

Table 2. Maximum STX concentrations, microalgal sources, and global PSP reports in gastropods.

Gastropod species and presumptive microalgal source	Common name	Maximum STX(s) concentration	Incident	Location	Reference
<i>Alexandrium acatenella</i>					
<i>Polinices lewisii</i>	Lewis moon snail	176-600 µg STX eq./100g tissue		British Columbia, Canada	129
<i>Alexandrium catenella</i>					
<i>Adelomelon ancilla</i>	Volute	toxic		Chile	85
<i>Argobuccinum</i> sp.	Whelk	Stomach 5629 µg STX eq./100g tissue; Muscle 92 µg STX eq./100g tissue			
<i>Concholepas concholepas</i>	Barnacle rock shell	toxic			
<i>Trophon</i> sp.	Trophon	toxic			
<i>Nassarius</i> sp.	Nassa mud snail (dog whelk)	9 µg STX eq./100g tissue		Washington, USA	85
<i>Neptunea</i> spp.		200-250 MU* 100 g ⁻¹ whole individuals		Alaska, USA	85
<i>Thais</i> sp.	Oyster drill	23 µg STX eq./100g tissue (GTX 2 and GTX 3 only)		Washington, USA	85
<i>Thais lamellosa</i>	Oyster drill	Whole animal positive			
<i>Thais lima</i>	Oyster drill	Whole animal 180 µg STX eq./100g tissue			
<i>Alexandrium tamarense</i>					
<i>Littorina sitkana</i>	Sitka periwinkle	Trace whole animal		Washington, USA	85
<i>Lunatia heros</i> (as <i>Polinices heros</i>)	Northern moon snail	1450 µg STX eq./100g tissue	2 cases PSP	Massachusetts, USA	130
<i>Buccinum undatum</i>	Waved whelk	whole body 608 µg STX eq./100g	12 cases PSP, 4	Quebec, Canada	85, 131

		tissue; digestive gland 1600 µg STX eq./100g tissue	fatalities		
		3337 µg STX eq./100g tissue	Illnesses and deaths	Gulf of Maine, USA	85, 132
<i>Crepidula fornicata</i>	Slipper limpet	46-58 µg STX eq./100g tissue			
<i>Colus stimpsoni</i>	Stimpson's colus	toxic			
<i>Lunatia heros</i> (= <i>Euspira heros</i> , <i>Polinices heros</i>)	Northern moon snail	2922 µg STX eq./100g tissue			
<i>Neptunea decemcostata</i>	Ten-ridged whelk	Raw~3000-4000, steamed 1060 µg STX eq./100g tissue			
<i>Thais lapillus</i>	Purpura	34 µg STX eq./100g tissue			
<i>Lunatia heros</i> (= <i>Euspira heros</i> , <i>Polinices heros</i>)	Northern moon snail	247 µg STX eq./100g tissue		Gulf of St. Lawrence, Canada	133
<i>Adelomedon brasiliana</i>	Volute	28 MU g ⁻¹ whole		Argentina	134
<i>Zidona angulata</i> *	Volute	210 MU g ⁻¹ viscera; 25 MU g ⁻¹ foot; 17 MU g ⁻¹ mucus	Mild case of PSP		
<i>Busycon</i> spp.	Whelk	50-500 MU 100 g ⁻¹		Quebec, Canada	85
<i>Rapana venosa</i>	Veined rapa whelk	11.4 MU g ⁻¹ viscera		Hiroshima Bay, Japan	135
<i>Gymnodinium catenatum</i>					
<i>Haliotis tuberculata</i>	Abalone	467 µg STX eq./100g muscle		Spain	83
<i>Pyrodinium bahamense</i>					
<i>Lambis lambis</i>	Spider conch	ND – 175 MU 100 g ⁻¹ whole	Several PSP cases	Sabah, Malaysia	136-137
<i>Oliva vidua fulminans</i>	Olive	2525 MU 100 g ⁻¹ whole	5 human fatalities; 8 cases of PSP	Malaysia	136-138
<i>Natica</i> sp.**	“Tekuyong”	71-876 MU 100 g ⁻¹		Borneo	139-140

Unknown origin

<i>Nassarius siguijorensis</i>	Nassa	370 MU 100 g ⁻¹	Daya Bay, Guangdong Province	141
<i>Nassarius succinctus</i>	Nassa	68 cases of PSP, March-Aug 1979; 1 fatality and 7 hospitalized	Zhejiang Povince, China	128, 142
<i>Nassarius</i> spp.	Nassa	50 PSP cases, 3 fatalities, April-May 2002	Fujian Province, China	128
		55 PSP cases, 1 fatality; summer 2004	Yin Chuan city, China	128
<i>Nassarius</i> spp.	Nassa	107,413 MU 100 g ⁻¹	Zhoushan Islands, China	128
<i>Charonia lampas</i>	Trumpet shell	17.5 MU g ⁻¹ digestive gland	Galicia, Spain	143
<i>Natica lineata</i>	Lined moon shell	PSP toxins	Taiwan	144
<i>Natica vitellus</i>	Calf moon shell			
<i>Niotha clathrata</i>	Basket shell	PSP, GTX-3		144-145
<i>Neptunea arthritica</i>	Arthritic neptune	GTX 1-4, neoSTX, STX	Sanriku coast, Japan	146
<i>Tectus fenestratus</i>	Fenestrate top shell	18.7 µg STX eq./100g tissue	Northwest Australia	147
<i>Tectus nilotica maxima</i>	Top shell	5.0 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Tectus pyramis</i>	Top shell	19 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Turbo argyrostoma</i>	Turban shell	20 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Turbo marmorata</i>	Turban shell	4.2 MU g ⁻¹ whole	Ishigaki Island, Japan	52

* MU = mouse units (1MU = 0.18 µgSTX)

** Presumed, genus and species name not given by author.

Table 4. Maximum STX concentrations, microalgal sources, and geographical reports of STXs in crustaceans.

Crustacean species and presumptive microalgal source	Common name	Maximum STX(s) concentration	Location	Reference
<i>Alexandrium catenella</i>				
<i>Cancer magister</i>	Dungeness crab	72 µg STX eq./100g viscera	Washington, USA	85
<i>Cancer productus</i>	Red rock crab	285 µg STX eq./100g viscera	Washington, USA	161
		27 µg STX eq./100g muscle		
<i>Fabia subquadrata</i>	Pea crab	32 µg STX eq./100g whole crabs	Washington, USA	85
<i>Hemigrapsus nudus</i>	Purple shore crab	44 µg STX eq./100g whole body	Washington, USA	161
		minus legs and carapace		
<i>Hemigrapsus oregonensis</i>	Green shore crab	31 µg STX eq./100g whole	Washington, USA	161
<i>Pagurus</i> sp.	Hermit crab	35 µg STX eq./100g whole crabs	Washington, USA	85
<i>Pugettia producta</i>	Northern kelp crab	146 µg STX eq./100g eggs;	Washington, USA	161
		1710 µg STX eq./100g viscera;		
		48 µg STX eq./100g muscle		
<i>Balanus</i> spp.	Barnacles	84 µg STX eq./100g whole	Washington, USA	161
<i>Alexandrium tamarense</i>				
<i>Anonyx sarsi</i>	Gammarid amphipod	180 µg STX eq./100g (tissue not specified)	St. Lawrence estuary, Canada	162
<i>Cancer borealis</i>	Jonah crab	56 µg STX eq./100g (tissue not specified)	Maine, USA	85
<i>Homarus americanus</i>	American lobster	1512 µg STX eq./100g hepatopancreas (bioassay); 961 µg STX eq./100g hepatopancreas (HPLC); 69 µg STX eq./100g meat (HPLC)	Bay of Gaspe, Canada	162
<i>Pyrodinium bahamense</i>				
ND	Crab	339 MU* 100 g ⁻¹	Brunei Darussalam	141

ND	Mangrove crabs	239 MU 100 g ⁻¹ guts; 175 MU 100 g ⁻¹ gills	Sabah, Malaysia	138
<i>Portunus pelagicus</i>	Blue manna crab	175 MU 100 g ⁻¹ whole crab; 288 MU 100 g ⁻¹ gills; 328 MU 100 g ⁻¹ guts	Sabah, Malaysia	138
		1.8 µg STX eq./100g whole	Northwest Australia	147
<i>Panulirus versicolor</i>	Painted spiny lobster	175 MU 100 g ⁻¹ whole lobster; 175 MU 100 g ⁻¹ body only	Sabah, Malaysia	138
<i>Panulirus longipes</i>	Longlegged spiny lobster	211 MU 100 g ⁻¹ whole lobster; 177 MU 100 g ⁻¹ head and legs	Sabah, Malaysia	138
ND	Penaeid shrimp	175 MU 100 g ⁻¹ frozen tails; 268 MU 100 g ⁻¹ body only	Sabah, Malaysia	138
ND	Penaeid shrimp “Udang”	190 MU 100 g ⁻¹	Brunei Darussalam	141
Unknown origin				
<i>Hemigrapsus sanguineus</i>	Asian shore crab	0.16 MU g ⁻¹ hepatopancreas	Sanriku coast, Japan	146
<i>Metopograpsus frontalis</i>	Mangrove shore crab	10.0 µg STX eq./100g whole	Northwest Australia	147
<i>Pachygrapsus crassipes</i>	Striped shore crab	0.10 MU g ⁻¹ hepatopancreas	Sanriku coast, Japan	146
<i>Percnon planissimum</i>	Sally lightfoot crab	7.4 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Pilumnus pulcher</i>	Hairy crab	80 µg STX eq./100g whole	Northwest Australia	147
<i>Pilumnus vespertilio</i>	Hairy crab	120 µg STX eq./100g whole	Northwest Australia	147
		6.1 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Schizophrys aspera</i>	Eyelash spider crab	2.3 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Telmessus acutidens</i>	Edible shore crab	2723 µg STX eq./100g viscera	Fukushima Prefecture, Japan	163,164
<i>Actaeodes tomentosus</i>	Xanthid crab	130 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Atergatis floridus</i>	Xanthid crab	Positive STX, NEO, GTX2	Fiji Islands	165
		16,611 µg STX eq./100g whole	Northwest Australia	147

		490 MU g ⁻¹ whole	Ishigaki Island, Japan	52
		Positive GTX 1-4	Taiwan	166
<i>Atergatopsis germaini</i>	Xanthid crab	Positive GTX 3, NEO, STX	Taiwan	167
<i>Demanina reynaudi</i>	Xanthid crab	Positive GTX 3-4, NEO	Taiwan	166
<i>Eriphia scabricula</i>	Xanthid crab	180 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Eriphia sebana</i>	Xanthid crab	Positive STX, NEO, GTX1, GTX2	Great Barrier Reef, Australia	168
<i>Euzanthus exsculptus</i>	Xanthid crab	29 µg STX eq./100g whole	Northwest Australia	147
<i>Lophozozymus octodentatus</i>	Xanthid crab	23 µg STX eq./100g whole	Northwest Australia	147
<i>Lophozozymus pictor</i>	Xanthid crab	18.9 MU g ⁻¹ whole crab	Australia	169
		Positive GTX	Taiwan	170
<i>Neoxanthias impressus</i>	Xanthid crab	147 µg STX eq./100g whole	Northwest Australia	147
		10 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Platypodia granulosa</i>	Xanthid crab	110 MU g ⁻¹ whole	Ishigaki Island, Japan	52
<i>Platypodia pseudogranulosa</i>	Xanthid crab	10 µg STX eq./100g whole	Northwest Australia	147
<i>Xanthias lividus</i>	Xanthid crab	Positive GTX	Taiwan	171
<i>Zosimus aeneus</i>	Xanthid crab	Positive STX, NEOSTX, GTXI-3	Fiji Islands	165
		Positive GTX	Taiwan	171
		660 MU g ⁻¹ whole	Ishigaki Island, Japan	52
		108,000 µg STX eq./100g chelae muscle; 720 µg STX eq./100g cephalothorax muscle	Japan	172
		78 µg STX eq./100g whole	Northwest Australia	147
		259 MU g ⁻¹ whole crab	Philippines	173
<i>Procambarus clarkii</i>	Red swamp crayfish	0.23 MU g ⁻¹ hepatopancreas	Sanriku, Japan	146
<i>Carcinoscorpius rotundicauda</i>	Mangrove horseshoe crab	STX	Thailand	174

* MU = mouse units (1MU = 0.18 µgSTX); ND = no data

Table 5. Maximum STX concentrations, microalgal sources, and geographical reports of STXs in various fish tissues and species.

Fish species and presumptive microalgal source	Common name	Maximum STX(s) concentration	Location	Reference
<i>Alexandrium fundyense</i> <i>Scomber scombrus</i>	Atlantic mackerel	209 µg STX eq./100g liver; 367 µg STX eq./100g liver	Bay of Fundy; Gulf of St. Lawrence	194-195
<i>Alexandrium tamarense</i> <i>Scomber japonicus</i>	Chub mackerel	2800 µg STX eq./100g muscle; 500 µg STX eq./100g liver; 72 µg STX eq./100g gills	Argentina	196
<i>Pyrodinium bahamense</i> <i>Rastrelliger</i> sp.	Short mackerel	99 MU 100 g ⁻¹ tissue	Brunei Darussalam	141
<i>Sardinella</i> sp.	Sardinella	99 MU 100 g ⁻¹ tissue	Brunei Darussalam	141
		572 µg STX eq./100g guts	Sabah, Malaysia	139
<i>Sphoeroides nephelus</i>	Southern puffer fish	1,443 µg STX eq./100g liver; 14,571 µg STX eq./100g muscle	USA	58
<i>Sphoeroides testudineus</i>	Checkered puffer fish	51.1 µg STX eq./100g liver; 104.3 µg STX eq./100g muscle	USA	58
<i>Sphoeroides spengleri</i>	Bandtail puffer fish	364.5 µg STX eq./100g muscle	USA	58
Unknown origin				
<i>Cololabis saira</i>	Pacific saury	0.14 MU g ⁻¹ viscera	Iwate, Japan	146
<i>Gadus macrocephalus</i>	Pacific cod	0.10 MU g ⁻¹ viscera; 0.10 MU g ⁻¹ intestine	Iwate, Japan	146
<i>Lamna ditropis</i>	Salmon shark	0.17 MU g ⁻¹ liver	Iwate, Japan	146
<i>Oncorhynchus keta</i>	Chum salmon	1.53 MU g ⁻¹ liver;	Iwate, Japan	146

		0.69 MU g ⁻¹ viscera		
<i>Scarus</i> (= <i>Ypsiscarus</i>) <i>ovifrons</i>	Knobsnout parrotfish	0.26 MU g ⁻¹ liver; 1.58 MU g ⁻¹ intestine	Iwate, Japan	146
<i>Arothron firmamentum</i>	Starry toadfish	740 MU g ⁻¹ ovary	Japan	197
<i>A. hispidus</i>	White-spotted puffer	Positive STX in liver, muscle, skin, and intestine	Philippines	198
<i>A. mappa</i>	Map puffer	Positive STX in liver, muscle, skin, and intestine	Philippines	198
<i>A. manillensis</i>	Narrow-lined puffer	Positive STX in liver, muscle, skin, and intestine	Philippines	198
<i>A. nigropunctatus</i>	Black spotted puffer	Positive STX in liver, muscle, skin, and intestine	Philippines	198
<i>A. reticularis</i>	Reticulated puffer	Positive STX in liver, muscle, skin, and intestine	Philippines	198
<i>A. stellatus</i>	Starry toadfish	Positive STX in liver, muscle, skin, and intestine	Philippines	198
<i>Chelonodon patoca</i>	Milk-spotted puffer	22.0 MU g ⁻¹ muscle; 40 MU g ⁻¹ skin; 12.0 MU g ⁻¹ liver; 2.8 MU g ⁻¹ ovary (data shown as mean)	Bangladesh	199
		Positive STX in liver, muscle, skin, and intestine	Philippines	198
<i>Colomesus asellus</i>	Amazon puffer	53.2 MU whole body	Brazil	200
<i>Takifugu pardalis</i>	Panther puffer	Positive for STX in liver	Japan	201
<i>T. poecilonotus</i>	Fine patterned puffer	Positive for STX in liver, ovary and digestive tract	Japan	202
<i>T. radiates</i>	Puffer	Positive for STX in liver	Japan	202
<i>T. vermicularis</i>	Purple puffer	Positive for STX in liver, ovary and digestive tract	Japan	202
<i>Tetraodon cutcutia</i>	Ocellated puffer	7.6 MU g ⁻¹ muscle; 20 MU g ⁻¹ skin; 6.0 MU g ⁻¹ liver; 5.6 MU g ⁻¹ ovary (data shown as mean)	Thailand	199
		182 MU 100 g ⁻¹ skin; 238 MU 100 g ⁻¹ muscle; 106 MU 100 g ⁻¹ liver	Bangladesh	203
<i>T. cochinchinensis</i> (as <i>T. fangi</i>)	Puffer	Positive for STX whole body	Thailand	204
<i>T. suvatii</i>	Arrowhead puffer	191 MU g ⁻¹ muscle; 230 MU g ⁻¹ skin; 174 MU g ⁻¹ liver; 117 MU g ⁻¹ egg	Thailand	205
<i>T. turgidus</i>	Brown puffer	<2 MU g ⁻¹ muscle; 37 MU g ⁻¹ skin; <2 MU g ⁻¹ liver; 27 MU g ⁻¹ ovary	Cambodia	206

* MU = mouse units (1MU = 0.18 µgSTX)