

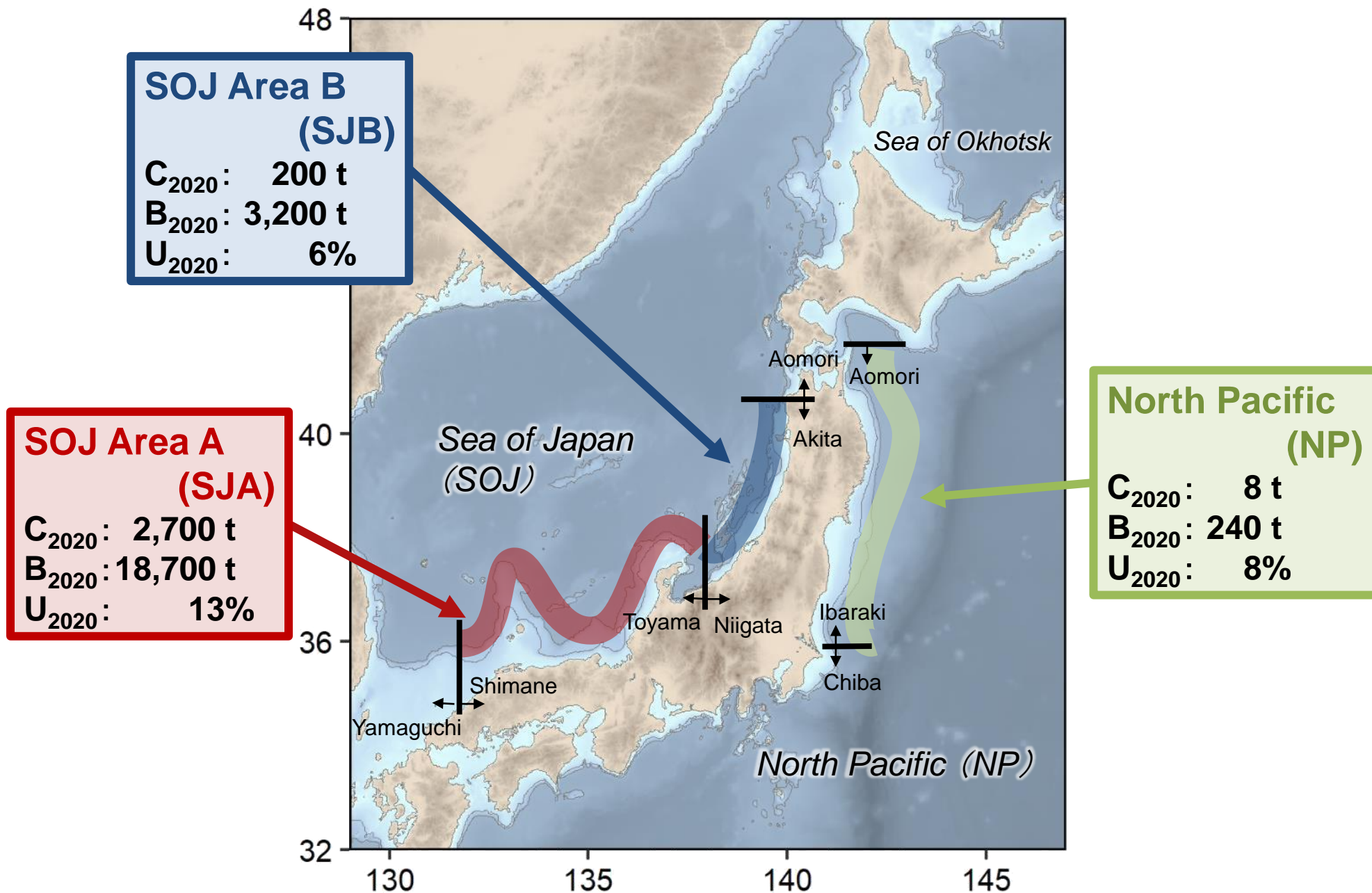
General introduction of the stock assessments



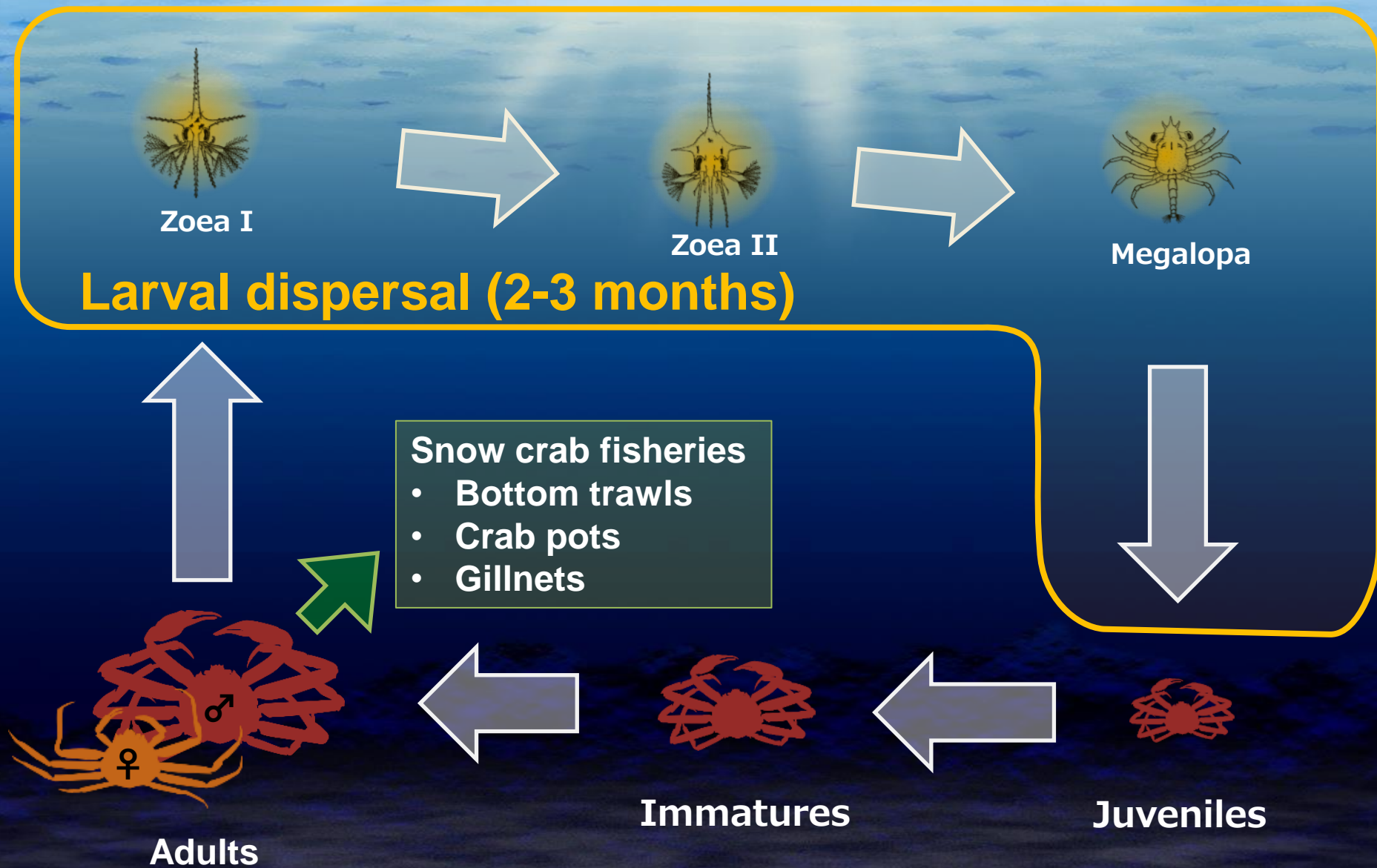
Kay Sakuma

 Fisheries Resources Institute,
Japan Fisheries Research and Education Agency

Geographic ranges of the stocks



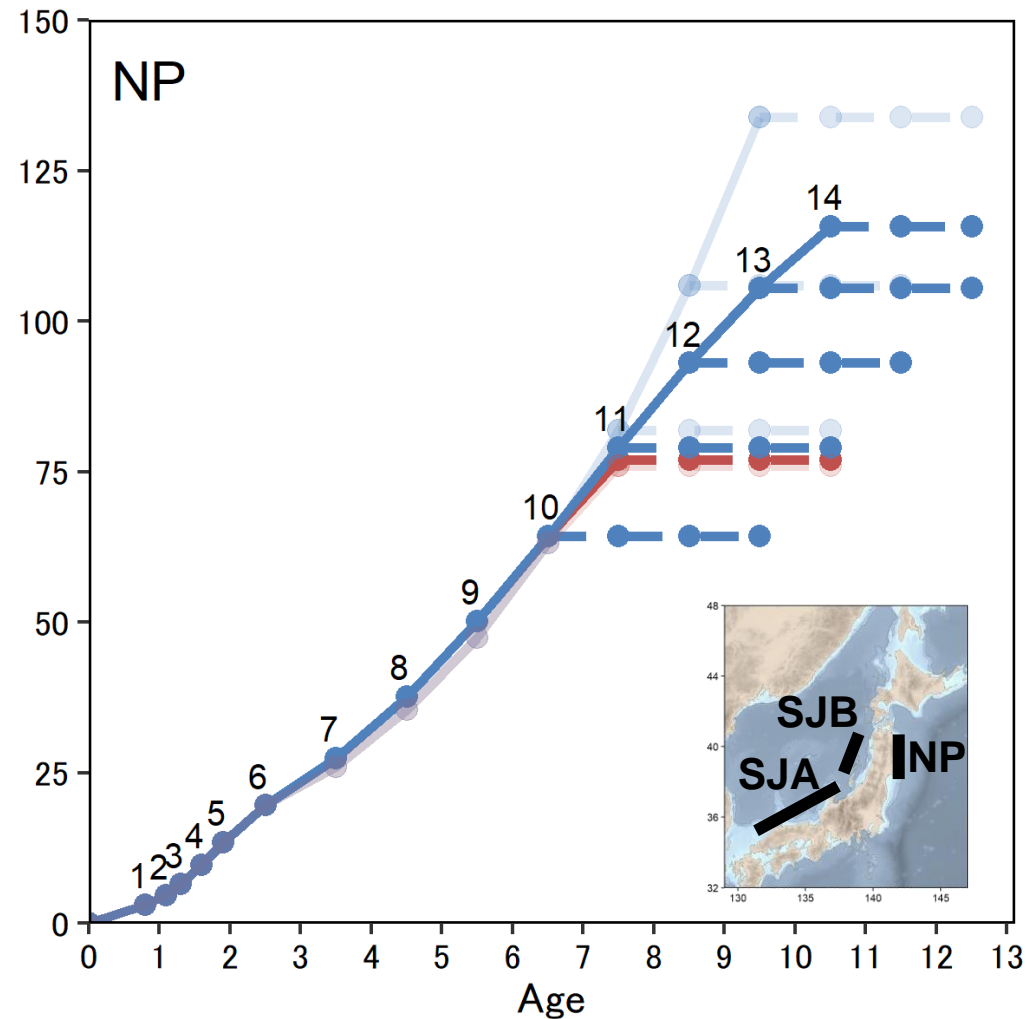
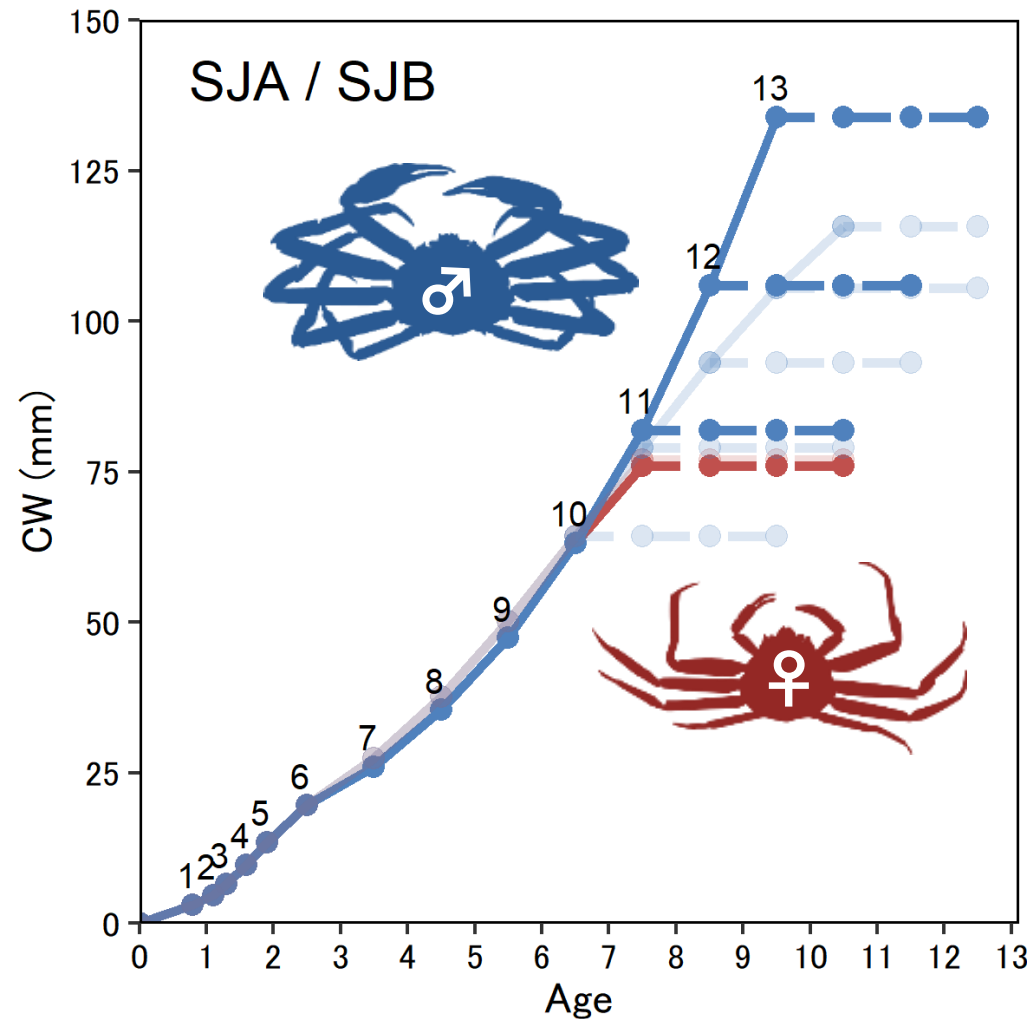
Life history of the snow crab *Chionoecetes opilio*



Age, instars and growth



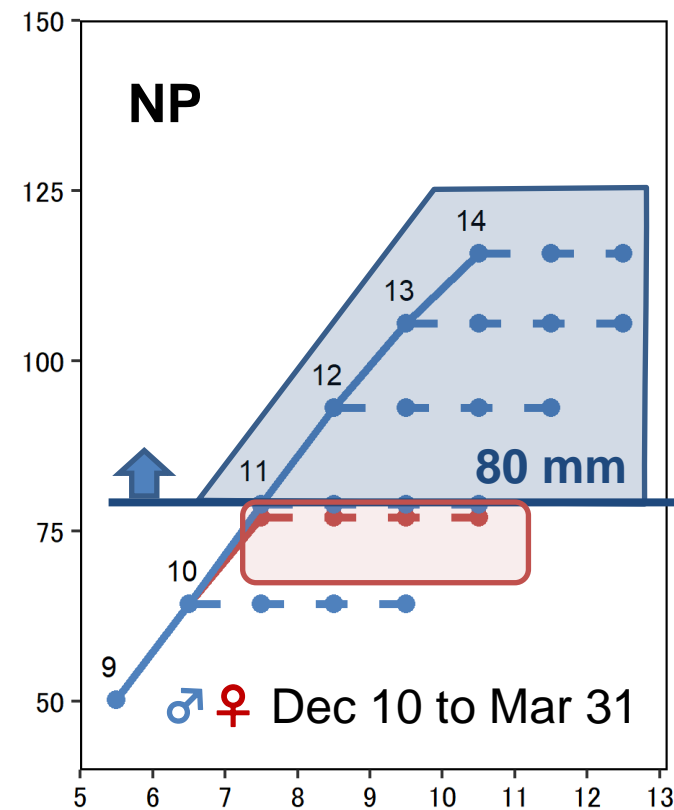
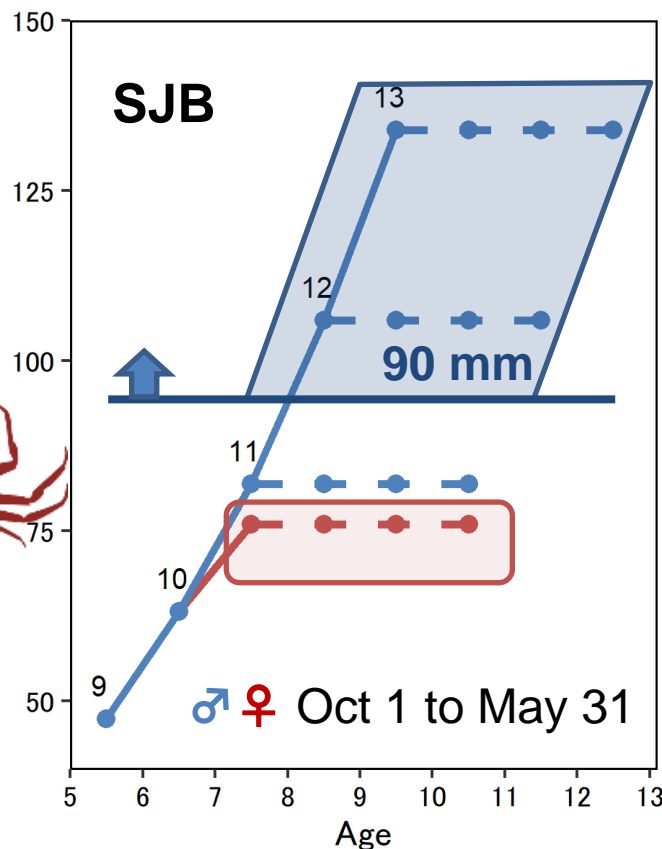
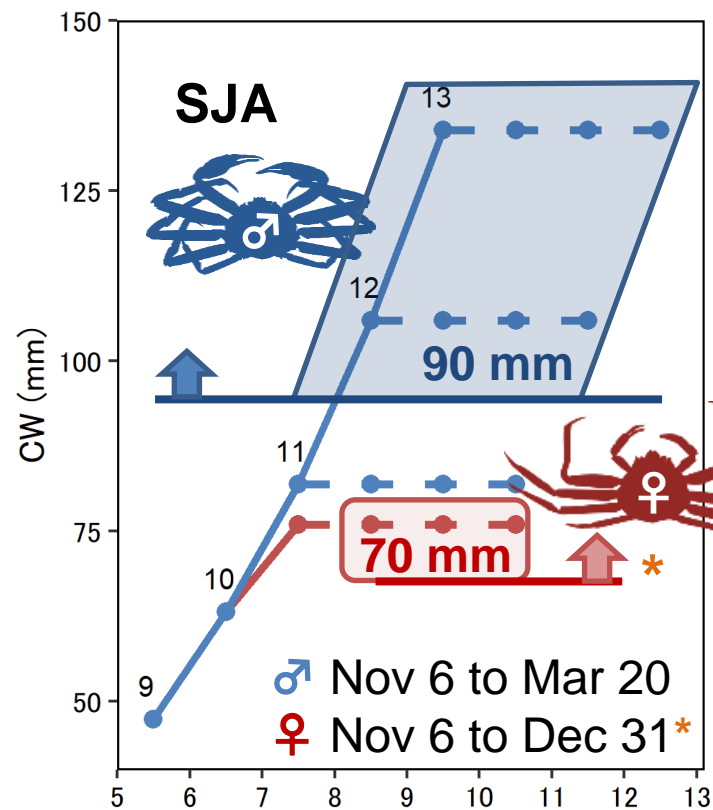
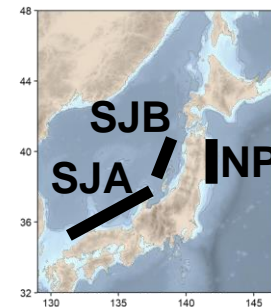
- ♂ Terminal molting at **11th-13th** instars in **SJA/SJB**, **10th-14th** in **NP**
- ♀ Terminal molting at 11th instar in both areas.
- ♂ Mature male CW is larger in **SJA/SJB**



Fishing regulations



- ♂ >90 mm in SJA/SJB, >80 mm in NP
- ♀ Mature females in SJB, NP
- ♂ ♀ Fishing season is also different in the three stocks
- ♂ ♀ Additional self-regulation rules (* in Figure)
e.g., Mature hardshell females >70 mm



Stock assessment strategy



SOJ Area A (SJA)

SOJ Area B (SJB)

North Pacific (NP)

Annual Survey

Bottom trawl



Crab pots

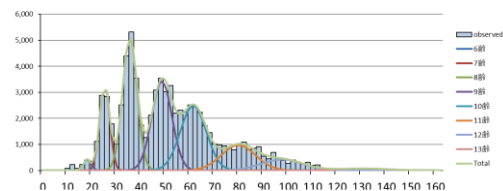


Bottom trawl

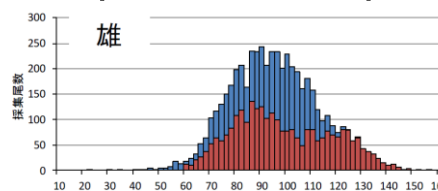


Data

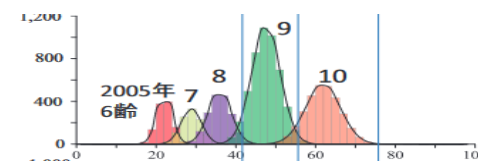
Size freq. -> NAA*
(Gaussian mixture model)



Size freq. -> B
(CW>90 mm)



Size freq. -> NAA
(Cohort slicing)



*Number at age

Strategy

Age structured model
(Ueda et al., unpubl.)

Biomass

RP

Projection

F30%SPR

Biomass

Projection

SAM (JASAM)
(Shibata et al., 2021)

Biomass

RP

Projection

Stock assessment strategy



SOJ Area A (SJA)

SOJ Area B (SJB)

North Pacific (NP)

Annual Survey

Bottom trawl



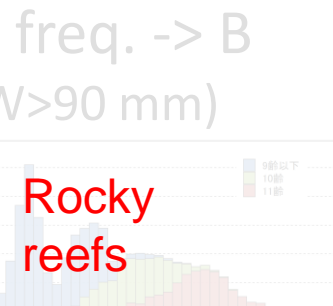
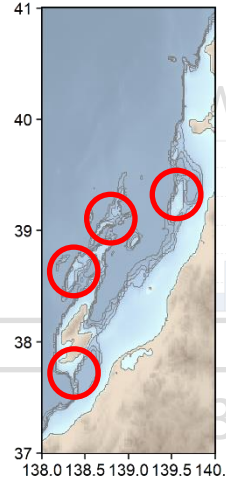
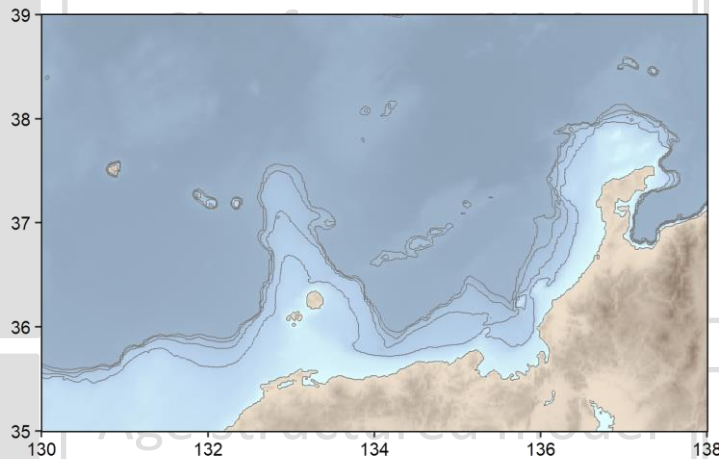
Crab pots



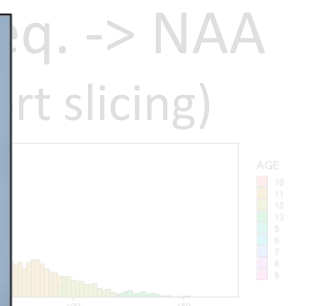
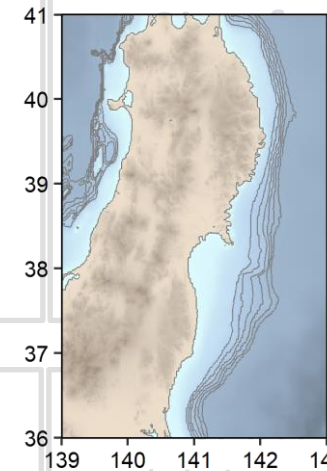
Bottom trawl



Data



Rocky reefs



AGE

Strategy

- ✓ **Bottom trawl survey** is desirable (higher coverage and accuracy)
- ✓ **Crab pot** is a choice because of steep, rough and rocky bottoms in SOJ Area B

Stock assessment strategy



SOJ Area A (SJA)

SOJ Area B (SJB)

North Pacific (NP)

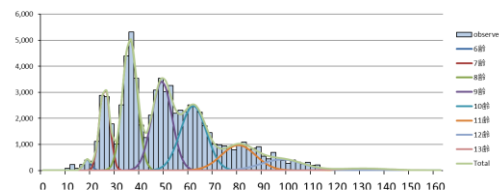
Annual Survey

- ✓ **Gaussian mixture model** provides more accurate NAA but requires plenty of data points (**SJA**).
- ✓ **Cohort slicing** has been used in **NP** as not enough samples are obtained for statistical analysis in annual surveys.

Data

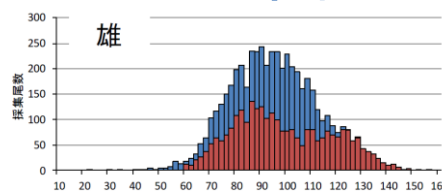
Size freq. -> NAA

(**Gaussian mixture model**)



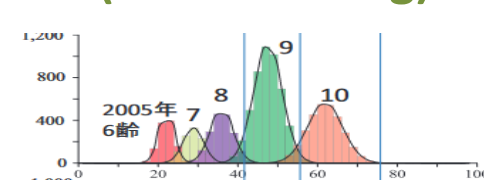
Size freq. -> B

(♂ CW > 90 mm, ♀ mature)



Size freq. -> NAA

(**Cohort slicing**)



Strategy

- ✓ Age-structured model is currently not applied and **standing stock biomass (CW > 90 mm males and mature females)** is used in **SJB**, because juvenile/immature information is unavailable from crab pot surveys

Stock assessment strategy



SOJ Area A (SJA)

SOJ Area B (SJB)

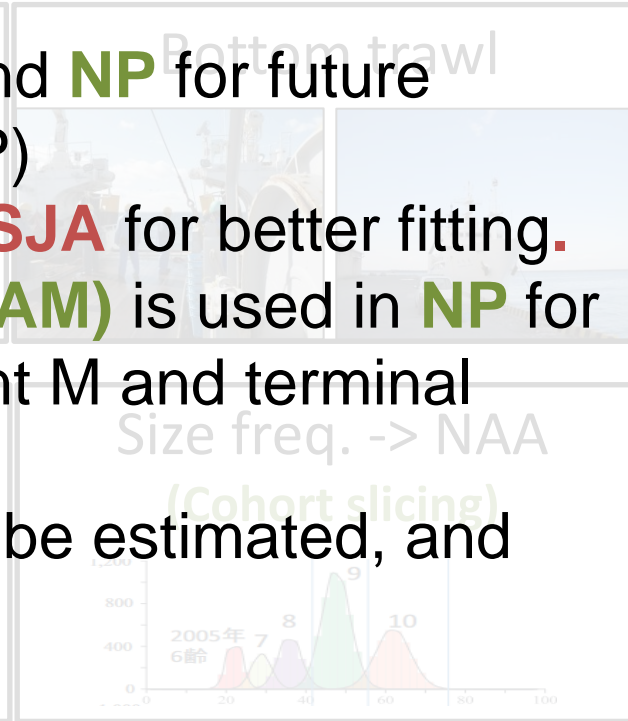
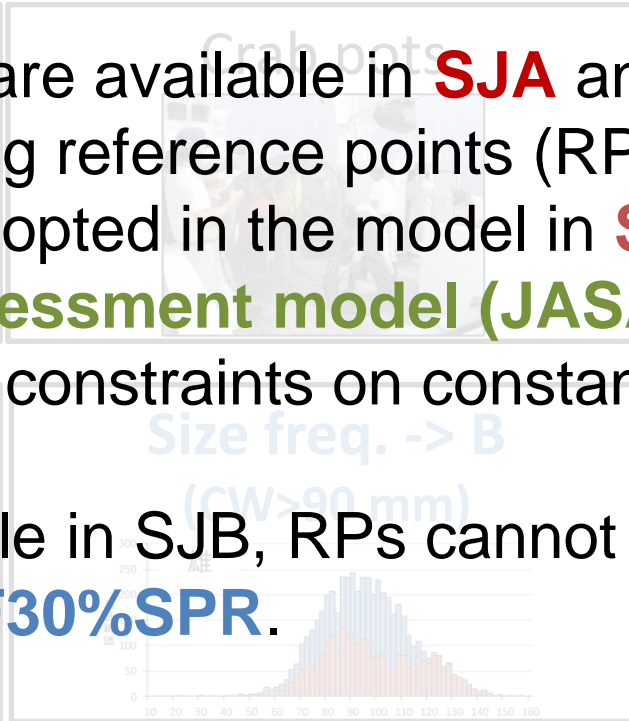
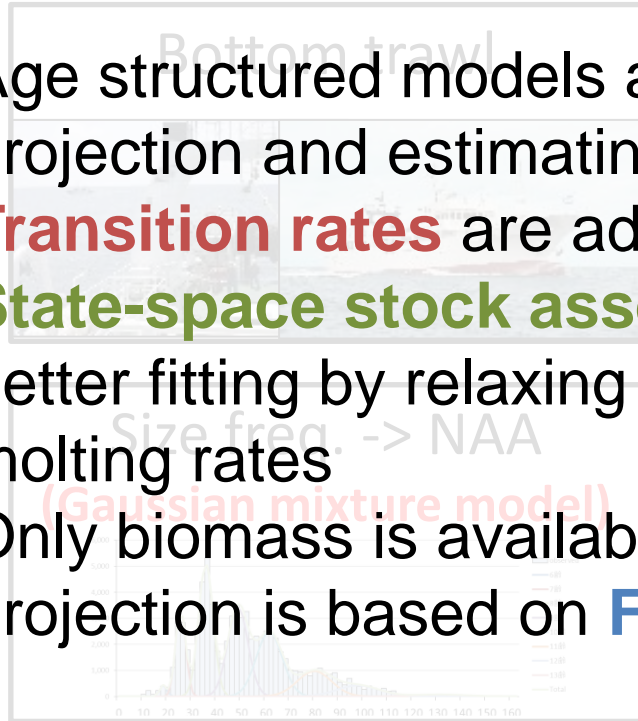
North Pacific (NP)

Annual Survey

- ✓ Age structured models are available in **SJA** and **NP** for future projection and estimating reference points (RP)
- ✓ **Transition rates** are adopted in the model in **SJA** for better fitting.
- ✓ **State-space stock assessment model (JASAM)** is used in **NP** for better fitting by relaxing constraints on constant M and terminal molting rates

Data

- ✓ Only biomass is available in SJB, RPs cannot be estimated, and projection is based on **F30%SPR**.



Strategy

Age structured model

(Ueda et al., unpubl.)

Biomass

RPs

Projection

F30%SPR

Biomass

Projection

SAM (JASAM)

(Shibata et al., 2021)

Biomass

RPs

Projection