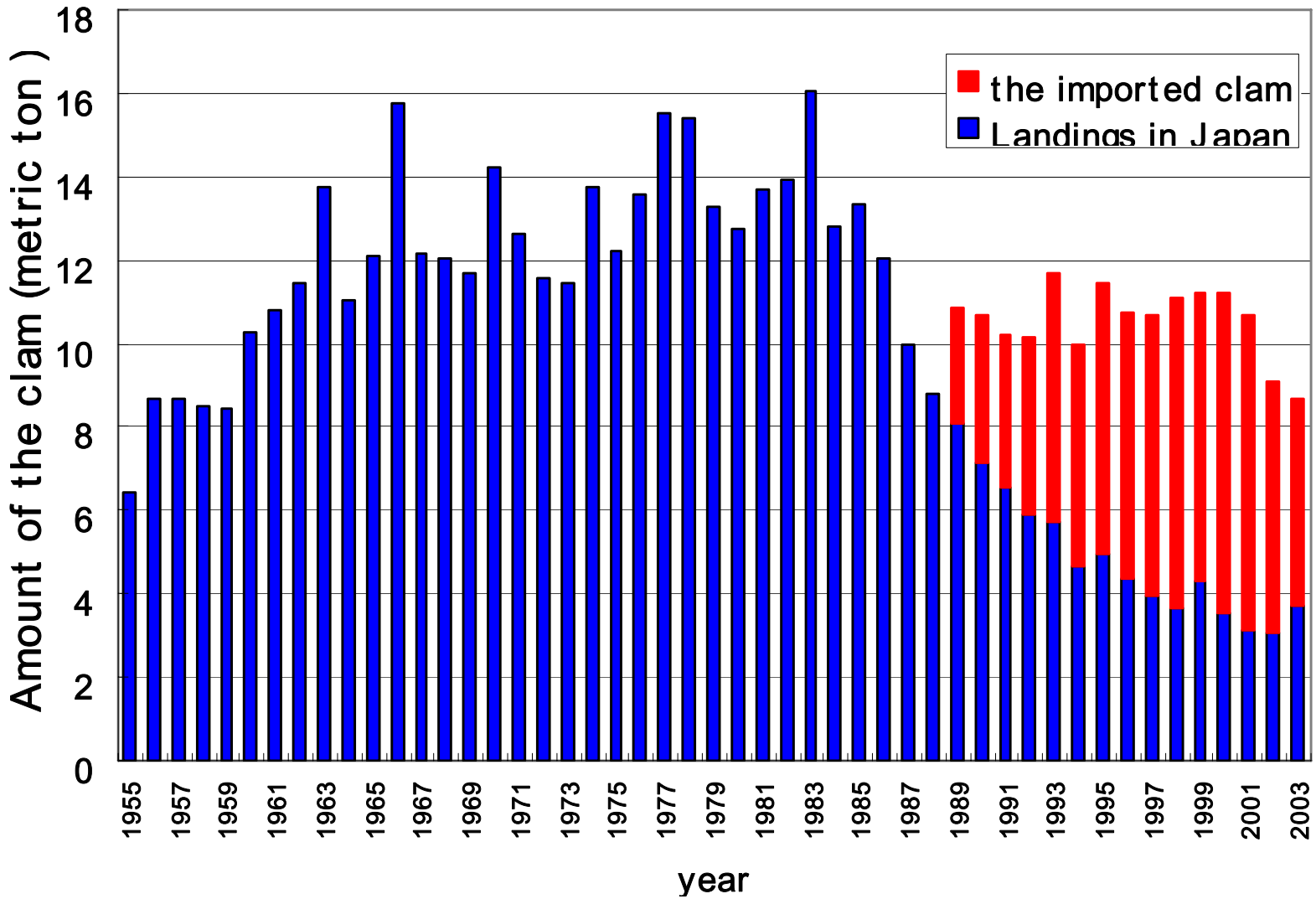
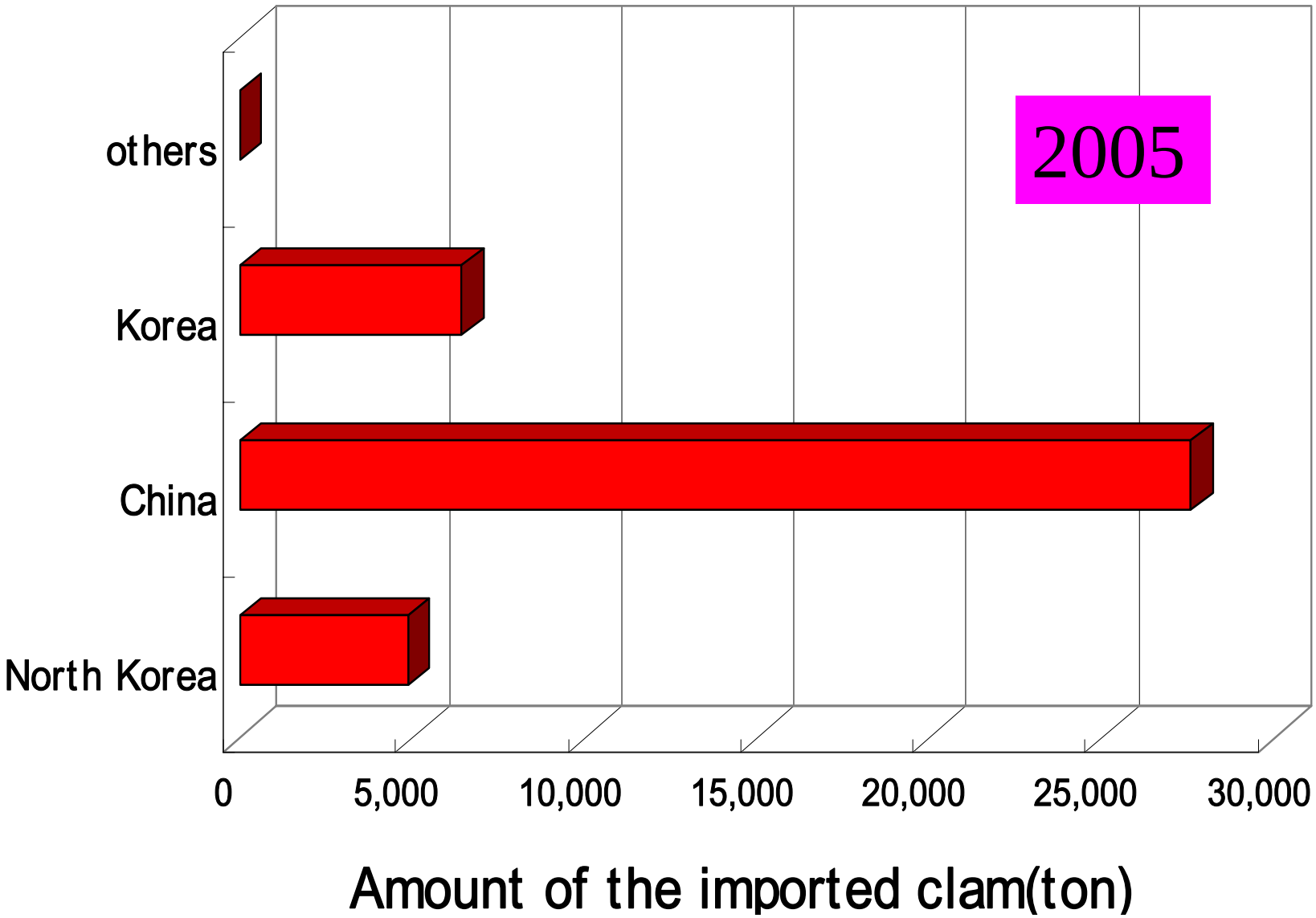
Biological impacts caused by the release of the imported manila clam, *Ruditapes philippinarum*, in Japan

Naoaki TEZUKA and Masami HAMAGUCHI(FEIS)

Changes in landings and amount of the imported clam in Japan



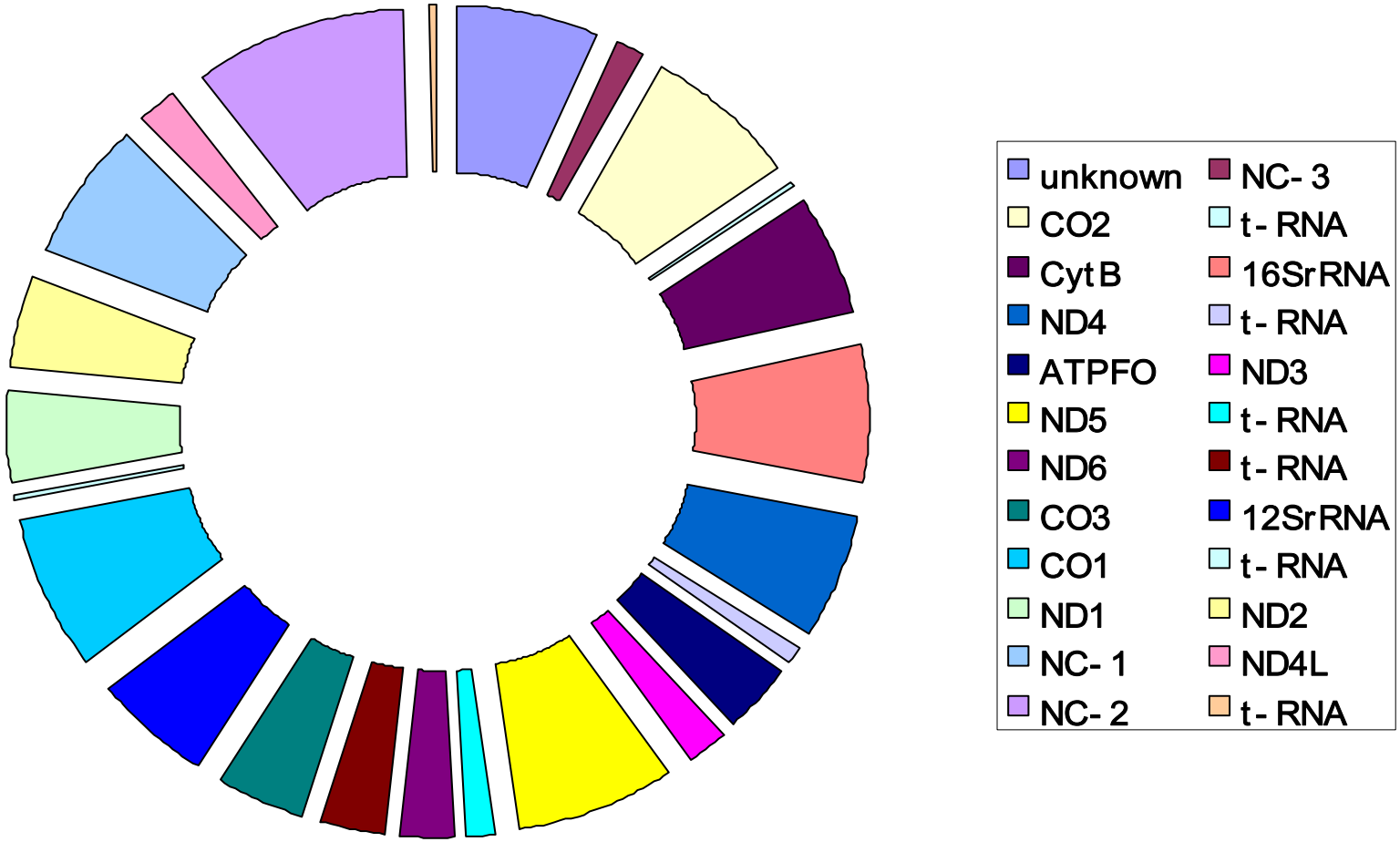
Import origin of the clam



Biological impacts caused by the imported manila clam

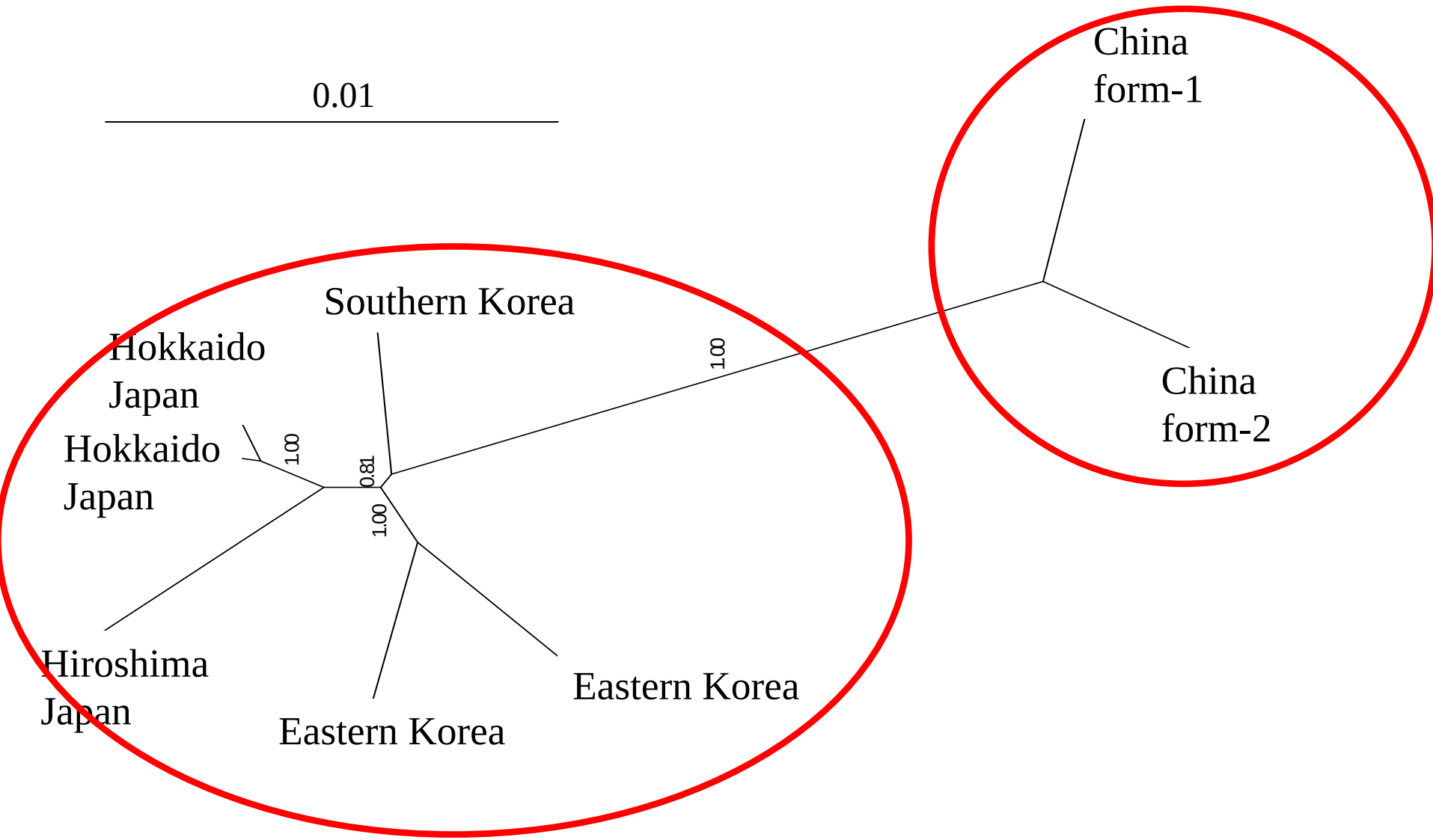
- **Is the imported clam genetically identical to the native clam ?**
- **Does nonindigenous species (NIS) introduce with the imported clam ?**
- **Does pathogens introduce with the imported clam ?**

Construction of the mitochondrial DNA of the clam



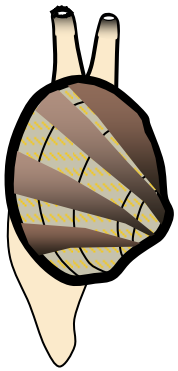
Total length was 22.7Kbp. The mitochondrial DNA of manila clam was longer than human !

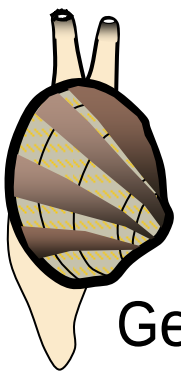
Phylogenetic relationship among 8 populations collected from China, Korea and Japan.



Rapid identification of genetic form of the clam by PCR and real-time PCR

genetic form China

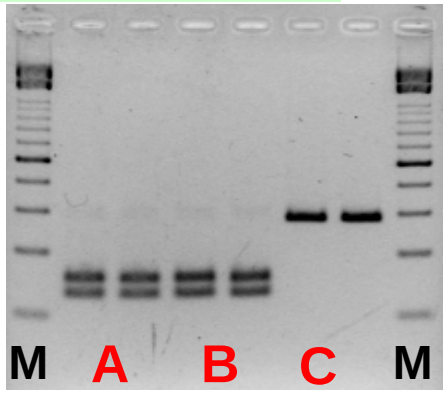




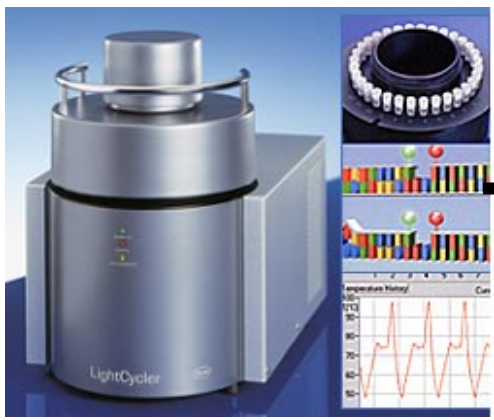
Genetic form Japan-southern Korea

Preparation Of DNA

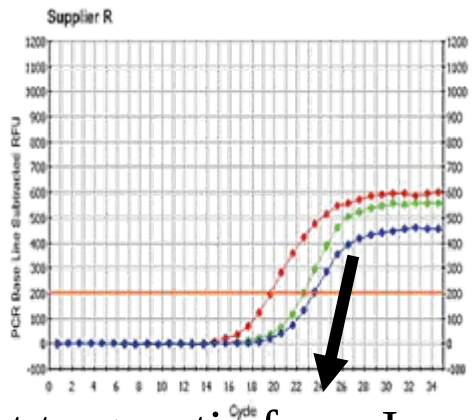
PCR-RFLP



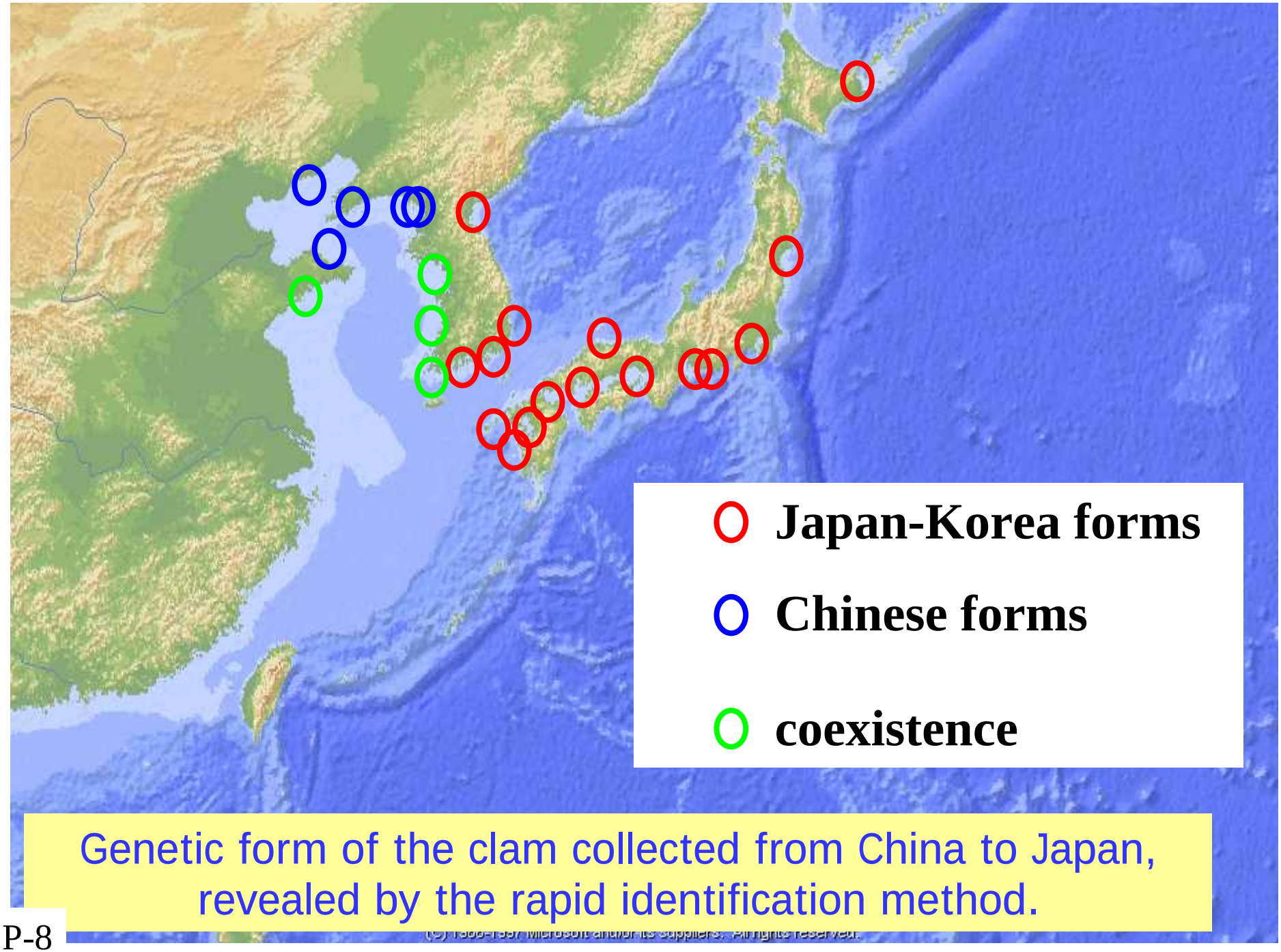
(A) genetic form China-1、
(B) genetic form China-2、
(C) genetic form Japan-southern Korea



Real-time PCR

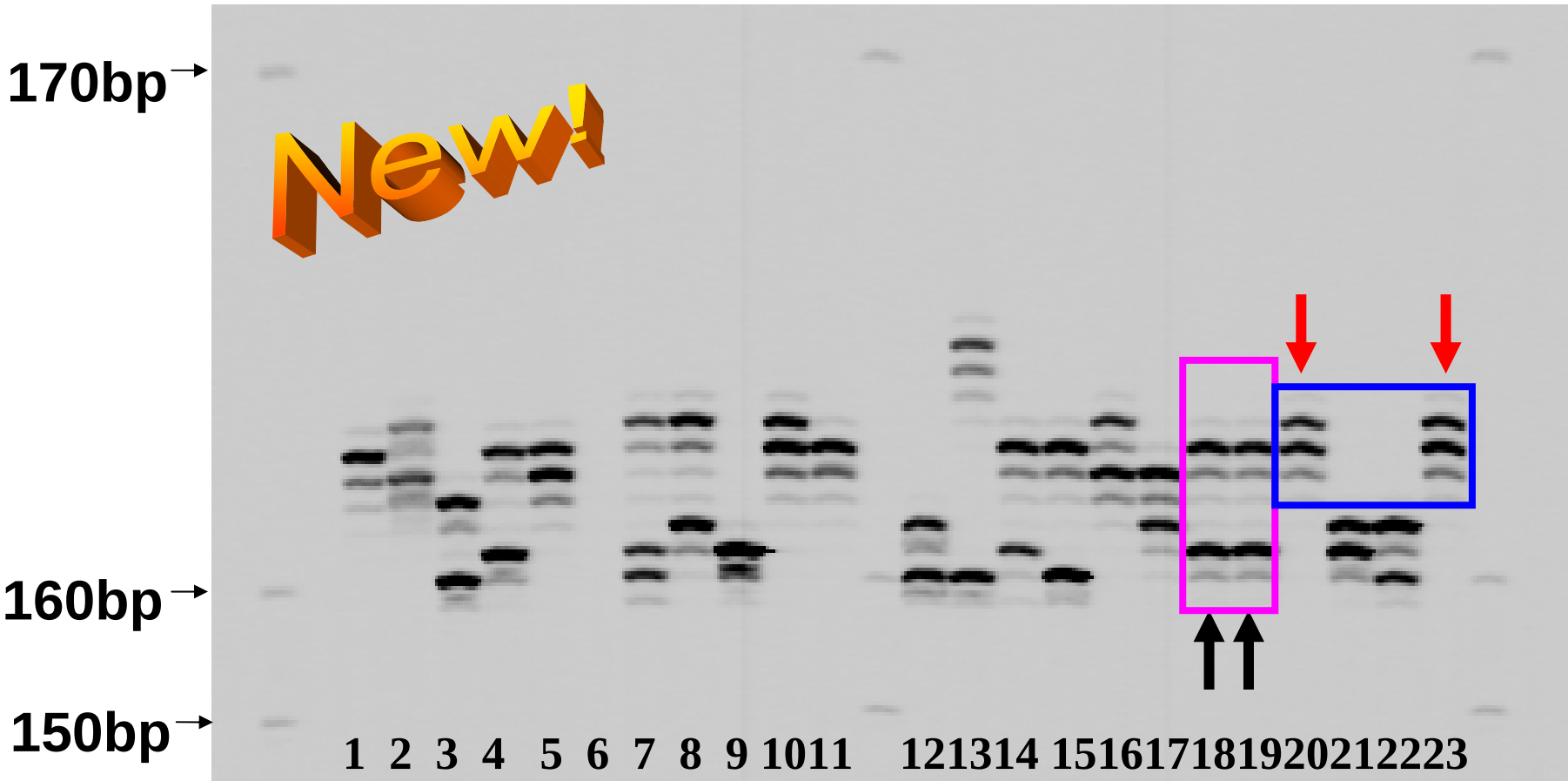


React to genetic form Japan-southern Korea form only!



Genetic form of the clam collected from China to Japan, revealed by the rapid identification method.

Microsatellite marker of the clam



Yasuda et al. Molecular Ecology Notes (2006)

Biological impacts caused by the imported manila clam

- **Is the imported clam genetically identical to the native clam ?**
- **Does nonindigenous species (NIS) introduce with the imported clam ?**
- **Does pathogens introduce with the imported clam ?**

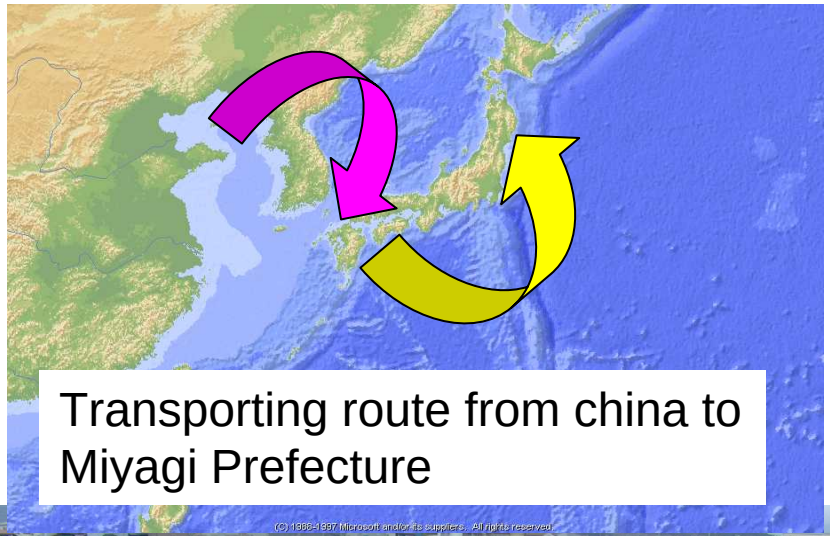
What is NIS?

Nonindigenous species (NIS): a species introduced to areas beyond its native range by human activity

Many human activities, such as agriculture, aquaculture, recreation and transportation, promote both the intentional and accidental spread of species across their natural dispersal barriers. Although most organisms die in transit, or soon after release, those that persist can have grave effects on human health, devastating economic impacts, and can threaten native biodiversity and ecosystem function. Annually, NIS cause environmental damage and economic losses in excess of US $137 billion in the USA alone.

Invasion of marine NIS is wide spread phenomenon in the world. Marine organisms have been moved around the world accidentally or intentionally. Aquaculture is now considered one of the major gateways for introduction of Marine NIS.

Survey of NIS with the imported clam



Transporting route from china to Miyagi Prefecture

Prof. Okoshi surveyed NIS with imported manila clam from China to Miyagi Prefecture, Japan.

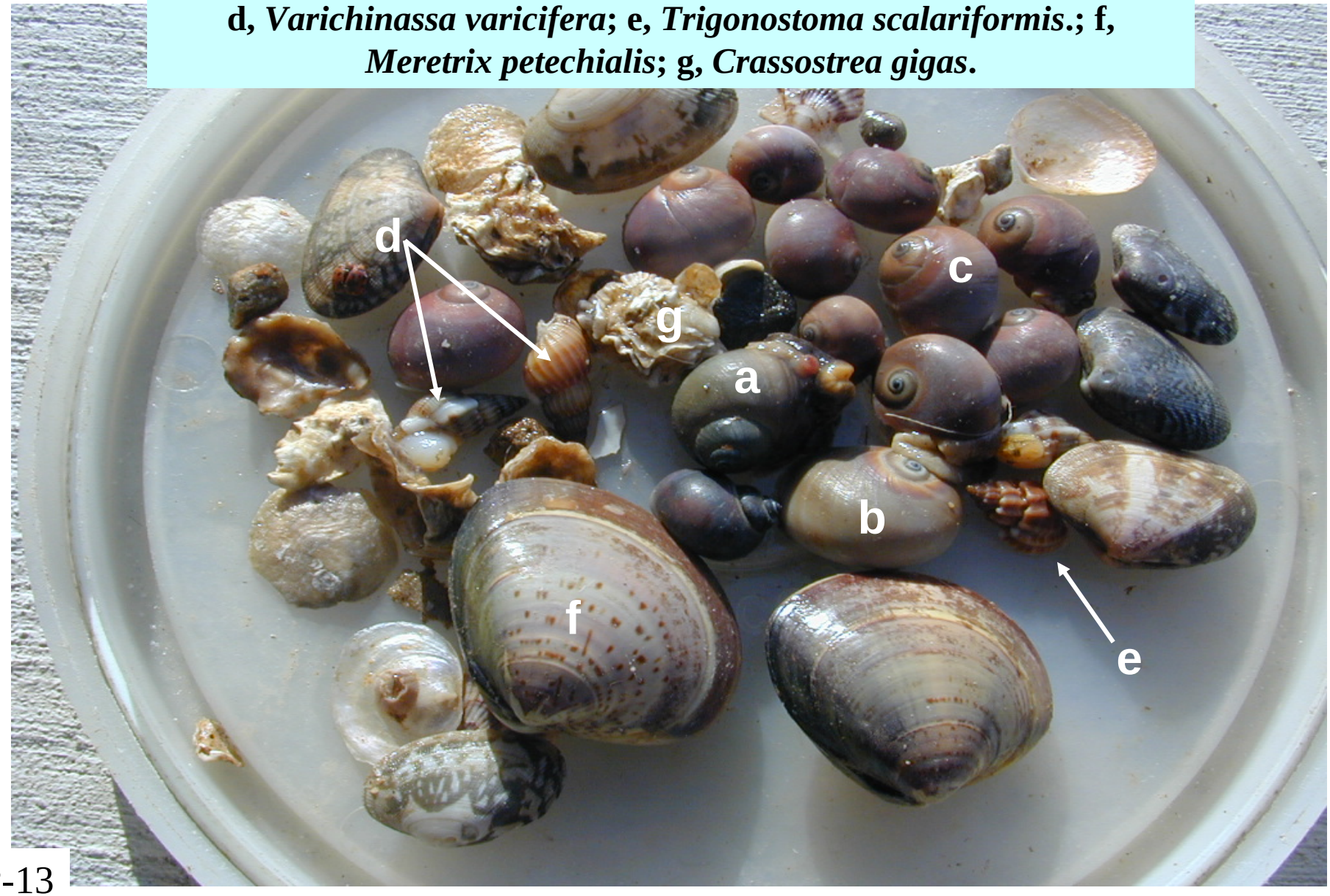
from Okoshi, 2005

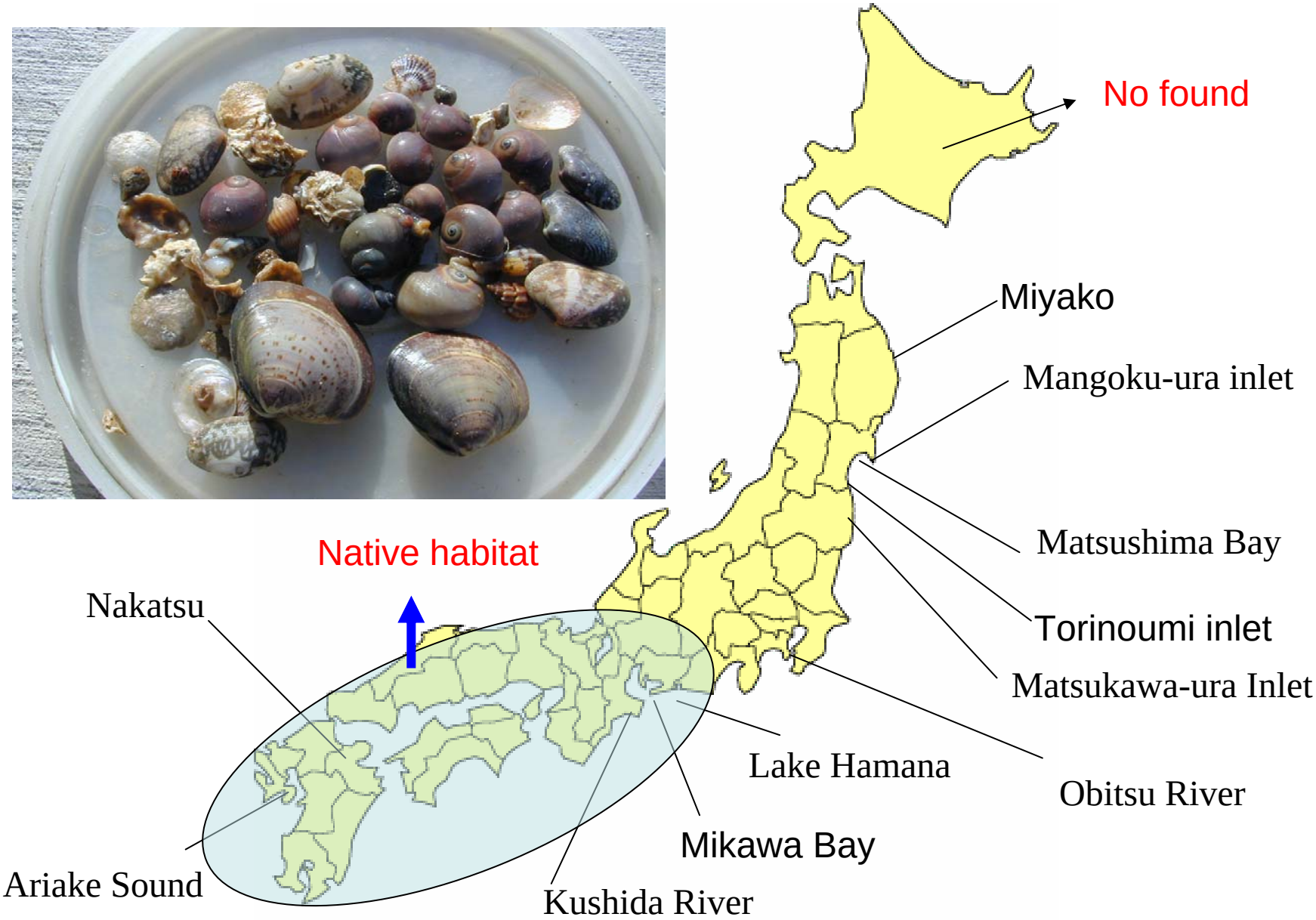
Sacks filled with the clam imported from China

Ship freighted with clams and NIS just before relaese

NIS collected from the clam sacks

. a, *Euspira fortunei*; b, *Glossaulax didyma*; c, *Glossaulax reiniana*; d, *Varichinassa varicifera*; e, *Trigonostoma scalariformis*.; f, *Meretrix petechialis*; g, *Crassostrea gigas*.





Distribution of the mollusk-eating snail *Euspira fortunei* in Japanese waters.

Biological impacts caused by the imported manila clam

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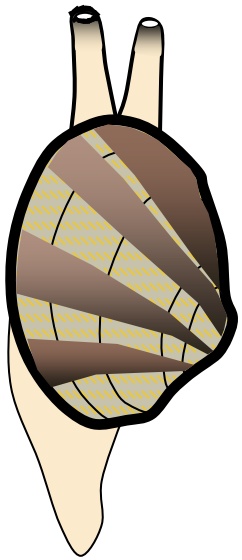
Perkinsus spp. in the imported clam



Histological observation of gill

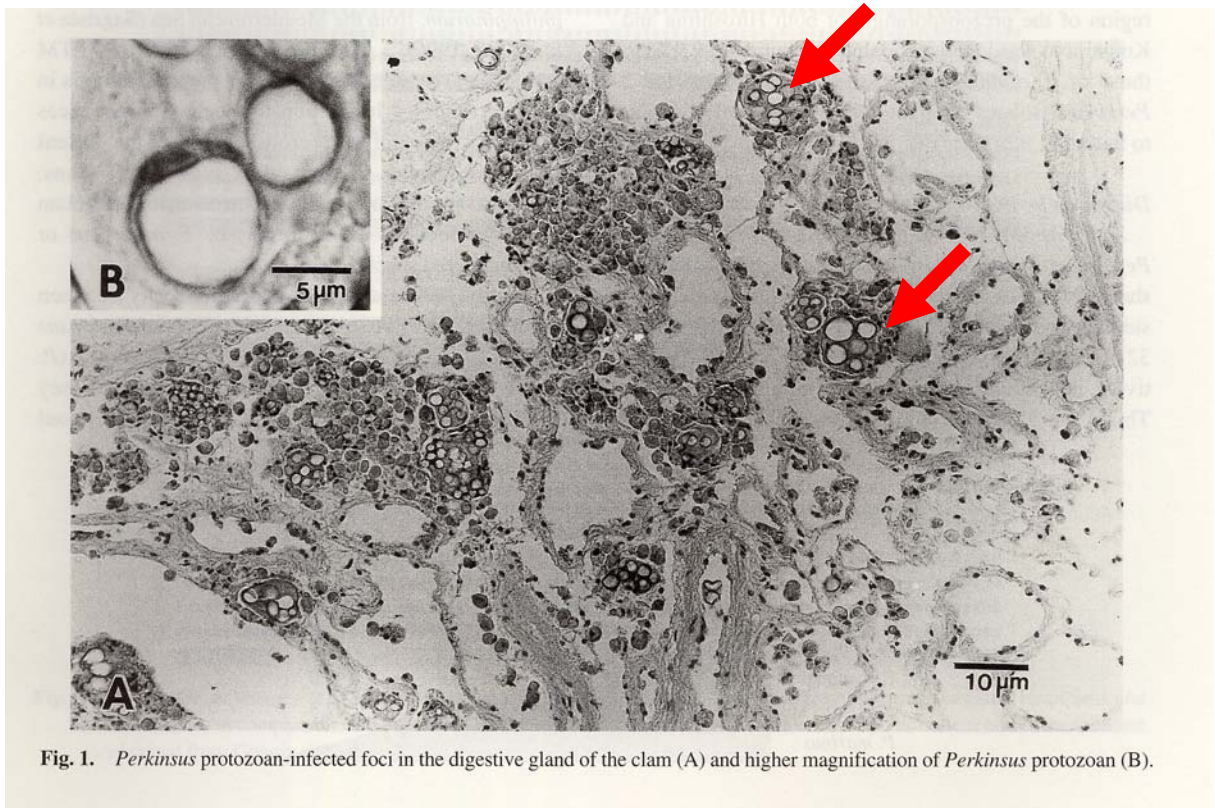


Fig. 1. *Perkinsus* protozoan-infected foci in the digestive gland of the clam (A) and higher magnification of *Perkinsus* protozoan (B).

Hamaguchi et al,(1999) reported high prevalence rate of perkinsus protozoan in imported clam.

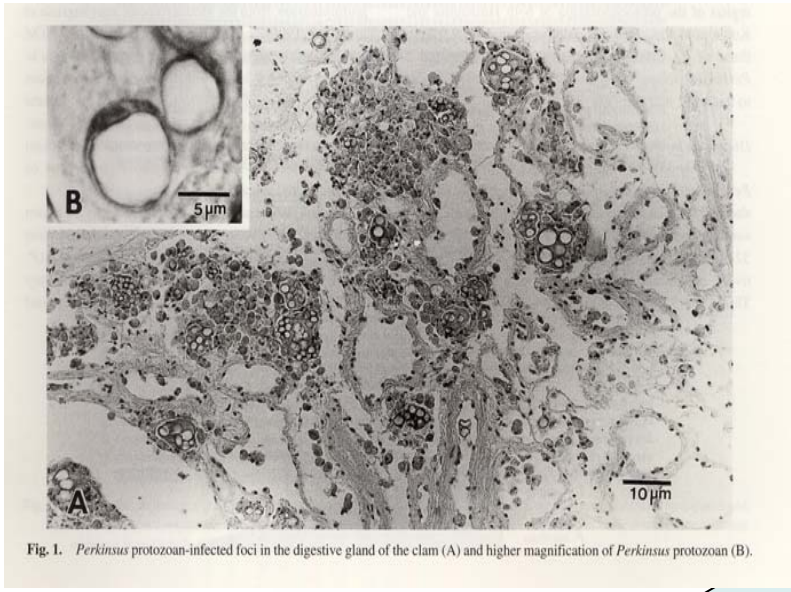


Fig. 1. *Perkinsus* protozoan-infected foci in the digestive gland of the clam (A) and higher magnification of *Perkinsus* protozoan (B).

No found

the clam production areas (over 1000 tons)

Mangoku-ura inlet

Hiroshima

Matsushima Bay

Nakatsu

Torinoumi inlet

Matsukawa-ura Inlet

Infection area of *Perkinsus* protozoan

Lake Hamana

Obitsu River

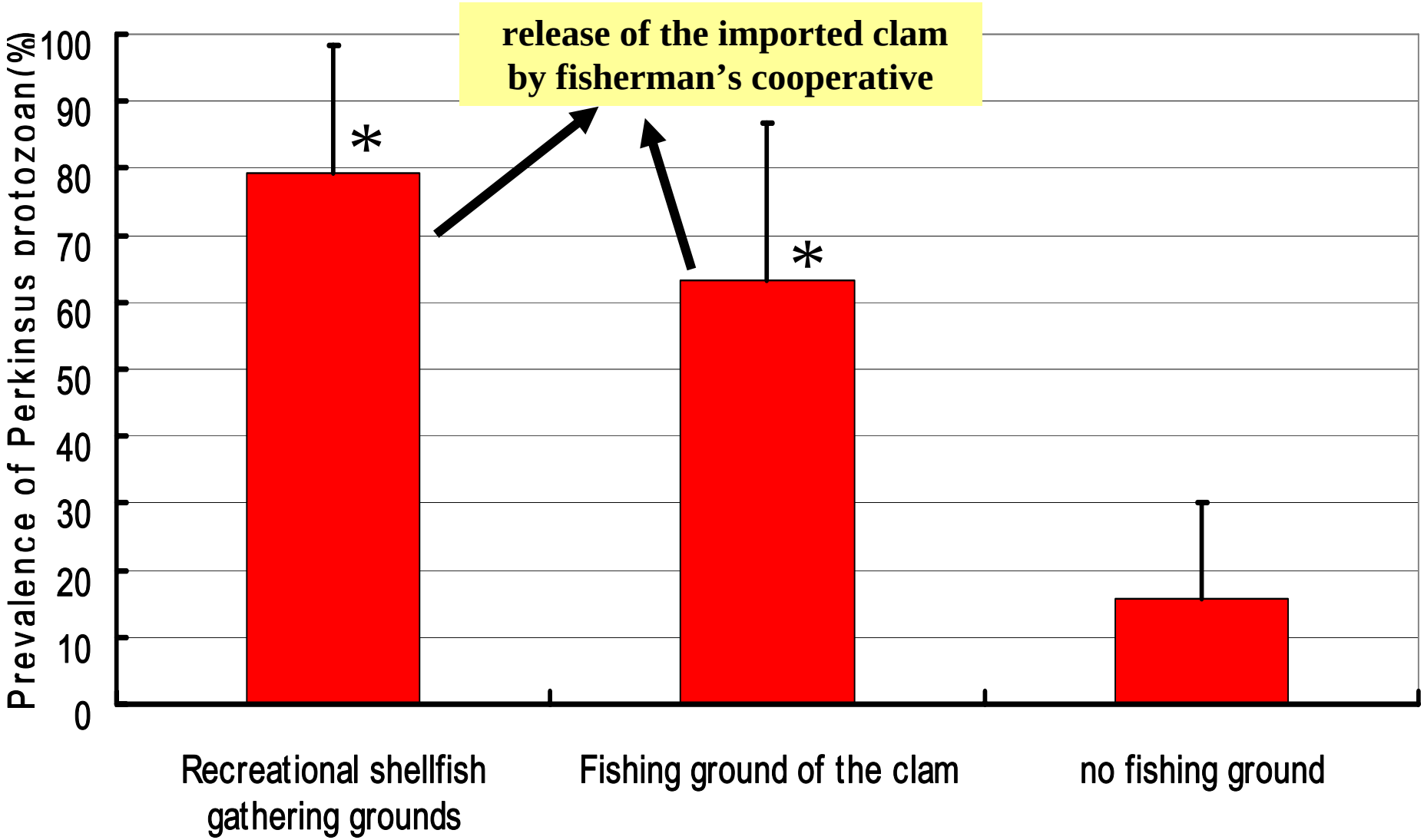
Mikawa Bay

Ariake Sound

Kushida River

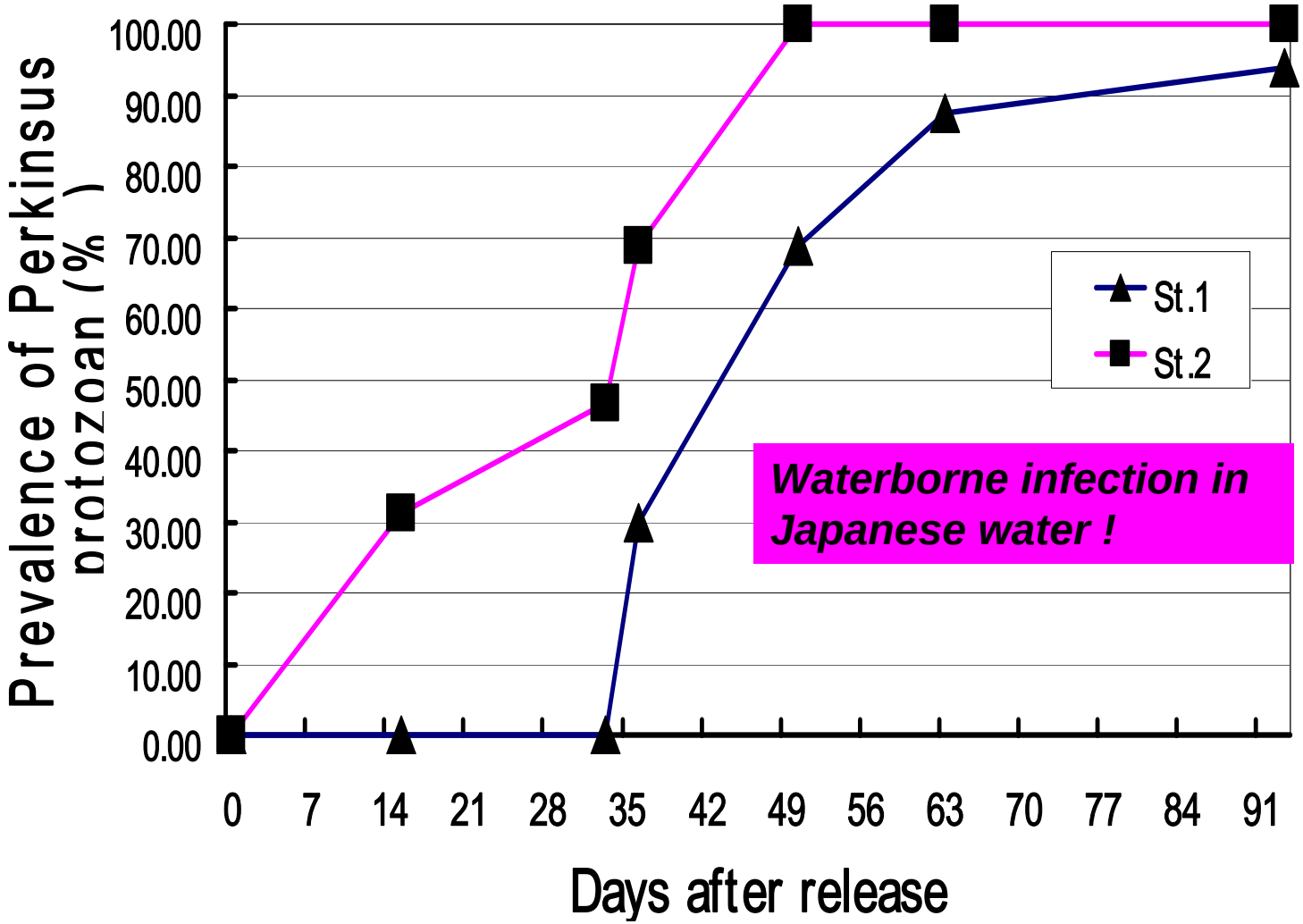
Distribution of the *Perkinus* protozoan, which is parasite of the clam, in Japanese waters.

Prevalence of *Perkinsus* protozoan in recreational shellfish gathering grounds, fishing grounds of the clam and undisturbed or no fishing grounds



Does *Perkinsus* protozoan infect in fishing ground in Japan ?

We released the non-infected clam to the aquaculture ground of the imported clam・・・



Biological impacts caused by the imported manila clam

- **Is the imported clam genetically identical to the native clam ?**

No it is not!

The naive clam is genetically different from the almost imported clam.

So the imported clam itself is also NIS.

Biological impacts caused by the imported manila clam in Japan

- **Does nonindigenous species (NIS) introduce with the imported clam ?**

Yes it is !

Euspira fortunei **is becoming a new, strong predator of the native clam stocks in Japan. The effect of NIS with the imported clam on preexisting population is also important problem to be solved.**

Biological impacts caused by the imported manila clam

- **Does pathogens introduce with the imported clam ?**

Yes or No

But, We need to attention to

NIS problems· · ·

Biological impacts caused by the imported manila clam

- **In the case of the clam, imported clam can have negative effect to the clam production in Japan.**

“Resource enhancing project of the native clam”

is necessary, and it is starting now in Japan.


Thank you !
Dr. Hamaguchi will correspond.
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