

Appendices

Abbreviations

List of experts of NOWPAP Working Group 3

Occurrences of red tides in the NOWPAP Region

Red-tide events in the NOWPAP Region

Abbreviations

CCG: Cochlodinium Corresponding Group
CEARAC: Special Monitoring & Coastal Environmental Assessment Regional Activity Centre
DSP: Diarrhetic Shellfish Poisoning
ECD: Electrolytic Clay Dispenser
EKWC: East Korean Warm Current
ELISA: Enzyme-Linked Immunosorbent Assay
EMECS: International Center for the Environmental Management of Enclosed Coastal
FPM: Focal Points Meeting
HAB: Harmful algae blooms
HPLC: High Performance Liquid Phase Separations
IMB FEB RAS: The Institute of Marine Biology Far Eastern Branch Russian Academy of Sciences
IOC: Intergovernmental Oceanographic Commission
JFRCA: Japan Fisheries Resource Conservation Association
KOICA: Korea International Cooperation Agency
LCC: Liman Cold Current
LC-MS: Liquid Chromatography Mass Spectrometry
NFRDI: National Fisheries Research and Development Institute
NOWPAP: Northwest Pacific Action Plan
NPEC: Northwest Pacific Region Environmental Cooperation Center
PICES: North Pacific Marine Science Organization
POMRAC: Pollution Monitoring Regional Activity Centre
PSP: Paralytic Shellfish Poisoning
SEPA: State Environmental Protection Administration
SOA: State Oceanic Administration
TTR: Training Through Research
TWC: Tsushima Warm Current
UNEP: United Nations Environment Programme
WESTPAC: IOC Sub-Commission for the Western Pacific
WG3: Working Group 3
YWC: Yellow Sea Warm Current

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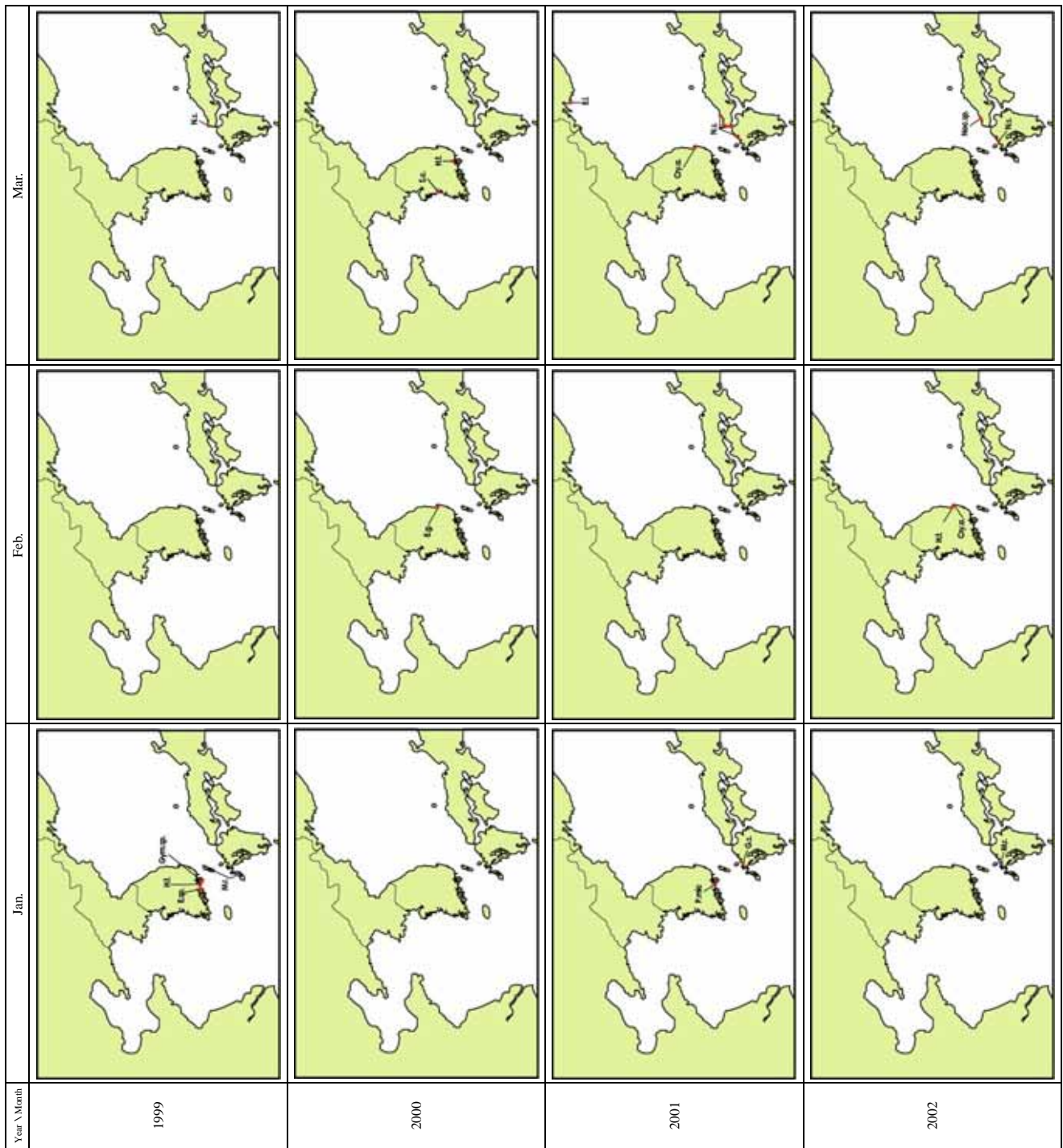
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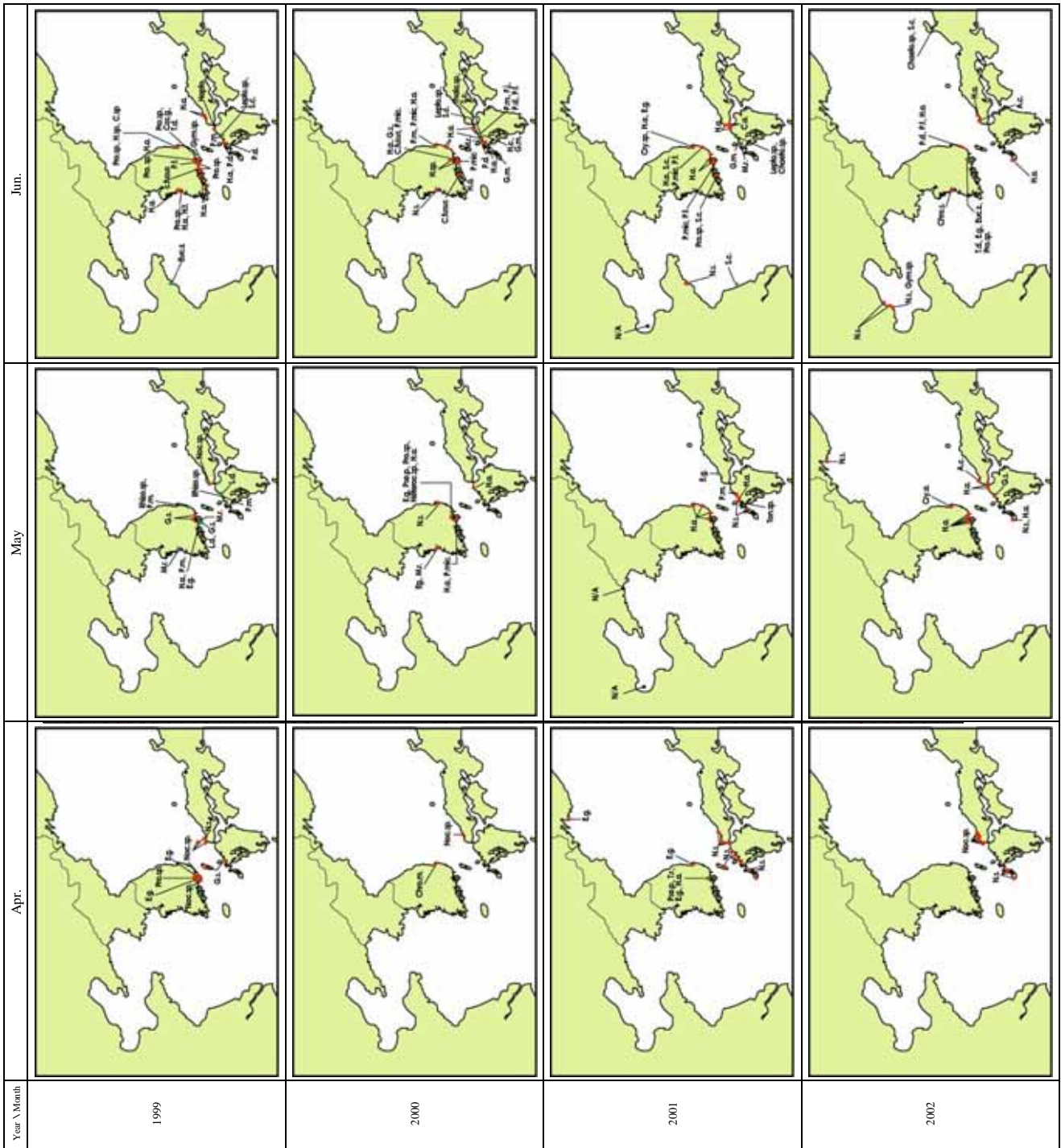
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Occurrences of red tides in the NOWPAP Region



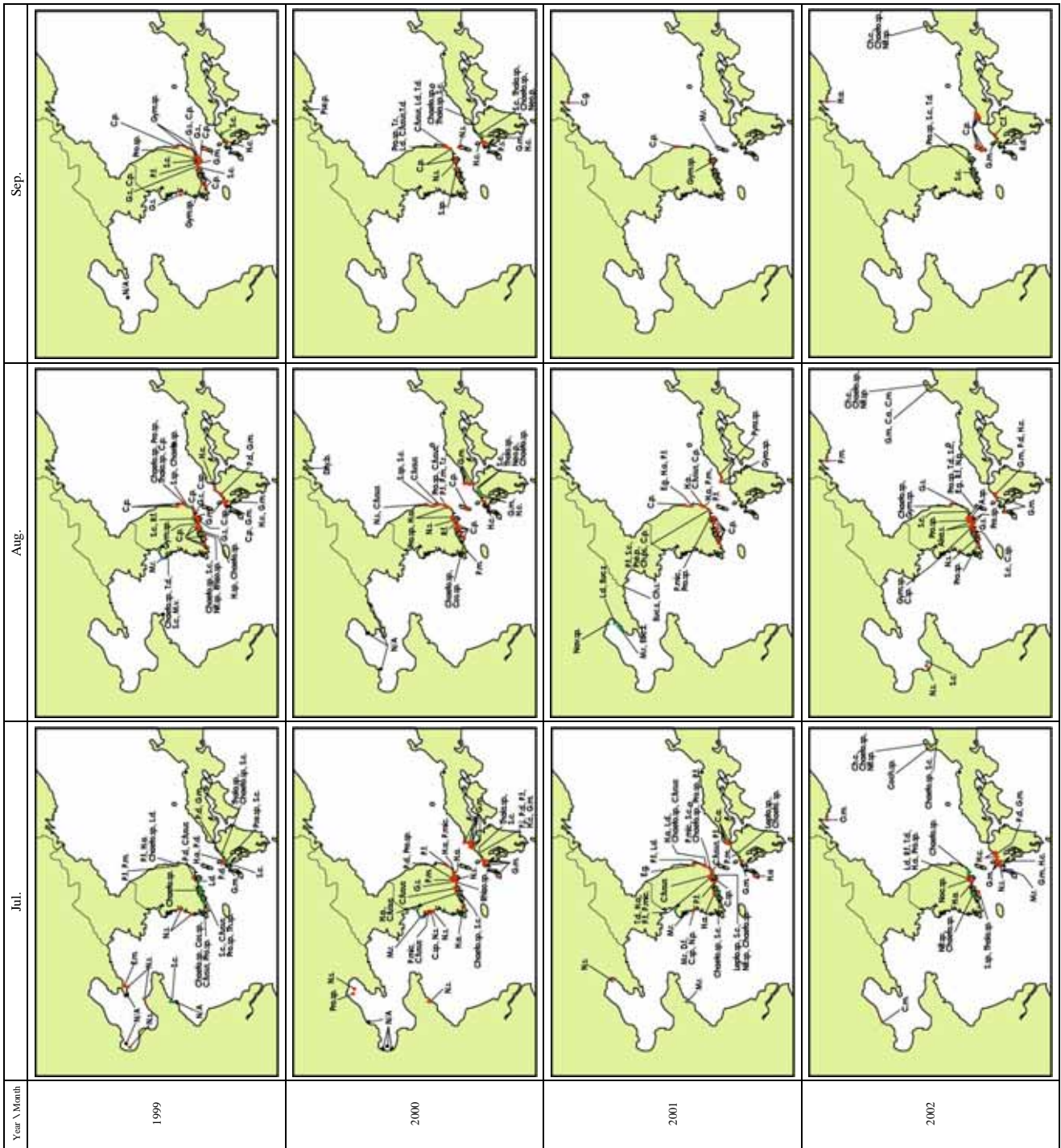
Class	Genus and Species	Abbreviation	
Cyanophyceae	<i>Microcystis viridis</i>	M.v.	
	<i>Chromonas marina</i>	Ch.m.	
	<i>Chromonas salina</i>	Ch.s.	
	<i>Cryptomonas acuta</i>	Cry.a.	
	<i>Cryptomonas</i> sp.	Cry.sp.	
	<i>Alexandrium catenella</i>	A.c.	
	<i>Alexandrium fraterculus</i>	A.f.	
	<i>Ceratium flexa</i>	C.f.	
	<i>Ceratium fissus</i>	C.fissus	
	<i>Ceratium</i> sp.	C.sp.	
Dinophyceae	<i>Cochlodinium polybracteoides</i>	C.P.	
	<i>Cochlodinium</i> sp.	Coch.sp.	
	<i>Gymnodinium mikimotoi</i>	G.m.	
	<i>Gymnodinium sanguinatum</i>	G.s.	
	<i>Gymnodinium</i> sp.	Gym.sp.	
	<i>Gyrodinium</i> sp.	Gyro.sp.	
	<i>Heterosigma circularisquama</i>	H.c.	
	<i>Heterosigma triquetra</i>	H.t.	
	<i>Heterosigma</i> sp.	Heteros.sp.	
	<i>Noctiluca scintillans</i>	N.s.	
Bacillariophyceae	<i>Noctiluca</i> sp.	Noct.sp.	
	<i>Oryzopsis marina</i>	O.m.	
	<i>Prorocentrum billicum</i>	P.b.	
	<i>Prorocentrum dentatum</i>	P.d.	
	<i>Prorocentrum micans</i>	P.mic.	
	<i>Prorocentrum minimum</i>	P.m.	
	<i>Prorocentrum sigmaoides</i>	P.s.	
	<i>Prorocentrum striatum</i>	P.st.	
	<i>Prorocentrum</i> sp.	Pror.sp.	
	<i>Dityrochya flabida</i>	D.f.	
Chrysiophyceae	<i>Phaeocystis</i> sp.	Phae.sp.	
	<i>Happophysae</i>	Happo.	
	Haptophyceae	<i>Asterionella</i> sp.	Aste.sp.
		<i>Chaetoceros carterianum</i>	Ch.c.
		<i>Chaetoceros</i>	Ch.c.
		<i>Chaetoceros pseudocarterianum</i>	Ch.p.
		<i>Chaetoceros socialis</i>	Ch.s.
		<i>Chaetoceros</i> sp.	Chaeo.sp.
		<i>Coscinodiscus gigas</i>	Cos.g.
		<i>Coscinodiscus</i> sp.	Cos.sp.
<i>Ditylum brightwellii</i>		Dty.b.	
<i>Leucampia zadaceras</i>		Leuc.z.	
Leptodermatales	<i>Leptodermis danicus</i>	L.d.	
	<i>Leptodermis</i> sp.	Lept.sp.	
	<i>Neosiphonia</i>	Neos.sp.	
	<i>Neosiphonia</i> sp.	Neos.sp.	
	<i>Stadiphanus palagicus</i>	Stad.sp.	
	<i>Stadiphanus</i> sp.	Stad.sp.	
	<i>Stadiphanus</i> sp.	Stad.sp.	
	<i>Stadiphanus</i> sp.	Stad.sp.	
	<i>Stadiphanus</i> sp.	Stad.sp.	
	<i>Stadiphanus</i> sp.	Stad.sp.	
Raphidophyceae	<i>Thalassiosira carinata</i>	T.c.	
	<i>Thalassiosira</i> sp.	Thal.sp.	
	<i>Thalassiosira</i> sp.	Thal.sp.	
	<i>Chaetoceros catenella</i>	Cha.c.	
	<i>Chaetoceros</i> sp.	Cha.c.	
	<i>Chaetoceros</i> sp.	Cha.c.	
	<i>Chaetoceros</i> sp.	Cha.c.	
	<i>Chaetoceros</i> sp.	Cha.c.	
	<i>Chaetoceros</i> sp.	Cha.c.	
	<i>Chaetoceros</i> sp.	Cha.c.	
Euglenophyceae	<i>Eutima lanowii</i>	E.l.	
	<i>Eutima</i> sp.	E.sp.	
	<i>Eutima</i> sp.	E.sp.	
	<i>Eutima</i> sp.	E.sp.	
	<i>Eutima</i> sp.	E.sp.	
	<i>Eutima</i> sp.	E.sp.	
	<i>Eutima</i> sp.	E.sp.	
	<i>Eutima</i> sp.	E.sp.	
	<i>Eutima</i> sp.	E.sp.	
	<i>Eutima</i> sp.	E.sp.	
Prasinophyceae	<i>Pyramimonas</i> sp.	Pyra.sp.	
	<i>Mesodinium rubrum</i>	M.r.	
	<i>Tomotia</i> sp.	Tom.sp.	

Occurrences of red tides in the NOWPAP Region(1)



Class	Genus and Species	Abbreviation
Cyanophyceae	<i>Microcystis viridis</i>	M.v.
	<i>Chroococcus marina</i>	Chro.m.
	<i>Chroococcus salina</i>	Chro.s.
	<i>Cryptomonas acuta</i>	Cry.a.
	<i>Cryptomonas</i> sp.	Cry.sp.
	<i>Alexandrium catenella</i>	A.c.
	<i>Alexandrium fraterculus</i>	A.f.
	<i>Alexandrium</i> sp.	A.sp.
	<i>Ceratium fovea</i>	C.f.
	<i>Ceratium fissus</i>	C.fissus
Dinophyceae	<i>Ceratium</i> sp.	C.sp.
	<i>Cochlodinium polykrikoides</i>	C.P.
	<i>Cochlodinium</i> sp.	Coch.sp.
	<i>Gymnodinium mikimotoi</i>	G.m.
	<i>Gymnodinium sanguinatum</i>	G.s.
	<i>Gymnodinium</i> sp.	Gym.sp.
	<i>Gyrodinium</i> sp.	Gyrod.sp.
	<i>Heterosigma circularisquama</i>	H.c.
	<i>Heterosigma triquetra</i>	H.t.
	<i>Heterosigma</i> sp.	Heteros.sp.
Chrysophyceae	<i>Noctiluca scintillans</i>	N.s.
	<i>Noctiluca</i> sp.	Noct.sp.
	<i>Oryzopsis marina</i>	O.m.
	<i>Prorocentrum billicum</i>	P.b.
	<i>Prorocentrum dentatum</i>	P.d.
	<i>Prorocentrum micans</i>	P.mic.
	<i>Prorocentrum minimum</i>	P.m.
	<i>Prorocentrum sigmales</i>	P.s.
	<i>Prorocentrum triestinum</i>	P.t.
	<i>Prorocentrum</i> sp.	Pro.sp.
Haptophyceae	<i>Ditychia flabida</i>	D.f.
	<i>Ditychia</i> sp.	D.sp.
	<i>Phaeo</i> sp.	Phae.sp.
	<i>Haptophyceae</i>	Hapto.
	<i>Asterionella</i> sp.	Aste.sp.
	<i>Chaetoceros carterianum</i>	Ch.c.
	<i>Chaetoceros</i>	Ch.c.
	<i>pseudocarterianum</i>	Ch.p.
	<i>Chaetoceros socialis</i>	Ch.s.
	<i>Chaetoceros</i> sp.	Chro.sp.
Bacillariophyceae	<i>Coscinodiscus gigas</i>	Cos.g.
	<i>Coscinodiscus</i> sp.	Cos.sp.
	<i>Ditylum brightwellii</i>	Dity.b.
	<i>Leucampia zadacrus</i>	Leuc.z.
	<i>Leprosidinium danicus</i>	Lep.d.
	<i>Leprosidinium</i> sp.	Lep.sp.
	<i>Nitzschia</i> sp.	Nitz.sp.
	<i>Nitzschia</i> sp.	Nitz.sp.
	<i>Nitzschia</i> sp.	Nitz.sp.
	<i>Nitzschia</i> sp.	Nitz.sp.
Raphidophyceae	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
	<i>Chaetoceros</i> sp.	Cha.sp.
Prasinophyceae	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
	<i>Prasinophyceae</i>	Pras.
Clade	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.
	<i>Tomatia</i> sp.	Tom.sp.

Occurrences of red tides in the NOWPAP Region(2)



Class	Genus and Species	Abbreviation
Cyanophyceae	<i>Microcystis viridis</i>	M.v.
	<i>Chroococcus marina</i>	Ch.m.
	<i>Chroococcus salina</i>	Ch.s.
	<i>Cryptomonas acuta</i>	C.a.
	<i>Cryptomonas</i> sp.	Cy.sp.
	<i>Alexandrium catenella</i>	A.c.
	<i>Alexandrium fraterculus</i>	A.f.
	<i>Alexandrium</i> sp.	A.sp.
	<i>Ceratium flexa</i>	C.f.
	<i>Ceratium flexus</i>	C.f.us
Dinophyceae	<i>Ceratium</i> sp.	C.sp.
	<i>Cochlodinium polykrikoides</i>	C.P.
	<i>Cochlodinium</i> sp.	Co.ch.sp.
	<i>Gymnodinium mikimotoi</i>	G.m.
	<i>Gymnodinium sanguinatum</i>	G.s.
	<i>Gymnodinium</i> sp.	Gm.sp.
	<i>Gyrodinium</i> sp.	Gy.sp.
	<i>Heterosigma circularisquama</i>	H.c.
	<i>Heterosigma triquetra</i>	H.t.
	<i>Heterosigma</i> sp.	He.sp.
Prasinophyceae	<i>Noctiluca scintillans</i>	N.s.
	<i>Noctiluca</i> sp.	No.sp.
	<i>Oryzopsis marina</i>	O.m.
	<i>Prorocentrum billicum</i>	P.b.
	<i>Prorocentrum dentatum</i>	P.d.
	<i>Prorocentrum micans</i>	P.m.
	<i>Prorocentrum minimum</i>	P.m.
	<i>Prorocentrum sigmoides</i>	P.s.
	<i>Prorocentrum striatum</i>	P.st.
	<i>Prorocentrum</i> sp.	Pr.sp.
Chrysiophyceae	<i>Dictyocha flabida</i>	D.f.
	<i>Diatomsis</i> sp.	Di.sp.
	<i>Hippodamiae</i>	Hippo.
	<i>Asterionella</i> sp.	Aste.sp.
	<i>Chaetoceros carolinianus</i>	Ch.c.
	<i>Chaetoceros</i>	Ch.c.
	<i>Chaetoceros pseudocarinatus</i>	Ch.p.
	<i>Chaetoceros socialis</i>	Ch.s.
	<i>Chaetoceros</i> sp.	Ch.sp.
	<i>Coscinella gigas</i>	Co.g.
Bacillariophyceae	<i>Coscinella</i> sp.	Co.sp.
	<i>Ditylum bairdii</i>	D.b.
	<i>Ditylum salinarum</i>	D.s.
	<i>Leptocylindrus danicus</i>	L.d.
	<i>Leptocylindrus</i> sp.	Le.sp.
	<i>Navicula</i> sp.	Nav.sp.
	<i>Navicula parvius</i>	N.p.
	<i>Navicula</i> sp.	N.sp.
	<i>Navicula</i> sp.	N.sp.
	<i>Navicula</i> sp.	N.sp.
Raphidophyceae	<i>Thalassiosira weissflogii</i>	T.w.
	<i>Thalassiosira</i> sp.	Th.sp.
	<i>Thalassiosira</i> sp.	Th.sp.
	<i>Thalassiosira</i> sp.	Th.sp.
	<i>Thalassiosira</i> sp.	Th.sp.
	<i>Thalassiosira</i> sp.	Th.sp.
	<i>Thalassiosira</i> sp.	Th.sp.
	<i>Thalassiosira</i> sp.	Th.sp.
	<i>Thalassiosira</i> sp.	Th.sp.
	<i>Thalassiosira</i> sp.	Th.sp.
Euglenophyceae	<i>Eutima lanowii</i>	E.l.
	<i>Eutima</i> sp.	E.sp.
	<i>Eutima</i> sp.	E.sp.
	<i>Eutima</i> sp.	E.sp.
	<i>Eutima</i> sp.	E.sp.
	<i>Eutima</i> sp.	E.sp.
	<i>Eutima</i> sp.	E.sp.
	<i>Eutima</i> sp.	E.sp.
	<i>Eutima</i> sp.	E.sp.
	<i>Eutima</i> sp.	E.sp.
Prasinophyceae	<i>Pyramionella</i> sp.	Py.sp.
	<i>Pyramionella</i> sp.	Py.sp.
	<i>Pyramionella</i> sp.	Py.sp.
	<i>Pyramionella</i> sp.	Py.sp.
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	<i>Pyramionella</i> sp.	Py.sp.
	<i>Pyramionella</i> sp.	Py.sp.
	<i>Pyramionella</i> sp.	Py.sp.
Clade	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.
	<i>Tomatia</i> sp.	To.sp.

Occurrences of red tides in the NOWPAP Region(3)

Red-tide events in the NOWPAP Region

Red tide events in China (B Sea Area and C Sea Area) (1)

Event No.	Location (name of the sea area)	Duration dd/mm/yy-dd/mm/yy	Causative species	Max. cell density (cells/L)	Approximate Area suffered (km ²)	Type of HAB Red tide or Toxic	Mitigation Activity and effectiveness	Damage	
								Fishery resources	Human health
1	Huanghua, Hebei	1989	<i>Gymnodinium</i> sp	No data	1,300	HAB	No data	38 million dollar	No data
2	Laizhou Bay	18/6/1990	No data	No data	1/3 Bay area	Red tide	No data	No data	No data
3	Jiaozhou Bay	26/6/1990	No data	No data	80,000	Red tide	No data	No data	No data
4	Baidaihe, Hebei	28/6/1990-4/7/1990	No data	No data	110	No data	No data	No data	No data
5	Laizhou Bay	June, 1990	<i>Noctiluca scintillans</i>	No data	No data	Red tide	No data	No data	No data
6	Laizhou Bay	19-20/8/1990	No data	No data	10	Red tide	No data	No data	No data
7	Laizhou Bay	26/8/1990	No data	No data	1,200	Red tide	No data	No data	No data
8	Laizhou Bay	30/8/1990	No data	No data	1,000	Red tide	No data	No data	No data
9	North Laizhou Bay	1/9/1990	No data	No data	No data	Red tide	No data	No data	No data
10	Changhai county, Liaoning	1990	No data	No data	No data	HAB	No data	2.5 million dollar due to death scallops	No data
11	Shrimp pond, Dalian	May to July, 1991	<i>Exuviaella cordata</i>	7.5 10 ⁷	No data	Red tide	No data	Loss of shrimp	No data
12	Liaodong Bay	4/7/1991-12/7/1991	<i>Noctiluca scintillans</i>	4.9 10 ⁷	100	Red tide	No data	No data	No data
13	Jiaozhou Bay	April, 1992	No data	No data	No data	Red tide	No data	No data	No data
14	East Qingdao	12/5/1992	No data	No data	1,200	Red tide	No data	No data	No data
15	Jiaozhou Bay	August, 1992	No data	No data	1,000	Red tide	No data	No data	No data
16	Dalian Bay	11/8/1993	No data	No data	40	Red tide	No data	No data	No data
17	Laizhou Bay	6/6/1995	<i>Noctiluca scintillans</i>	2.16 10 ⁷	90	Red tide	No data	No data	No data
18	Liaodong Bay	20/8/1995	No data	No data	100	Red tide	No data	No data	No data
19	Penglai, Laizhou Bay	13-14/4/1997	No data	No data	1	Red tide	No data	No data	No data
20	Bohai Bay	28/6/1997	No data	No data	3	Red tide	No data	No data	No data
21	Jiaozhou Bay	3-8/7/1998	<i>Skeletonema costatum</i>	4.5 10 ⁶	10	Red tide	No data	No data	No data
22	Yantai, Laizhou Bay	August, 1998	No data	No data	100	HAB	No data	4 million dollar Fishery losses	No data
23	Bohai Sea	16/8/1998-19/9/1998	<i>Ceratium furca</i> , <i>Dinophysis ovata</i>	1.25 10 ⁶	5,000	toxic	No data	dollar Fishery losses	DSP detected
24	Yantai, Bohai	15/8/1998-10/9/1998	<i>Gymnodinium sanguineum</i>	No data	170	HAB	No data	Shellfish death	No data
25	Laizhou Bay	2/9/1998	No data	No data	No data	Red tide	No data	No data	No data
26	Liaodong Bay	18/9/1998	<i>Ceratium furca</i>	No data	No data	Red tide	No data	No data	No data
27	Liaodong Bay	29/9/1998	<i>Ceratium furca</i>	No data	No data	Red tide	No data	No data	No data
28	Bohai Bay	1/10/1998	No data	No data	No data	Red tide	No data	No data	No data
29	Bohai Bay	3/10/1998	<i>Gonyaulax spinifera</i> , <i>Ceratium furca</i>	No data	800	Red tide	No data	No data	No data
30	Bohai Bay	9/10/1998	No data	No data	No data	Red tide	No data	No data	No data
31	Jiaozhou Bay	8-15/6/1999	<i>Eucampia zooducius</i>	2.3 10 ⁶	No Data	Red tide	No data	No data	No data
32	Bohai Bay	2-4/7/1999	No data	No data	1,500	Red tide	No data	No data	No data
33	Dalian Bay	July, 1999	<i>Exuviaella marina</i>	8.1 10 ⁶	No data	HAB	No data	No data	DSP detected
34	Bohai Sea	13-21/7/1999	<i>Noctiluca scintillans</i>	No data	6,300	Red tide	No data	No data	No data
35	Dalian Bay	17-21/7/1999	<i>Noctiluca scintillans</i>	No data	100	Red tide	No data	No data	No data
36	Penglai, Shandong	17/7/1999	<i>Noctiluca scintillans</i>	No data	680	Red tide	No data	No data	No data
37	South Dalian	18/7/1999	No data	No data	30	Red tide	No data	No data	No data
38	Jiaozhou Bay	23/7/1999	<i>Skeletonema costatum</i>	No data	26	Red tide	No data	No data	No data

Red tide events in China (B Sea Area and C Sea Area) (2)

Event No.	Location (name of the sea area)	Duration dd/mm/yy-dd/mm/yy	Causative species	Max. cell density (cells/L)	Approximate Area suffered (km ²)	Type of HAB Red tide or Toxic	Mitigation Activity and effectiveness	Damage	
								Fishery resources	Human health
39	Xiaomai Island, Qingdao	26/7/1999	No data	No data	60	Red tide	No data	No data	No data
40	Shidao, Shuangdong	6/8/1999	No data	No data	160	Red tide	No data	No data	No data
41	Central Bohai Sea	25/9/1999	No data	No data	30	Red tide	No data	No data	No data
42	Liaodong Bay, Bohai	9-15/7/2000	<i>Noctiluca scintillans</i>	No data	350	Red tide	No data	No data	No data
43	Liaodong Bay	Jul-00	<i>Prorocentrum</i> sp.	No data	No data	HAB	No data	Death of jellyfish	No data
44	Bohai Bay	23/7/2000	No data	No data	1,040	Red tide	No data	No data	No data
45	North Island, Bohai	13/8/2000	No data	No data	217	Red tide	No data	No data	No data
46	Changxin Island, Bohai Sea	13/8/1/2000	No data	No data	44	Red tide	No data	No data	No data
47	Zhuanghe, Yellow Sea	2/8/2000	No data	No data	827	HAB	No data	15 million	No data
48	Southeast Qikou	20-21/7/2000	No data	No data	180	Red tide	No data	No data	No data
49	Beidaihe, Tianjing	23/7/2000	No data	No data	3	Red tide	No data	No data	No data
50	Tanggu, Tianjing	25/7/2000	No data	No data	134	Red tide	No data	No data	No data
51	Jiaozhou Bay	20-23/7/2000	<i>Noctiluca scintillans</i>	No data	2	Red tide	No data	No data	No data
52	Dandong, North Yellow Sea	24/5/2001	No data	No data	No data	Red tide	No data	No data	No data
53	Bohai Bay	26/5/2001	No data	No data	No data	Red tide	No data	No data	No data
54	Bohai Bay	19/6/2001	No data	No data	No data	Red tide	No data	No data	No data
55	Jiaozhou Bay	11-12/6/2001	<i>Noctiluca scintillans</i>	No data	5	Red tide	No data	No data	No data
56	The Coast of Jiangsu	20/6/2001	<i>Skeletonema costatum</i>	No data	1,000	Red tide	No data	No data	No data
57	Jiaozhou Bay	7-12/7/2001	<i>Mesodinium rubrum</i>	No data	20	Red tide	No data	No data	No data
58	Yingkou, Liaodong Bay	15-16/7/2001	<i>Noctiluca scintillans</i>	No data	360	Red tide	No data	No data	No data
59	Bayuquan, Liaodong Bay	12-23/8/2001	<i>Leptocylindrus danicus</i>	No data	770	Red tide	No data	No data	No data
60	Yalujiang Estuary, North Yellow Sea	24/8/2001-14/9/2001	<i>Eucampia zoodiacus</i> , <i>Chaetoceros socialis</i>	No data	1,100	Red tide	No data	No data	No data
61	Liao River Estuary	25-26/8/2001	<i>Navicula</i> sp.	No data	130	Red tide	No data	No data	No data
62	Bayuquan, Liaodong Bay	27-30/8/2001	<i>Mesodinium rubrum</i> , <i>Eucampia zoodiacus</i>	No data	100	Red tide	No data	No data	No data
63	Qinghuangdao Bay, Bohai Sea	3-4/6/2002	<i>Noctiluca scintillans</i>	No data	1	Red tide	No data	No data	No data
64	Jingtang Harbour, Bohai Bay	16-17/6/2002	<i>Noctiluca scintillans</i>	No data	15	Red tide	No data	No data	No data
65	Jingtang Harbour, Bohai Bay	27/6/2002	<i>Gymnodinium</i> sp., <i>Noctiluca scintillans</i>	No data	1	Red tide	No data	No data	No data
66	Qinghuangdao Bay, Bohai Sea	25/7/2002	<i>Chattonella marina</i>	No data	8	HAB	No data	No data	No data
67	Laizhou Bay	10/8/2002	<i>Noctiluca scintillans</i>	No data	20	HAB	No data	0.6 million	No data
68	Laizhou Bay	15/8/2002	<i>Skeletonema costatum</i>	No data	30	HAB	No data	1 million dollar	No data
69	East Liaodong Bay	28/5/2003	<i>Noctiluca scintillans</i>	No data	10	Red tide	No data	No data	No data
70	Dandong waters, Yellow Sea	Jun-03	No data	No data	30	Red tide	No data	No data	No data

Red tide events in China (B Sea Area and C Sea Area) (3)

Event No.	Location (name of the sea area)	Duration dd/mm/yy-dd/mm/yy	Causative species	Max. cell density (cells/L)	Approximate Area suffered (km ²)	Type of HAB Red tide or Toxic	Mitigation Activity and effectiveness	Damage	
								Fishery resources	Human health
71	Dalian Bay	Jul-03	<i>Heterosigma akashiwo</i>	No data	15	HAB	No data	No data	No data
72	Jiaozhou Bay	Jul-03	<i>Coscinodiscus asteromphalus</i>	No data	200	Red tide	No data	No data	No data
73	Qinghuangdao, East Bohai Sea	25-26/4/2003-	<i>Noctiluca scintillans</i>	No data	70	Red tide	No data	No data	No data
74	Liaodong Bay	28/5/2003	<i>Noctiluca scintillans</i>	No data	10	Red tide	No data	No data	No data
75	Qinghuangdao, East Bohai Sea	28/5/2003-4/6/2003	<i>Noctiluca scintillans</i>	No data	8	Red tide	No data	No data	No data
76	Liaodong Bay	28/5/2003	<i>Noctiluca scintillans</i>	No data	140	HAB	No data	Fish kills	No data
77	Qinghuangdao, East Bohai Sea	12/6/2003	<i>Noctiluca scintillans</i>	No data	0	Red tide	No data	No data	No data
78	Luanhe, Qinghuangdao, East Bohai Sea	21/6/2003	<i>Noctiluca scintillans</i>	No data	12	Red tide	No data	No data	No data
79	Qinghuangdao, East Bohai Sea	25-27/6/2003	<i>Noctiluca scintillans</i>	No data	1	Red tide	No data	No data	No data
80	Dagu Harbour, Bohai Bay	1-8/7/2003	<i>Noctiluca scintillans</i>	No data	100	Red tide	No data	No data	No data
81	Bohai Bay	12-13/8/2003	<i>Noctiluca scintillans</i>	No data	2	Red tide	No data	No data	No data
82	Lai Zhou Bay	2003	<i>Gonyaulax spinifera</i>	No data	No data	Red tide	No data	No data	No data
83	Jiaozhou Bay	9-28/2/2004	<i>Rhizosolenia</i> sp.	No data	No data	Red tide	No data	No data	No data
84	Yellow River Estuary	11-18/6/2004	<i>Phaeocystis</i> sp.	No data	1,850	HAB	No data	No data	No data
85	Central Bohai Bay	12-18/6/2004	<i>Karania mikimotoi</i>	No data	3,200	HAB	No data	No data	No data
86	Jingshitan , Dalian , Yellow Sea	6/9/2004	<i>Chattonella antitqua</i>	No data	No data	HAB	No data	No data	No data
87	Jingshitan , Dalian , Yellow Sea	25/9/2004	<i>Alexandrium catenella</i>	No data	No data	HAB	No data	No data	No data

Red tide events in Japan (northern Kyushu coastal waters) (1)

Event No.	Location (name of the sea area)		Duration d/mm/yy-dd/mm/yy	Continuous days	Causative species		Max. cell density (cells/L)	
	Location 1	Location 2						
NS-01	remote island	Fukuoka	27/01/98 - 02/02/98	7	<i>Skeletonema costatum</i>		3,600	
NS-02	remote island	Gojo	07/04/98 - 25/04/98	19	<i>Gymnodinium sanguinolentum</i>		588	
NS-03	remote island	Fukuoka	16/05/98 - 21/05/98	6	<i>Prorocentrum minimum</i>		13,000	
FO-01	N	other	01/06/98 - 05/06/98	5	<i>Heterosigma akashiwo</i>		10,000	
FO-02	N	Fukuoka	15/06/98 - 17/06/98	3	<i>Skeletonema costatum</i>		25,950	
SA-04	N	other	22/06/98 - 03/07/98	12	<i>Heterosigma akashiwo</i>		79,070	
SA-05	N	other	24/06/98 - 26/06/98	3	<i>Prorocentrum minimum</i>	<i>Prorocentrum minimum</i>	4,420	1,260
SA-06	N	Fukuoka	24/06/98 - 29/06/98	6	<i>Prorocentrum minimum</i>		5,190	
FO-06	N	Fukuoka	13/07/98 - 16/07/98	4	<i>Chaetoceros</i> sp.		7,200	
NS-02	N	other	11/08/98 - 11/08/98	1	<i>Ceratium hirundinella</i>		18,000	
NS-03	N	remote island	19/08/98 - 02/09/98	14	<i>Prorocentrum minimum</i>		4,600	
NS-17	remote island	Fukuoka	23/08/98 - 26/08/98	4	<i>Thalassiosira</i> sp.		119	
FO-08	N	Fukuoka	27/08/98 - 28/08/98	2	unknown		7,420	
FO-09	N	Fukuoka	09/09/98 - 10/09/98	2	<i>Skeletonema costatum</i>		2,500	
NS-23	N	remote island	21/10/98 - 24/10/98	4	<i>Skeletonema costatum</i>		2,556	
NS-08	remote island	Fukuoka	24/10/98 - 06/11/99	10	<i>Micidinium rubrum</i>		4,600	
NS-01	remote island	Gojo	05/11/99 - 09/11/99	5	<i>Micidinium rubrum</i>		882	
YG-01	N	other	10/03/99 - 12/03/99	3	<i>Noctiluca scintillans</i>		3,360	
SA-01	N	other	04/04/99 - 20/04/99	17	<i>Gymnodinium sanguinolentum</i>		3,600	
NS-02	remote island	Fukuoka	19/04/99 - 26/04/99	8	<i>Gymnodinium sanguinolentum</i>		2,420	
YG-02	N	other	20/04/99 - 31/04/99	12	<i>Noctiluca scintillans</i>		450	
YG-03	N	other	20/04/99 - 21/04/99	2	<i>Noctiluca</i> sp.		-	
YG-04	N	other	26/04/99 - 27/04/99	2	<i>Noctiluca</i> sp.		-	
FO-02	N	Fukuoka	12/05/99 - 12/05/99	1	<i>Rhizosolenia</i> sp.		3,360	
FO-05	N	Fukuoka	12/05/99 - 14/05/99	3	<i>Noctiluca</i> sp.		3,600	
SA-02	N	other	07/06/99 - 05/07/99	29	<i>Heterosigma akashiwo</i>	<i>Prorocentrum minimum</i>	29,810	52,820
FO-05	N	Fukuoka	09/06/99 - 14/06/99	6	<i>Skeletonema costatum</i>	<i>Prorocentrum minimum</i>	83,790	2,250
SA-03	N	other	20/06/99 - 26/07/99	37	<i>Prorocentrum minimum</i>	<i>Leptodinium</i> sp.	71,765	6,590
SA-06	N	other	21/06/99 - 22/06/99	2	<i>Heterosigma akashiwo</i>		7,720	
NS-09	N	Fukuoka	01/07/99 - 21/07/99	21	<i>Skeletonema costatum</i>		18,600	
FO-09	N	Fukuoka	05/07/99 - 08/07/99	4	<i>Skeletonema costatum</i>	<i>Chaetoceros</i> sp.	9,200	4,500
SA-04	N	other	22/07/99 - 29/07/99	8	<i>Skeletonema costatum</i>	<i>Pseudoisochla</i> sp.	8,670	1,380
FO-11	N	Fukuoka	22/07/99 - 22/08/99	32	<i>Prorocentrum dentatum</i>		9,680	40
NS-11	N	Fukuoka	23/07/99 - 06/08/99	15	<i>Gymnodinium mikimotoi</i>		4,950	
SA-07	N	other	03/08/99 - 09/08/99	7	<i>Gymnodinium mikimotoi</i>		3,740	
SA-08	N	other	05/08/99 - 09/08/99	5	<i>Gymnodinium mikimotoi</i>		11,040	
SA-09	N	other	05/08/99 - 09/08/99	5	<i>Gymnodinium mikimotoi</i>		1,940	
FO-13	N	remote island	09/08/99 - 18/08/99	10	<i>Ceratium hirundinella</i>		7,040	
SA-10	N	remote island	10/08/99 - 16/08/99	7	<i>Ceratium hirundinella</i>		3,360	
SA-12	remote island	Fukuoka	06/09/99 - 27/09/99	43	<i>Heterosigma akashiwo</i>		4,050	
NS-24	remote island	Fukuoka	07/09/99 - 17/09/99	12	<i>Gymnodinium mikimotoi</i>		11,670	
FO-16	N	Fukuoka	07/09/99 - 13/09/99	7	<i>Skeletonema costatum</i>		49,970	
NS-32	remote island	Fukuoka	07/12/99 - 21/12/99	15	<i>Skeletonema costatum</i>		3,900	
FO-02	N	other	23/03/00 - 26/03/00	4	<i>Micidinium rubrum</i>		9,170	
FO-04	N	other	01/06/00 - 06/06/00	6	<i>Heterosigma akashiwo</i>		26,060	
FO-06	N	Fukuoka	02/06/00 - 06/06/00	5	<i>Prorocentrum minimum</i>		6,090	
SA-03	N	other	13/06/00 - 19/06/00	7	<i>Skeletonema costatum</i>		38,340	18,000
SA-03	N	other	13/06/00 - 19/06/00	7	<i>Heterosigma akashiwo</i>		54,000	
SA-05	N	other	26/06/00 - 30/06/00	5	<i>Heterosigma akashiwo</i>		2,800	
SA-05	N	other	26/06/00 - 30/06/00	5	<i>Heterosigma akashiwo</i>		2,800	500
SA-06	N	remote island	27/06/00 - 27/07/00	31	<i>Gymnodinium mikimotoi</i>	<i>Micidinium rubrum</i>	10,040	
FO-07	N	Fukuoka	30/06/00 - 31/07/00	32	<i>Fibrocapsa japonica</i>	<i>Prorocentrum dentatum</i>	694	15,500
YG-02	N	other	06/07/00 - 03/08/00	29	<i>Gymnodinium mikimotoi</i>	<i>Thalassiosira</i> sp.	14,800	88
SA-07	N	other	10/07/00 - 19/07/00	10	<i>Gymnodinium mikimotoi</i>		12,060	
NS-09	N	other	11/07/00 - 24/07/00	14	<i>Gymnodinium mikimotoi</i>		30,600	
NS-10	N	remote island	13/07/00 - 22/07/00	10	<i>Gymnodinium mikimotoi</i>		17,560	
NS-12	remote island	Gojo	26/07/00 - 17/08/00	23	<i>Gymnodinium mikimotoi</i>		37,300	
FO-10	N	Fukuoka	04/08/00 - 11/08/00	8	<i>Skeletonema costatum</i>	<i>Thalassiosira</i> sp.	8,800	6,860
SA-10	N	remote island	18/08/00 - 11/09/00	25	<i>Heterosigma akashiwo</i>		310	5,900
NS-19	remote island	Fukuoka	21/08/00 - 24/08/00	4	<i>Ceratium hirundinella</i>	<i>Heterosigma akashiwo</i>	2,335	6,460
FO-14	N	Fukuoka	06/09/00 - 12/09/00	7	<i>Skeletonema costatum</i>		16,870	9,560
NS-21	remote island	Fukuoka	18/09/00 - 25/09/00	8	<i>Noctiluca scintillans</i>		1,476	
SA-11	N	remote island	27/09/00 - 29/09/00	3	<i>Prorocentrum minimum</i>		2,200	
NS-23	N	remote island	28/09/00 - 04/10/00	7	<i>Prorocentrum minimum</i>		1,500	
FO-15	N	Fukuoka	07/11/00 - 17/11/00	5	<i>Thalassiosira</i> sp.		2,410	19,100

Source : Kyushu Fishery Coordination Office, "Situation of Red Tide in the Seas surrounding Kyushu Island, 1999-2003."

Red tide events in Japan (northern Kyushu coastal waters) (2)

Event No.	Location (name of the sea area)		Duration dd/mm/yy-dd/mm/yy	Continuous days	Causative species	Max. cell density (cells/L)	
	Location 1	Location 2					
NS-27	remote Island	Fukuoka	08/11/00 - 15/11/00	8	<i>Nitzschia</i> sp.	3,585	
SA-01	N	Funakawa	21/03/01 - 25/03/01	5	<i>Gymnodinium sanguinatum</i>	334	
YG-01	N	other	20/03/01 - 23/04/01	35	<i>Noctiluca scintillans</i>	2,700	
FO-01	N	other	21/03/01 - 23/03/01	3	<i>Noctiluca scintillans</i>	1	75
NS-05	remote Island	Gojo	07/04/01 - 11/04/01	5	<i>Noctiluca scintillans</i>	5,120	
NS-04	N	Funakawa	10/04/01 - 13/04/01	4	<i>Noctiluca scintillans</i>	731	
NS-05	remote Island	Ik	17/04/01 - 20/04/01	4	<i>Noctiluca scintillans</i>	249	
NS-06	remote Island	Gojo	17/04/01 - 18/04/01	2	<i>Noctiluca scintillans</i>	1,220	
FO-04	N	other	17/04/01 - 20/04/01	4	<i>Noctiluca scintillans</i>	1,928	
NS-08	remote Island	Fukuoka	18/04/01 - 19/04/01	2	<i>Noctiluca scintillans</i>	380	
SA-02	N	Funakawa	18/04/01 - 19/04/01	2	<i>Noctiluca scintillans</i>	380	
NS-09	remote Island	Ik	27/04/01 - 01/05/01	5	<i>Noctiluca scintillans</i>	467	
FO-05	N	Fukuoka	06/05/01 - 14/05/01	9	<i>Prorocentrum minimum</i>	6,450	
SA-03	N	other	07/05/01 - 11/05/01	5	<i>Heterosigma akashiwo</i>	19,760	
NS-12	remote Island	Gojo	22/05/01 - 23/05/01	2	<i>Noctiluca scintillans</i>	2,672	
NS-13	N	Funakawa	30/05/01 - 31/05/01	2	<i>Prorocentrum minimum</i>	2	27
FO-09	N	other	05/06/01 - 11/06/01	7	<i>Heterosigma akashiwo</i>	9,530	
YG-03	N	other	15/06/01	1	<i>Heterosigma akashiwo</i>	69,000	
NS-19	N	Funakawa	20/06/01 - 26/06/01	7	<i>Mesodinium rubrum</i>	1,240	
FO-10	N	Fukuoka	26/06/01 - 06/07/01	11	<i>Utrixylintra</i> sp.	1,656	10,800
NS-21	N	other	27/06/01 - 03/07/01	7	<i>Chlamydomonas</i> sp.	3,320	
NS-21	N	other	27/06/01 - 03/07/01	7	<i>Chlamydomonas</i> sp.	3,320	
FO-12	N	Fukuoka	09/07/01 - 23/07/01	15	<i>Prorocentrum minimum</i>	25,000	
NS-25	remote Island	Gojo	19/07/01 - 24/07/01	6	<i>Heterosigma akashiwo</i>	27,780	
YG-05	N	other	03/08/01	1	<i>Prorocentrum</i> sp.	17,900	
NS-32	remote Island	Fukuoka	06/08/01 - 07/09/01	1	<i>Gyrodinium</i> sp.	5,000	
NS-33	remote Island	Fukuoka	06/09/01 - 07/09/01	2	<i>Mesodinium rubrum</i>	2,275	
FO-16	N	Fukuoka	01/11/01 - 11/11/01	11	<i>Noctiluca scintillans</i>	3,571	
NS-40	remote Island	Fukuoka	19/11/01 - 23/11/01	5	<i>Mesodinium rubrum</i>	105	
FO-18	N	other	21/11/01 - 22/11/01	2	<i>Mesodinium rubrum</i>	2,630	111
NS-41	remote Island	Gojo	05/12/01 - 05/12/01	1	<i>Mesodinium rubrum</i>	5,983	
NS-42	remote Island	Fukuoka	10/12/01	1	<i>Mesodinium rubrum</i>	911	
NS-02	N	Funakawa	13/01/02 - 17/01/02	5	<i>Mesodinium rubrum</i>	2,010	
FO-07	N	other	14/01/02 - 22/04/02	4	<i>Noctiluca scintillans</i>	132	
NS-04	remote Island	Gojo	01/04/02 - 02/04/02	2	<i>Noctiluca scintillans</i>	462	
NS-06	remote Island	Gojo	23/04/02	1	<i>Noctiluca scintillans</i>	188	
NS-07	remote Island	Ik	24/04/02 - 26/04/02	3	<i>Noctiluca scintillans</i>	150	
NS-10	remote Island	Gojo	25/04/02 - 07/05/02	13	<i>Noctiluca scintillans</i>	3,400	
NS-08	N	Fukuoka	01/05/02 - 13/05/02	13	<i>Gymnodinium sanguinatum</i>	33,000	
FO-05	N	other	14/05/02 - 13/05/02	1	<i>Heterosigma akashiwo</i>	5,000	
NS-12	remote Island	Gojo	17/05/02 - 22/05/02	6	<i>Heterosigma akashiwo</i>	20,520	
YG-04	N	other	29/05/02 - 05/06/02	8	<i>Alexandrium catenella</i>	4,000	
NS-14	remote Island	Gojo	03/06/02 - 15/06/02	13	<i>Heterosigma akashiwo</i>	10,400	
NS-14	remote Island	Gojo	03/06/02 - 15/06/02	13	<i>Heterosigma akashiwo</i>	1,110	
SA-06	N	Funakawa	05/07/02 - 13/07/02	9	<i>Gymnodinium sanguinatum</i>	117,980	
FO-08	N	Fukuoka	11/07/02 - 11/08/02	32	<i>Prorocentrum minimum</i>	2,000	15
SA-07	N	Funakawa	11/07/02 - 22/07/02	23	<i>Gymnodinium mikimotoi</i>	2,000	
NS-17	N	Funakawa	19/07/02 - 22/07/02	4	<i>Gymnodinium mikimotoi</i>	6,660	
NS-08	remote Island	Gojo	22/07/02 - 24/07/02	3	<i>Gymnodinium mikimotoi</i>	4,480	
SA-08	N	Gojo	22/07/02 - 28/07/02	7	<i>Mesodinium rubrum</i>	1,408	
SA-09	N	Funakawa	26/07/02 - 27/07/02	2	<i>Heterosigma akashiwo</i>	1,840	
NS-23	N	other	30/07/02 - 31/07/02	2	<i>Noctiluca scintillans</i>	121	
FO-10	N	Fukuoka	12/08/02 - 21/08/02	10	<i>Heterosigma akashiwo</i>	770	
NS-26	remote Island	Gojo	24/08/02 - 27/08/02	4	<i>Cochlodinium polykrikoides</i>	221	
NS-27	remote Island	Fukuoka	05/09/02 - 13/09/02	9	<i>Cochlodinium polykrikoides</i>	109	
SA-12	remote Island	Gojo	09/09/02 - 14/09/02	6	<i>Gymnodinium mikimotoi</i>	194	
NS-29	remote Island	Fukuoka	10/09/02 - 13/09/02	4	<i>Cochlodinium polykrikoides</i>	358	
FO-12	N	Fukuoka	19/09/02 - 24/09/02	6	<i>Ceratium furc</i>	350	
SA-13	N	other	19/09/02 - 03/10/02	15	<i>Rhizosolenia delicatula</i>	33,670	
YG-05	N	other	24/09/02 - 07/10/02	8	<i>Cochlodinium polykrikoides</i>	2,600	
FO-15	N	Fukuoka	02/10/02 - 14/11/02	6	<i>Gymnodinium sanguinatum</i>	7,000	
NS-36	remote Island	Gojo	28/11/02	1	<i>Mesodinium rubrum</i>	1,950	
NS-36	remote Island	Gojo	29/11/02 - 01/12/02	3	<i>Mesodinium rubrum</i>	7100	
SA-17	N	other	09/12/02 - 28/12/02	20	<i>Gymnodinium sanguinatum</i>	478	
YG-07	N	other	21/12/02	1	<i>Gymnodinium sanguinatum</i>	204	

Source : Kyushu Fishery Coordination Office, "Situation of Red Tide in the Seas surrounding Kyushu Island, 1999-2003."

Red tide events in Japan (northern Kyushu coastal waters) (3)

Event No.	Location (name of the sea area)		Duration dd/mm/yy- dd/mm/yy	Approximate Area affected (km ²)	Fish/shellfish species		Contents		Quantity		Economic loss(thousand yen)	Human health
	Location 1	Location 2										
NS-01	remote Island	Fushimi	27/01/98 - 02/02/98	0.75								
NS-02	remote Island	Goto	07/04/98 - 25/04/98	0.5								
NS-08	remote Island	Fushimi	16/05/98 - 21/05/98	0.02								
FD-03	N	other	01/06/98 - 05/06/98	5								
FD-04	N	Fukuoka	15/06/98 - 17/06/98	0.6								
SA-04	N	Fukuoka	15/06/98 - 17/06/98	71								
SA-05	N	other	22/06/98 - 03/07/98	unknown								
SA-06	N	other	24/06/98 - 26/06/98	unknown								
FD-06	N	Fukuoka	13/07/98 - 16/07/98	41.5								
VG-02	N	other	11/08/98 - 21/08/98	0.65								
VG-03	N	remote Island	19/08/98 - 02/09/98	0.65								
NS-17	remote Island	Fushimi	25/08/98 - 26/08/98	0.015								
FD-08	N	Fukuoka	27/08/98 - 28/08/98	40.6								
FD-09	N	Fukuoka	09/09/98 - 10/09/98	49								
NS-22	remote Island	inurikawa	21/10/98 - 24/10/98	0.8								
NS-23	remote Island	Fushimi	21/10/98 - 24/10/98	0.8								
NS-28	remote Island	Fushimi	29/12/98 - 06/01/99	0.055								
NS-01	remote Island	Goto	05/01/99 - 09/01/99	0.285								
VG-01	N	other	10/03/99 - 12/03/99									
SA-01	N	other	04/04/99 - 20/04/99									
NS-02	remote Island	Fushimi	19/04/99 - 26/04/99	2.31								
VG-02	N	other	20/04/99 - 31/04/99	0.92								
VG-04	N	other	26/04/99 - 27/04/99									
FD-02	N	Fukuoka	10/05/99 - 12/05/99	75								
FD-05	N	other	12/05/99 - 14/05/99									
FD-03	N	Fukuoka	31/05/99 - 02/06/99	30								
SA-02	N	other	07/06/99 - 05/07/99									
FD-05	N	Fukuoka	09/06/99 - 14/06/99	35								
SA-03	N	Fukuoka	09/06/99 - 14/06/99									
SA-03	N	other	20/06/99 - 26/07/99									
NS-09	N	other	21/06/99 - 22/06/99	4								
FD-09	N	Fukuoka	01/07/99 - 21/07/99									
SA-08	N	inurikawa	05/07/99 - 08/07/99	47								
SA-08	N	inurikawa	25/07/99 - 29/07/99									
FD-01	N	Fukuoka	22/07/99 - 22/08/99	62								
NS-11	N	inurikawa	23/07/99 - 06/08/99	6								
SA-07	N	inurikawa	03/08/99 - 09/08/99									
SA-08	N	other	05/08/99 - 09/08/99									
SA-09	N	other	05/08/99 - 09/08/99									
SA-13	N	inurikawa	09/08/99 - 18/08/99	3								
SA-10	N	inurikawa	10/08/99 - 16/08/99	15								
SA-12	N	inurikawa	16/08/99 - 27/08/99									
NS-24	remote Island	Fushimi	06/09/99 - 17/09/99	0.4								
FD-16	N	Fukuoka	07/09/99 - 13/09/99	40								
NS-32	remote Island	Fushimi	09/12/99 - 21/12/99	0.07								
FD-02	N	other	23/03/00 - 26/03/00	unknown								
FD-04	N	other	01/06/00 - 06/06/00	65								
FD-05	N	Fukuoka	02/06/00 - 06/06/00									
FD-06	N	Fukuoka	13/06/00 - 19/06/00	60								
SA-03	N	other	15/06/00 - 20/06/00	0.005								
SA-08	N	other	26/06/00 - 30/06/00	0.125								
SA-06	N	other	27/06/00 - 27/07/00	4								
FD-07	N	Fukuoka	30/06/00 - 31/07/00	40								
VG-02	N	other	09/07/00 - 03/08/00	unknown								
SA-07	N	other	10/07/00 - 19/07/00	2								
NS-09	N	other	11/07/00 - 21/07/00	0.01								
NS-10	N	inurikawa	13/07/00 - 23/07/00	unknown								
NS-12	remote Island	Goto	26/07/00 - 17/08/00	70								
FD-10	N	Fukuoka	04/08/00 - 11/08/00									
SA-10	N	inurikawa	18/08/00 - 11/09/00	unknown								
NS-19	remote Island	Fushimi	21/08/00 - 24/08/00	0.2								
FD-13	N	Fukuoka	05/09/00 - 12/09/00	55								
NS-21	remote Island	Fushimi	18/09/00 - 25/09/00	0.0005								
SA-11	N	inurikawa	27/09/00 - 29/09/00	12								
NS-23	N	inurikawa	28/09/00 - 04/10/00	3								
FD-15	N	Fukuoka	07/11/00 - 17/11/00	unknown								

Source : Kyushu Fishery Coordination Office, "Situation of Red Tide in the Seas surrounding Kyushu Island, 1999-2003."

Red tide events in Japan (northern Kyushu coastal waters) (4)

Event No.	Location (name of the sea area)	Duration	Approximate Area suffered (km ²)	Fish/shellfish species	Contents	Quantity	Economic loss(thousand yen)	Human health
NS-27	remote Island	08/11/00 - 15/11/00	14					
SA-01	Fushima	21/01/01 - 25/01/01	unknown					
YG-01	other	20/03/01 - 23/04/01	unknown					
FD-01	other	21/03/01 - 23/03/01	0.4					
NS-02	remote Island	07/04/01 - 11/04/01	2					
NS-03	remote Island	07/04/01 - 11/04/01	2					
NS-04	remote Island	10/04/01 - 13/04/01	0.1					
NS-05	remote Island	17/04/01 - 20/04/01	0.3					
NS-06	remote Island	17/04/01 - 18/04/01	58.7					
FD-04	other	17/04/01 - 20/04/01	60					
NS-07	remote Island	18/04/01 - 21/04/01	0.0025					
NS-08	remote Island	18/04/01 - 19/04/01	0.0025					
SA-02	Fushima	18/04/01 - 24/05/01	0.08					
NS-09	remote Island	27/04/01 - 01/05/01	unknown					
FD-05	Fukuokawan	06/05/01 - 14/05/01	70					
SA-03	other	07/05/01 - 11/05/01	0.4					
NS-12	remote Island	22/05/01 - 23/05/01	unknown					
NS-13	remote Island	22/05/01 - 23/05/01	unknown					
NS-14	remote Island	30/05/01 - 31/05/01	0.2					
FD-09	other	05/06/01 - 11/06/01	0.001					
YG-03	other	15/06/01	unknown					
NS-19	remote Island	20/06/01 - 26/06/01	0.4					
FD-10	Fukuokawan	26/06/01 - 06/07/01	70					
NS-20	remote Island	27/06/01 - 03/07/01	unknown					
YG-04	other	27/06/01 - 03/07/01	0.07					
NS-21	remote Island	27/06/01 - 03/07/01	0.5					
NS-22	remote Island	27/06/01 - 03/07/01	18					
FD-12	Fukuokawan	09/07/01 - 23/07/01	80					
NS-25	remote Island	Goto	19/07/01 - 24/07/01	unknown				
YG-05	other	03/08/01	unknown					
YG-06	other	06/08/01	0.02					
NS-22	Fushima	06/09/01 - 07/09/01	0.12	Purpy fish	amberjacks	226 kg	230	7
FD-16	Fukuokawan	01/11/01 - 11/10/01	unknown	Yellowtail	deed	6 kg		
NS-40	remote Island	Fushima	19/11/01 - 23/11/01	Fishes	deed			
FD-18	other	21/11/01 - 22/11/01	under 1					
NS-41	remote Island	Goto	08/12/01 - 05/12/01					
NS-42	remote Island	Fushima	10/12/01 - 17/01/02					
NS-02	remote Island	Fushima	13/01/02 - 17/01/02					
NS-01	remote Island	Fushima	13/01/02 - 22/04/02					
FD-02	other	14/03/02	0.4					
NS-04	remote Island	Goto	01/04/02 - 02/04/02					
NS-06	remote Island	Goto	23/04/02	unknown				
NS-07	remote Island	Ik	24/04/02 - 26/04/02	unknown				
NS-10	remote Island	Goto	25/04/02 - 07/05/02	unknown				
NS-05	remote Island	Fukuokawan	01/05/02 - 13/05/02	70				
YG-02	other	14/05/02	0.001					
NS-12	remote Island	Goto	17/05/02 - 22/05/02	0.4				
YG-03	other	29/05/02 - 05/06/02	unknown					
YG-04	other	06/06/02	unknown					
NS-14	remote Island	Goto	10/06/02 - 15/06/02	unknown				
NS-15	remote Island	Goto	10/06/02 - 15/06/02	unknown				
SA-06	remote Island	other	05/07/02 - 13/07/02	0.3	Abalone	56 kg	unknown	unknown
FD-08	Fukuokawan	11/07/02 - 11/08/02	70			130 kg		
FD-09	other	11/07/02 - 02/08/02	1	Abalone	deed			
SA-07	remote Island	Amberjacks	5	Amberjacks	deed	unknown		
NS-17	remote Island	Amberjacks	0.015	Amberjacks	deed	200 incls		
NS-18	remote Island	Goto	01/08/02					
SA-08	remote Island	Goto	22/07/02 - 28/07/02	0.0025				
SA-09	remote Island	Goto	26/07/02 - 27/07/02	0.006	Pearl shell	5,000 incls.		
NS-23	remote Island	other	30/07/02 - 31/07/02	0.001				
FD-10	Fukuokawan	12/08/02 - 21/08/02	70					
NS-26	remote Island	Goto	24/08/02 - 27/08/02	unknown	Amberjacks	9,280 incls.	29,044	1,240
NS-27	remote Island	Fushima	02/09/02 - 13/09/02	0.0025				
NS-28	remote Island	Fushima	02/09/02 - 13/09/02	0.0025				
SA-12	remote Island	other	09/09/02 - 14/09/02	0.0025				
NS-29	remote Island	Fushima	10/09/02 - 13/09/02	0.0006				
FD-12	Fukuokawan	19/09/02 - 24/09/02	70					
SA-13	remote Island	other	19/09/02 - 03/10/02	6.5				
YG-05	remote Island	Yellowtail	24/09/02 - 07/10/02	unknown	Yellowtail	2,000 incls.		15,000
NS-33	remote Island	Fukuokawan	02/11/04	0.02				
NS-34	remote Island	Fukuokawan	02/11/04	0.02				
YG-06	remote Island	other	28/11/04	0.001				
NS-36	remote Island	Goto	29/11/02 - 01/12/02	0.07				
SA-17	remote Island	other	09/12/02 - 28/12/02	4.16				
YG-07	remote Island	other	21/12/02	0.0025				

Source : Kyushu Fishery Coordination Office, "Situation of Red Tide in the Seas surrounding Kyushu Island, 1999-2003."

Red tide events in Korea (1)

Event No.	Location (name of the sea area)	Duration	Continuous days	Causative species	Max. cell density (cells/L)	mitigation activities effectiveness	Damage
1	Tongyeong bukjeon	01-01-99 -		<i>Heterosigma triquetra</i>	5,200,000		
2	Saehun bangchodong	23-01-99 -		<i>Eutreptiella sp.</i>	3,000,000		
3	Tongyeong hamsan	28-01-99 -		<i>Gymnodinium sp.</i>	780,000		
4	Tongyeong kwangdeomyeon	19-04-99 -		<i>Noctiluca sp.</i>	830,000		
5	Misan sanho	23-04-99 -		<i>Prorocentrum sp.</i>	19,800,000		
6	Geose Hanmyeong	26-04-99 -		<i>Noctiluca sp.</i>	5,450,000		
7	Misan nampo	26-04-99 -		<i>Eutreptiella gymnasica</i>	31,000,000		
8	Jinhaemam huseam	28-04-99 -		<i>Eutreptiella gymnasica</i>	16,500,000		
9	Gunsan neseang	01-05-99 -		<i>Gymnodinium rubrum</i>	800,000		
10	Jinhaemam huseam	06-05-99 -		<i>Gymnodinium sanguineum</i>	1,520,000		
11	Ulsan	13-05-99 -		<i>Rhizosolenia sp.</i>	2,000,000		
12	Tongyeong, bucheon, bukjin	15-05-99 -		<i>Heterosigma akashiwo</i>	4,500,000		
13	Misanam	24-05-99 -		<i>Gymnodinium sanguineum</i>	1,800,000		
14	Tongyeong woomoonam	24-05-99 -		<i>Prorocentrum</i>	1,460,000		
15	Tongyeong bukjeon	28-05-99 -		<i>Gymnodinium rubrum</i>	12,000,000		
16	Kusan	02-06-99 -		<i>Leptocylindrus danicus</i>	17,300,000		
17	Misanam	04-06-99 -		<i>Heterosigma akashiwo</i>	12,800,000		
18	Namhaegun	08-06-99 -		<i>Ceratium furca</i>	6,000,000		
19	Yesu gatnakhang	09-06-99 -		<i>Heterosigma akashiwo</i>	16,700,000		
20	Pohang yangjilham	18-06-99 -		<i>Prorocentrum sp.</i>	650,000		
21	Tongyeong kwangdeomyeon	18-06-99 -		<i>Prorocentrum sp.</i>	6,600,000		
22	Geopdo	19-06-99 -		<i>Prorocentrum sp.</i>	5,330,000		
23	Tongyeong bukjeon	21-06-99 -		<i>Gymnodinium sp.</i>	5,350,000		
24	Namhae kapjilham	21-06-99 -		<i>Prorocentrum sp.</i>	5,350,000		
25	Misan kadukdo	24-06-99 -		<i>Coscinodiscus gigas</i>	15,000,000		
26	Wando	24-06-99 -		<i>Prorocentrum sp.</i>	13,000,000		
27	Ulsan	29-06-99 -		<i>Thalassiosira decipiens</i>	18,000,000		
28	Pohang yangjilham	01-07-99 -		<i>Heterosigma akashiwo</i>	13,000,000		
29	Jinam yeong	06-07-99 -		<i>Heterosigma akashiwo</i>	18,000,000		
30	Tongyeong bukjeon	06-07-99 -		<i>Heterosigma akashiwo</i>	600,000		
31	Tongyeong bukjeon	06-07-99 -		<i>Thalassiosira sp.</i>	2,000,000		
32	Namhae kapjilham	07-07-99 -		<i>Thalassiosira sp.</i>	2,000,000		
33	Jinam	08-07-99 -		<i>Ceratium furca</i>	1,600,000		
34	Pohang yangjilham	21-07-99 -		<i>Coscinodiscus gigas</i>	1,500,000		
35	Bumkuk widoam	22-07-99 -		<i>Prorocentrum micans</i>	2,000,000		
36	Jinhaemam	22-07-99 -		<i>Prorocentrum micans</i>	6,200,000		
37	Gosung	07-08-99 -		<i>Ceratium furca</i>	1,000,000		
38	Asanam	08-08-99 -		<i>Prorocentrum danatum</i>	4,180,000		
39	Namhaekun	10-08-99 -		<i>Gymnodinium sp.</i>	15,500,000		
40	Yesu	10-08-99 -		<i>Mesodinium rubrum</i>	4,537,000		
41	Ulsan	11-08-99 -		<i>Chaetoceros sp.</i>	2,000,000		
42	Chunnam	11-08-99 -		<i>Skeletonema costatum</i>	2,000,000		
43	Misan, sanho, dukdong	11-08-99 - 26/09/99		<i>Chaetoceros sp.</i>	16,800,000		
44	Gohang	11-08-99 - 22/09/99		<i>Skeletonema costatum</i>	30,000,000		
45	Yesu hwajungmyeon	13-08-99 - 17/09/99		<i>Chaetoceros sp.</i>	25,000,000		
46	Pohang yangjilham	14-08-99 -		<i>Thalassiosira decipiens</i>	7,500,000		
47	Namhaekun sangju	14-08-99 - 01/10/99		<i>Rhizosolenia fragilisima</i>	1,760,000		
48	Tongyeong	16-08-99 -		<i>Skeletonema costatum</i>	2,840,000		
49	Geopdo	17-08-99 -		<i>Heterosigma sp.</i>	260,000		
50	Ulsan	17-08-99 -		<i>Skeletonema costatum</i>	50,000		
51	Misan	17-08-99 -		<i>Chaetoceros sp.</i>	2,300,000		
52	Geopdo	18-08-99 -		<i>Chaetoceros sp.</i>	300,000		
53	Misanam	19-08-99 -		<i>Skeletonema costatum</i>	500,000		
54	Jinhaemam	19-08-99 -		<i>Skeletonema costatum</i>	1,870,000		
55	Geopdo	21-08-99 -		<i>Ceratium sp.</i>	3,440,000		
56	Gosung	21-08-99 - 06/09/99		<i>Gymnodinium sanguineum</i>	3,080,000		
57	Wando	24-08-99 - 25/09/99		<i>Gymnodinium mikimotoi</i>	7,500,000		
58	Geopdo	25-08-99 - 02/10/99		<i>Cochlodinium polykrikoides</i>	2,700,000		
59	Janghueng	25-08-99 - 20/09/99		<i>Cochlodinium polykrikoides</i>	500,000		
60	Pusan	28-08-99 - 03/09/99		<i>Cochlodinium polykrikoides</i>	1,700,000		
61	Ulsan	29-08-99 - 07/09/99		<i>Cochlodinium polykrikoides</i>	4,000,000		
62	Pyeongju	29-08-99 - 06/09/99		<i>Cochlodinium polykrikoides</i>	1,100,000		
63	Kyongju yangjilham	31-08-99 - 09/09/99		<i>Cochlodinium polykrikoides</i>	4,500,000		
64	Jinhaemam	31-08-99 - 09/09/99		<i>Cochlodinium polykrikoides</i>	3,000,000		
65	Pohang	02-09-99 - 09/09/99		<i>Cochlodinium polykrikoides</i>	3,000,000		
66	Janghueng	06-09-99 -		<i>Cochlodinium polykrikoides</i>	7,800,000		
67	Namhae	06-09-99 -		<i>Chaetoceros sp.</i>	4,300,000		
68	Geopdo	13-09-99 -		<i>Gymnodinium sanguineum</i>	1,000,000		
69	Gokun	14-09-99 -		<i>Gymnodinium sp.</i>	500,000		
70	Wommunam	15-09-99 -		<i>Prorocentrum trisetum</i>	2,500,000		
71	Gosung	15-09-99 -		<i>Gymnodinium sanguineum</i>	3,100,000		
72	Kadukdo	15-09-99 -		<i>Gymnodinium sp.</i>	3,000,000		
73	Jinam	15-09-99 -		<i>Gymnodinium sp.</i>	265,000		

Red tide events in Korea (2)

Event No.	Location (name of the sea area)	Duration dd/mm/yy- dd/mm/yy	Continuous days	Causative species	Max. cell density (cells/L)	mitigation activities/and effectiveness	Damage
74	Masanman	15-09-99 -		<i>Skeletonema costatum</i>	1,500,000		Human health
75	Geopdo	15-09-99 -		<i>Gymnodinium sanguineum</i>	400,000		Fisheries resources
76	Geopdo	15-09-99 -		<i>Gymnodinium mikimotoi</i>	2,300,000		
77	Ulsan	10-09-99 -		<i>Gymnodinium sp.</i>	3,000,000		
78	Tongyeong	25-09-99 -		<i>Gymnodinium sanguineum</i>	1,000,000		
79	Jinhaeman	27-09-99 -		<i>Prorocentrum sp.</i>	8,500,000		
80	Namhae	28-09-99 -		<i>Skeletonema costatum</i>	8,000,000		
81	Gosungkun	02-10-99 -		<i>Prorocentrum minimum</i>	1,300,000		
82	Jinbuk	12-10-99 -		<i>Cochlodinium polykrikoides</i>	250,000		
83	Chungnam	21-10-99 -		<i>Cochlodinium polykrikoides</i>	15,000,000		
84	Pohang	17-02-00		<i>Eutreptiella gymnasica</i>	25,000,000		
85	kunsan	02-03-00		<i>Skeletonema costatum</i>	1,350,000		
86	Jinhaeman	20-03-00		<i>Heterosigma triquetra</i>	17,600,000		
87	Pohang	01-04-00		<i>Chomonas marina</i>	1,500,000		
88	kunsan	01-05-00		<i>Mesodinium rubrum</i>	1,500,000		
89	Masanman	02-05-00		<i>Eutreptiella gymnasica</i>	75,000,000		
90	Masanman	02-05-00		<i>Pseudonitzschia pungens</i>	5,700,000		
91	Masanman	23-05-00		<i>Heterosigma sp.</i>	2,550,000		
92	Masanman	23-05-00		<i>Heterosigma akashiwo</i>	15,400,000		
93	Kyungju	25-05-00		<i>Noctiluca scintillans</i>	1,500,000		
94	Tongyeong	29-05-00		<i>Heterosigma akashiwo</i>	1,500,000		
95	Jinhaeman	05-06-00		<i>Prorocentrum micans</i>	13,850,000		
96	Onsanman	17-06-00		<i>Gymnodinium sanguineum</i>	1,120,000		
97	Masanman	11-06-00		<i>Heterosigma akashiwo</i>	1,750,000		
98	Buk-Sinman	15-06-00		<i>Ceratium furca</i>	6,200,000		
99	Buamgangman	15-06-00		<i>Heterosigma</i>	3,200,000		
100	kunsan	21-06-00		<i>Proro. Micans</i>	15,200,000		
101	Yeosu	21-06-00		<i>Proro. Micans</i>	10,200,000		
102	Tongyeong	27-06-00		<i>Noctiluca scintillans</i>	1,800,000		
103	Pohang	30-06-00		<i>Ceratium furca</i>	99,600,000		
104	Geopdo	01-07-00		<i>Proro. Micans</i>	5,000,000		
105	Chinabuk	03-07-00		<i>Noctiluca scintillans</i>	300,000		
106	Kanukman	03-07-00		<i>Ceratium sp.</i>	600,000		
107	Geopdo	04-07-00		<i>Heterosigma akashiwo</i>	2,040,000		
108	Chansanman	04-07-00		<i>Noctiluca scintillans</i>	650,000		
109	Jinhaeman	05-07-00		<i>Proro. Micans</i>	3,000,000		
110	Pusan	06-07-00		<i>Ceratium sp.</i>	12,500,000		
111	Ulsan	06-07-00		<i>Heterosigma akashiwo</i>	32,000,000		
112	Geopdo	10-07-00		<i>Prorocentrum micans</i>	3,000,000		
113	Jinhaeman	14-07-00		<i>Gymnodinium sanguineum</i>	1,300,000		
114	Yeosu	18-07-00		<i>Ceratium furca</i>	840,000		
115	Tongyeong	18-07-00		<i>Skeletonema costatum</i>	5,710,000		
116	Misan	18-07-00		<i>Rhizosolenia sp.</i>	4,300,000		
117	kunsan	19-07-00		<i>Proro. dentatum</i>	30,300,000		
118	Incheon	20-07-00		<i>Noctiluca scintillans</i>	5,000,000		
119	Geopdo	20-07-00		<i>Mesodinium rubrum</i>	5,000,000		
120	Jumann	20-07-00		<i>Proro. Mibinium</i>	750,000		
121	Kudukdo	20-07-00		<i>Heterosigma akashiwo</i>	47,800,000		
122	Ulsan	28-07-00		<i>Heterosigma akashiwo</i>	4,200,000		
123	Masanman	29-07-00		<i>Prorocentrum sp.</i>	1,500,000		
124	Geopdo	02-08-00		<i>Noctiluca scintillans</i>	13,200,000		
125	Jinhaeman	07-08-00		<i>Rhizosolenia sp.</i>	700,000		
126	Haengnamman	08-08-00		<i>Proro. Sp. Thaladecipiens</i>	4,800,000		
127	Ulsan	08-08-00		<i>Prorocentrum sp.</i>	1,200,000		
128	Pohang	08-08-00		<i>Skeletonema costatum</i>	20,000,000		
129	Kyungbuk	08-08-00		<i>Prorocentrum sp.</i>	12,000,000		
130	Onsanman	08-08-00		<i>Noctiluca scintillans</i>	1,000,000		
131	JungsangPohang	11-08-00		<i>Heterosigma akashiwo</i>	5,000,000		
132	Pohang	17-08-00		<i>Prorocentrum sp.</i>	2,300,000		
133	Kyongsju	21-08-00		<i>Skeletonema costatum</i>	9,000,000		
134	Ulsan	21-08-00		<i>Ceratium furca</i>	1,500,000		
135	Ulsan	21-08-00		<i>Ceratium furca</i>	450,000		
136	Jumann	22-08-00		<i>Prorocentrum triestinum</i>	40,000		
137	Jumann	22-08-00		<i>Chaetoceros sp.</i>	193,000		
138	Jumann	22-08-00		<i>Prorocentrum minimum</i>	15,000,000		
139	Ulsan	24-08-00		<i>Prorocentrum minimum</i>	4,800,000		
140	Onsanman	24-08-00		<i>Thalassiosira decipiens</i>	10,000,000		
141	Kyungbuk	25-08-00		<i>Ceratium furca</i>	30,000,000		
142	Onsanman	28-08-00		<i>Thalassiosira rotula</i>	180,000		
143	Pohang	28-08-00		<i>Thalassiosira rotula</i>	640,000		
144	Ulsan	28-08-00		<i>Chaetoceros sp.</i>	6,800,000		
145	Ulsan	29-08-00		<i>Prorocentrum dentatum</i>	40,000		
146	Yeosu	22-08-00	10/09/00	<i>Prorocentrum dentatum</i>	84,000		
				<i>Thalassiosira rotula</i>	128,000		
				<i>Cochlodinium polykrikoides</i>	910,000		
				<i>Ceratium furca</i>	6,000,000		
				<i>Skeletonema costatum</i>	400,000		
				<i>Chaetoceros sp.</i>	40,000		
				<i>Prorocentrum dentatum</i>	128,000		
				<i>Thalassiosira rotula</i>	128,000		
				<i>Cochlodinium polykrikoides</i>	910,000		

Red tide events in Korea (3)

Event No.	Location (name of the sea area)		Duration dd/mm/yy- dd/mm/yy	Continuous days	Causative species		Max. cell density (cells/L)		mitigation activities	Damage
	Location 1	Location 2								
147	Tongyeong		24/08/00	11/09/00	19	<i>Cochlodinium polybracteoides</i>	900,000		Clay dispersant	Human health
148	Gejeo		02/09/00	20/09/12	11	<i>Cochlodinium polybracteoides</i>	1,500,000		Clay dispersant	Human health
149	Pusan		07/09/00	20/09/97	11	<i>Cochlodinium polybracteoides</i>	5,000,000		Clay dispersant	Human health
150	Ulsan		08/09/00			<i>Prorocentrum</i> sp.	1,520,000	1,600,000		
151	Ulsan		19/09/00			<i>Ceratium furca</i>	800,000			
152	Gejeo		19/09/00			<i>Noritella scintillans</i>	450,000			
153	Namhae		21/09/00			<i>Skeletonema costatum</i>	30,000,000			
154	Ulsan		21/09/00			<i>Leptocylindrus danicus</i>	16,000,000	53,000		
155	Minamian		22/09/00			<i>Mesodinium rubrum</i>	10,450,000	7,700,000	6,300,000	
156	Ulsan		26/09/00			<i>Prorocentrum</i> sp.	2,280,000			
157	Ulsan		29/09/00			<i>Prorocentrum</i> sp.	300,000			
158	Gejeo		05-10/00			<i>Gymnodinium sanguinatum</i>	350,000			
159	Gejeo		08-10/00			<i>Ceratium furca</i>	850,000			
160	Hwado		31-10/00			<i>Prora. MCans</i>	6,200,000			
161	Tongyeong		27-11/00			<i>Prorocentrum micans</i>	700,000			
162	Tongyeong		20/01/26			<i>Prorocentrum micans</i>	1,58,400			
163	Pohang		20/01/31/9			<i>Cryptomonas acuta</i>	1,400,000			
164	Pohang		20/01/47			<i>Euterpella gymnasica</i>	12,580,000			
165	Minamian		20/01/4/20			<i>Pseudonitzschia pungens</i>	12,580,000			
166	Minamian		20/01/5/28			<i>Heterosigma akashiwo</i>	2,800,000			
167	Pusan		20/01/5/28			<i>Heterosigma akashiwo</i>	2,000,000			
168	Ulsan		20/01/5/28			<i>Heterosigma akashiwo</i>	11,900,000			
169	Onsanman		20/01/5/29			<i>Heterosigma akashiwo</i>	7,500,000			
170	Onsanman		20/01/6/1			<i>Heterosigma akashiwo</i>	300,000			
171	Tongyeong		20/01/6/4			<i>Prorocentrum micans</i>	##/##/##			
172	Pohang		20/01/6/8			<i>Cryptomonas</i> sp.	30,000,000	100,000		
173	Ulsan		20/01/6/8			<i>Skeletonema costatum</i>	30,000,000			
174	Pohang		20/01/6/8			<i>Heterosigma akashiwo</i>	1,000,000			
175	Ulsan		20/01/6/8			<i>Prorocentrum micans</i>	40,000,000			
176	Pohang		20/01/6/13			<i>Euterpella gymnasica</i>	2,200,000			
177	Tongyeong		20/01/6/21			<i>Euterpella gymnasica</i>	900,000	110,000		
178	Tongyeong		20/01/6/22			<i>Heterosigma akashiwo</i>	900,000			
179	Jeonnam		20/01/6/22			<i>Prorocentrum micans</i>	3,600,000	500,000		
180	Yeso		20/01/6/27			<i>Heterosigma akashiwo</i>	8,900,000	940,000		
181	Masan		20/01/7/3			<i>Prorocentrum micans</i>	1,200,000	900,000		
182	Pusan		20/01/7/3			<i>Skeletonema costatum</i>	1,200,000			
183	Ulsan		20/01/7/3			<i>Heterosigma akashiwo</i>	8,900,000			
184	Jinhaeman		20/01/7/3			<i>Thalassiosira decipiens</i>	12,500,000			
185	Beryung		20/01/7/6			<i>Mesodinium rubrum</i>	1,500,000	25,000	400,000	300,000
186	Seohun		20/01/7/9			<i>Dicoccha fibula</i>	1,340,000	52,000		
187	Masan	Jinhaeman	20/01/7/12			<i>Prorocentrum micans</i>	1,500,000			
188	Gejeo		20/01/7/12			<i>Ceratium</i> sp.	1,800,000			
189	Jinhaeman		20/01/7/18			<i>Ceratium furca</i>	4,800,000	200,000	200,000	300,000
190	Kadokko		20/01/7/18			<i>Leptocylindrus danicus</i>	5,000,000			
191	Kwangyeonman		20/01/7/18			<i>Heterosigma akashiwo</i>	2,000,000	650,000		
192	Doksando		20/01/7/20			<i>Chaetoceros</i> sp.	5,400,000	500,000		
193	Pusan		20/01/7/23			<i>Ceratium furca</i>	5,400,000	330,000		
194	Onsanman		20/01/7/24			<i>Leptocylindrus danicus</i>	1,000,000	780,000	30,000	
195	Ulsan		20/01/7/24			<i>Prorocentrum micans</i>	2,000,000	100,000		
196	Pusan		20/01/7/30			<i>Chaetoceros</i> sp.	100,000			
197	Pusan		20/01/7/30			<i>Prorocentrum micans</i>	1,500,000			
198	Pusan		20/01/7/30			<i>Skeletonema costatum</i>	1,200,000			
199	Tongyeong		20/01/7/30			<i>Prorocentrum micans</i>	3,000,000	50,000		
200	Ulsan		20/01/8/2			<i>Heterosigma akashiwo</i>	8,000,000			
201	Onsanman		20/01/8/2			<i>Heterosigma akashiwo</i>	6,300,000	650,000		
202	Masan		20/01/8/4			<i>Prorocentrum micans</i>	1,400,000	200,000		
203	Pusan		20/01/8/8			<i>Skeletonema costatum</i>	13,000,000			
204	Onsanman		20/01/8/10			<i>Prorocentrum micans</i>	4,000,000	200,000	300,000	
205	Pohang		20/01/8/14			<i>Euterpella gymnasica</i>	600,000			
206	Jamam		20/01/8/14	20/01/9/9	23	<i>Cochlodinium polybracteoides</i>	9,500,000			Clay dispersant
207	Yeso		20/01/8/14	20/01/9/8	23	<i>Cochlodinium polybracteoides</i>	900,000			Clay dispersant
208	Namhae		20/01/8/15	20/01/9/8	18	<i>Cochlodinium polybracteoides</i>	900,000			Clay dispersant
209	Tongyeong		20/01/8/16	20/01/9/16	31	<i>Cochlodinium polybracteoides</i>	100,000			Clay dispersant
210	Uiju		20/01/8/17			<i>Prorocentrum micans</i>	41,000			Clay dispersant
211	Jamam()		20/01/8/17	20/01/9/11	26	<i>Cochlodinium polybracteoides</i>	300,000	150,000	50,000	Clay dispersant
212	Pusan		20/01/8/18			<i>Prorocentrum micans</i>	100,000			Clay dispersant
213	Pusan		20/01/8/22			<i>Chaetoceros</i> sp.	80,000	80,000	50,000	Clay dispersant
214	Gejeo		20/01/8/23	20/01/9/12	17	<i>Skeletonema costatum</i>	680,000			Clay dispersant
215	Pusan		20/01/8/24	20/01/9/12	20	<i>Cochlodinium polybracteoides</i>	900,000			Clay dispersant
216	Ulsan		20/01/8/25	20/01/9/12	19	<i>Cochlodinium polybracteoides</i>	750,000			Clay dispersant
217	Pohang		20/01/8/30	20/01/9/12	14	<i>Cochlodinium polybracteoides</i>	1,500,000			Clay dispersant
218	Donghae		20/01/9/5	20/01/9/24	17	<i>Cochlodinium polybracteoides</i>	1,700,000			Clay dispersant
219	Gejeo		20/01/9/28			<i>Gymnodinium sanguinatum</i>	4,780,000			Clay dispersant

Red tide events in Korea (4)

Event No.	Location (name of the sea area)	Location 1	Location 2	Duration dd/mm/yy- dd/mm/yy	Continuous days	Causative species	Max. cell density (cells/L)	mitigation activities effectiveness	Damage
220	Geje			#####		<i>Alexandrium</i> sp.	4,780,000		Human health
221	Geje			#####		<i>Alexandrium</i> sp.	6,200,000		
222	Pohang			2002/2/14		<i>Heterosigma triquetra</i>	9,000,000		
223	Pohang			2002/2/15	3	<i>Cryptomonas acuta</i>	80,000,000		
224	Misaminan			2002/5/17	+	<i>Heterosigma akashiwo</i>	8,000,000		
225	Danghangman			2002/5/21	0	<i>Heterosigma akashiwo</i>	5,000,000		
226	Jindongman			2002/5/22		<i>Heterosigma akashiwo</i>	11,200,000		
227	Kadokdo			2002/5/23		<i>Heterosigma akashiwo</i>	2,600,000		
228	Pohang			2002/5/24		<i>Cryptomonas acuta</i>	32,000,000		
229	Pusan			2002/5/24		<i>Heterosigma akashiwo</i>	3,000,000		
230	Kunsin			2002/6/4		<i>Leptocylindrus danicus</i>	30,000,000		
231	Misaminan			2002/6/15		<i>Chromonas salina</i>	2,100,000		
232	Ulsan			2002/6/17		<i>Entrepella kymatisica</i>	2,100,000		
233	Ulsan			2002/6/20		<i>Prorocentrum decipiens</i>	5,000,000		
234	Misaminan			2002/6/20		<i>Prorocentrum dentatum</i>	1,000,000	300,000	
235	Misaminan			2002/6/27		<i>Prorocentrum dentatum</i>	1,800,000	600,000	
236	Misaminan			2002/7/10		<i>Heterosigma akashiwo</i>	1,800,000	120,500,000	
237	Wanmumman			2002/7/11		<i>Leptocylindrus danicus</i>	50,000		
238	Kanmukman			2002/7/11		<i>Rhizosolenia fragilisima</i>	24,000		
239	Donsanb			2002/7/11		<i>Heterosigma akashiwo</i>	50,000		
240	Misaminan			2002/7/18		<i>Chaetoceros</i> sp.	1,800,000		
241	Misaminan			2002/7/24		<i>Thalassiosira decipiens</i>	5,800,000		
242	Pusan			2002/7/24		<i>Prorocentrum</i> sp.	3,200,000		
243	Geje			2002/8/5		<i>Chaetoceros</i> sp.	2,500,000		
244	Ryongnam			2002/8/5		<i>Noctiluca scintillans</i>	9,200,000		
245	Geje			2002/8/5		<i>Akashiwo sanguinea</i>	1,100,000		
246	Pusan			2002/8/16	25	<i>Akashiwo sanguinea</i>	1,200,000		
247	Jinhang			2002/8/17	25	<i>Gomadinium</i> sp.	2,500,000		
248	Geje			2002/8/18	25	<i>Prorocentrum</i> sp.	4,500,000		
249	Tongyeong			2002/8/18	25	<i>Alexandrium</i> sp.	15,000,000		
250	Saem			2002/8/24	25	<i>Cochlodinium polykrikoides</i>	12,000,000		
251	Jindongman			2002/8/24	13	<i>Cochlodinium polykrikoides</i>	10,000,000		
252	Misaminan			2002/8/24	13	<i>Cochlodinium polykrikoides</i>	1,200,000		
253	Misaminan			2002/8/24	13	<i>Cochlodinium polykrikoides</i>	800,000		
254	Pohang			2002/8/24	13	<i>Prorocentrum</i> sp.	400,000	300,000	
255	Pusan			2002/8/24	13	<i>Prorocentrum</i> sp.	600,000		
256	Gosung			2002/8/24	13	<i>Prorocentrum</i> sp.	800,000		
257	Namhae			2002/8/28		<i>Thalassiosira decipiens</i>	3,400,000		
258	Jinhang			2002/8/28		<i>Thalassiosira decipiens</i>	8,700,000		
259	Jinhang			2002/8/29		<i>Thalassiosira decipiens</i>	7,500,000		
260	Misan			2002/9/5		<i>Rhizosolenia fragilisima</i>	180,000	870,000	
261	Namhae			2002/9/7		<i>Prorocentrum</i> sp.	25,000,000		
262	Namhae			2002/9/9		<i>Skeletonema costatum</i>	15,000,000		
263	Misaminan			2002/9/10		<i>Skeletonema costatum</i>	3,500,000		
264	Geje			2002/10/2		<i>Thalassiosira decipiens</i>	1,800,000		
265	Pohang			2003/2/7		<i>Alexandrium</i> sp.	4,000,000		
266	Misaminan			2003/4/28		<i>Prorocentrum minimum</i>	32,000,000		
267	Misaminan			2003/5/14		<i>Heterosigma akashiwo</i>	32,500,000		
268	Misaminan			2003/5/14		<i>Rhizosolenia setigera</i>	4,053,000	259,400	
269	Misaminan			2003/5/19		<i>Entrepella kymatisica</i>	16,650,000		
270	Misaminan			2003/5/23		<i>Heterosigma akashiwo</i>	27,800,000		
271	Misaminan			2003/6/10		<i>Prorocentrum</i> sp.	3,600,000		
272	Tongyeong			2003/6/12		<i>Akashiwo sanguinea</i>	500,000		
273	Pusan			2003/6/13		<i>Prorocentrum</i> sp.	5,500,000		
274	Kaildo			2003/6/21		<i>Prorocentrum dentatum</i>	2,300,000		
275	Namhae			2003/6/23		<i>Prorocentrum dentatum</i>	4,500,000	210,000	
276	Gosung			2003/6/50		<i>Prorocentrum dentatum</i>	3,500,000	350,000	
277	Kangjinman			2003/7/5		<i>Heterosigma triquetra</i>	5,100,000	600,000	120,000
278	Tongyeong			2003/7/8		<i>Skeletonema costatum</i>	45,000,000		
279	Yeosu			2003/7/8		<i>Prorocentrum dentatum</i>	20,000,000		
280	Chungnam			2003/7/9		<i>Heterosigma akashiwo</i>	10,000,000		
281	Gosung			2003/7/11		<i>Prorocentrum minimum</i>	4,500,000		
282	Pohang			2003/7/11		<i>Akashiwo sanguinea</i>	80,000,000		
283	Ulsan			2003/8/5		<i>Heterosigma akashiwo</i>	13,000,000		
284	Yeosu			2003/8/13	47	<i>Chaetoceros</i> sp.	9,500,000		
285	Namhae			2003/8/13	56	<i>Cochlodinium polykrikoides</i>	23,000,000		
286	Wando			2003/10/7	53	<i>Skeletonema costatum</i>	16,000,000	20,000,000	
287	Tongyeong			2003/8/14	52	<i>Cochlodinium polykrikoides</i>	24,000,000		
288	Geje			2003/8/24	37	<i>Cochlodinium polykrikoides</i>	7,200,000		
289	Namhae			2003/8/25	42	<i>Cochlodinium polykrikoides</i>	40,000,000		
290	Ulsan			2003/8/27	42	<i>Skeletonema costatum</i>	20,000,000		
291	Pohang			2003/8/27	42	<i>Cochlodinium polykrikoides</i>	16,000,000		
292	Pusan			2003/8/28	41	<i>Cochlodinium polykrikoides</i>	12,400,000		

Red tide events in Korea (5)

Event No.	Location (name of the sea area)		Duration dd/mm/yy-dd/mm/yy	Continuous days	Causative species	Max. cell density (cell/L)		mitigation activities effectiveness	Damage	
	Location 1	Location 2							Fisheries resource	Human health
293	Ulljin		2003/8/30-2003/7/07	30	<i>Cochlidinium bolivickoides</i>	26,000,000				
294	Donghae		2003/5/9/5-2003/7/0/5	33	<i>Cochlidinium bolivickoides</i>	23,000,000				
295	Boryeong		2003/9/16		<i>Heterosigma akashiwo</i>	27,000,000				
296	Geogje		2003/9/15		<i>Prorocentrum dentatum</i>	15,600,000				
297	Misanman		2003/9/17		<i>Prorocentrum minimum</i>	30,000,000				
298	Misanman		2003/9/22		<i>Skeletonema costatum</i>	6,150,000				

Red tide events in Russia

Event No.	Location (name of the sea area)	LatitudeN	LongitudeE	Duration dd/mm/yy-dd/mm/yy	Approximate area suffered (km ²)	Type of HAB (Red tide or Toxic)	Causative species	Max. cell density cells/l	Mitigation activity and effectiveness	Damage Fishery resources / Human health
1	Peter the Great Bay	43 11 7	132 16 6	15/06/1992	<1	Red tide	<i>Noctiluca scintillans</i>	450,000	no data	no data
2	Amurskii Bay	43 15 3	131 90 2	25/06/1992	<1	Red tid	<i>Pseudo-nitzschia pungens/multiseriis</i>	35,000,000	no data	no data
3	Amurskii Bay	43 15 3	131 90 2	15/07/1992	<1	Red tide	<i>Prorocentrum minimum</i>	8,000,000	no data	no data
4	Peter the Great Bay	43 11 7	132 16 6	05/06/1993	<1	Red tide	<i>Noctiluca scintillans</i>	500,000	no data	no data
5	Amurskii Bay	43 15 3	131 90 2	31/07/1993	<1	Red tid	<i>Skeletonema costatum</i>	17,400,000	no data	no data
6	Peter the Great Bay	43 11 7	132 16 6	25/05/1994	<1	Red tide	<i>Noctiluca scintillans</i>	550,000	no data	no data
7	Peter the Great Bay	43 11 7	132 16 6	10/06/1995	<1	Red tide	<i>Noctiluca scintillans</i>	400,000	no data	no data
8	Amurskii Bay	43 15 3	131 90 2	12/06/1995	<1	Red tide	<i>Heterosigma akashiwo</i>	5,000,000	no data	no data
9	Amurskii Bay	43 15 3	131 90 2	29/07/1996	<1	Red tid	<i>Skeletonema costatum</i>	12,700,000	no data	no data
10	Amurskii Bay	43 15 3	131 90 2	15/07/1997	<1	Red tide	<i>Skeletonema costatum</i>	3,000,000	no data	no data
11	Amurskii Bay	43 15 3	131 90 2	03/11/1997	<1	Red tid	<i>Pseudo-nitzschia calliantha/pseudodelicatissima</i>	2,700,000	no data	no data
12	Rynda Bay	43 2 5	131 78 7	11/09/2000	<1	Red tide	<i>Pseudo-nitzschia pungens</i>	1,690,000	no data	no data
13	Rynda Bay	43 2 5	131 78 7	15/08/2000	<1	Red tide	<i>Ditylum brighwellii</i>	1,400,000	no data	no data
14	Golden Horn Bay	43 10 67	131 88 2	12/03/2001	<1	Red tide	<i>Eutrepia lanowii</i>	15,600,000	no data	no data
15	Golden Horn Bay	43 10 67	131 88 2	10/04/2001	<1	Red tide	<i>Eutrepitella gymmastica</i>	30,900,000	no data	no data
16	Golden Horn Bay	43 10 67	131 88 2	10/09/2001	<1	Red tide	<i>Chattonella globosa</i>	6,000,000	no data	no data
17	Rynda Bay	43 2 5	131 78 7	15/05/2002	5	Red tide	<i>Noctiluca scintillans</i>	700,000	no data	no data
18	Amurskii Bay	43 15 3	131 90 2	09/07/2002 - 25/07/2002	<1	Red tide	<i>Oxyrrhis marina</i>	20,000,000	no data	no data
19	Amurskii Bay	43 15 3	131 90 2	01/08/2002 - 06/08/2002	<1	Red tide	<i>Prorocentrum minimum</i>	11,940,000	no data	no data
20	Amurskii Bay	43 15 3	131 90 2	03/09/2002	<1	Red tide	<i>Heterosigma akashiwo</i>	7,000,000	no data	no data
21	Vostok Bay	42 88 7	132 72 9	05/05/2003	<1	Red tide	<i>Noctiluca scintillans</i>	970,000	no data	no data
22	Amurskii Bay	43 15 3	131 90 2	11/05/2003 - 17/06/2003	2	Red tide	<i>Noctiluca scintillans</i>	800,000	no data	no data
23	Amurskii Bay	43 15 3	131 90 2	17/06/2003	<1	Red tide	<i>Heterosigma akashiwo</i>	25,000,000	no data	no data

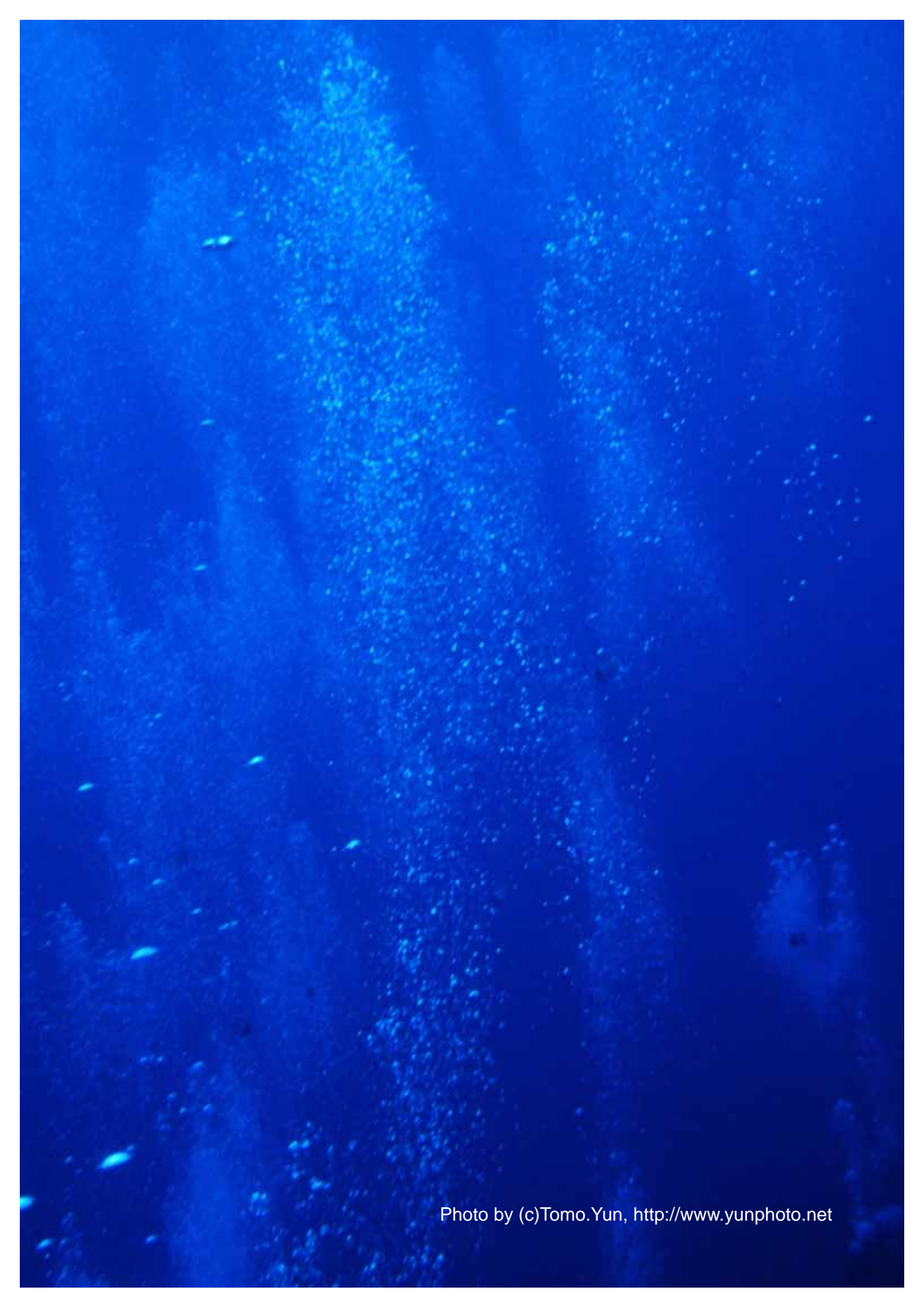
A deep blue underwater scene featuring a dense school of small fish swimming in a vertical column. The fish are small and silvery, creating a shimmering effect as they move. The background is a deep, clear blue, with some faint, larger fish visible in the distance. The overall atmosphere is serene and mysterious.

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