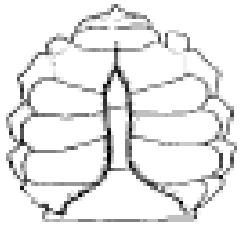
Female

Determining gender – invertebrates - crab

Female



Male



http://www.dfw.state.or.us/mrp/shellfish/crab/research.asp

Measuring fish

- Longest longitudinal axis
- Straight vs curvilinear
- Most common – fork length & total length - more definitions in table 15-1
- Rounding – down to nearest whole cm (fish) or mm (invertebrates)

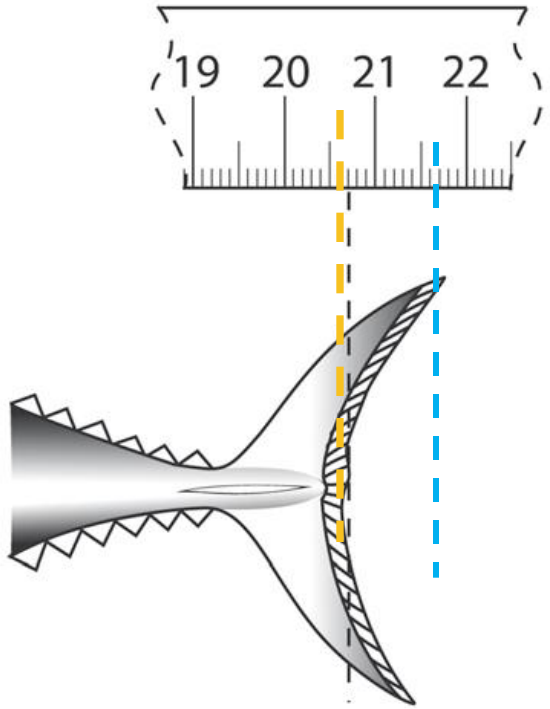


Image from Brogan et al. (2006)

Fork length = 20 cm

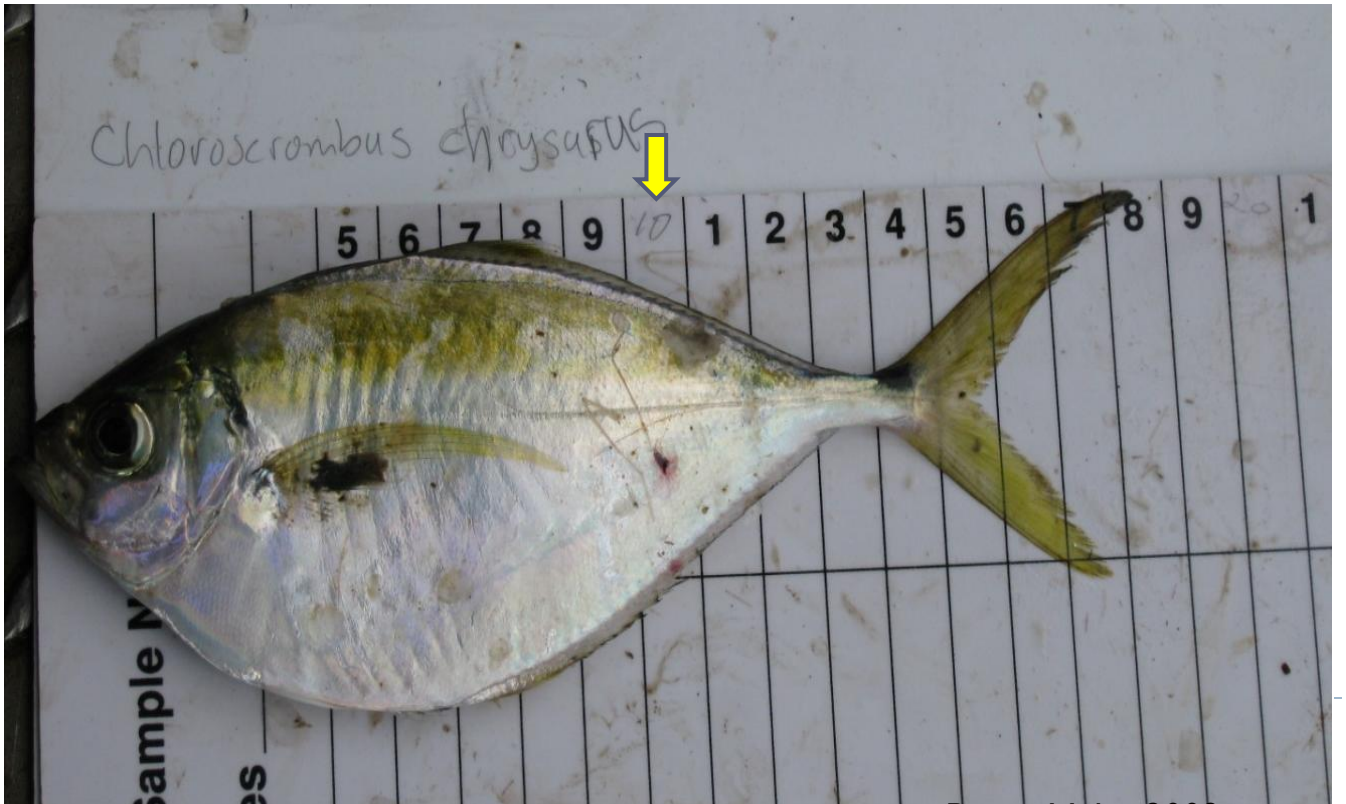
Total length = 21 cm

Measuring fish

- Most common – fork length & total length
- More definitions in table 15-1
- Straight vs curvilinear
- Rounding – down to nearest whole centimeter (fish) or millimeter (invertebrates)
- Tips
  - Close mouth & straighten fish
  - Press snout against measuring board or other vertical surface
  - Take reading from directly above tail
  - If fish too long, take multiple measurements

Measurement types - fish

- **Fork length** (code 01)- Snout tip to center of fork in caudal fin (straight).
- Typically taken on species with concave (forked) tails including bony fish & sharks with distinct fork

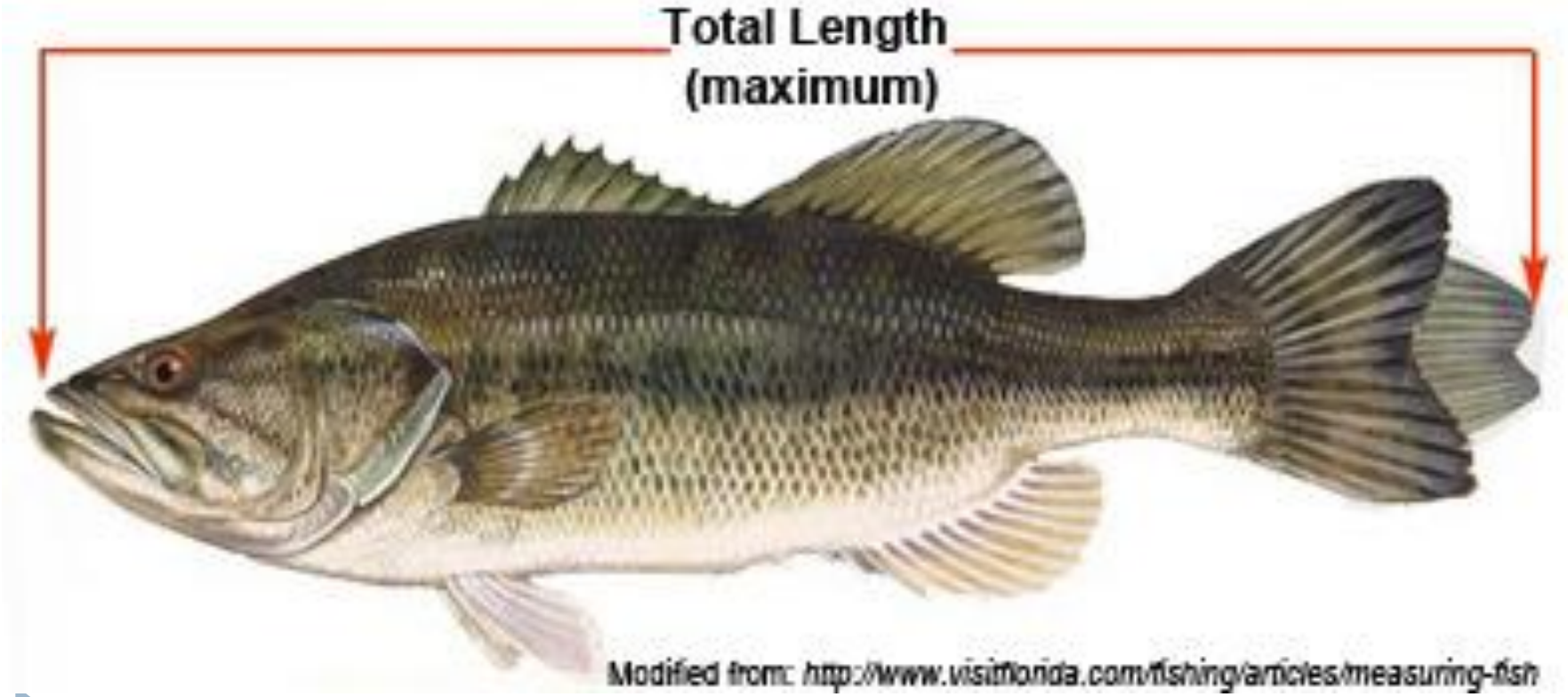


Measurement types - fish

- **Total length** (code 02) – snout to tip of tail in its natural position
- Typical bony fish with straight or convex tails & most

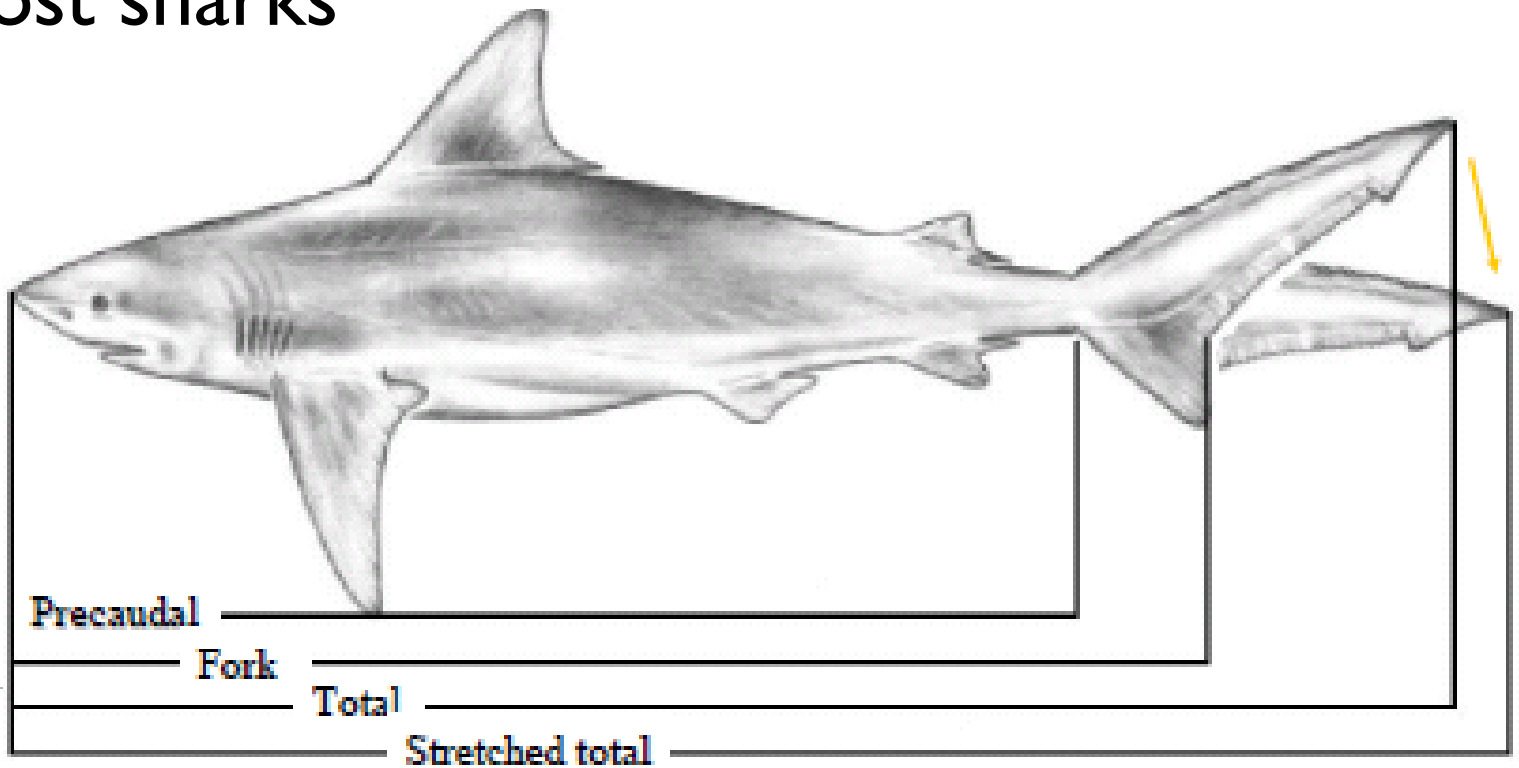
Measurement types - fish

- **Maximum (stretched /pinched) total length** – snout to tip of tail flexed down to center line or pinched



Measurement types - fish

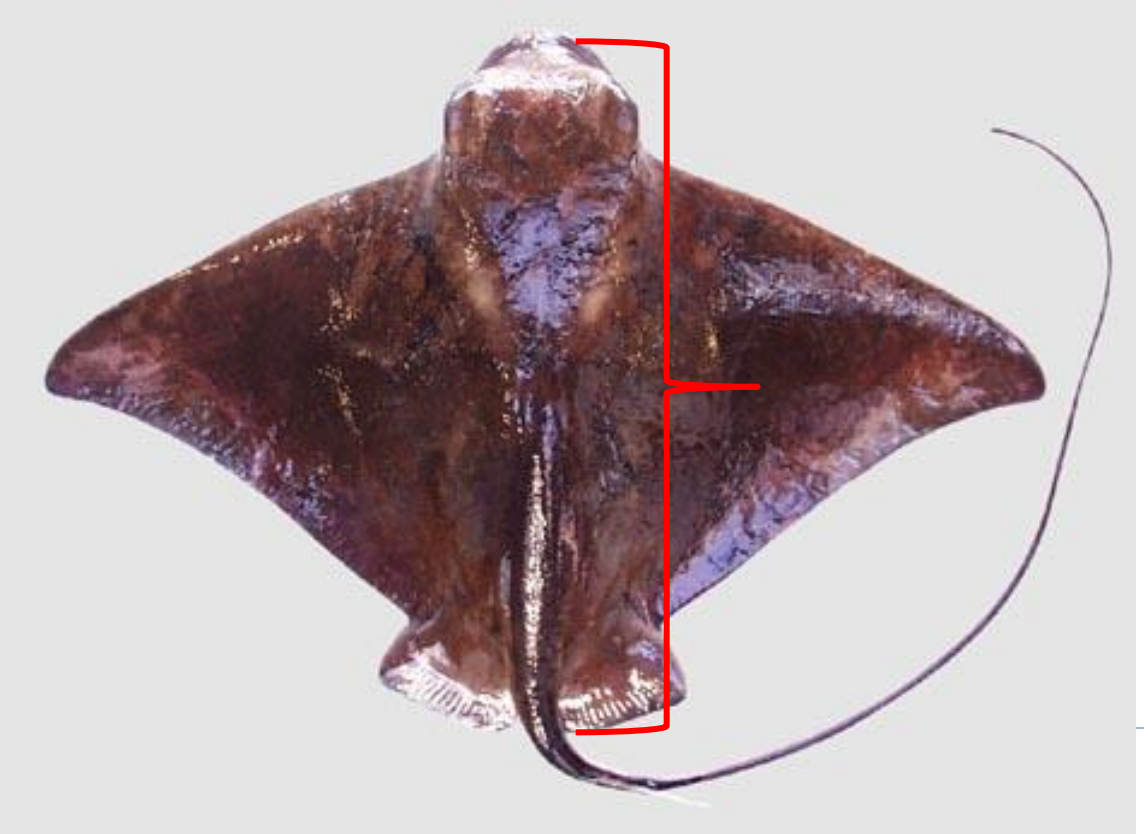
- **Maximum (stretched /pinched) total length** (code 13) – snout to tip of tail flexed down to center line or pinched
- Most sharks



- What do you do if you get a fish without a tail?
- Record length as zero (0) next to appropriate sex.

Measurement types - fish

- **Disc length (pelvic)** (code 14) –Tip of the snout to the posterior edge of the pelvic fins
- Typical measurement for Myliobatoidei



Measurement types - Invertebrates

- Most common – **total length**, carapace length & carapace width

Total length (code 31)

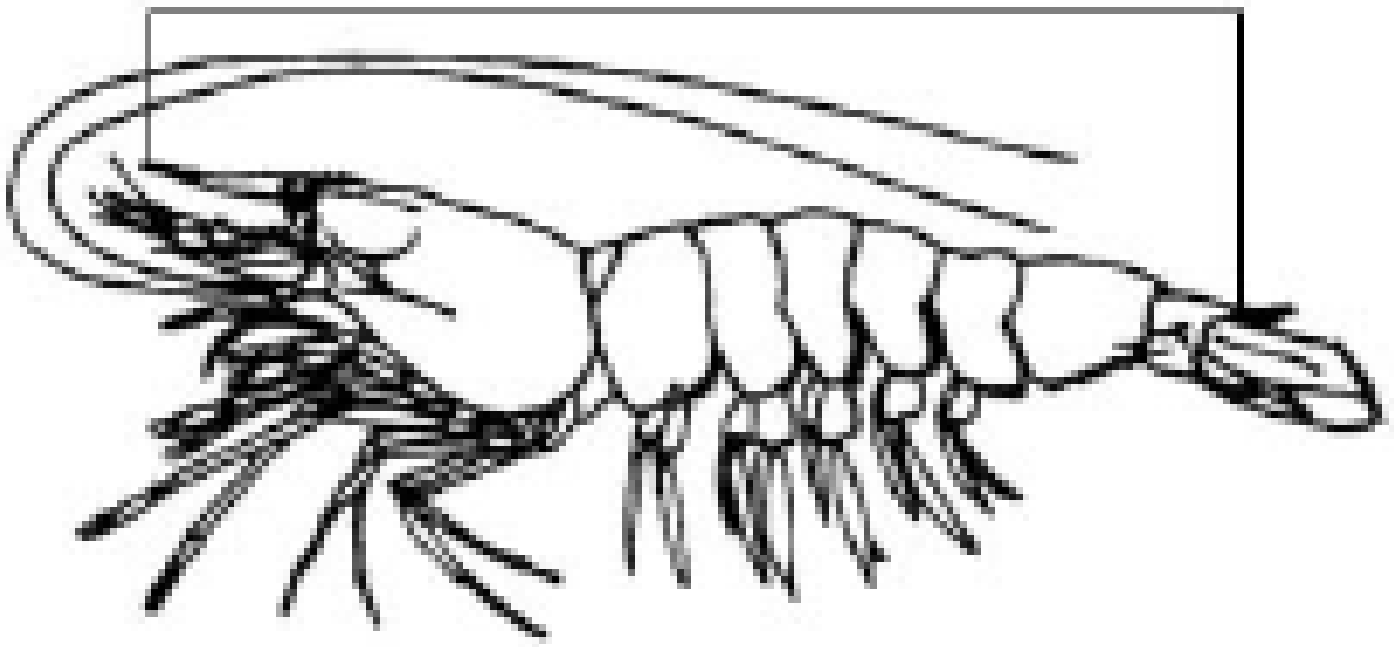
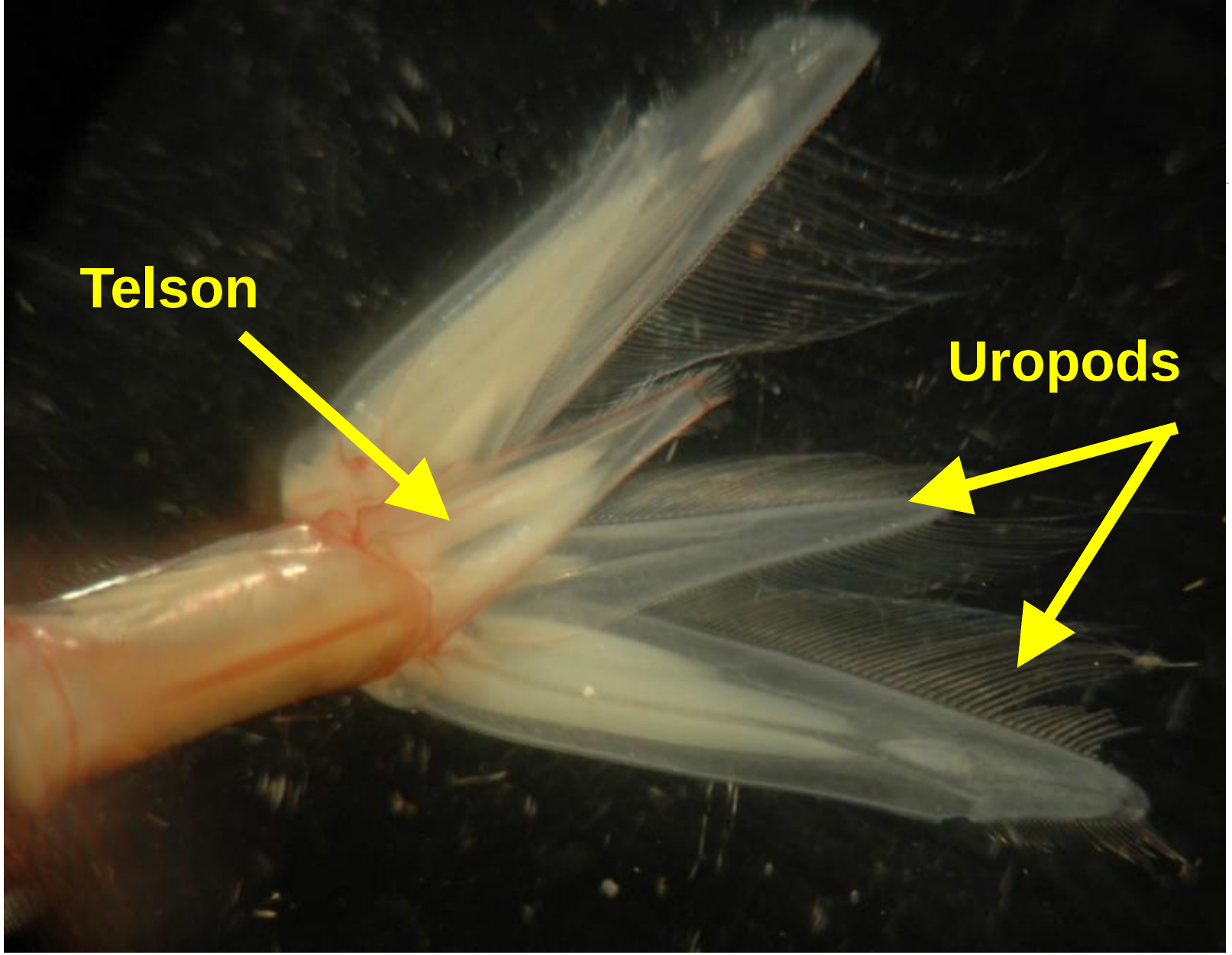


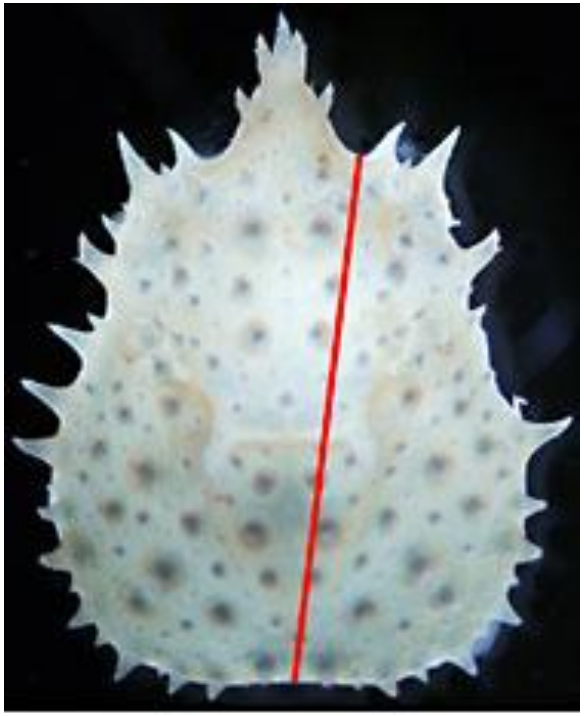
Image: ACCSP - Atlantic Coastal Cooperative Statistics Program



http://www.wallawalla.edu/academics/departments/biology/rosario/inverts/Arthropoda/Crustacea/Malacostraca/Eumalacostraca/Eucarida/Decapoda/Dendrobranchiata/Bentheogennema_burkenroadi.html

Measurement types - Invertebrates

- Most common – total length, **carapace length** & carapace width

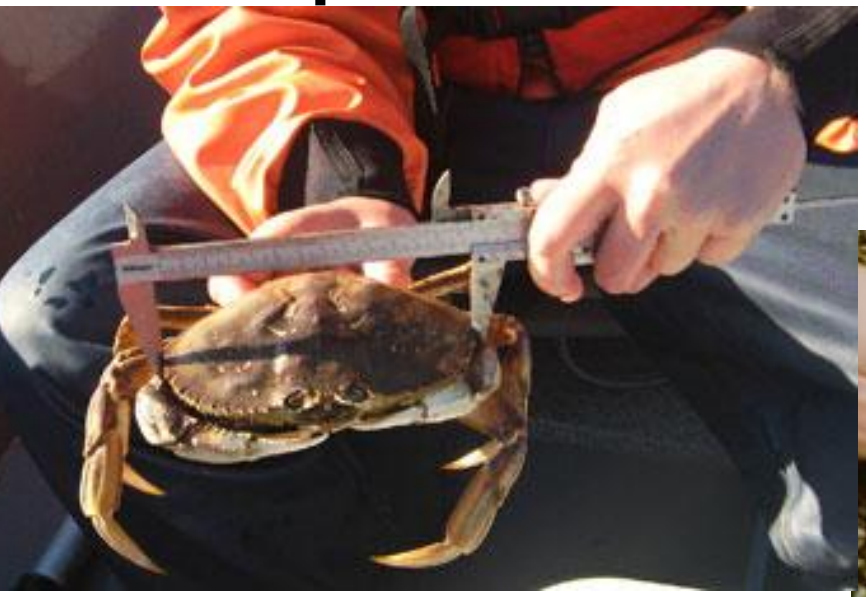


http://www.afsc.noaa.gov

http://www.digsfish.com/crustaceans.html

Measurement types - Invertebrates

- Most common – total length, carapace length & **carapace width**



http://www.dfw.state.or.us/mrp/shellfish/crab/research.asp

Length form

Fish / Invertebrate Length Frequencies

Page _____ of _____

Observer code	Vessel code	Trip ID	Date (dd/mm/yy)	Haul / set

Species Name	Code	Sex	Mat.	LType	Length	#	Length	#	Length	#	Length	#	Length	#	KPC

Comments:

Sex:
M - Male
F - Female
I - Indeterminate
U - Unknown

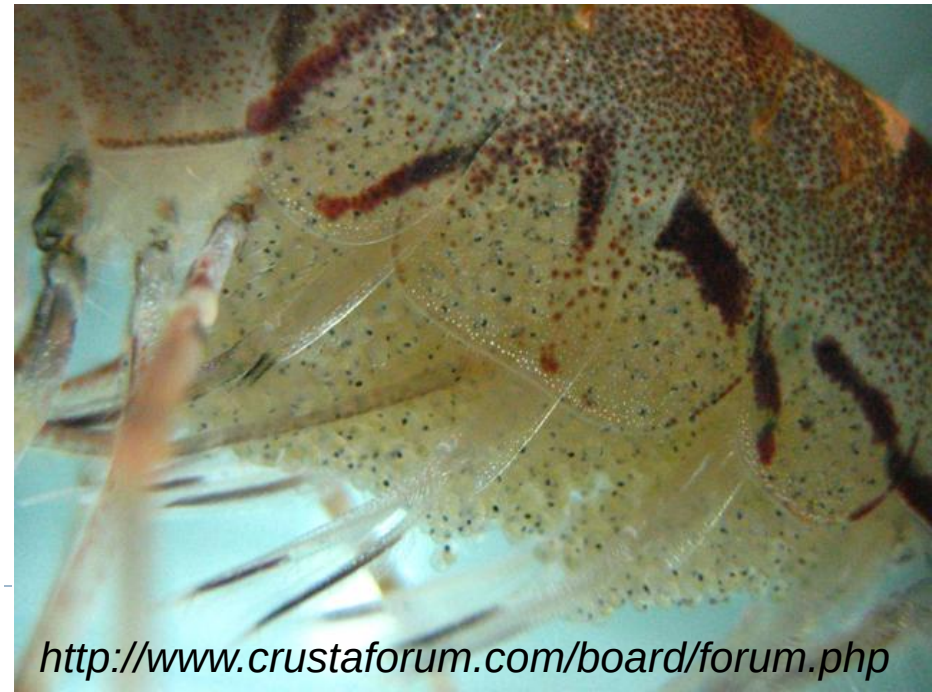
Common length types (record as number & letter combination):

01 - Fork	13 - Total (stretched or pinched)	S - Straight
02 - Total (natural)	34 - Carapace length (lobster)	C - Curved
03 - Standard	37 - Carapace length (crab)	E - Estimated
05 - Lower jaw to fork	38 - Carapace width (crab)	

Version 1.2 12/2011

Maturity field

- Blank – fish & male inverts
- Female crab / lobster
  - 1-no eggs visible
  - 2-eggs visible (no eyes)
  - 3-eggs visible (eyes visible)
  - 4-eggs visible (eyes unknown)



Length form

Fish / Invertebrate Length Frequencies

Page _____ of _____

Observer code	Vessel code	Trip ID	Date (dd/mm/yy)	Haul / set

Species Name	Code	Sex	Mat.	LType	Length	#	Length	#	Length	#	Length	#	Length	#	KPC
				01S											

Comments:

Sex:
M - Male
F - Female
I - Indeterminate
U - Unknown

Common length types (record as number & letter combination):

01 - Fork	13 - Total (stretched or pinched)	S - Straight
02 - Total (natural)	34 - Carapace length (lobster)	C - Curved
03 - Standard	37 - Carapace length (crab)	E - Estimated
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Version 1.2 12/2011

Length form

Fish / Invertebrate Length Frequencies

Page _____ of _____

Observer code	Vessel code	Trip ID	Date (dd/mm/yy)	Haul / set

Species Name	Code	Sex	Mat.	LType	Length	#	Length	#	Length	#	Length	#	Length	#	KPC
					0	1	23	1	24	3	25	1	26	1	105

Comments:

Sex:
M - Male
F - Female
I - Indeterminate
U - Unknown

Common length types (record as number & letter combination):

01 - Fork	13 - Total (stretched or pinched)	S - Straight
02 - Total (natural)	34 - Carapace length (lobster)	C - Curved
03 - Standard	37 - Carapace length (crab)	E - Estimated
05 - Lower jaw to fork	38 - Carapace width (crab)	

Version 1.2 12/2011

Activity

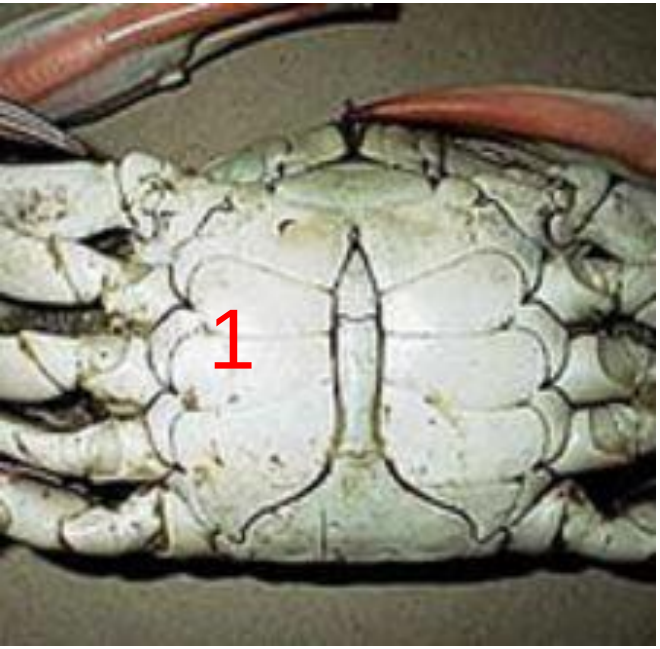
- Groups of 3
- Each packet of ~80 "fish" has information on the species, length type, and target number of fish to measure
- Do not write on the "fish"
- Each "fish" has a sex recorded on it [♀=female or ♂=male]
- Make a sampling plan before making any measurements
- Measure a subsample of fish according to your plan
- Complete Fish/Invertebrate Length Frequency form and questions on the handout
- 15 minutes (homework)

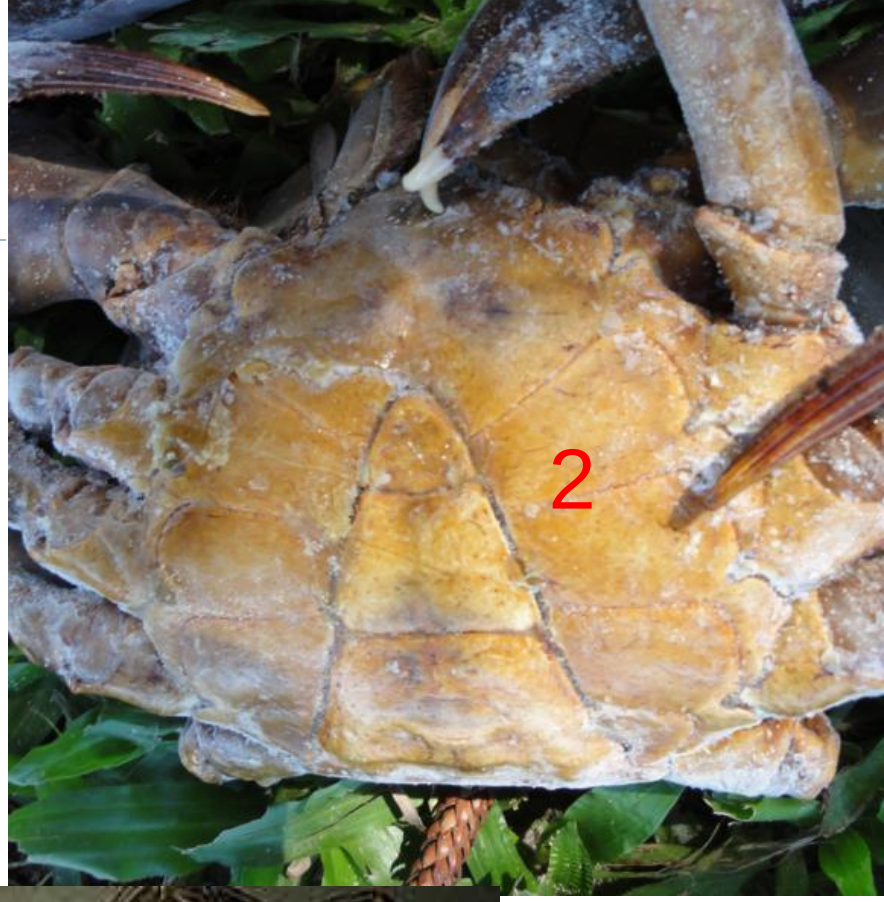
Summary

- How are length frequency data utilized?
- What are the most common measurement types for
  - bony fish with a round tail?
  - crab?
  - skates/rays (not Myliobatoidei)?
  - Sharks without distinct fork
- What are the primary differences between male & female fish

Summary

- What are the crab genders?

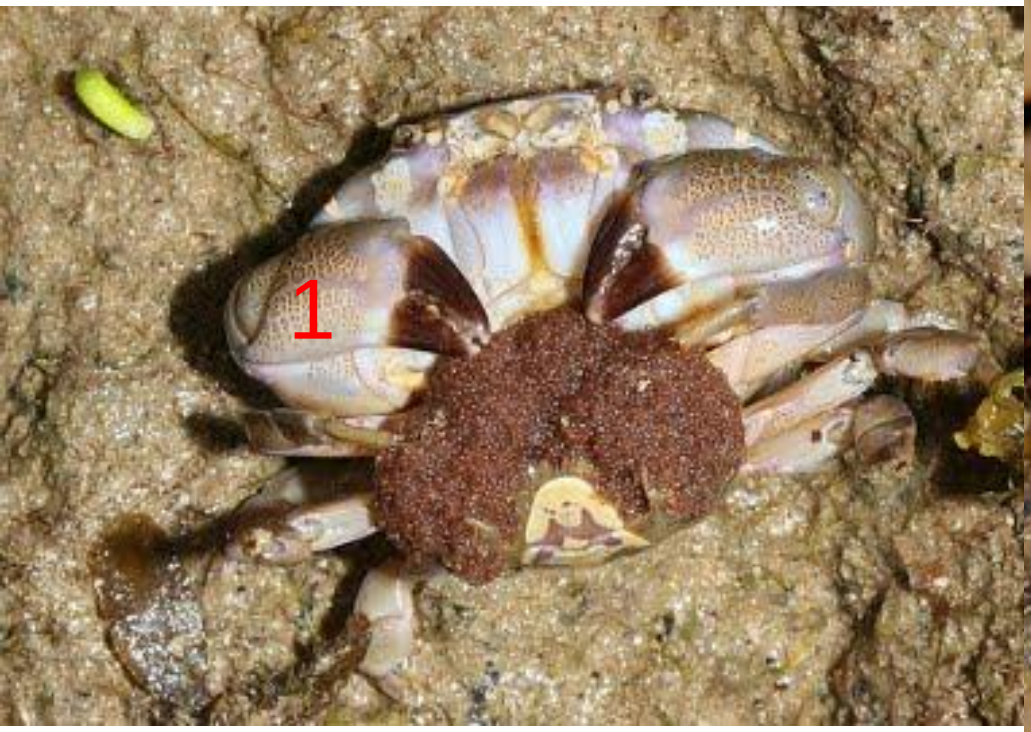




Photos:
http://www.suite101.com/ ;
http://www.ehow.com/

Summary

- How would you record the maturity of these gravid crab?



- *Images: http://iyb2010singapore.blogspot.com/*

References

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- McAuliffel, J. A., D. G. Itano, and S. Arceneaux. 2007. Photographic identification guide for billfish, sharks, rays, tuna-like and non-tuna finfish taken in WCPO pelagic longline fisheries (v1). Report submitted to the Western and Central Pacific Fisheries Commission, Scientific Committee, Third Regular Session, 13-24 August 2007, Honolulu, USA, WCPFC-SC3-FT SWG/IP-6.
- S Soondron, A Venkatasami and A Sheik Mamode. No Date. Some results of the study on sexual maturity of *Lethrinus mahsena* from Saya de Malha Bank. Albion Fisheries Research Centre. *http://www.gov.mu/portal/sites/ncb/moa/farc/amas99/s62.htm*
- Van Helvoort, G. 1986. Observer program operations manual. FAO Fisheries Technical Paper 275, FAO, Rome.

Fish / Invertebrate Length Frequencies

Observer code		Vessel code		Trip ID		(dd/mm/yy)		Haul / set
A732	1	LIB732		91	1	01/05/11		3

Species Name	Code	Sex	Mat.	LType	Length	#	Length	#	Length	#	Length	#	Length	#	KPC
okay if blank	CVJ	M	B	01S											
	or	or	l	or											
	PET	F	a	02S											
	or		n												
	BOA		k												
	or														
	ILI														
	Or														
	BUA														
	1	1		1	1										1

Lengths should be in ascending order for each sex and length type

Sum lengths/counts per row = KPC; for correct addition in each row

Comments:

Sex:
M - Male
F - Female
I - Indeterminate
U - Unknown

Common length types (record as number & letter combination):

01 - Fork	13 - Total (stretched or pinched)	S - Straight
02 - Total (natural)	34 - Carapace length (lobster)	C - Curved
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