

## Less Recovery from Imposex in the Rock Shell, *Thais clavigera* from Korea

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### Introduction:

Imposex, a superimposition of male genital tracts (penis and vas deferens) on female gastropods, occurs cause specific and at low concentrations of certain organotins such as tributyltin (TBT) and triphenyltin (TPT). Spawning disturbance or reproductive failure is known at severely affected stages. Since the first report from Plymouth, England in 1969, imposex has been reported from all over the world involving more than 140 species (Horiguchi *et al.*, 2001).

In Korea, the legislation for the use of organotin compounds, such as TBT and TPT, in antifouling paints for ships and fishing nets has started since March 2000. Up to now, however, high concentrations of TBT and TPT have been still detected in tissue of some shellfishes.

Here, we will report the present status on imposex and its recovery rate of gastropods from Korea, together with the temporal trends of organotin concentrations in tissue of gastropods from Korea between 1995-1997 and 2002.

### Methods:

As part of the project to study organotin pollution in Korean coastal waters and its adverse effects on marine organisms, we sampled gastropods (the rock shell, *Thais clavigera*) at 26 sites along the Korean coast between October 1995 and August 1997, and at 28 sites from March to August 2002. We investigated organotin concentrations in seawater and the rock shell, as well as imposex symptoms (the percentage occurrence and the degree of imposex in the rock shell).

Gastropod specimens were collected at every site by authors. Sex was determined based on the presence of female accessory sex organs, such as albumen, sperm-ingesting and capsule glands. A masculinized female was defined as a female with male sexual characteristics: Imposex was recognized to be the individual that had penis and/or vas deferens as well as female accessory sex organs. Anatomical characteristics of penis, vas deferens, accessory sex organs and gonad of each individual were observed. After the biological observation, such as imposex examination, tissue concentrations of organotin compounds, such as TBT, TPT and their metabolites were quantitatively measured by gas chromatography with flame photometric detection (GC-FPD) or mass spectrometric detection (GC-MSD), as described in Horiguchi *et al.* (1994).

### Results:

Organotins (TBT and TPT) are known to cause imposex in the rock shell. In the first survey from 1995 to 1997, percentages occurrence of imposex in rock shell populations were 100% in almost all sites surveyed along the Korean coast. No imposex, i.e. all normal females, were only observed in the population from Deukryang Bay situated in the southwestern part of the South Sea, while the percentages occurrence of imposex were in the range of 67%-88%, close to the inner part of the bay. Percentages occurrence of sterile individuals (with blocked capsule glands by vas deferens formation) were higher (60% or more) in the eastern part than those in the western part of the South Sea. No sterile females were observed in the open-sea-side and some other areas.

In the second survey in 2002, percentages occurrence of imposex in rock shell populations were 100% in most of sites surveyed along the South Sea coast. While, percentages occurrence of imposex in rock shell populations from Jeju coast were in the range of 0%-100%: no imposex, i.e. all normal females, were recognized at three of eight sites surveyed in Jeju. Geographical distribution of percentages occurrence of sterile individuals was similar to that of the first survey: higher (60% or more) in the eastern part than the western part of the South Sea. No sterile females were found at six of nineteen sites along the South Sea coast and at four of eight sites surveyed in Jeju island, respectively.

These results indicate less recovery from imposex in the rock shell from Korea after legislation for TBT and TPT use. It could imply either the time-lagged recovery from gastropod imposex after legislation or persistence of TBT and TPT in the marine environment resulting from their long lives in the bottom sediments or continuous illegal use as antifoulants. Further discussion will be done, based on analytical results of organotin concentrations in tissue of the rock shell.