宮崎県産ボウシュウボラ(巻貝)の毒性

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Toxicity of a Trumpet Shell *Charonia sauliae* ("Boshubora") Inhabiting along the Coasts of Miyazaki Prefecture

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A total of 375 specimens of a trumpet shell *Charonia sauliae* ("boshubora") were collected from September 1982 through May 1984, from the following eight places in Miyazaki Prefecture: Kitaura (12 specimens), Urashiro (122), Yasui (24), Akamizu (122), Tsuno (22), Aoshima (24), Oshima (5), and Kushima (44). Digestive glands were excised from these specimens and examined for toxicity by an official assay method of tetrodotoxin.

Seventy-two out of the 375 specimens (19%) were toxic, with the highest toxicity of 106 MU/g in the digestive gland. The frequency of toxic specimens varied between 0 and 55%, depending upon the place of collection. It was found that this shell as a whole is less toxic in Miyazaki Prefecture than in other prefectures so far screened.

Out of the four specimens of a starfish *Astropecten polyacanthus* ("togemomijigai") collected at Urashiro and Kushima, three were toxic (the highest toxicity score 18 MU/g for the whole body), suggesting its involvement in toxification of the trumpet shell.

Two food poisoning cases have so far been reported which are associated with ingestion of a trumpet shell *Charonia sauliae* ("boshubora"): one in Shizuoka Prefecture[1] in December 1979 and the other in Wakayama Prefecture[2] in December 1982. In both cases, the causative agent was identified later as tetrodotoxin which was supposed to have come from a starfish *Astropecten polyacanthus* ("togemomijigai") by the food chain.[2,3]

This species of trumpet shell is widely distributed along the Pacific coasts of southwestern Japan. Tetrodotoxin is a potent neurotoxin, posing continuously a serious problem in food hygiene. These situations aroused us to survey the toxicity of the trumpet shells inhabiting the coasts of Miyazaki Prefecture. The results obtained showed that the trumpet shells are toxified in Miyazaki Prefecture as well, though at a lower level than those from other prefectures so far reported.

Materials and Methods

Materials

A total of 375 specimens of the trumpet shell *Charonia sauliae* ("boshubora") were collected at eight places in Miyazaki Prefecture in September 1982 through May 1984 (Fig. 1). The specimens were caught mostly by a trawling net, and some by a gill net for lobster or diving.

Four specimens of a starfish *Astropecten polyacanthus* ("togemomijigai") were also collected at Urashiro and Kushima.

The trumpet shell and starfish specimens thus collected were kept frozen below −20°C until assayed for toxicity.

Assay of Toxicity

Each trumpet shell specimen was partially thawed, and the digestive gland was removed and examined for toxicity by the official assay method of tetrodotoxin.[4] In the case of starfish, the whole body was subjected to toxicity assay similarly.

"Toxic" specimens were defined here to be ≧2 MU/g digestive gland (trumpet shell) or ≧5 MU/g whole body (starfish).

Results and Discussion

Out of the 375 trumpet shell specimens collected,

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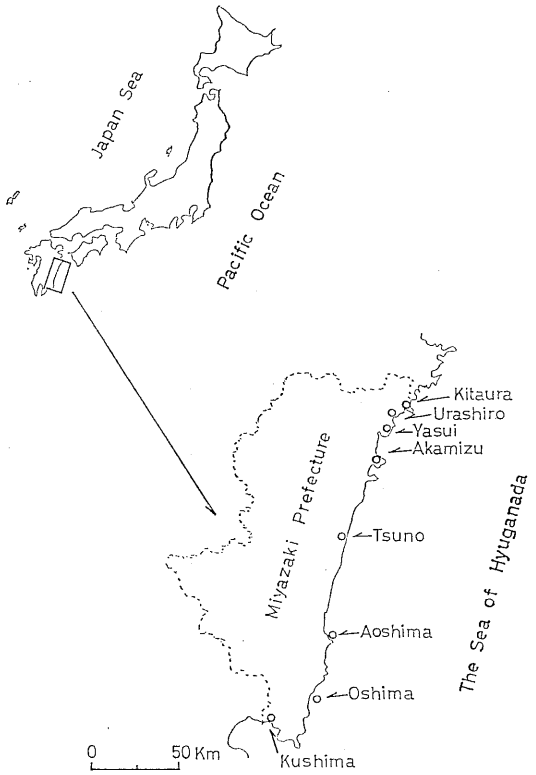

Fig. 1. Map showing the sampling places of trumpet shell.

72 were found to be toxic (Table 1). The frequency of toxic specimens was calculated to be 19% on an average. However, the frequency varied from 0 to 55%, depending upon the place of collection. For example, all the specimens at Yasui were non-toxic, whereas at Akamizu, a nearby place, about 1/4 the total specimens was found to be toxic (Fig. 1 and Table 1).

The average toxicity of all the specimens assayed was calculated to be 3.6 MU/g digestive gland, assuming for convenience that the toxic scores of all the non-toxic specimens were zero. The highest was recorded at Aoshima (12.5 MU/g digestive gland), followed by Kushima (7.6 MU/g) and Akamizu (5.2 MU/g).

The highest toxicity detected was 106 MU/g digestive gland of an Aoshima specimen. The total toxicity of this one was roughly calculated to be 5,300 MU, which is approximately one half of the lethal dose of tetrodotoxin in human being.

Eight to twenty-one specimens were collected monthly throughout a year at Urashiro, and assayed for toxicity. The results showed that the trumpet shells here were mostly non-toxic except winter months (February and March) when some toxic specimens were detected with the highest score of 17 MU/g digestive gland.

Size-dependency of the toxicity was not clear, since even the specimens of comparable sizes collected at the same place in the same season exhibited wide variations in toxicity (Fig. 2).

As far as the present data are concerned, the frequency of toxic specimens, along with the toxicity level of the trumpet shell, is significantly lower in Miyazaki Prefecture than in several other prefectures so far screened: *e.g.*, the frequency of toxic specimens and the highest toxicity recorded being 95% and 1,950 MU/g digestive gland, respectively, in Shizuoka Prefecture[1]; 68% and 480 MU/g, respectively, in Wakayama Prefecture[2]; and 69% and 460 MU/g, respectively, in Mie Prefecture.*3

On the other hand, three out of the four starfish

Table 1. Toxicity of trumpet shell specimens collected at eight places in Miyazaki Prefecture

Place of collection*1	No. of specimens	No. of toxic specimens*2	Frequency of toxic specimens	Average toxicity of all specimens assayed*3	Highest toxicity
Kitaura	12	1	8%	0.5	5
Urashiro	122	2	2	0.2	17
Yasui	24	0	0	0	—
Akamizu	122	29	24	5.2	90
Tsuno	22	5	23	1.2	6
Aoshima	24	10	42	12.5	106
Oshima	5	1	20	4.8	25
Kushima	44	24	55	7.6	35
Total	375	72	(ave. 19)	(ave. 3.6)	106

*1 Refer to Fig. 1.
*2 "Toxic" is defined here as ≧2 MU/g digestive gland.
*3 Calculated on the assumption that the toxicity scores of the non-toxic specimens were 0 MU/g digestive gland.

*3 T. NOGUCHI, J. MARUYAMA, J. K. JEON, H. NODA, and K. HASHIMOTO: Abstracts of Oral Presentation at the Autumn Meeting of the Japanese Society of Scientific Fisheries, Kyoto, 1983, p. 189.

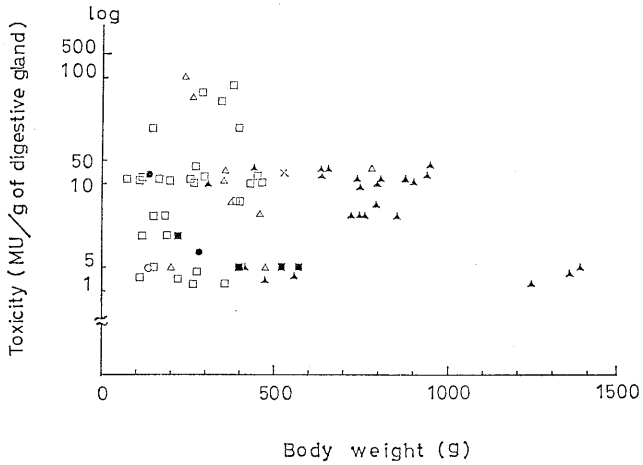

Fig. 2. Toxicity scores of trumpet shell specimens in function of their body weights: ○=Kitaura, ●=Urashiro, □=Akamizu, ■=Tsuno, △=Aoshima, ▲=Kushima, ×=Oshima.

specimens collected were found to be toxic. The highest toxicity recorded was 18 MU/g whole body. This suggests that the starfish is involved in toxification of the trumpet shell here.

Further screening of toxicity is needed on the trumpet shells inhabiting the coasts of Miyazaki Prefecture.

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