PICES 17th Annual meeting

Molecular phylogeography of *Nemopilema nomurai* (Class : Scyphozoa) in Korean waters

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Mass occurrence *of* *Nemopilema nomurai*

- **Distribution : East China Sea, Korea Peninsula, Japan Sea**
- **Damage to fishery and human health.**
- **August, 2003 : 44 inds./10,000m^2 , Yellow Sea**
- **August, 2005 : 162 inds./10,000m^2 , Yellow Sea**
- **August, 2007 : 45 inds./10,000m^2 , Yellow Sea**

Life history of *N. nomurai*

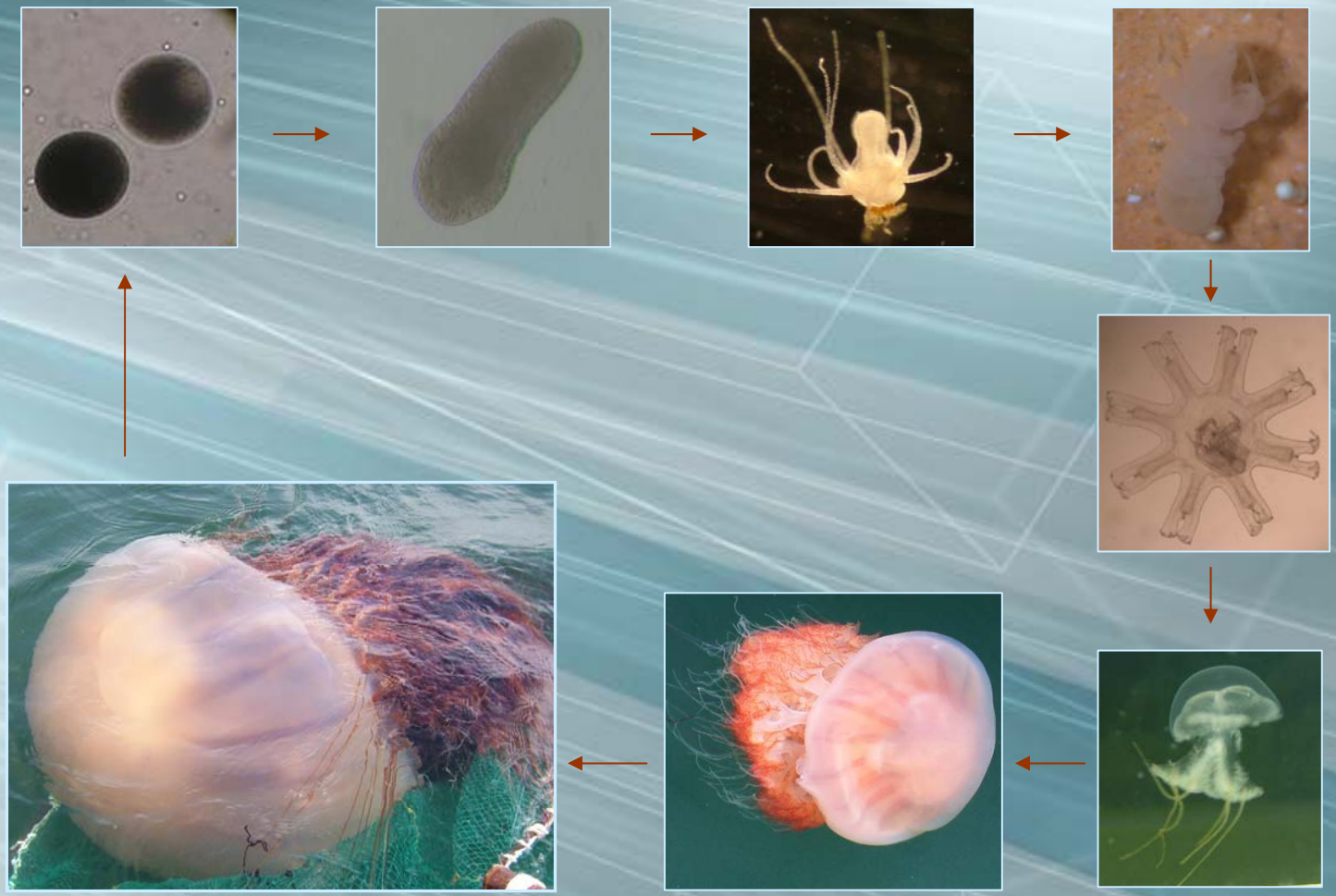
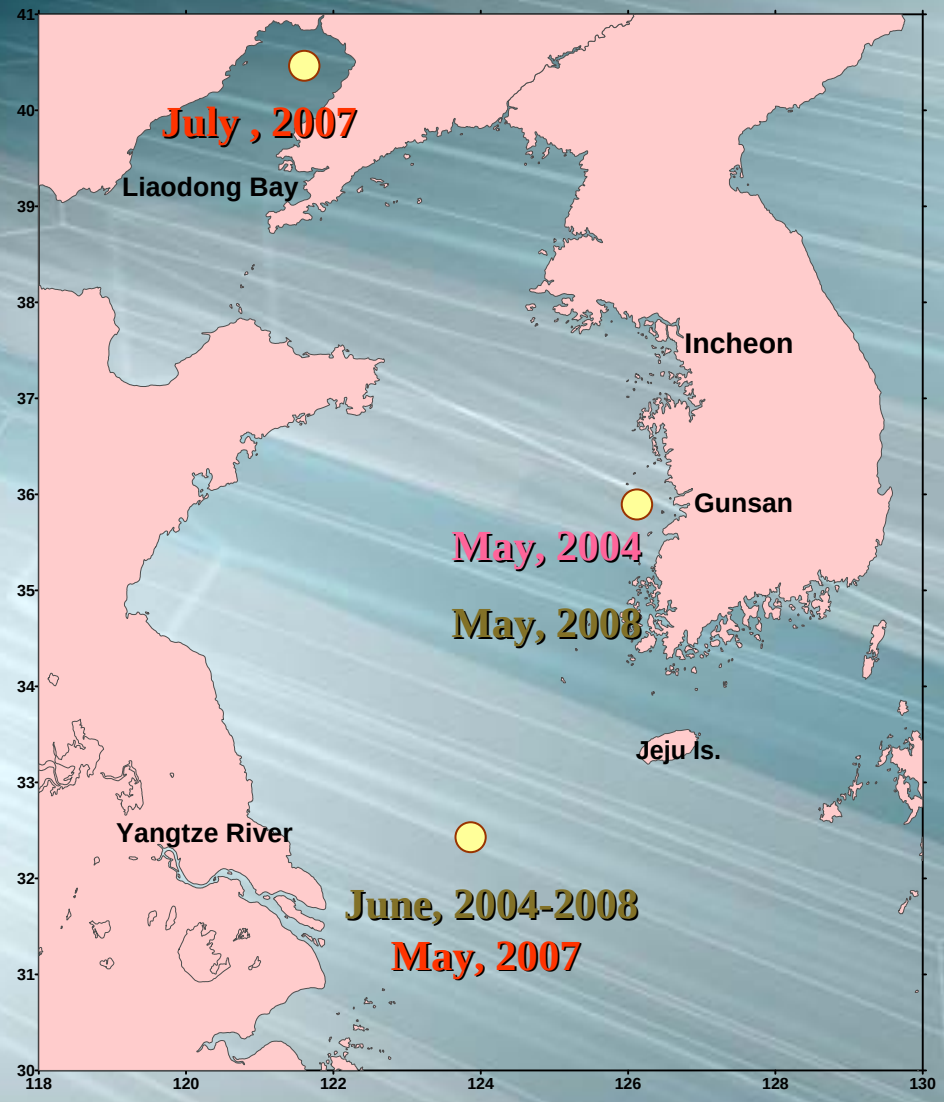


Photo by Hye-Eun Lee

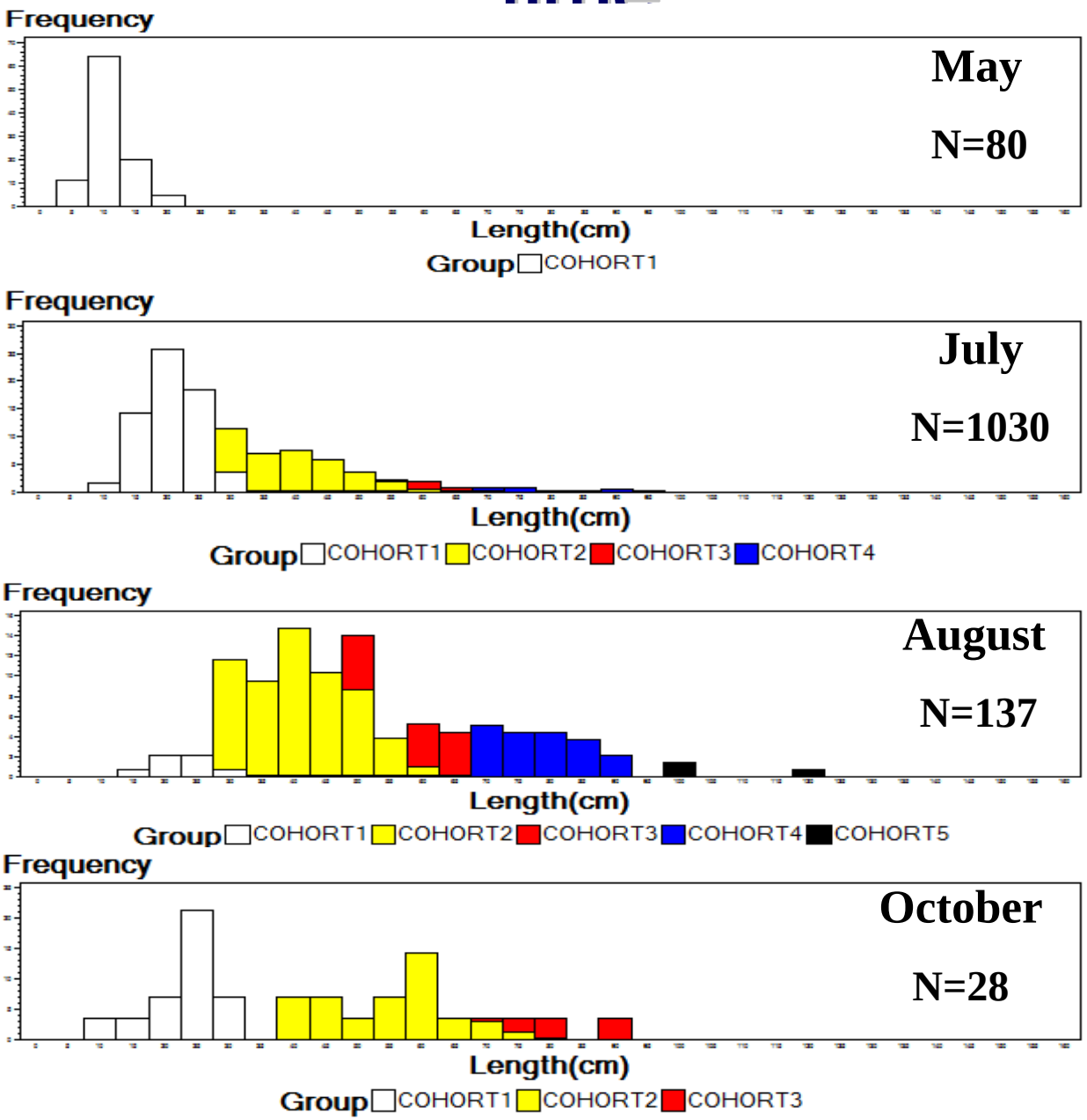
Early appearance of *N. nomurai*



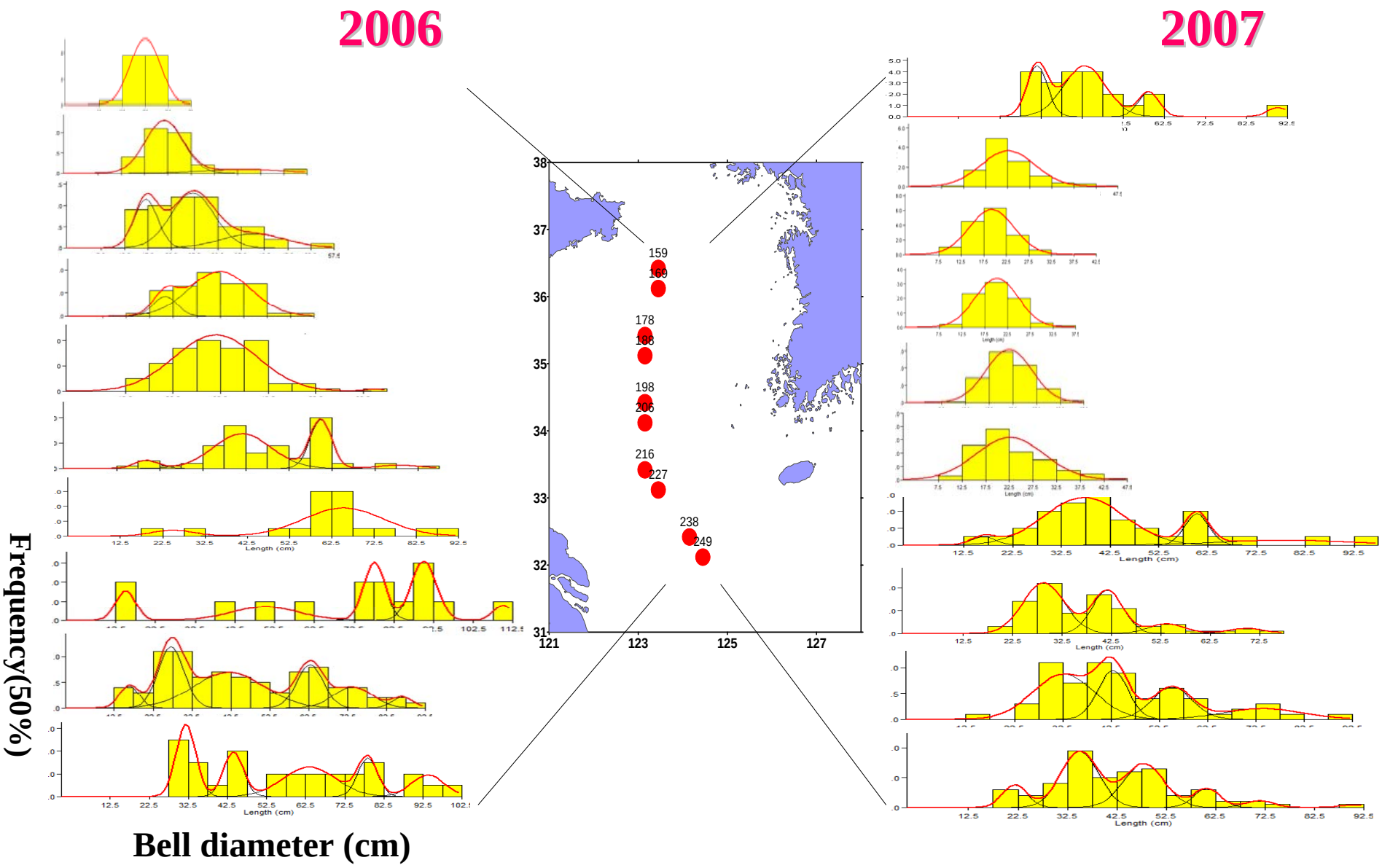
- **East China Sea**
  - **Mid June, 2004-2008**
  - **Late May, 2007 (2.5-20 cm)**
- **Korean waters**
  - **May, 2004 off Gunsan (2-9 cm)**
  - **June, 2008 off Gunsan (9-55 cm)**
- **Chinese waters**
  - **Late June - early July, 2007 (2-6 cm) at Liaodong Bay**

  (Jing Dong, IJW4, 2007)

Cohorts analysis of *N. nomurai* with time



Cohorts of *N. nomurai* in July, Yellow Sea



Genetic discontinuity between the groups in the north East China Sea and the Yellow Sea occurs or not ?

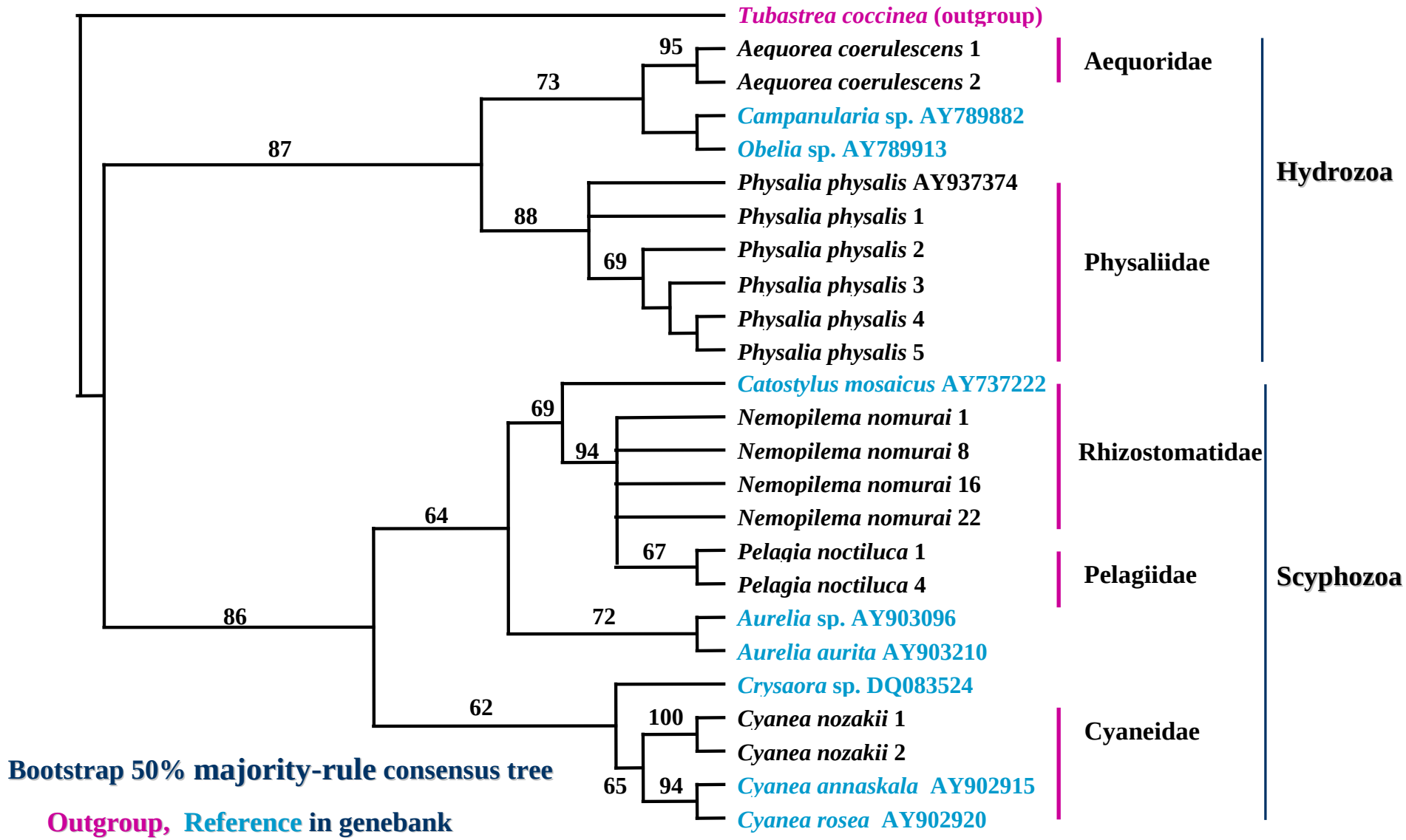
Materials & Methods

Class	Order	Family	Speicies	Location & Date	No. of samples
Scyphozoa	Rhizostomeae	Rhizostomidae	***Nemopilema nomurai***	Ieo-do : May, 2007	29
				Ieo-do : July, 2007	20
				Incheon : August, 2007	19
				Center of theYellow Sea : July, 2007	18
				Gunsan : August, 2007	15
				Busan : July, 2007	20
				Kangnung : August, 2007	19
	Semaeostomeae	Pelagiidae	***Pelagia noctiluca***	Kijang : May, 2008	2
		Cyaneidae	***Cyanea nozakii***	Center of Yellow Sea : July, 2007	2
Hydrozoa	Siphonophora	Physaliidae	***Physalia physalis***	Sungsan-po : July, 2007	5
	Leptomedusae	Aequoridae	***Aequorea coerulescens***	Kijang : May, 2008	2

Materials & Methods

- Extraction : CTAB extraction method (Asahida *et al*., 1996)
- Amplifying : COI mtDNA
- Sequencing : 3730 xl DNA analyzer
- Phylogeny
  - Maximum Likelihood (ML) analysis (PAUP 4.0b 10)
  - Modeltest 3.7
- Population genetics
  - Genetic diversity, differentiation and AMOVA test (Arlequin 3.1)
  - Gene genealogy (TCS program)

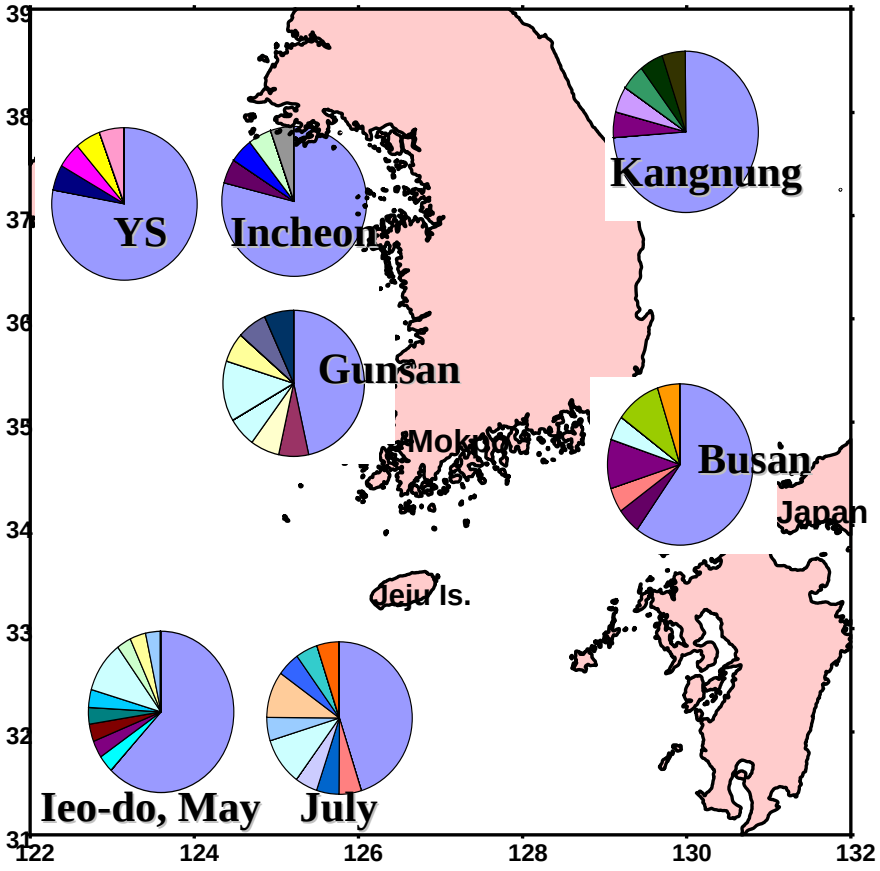
Result : COI mtDNA genetic trees of medusozoan



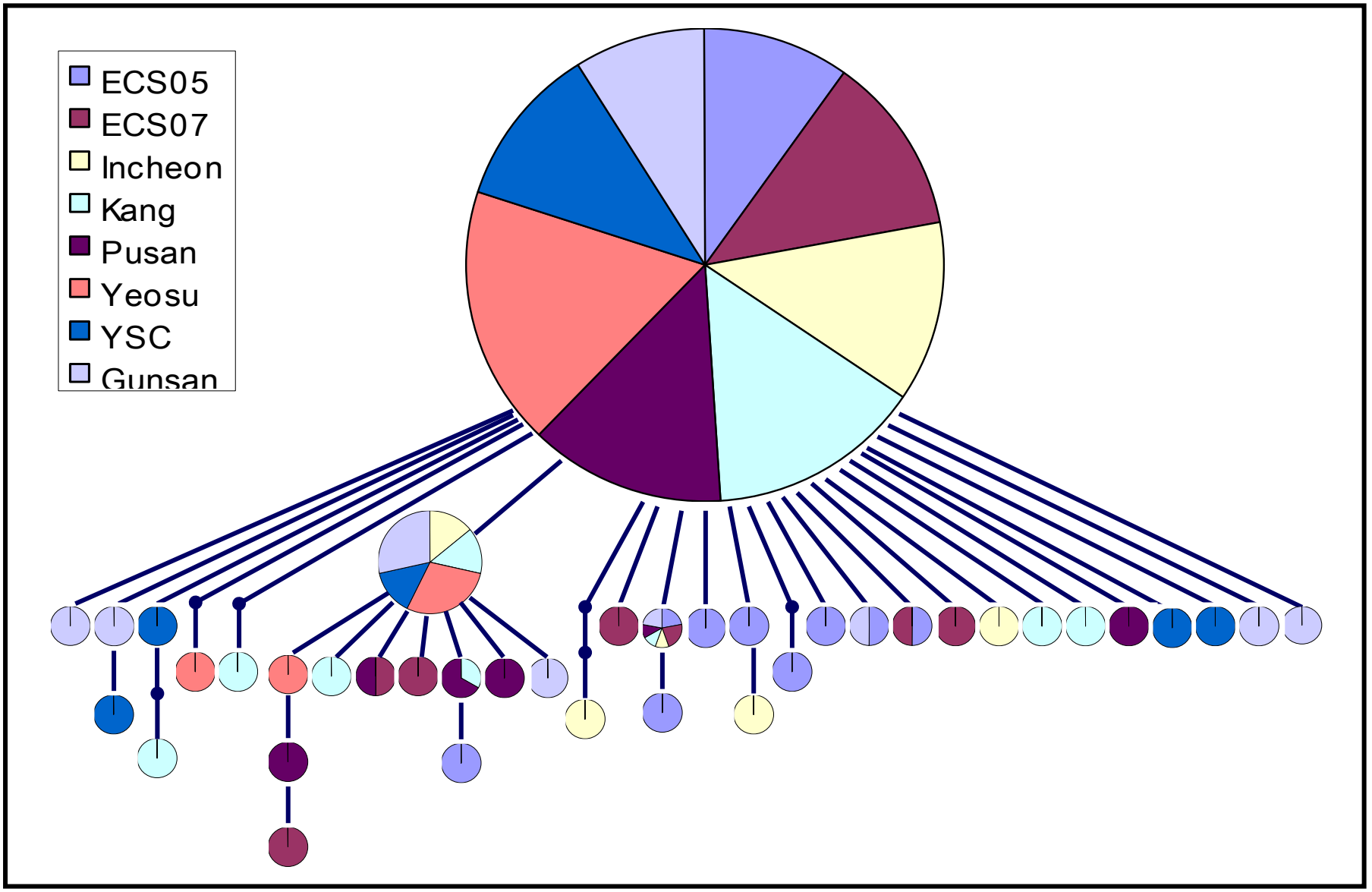
Bootstrap 50% majority-rule consensus tree

Outgroup, Reference in genebank

Result - Genetic diversity of *N. nomurai* among sites



Group	Sample size	No. of haplotypes	Genetic diversity
Ieodo – May	29	10	0.6158 +/- 0.1035
Ieodo – July	20	10	0.8000 +/- 0.0886
Gunsan	15	8	0.7905 +/- 0.1049
Busan	20	7	0.6421 +/- 0.1176
Incheon	19	5	0.3860 +/- 0.1398
Yellow Sea (37°E, 123°N)	18	5	0.4052 +/- 0.1489
Kangnung	19	6	0.4678 +/- 0.1396



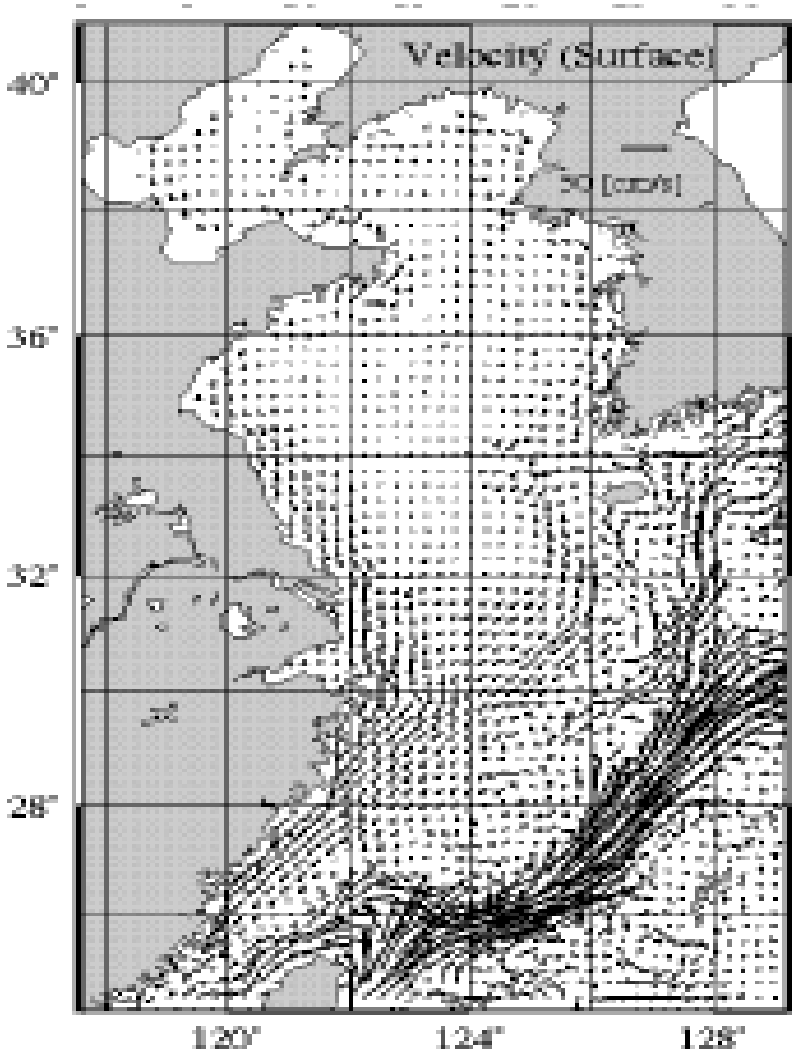
Haplotype network based on COI mtDNA (TCS)

Genetic differentiation & distance between groups

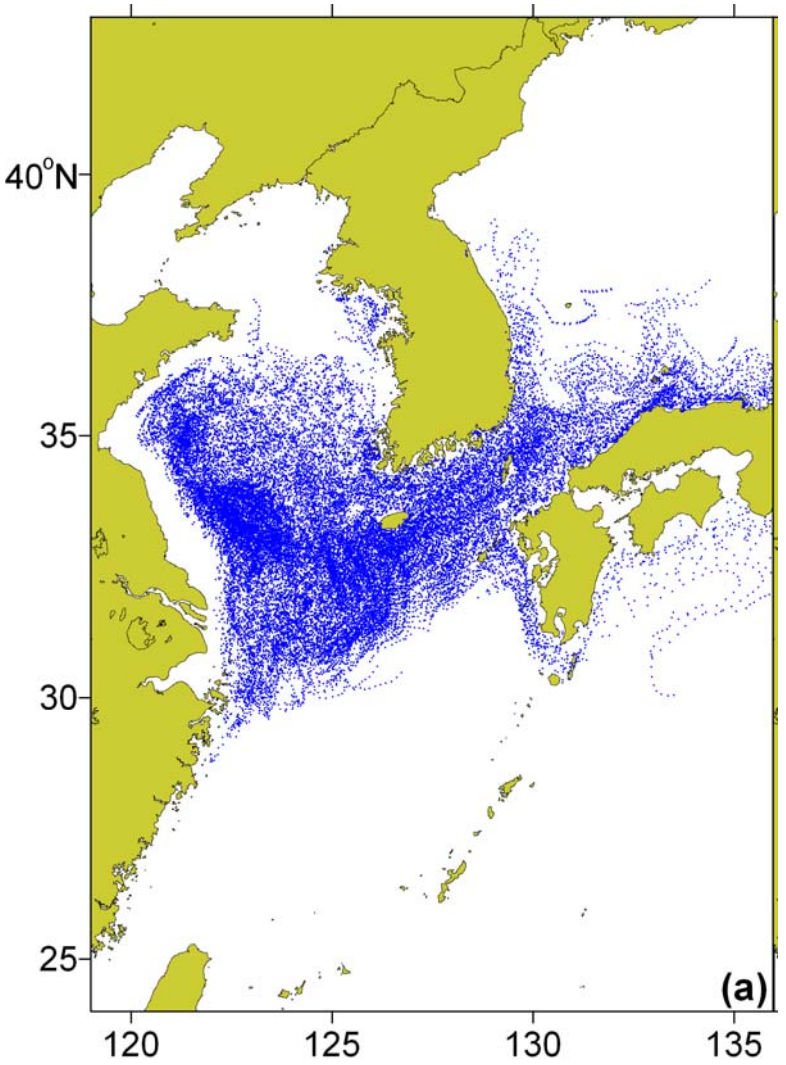
	Ieo-do, May	Ieo-do, July	Incheon	Yellow Sea	Gunsan	Busan	Kangnung
Ieo-do, May	0						
Ieo-do, July	0.318	0					
Incheon	0.974	7.879	0				
Yellow Sea	0.828	7.011	-2.490	0			
Gunsan	-0.896	-2.400	7.597	6.670	0		
Busan	-1.583	0.200	1.766	1.667	-0.239	0	
Kangnung	-0.421	5.064	-2.060	-2.274	4.593	-0.464	0

F-statistics from haplotype frequencies (%)

Significant Fst P values (level=5.00)



The current system in the East China Sea and the Yellow Sea



Simulated positions of tracers deployed off the north East China Sea

Conclusion

- **Genetic diversity of the *N. nomurai* in the north East China Sea was the highest but the lowest in the center of Yellow Sea in accordance with the increasing number of cohorts in the north East China Sea.**

- **Genetic differentiation and distance between *N. nomurai* groups in Incheon-Yellow Sea and the groups in the East China Sea were significantly different.**

- **Genetic discontinuity of the jellyfish in the Yellow Sea and in the north East China Sea seem to occur based on the genetic diversity and differentiation of *N. nomurai*.**

Conclusion

- **However, the jellyfish groups in Gunsan and Busan and the groups in the East China Sea were significantly related.**
- **Tsushima warm current and Changjian Dilute Water to affect water movement in East China Sea, Yellow Sea and Korean Strait might affect to the genetic structure of the medusae in Korean waters.**
- **Genetic dispersal might occurs from the East China Sea to the Yellow Sea and founder effect might be existed with considering the connectivity of genetic haplotypes.**

Thank you ~