

Oceanography Committee

ICES CM 1998/C:4 (Add.)

010



ADDENDUM TO THE

REPORT OF THE

WORKING GROUP ON HARMFUL ALGAL BLOOM DYNAMICS

Lisbon, Portugal
24–28 March 1998

This report is not to be quoted without prior consultation with the General Secretary. The document is a report of an expert group under the auspices of the International Council for the Exploration of the Sea and does not necessarily represent the views of the Council.

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

Palægade 2–4

DK-1261 Copenhagen K

Denmark

HARMFUL ALGAL BLOOMS IN DENMARK 1997

- | | |
|---|--|
| 1. Location | Skagerak/Kattegat |
| 2. Date of occurrence | August-September |
| 3. Effects: | Fishkills/kills of invertebrates |
| 4. Management actions: | Intensified monitoring; warning to aquaculturists |
| 5. Causative species: | Gyrodinium aureolum |
| 6. Environment: | Long warm/calm period |
| 7. Advected population/In Situ Growth: | Advised from the northern part of Kattegat/-Skagerak, followed by in-situ growth |
| 8. Previous occurrences | It occurs a few times every 10 years in Danish waters. |
| 9. Additional comments | This is the first time Gyrodinium aureolum has been observed in the southern part of Kattegat with fishkills and kill offs of benthic invertebrates. |
| 10. Individual to contact | Per Andersen
Bio/consult as
J. Ewaldsvej 42-44
8230 Aabyhoej
Denmark
Phone: +45 86 25 18 11
Fax: +45 86 25 81 73
E-mail: pa@bioconsult.dk |

HARMFUL ALGAL BLOOMS IN DENMARK 1997

- | | |
|---|---|
| 1. Location | Kattegat, Vejle Fjord |
| 2. Date of occurrence | June |
| 3. Effects: | No |
| 4. Management actions: | Closure of shellfisheries |
| 5. Causative species: | Alexandrium minutum |
| 6. Environment: | |
| 7. Advected population/In Situ Growth: | in-situ growth ?? |
| 8. Previous occurrences | First occurrence in this locality. |
| 9. Additional comments | <p>The species is relatively new in Danish waters. It has previously been registered in shallow coves.</p> <p>1991: Kertinge Nor, max. conc. 42.200 celle/L</p> <p>1992: EmtekFr, max. conc. 3.200 cells/L.</p> |
| 10. Individual to contact | <p>Per Andersen
Bio/consult as
J. Ewaldsvej 42-44
8230 Aabyhoej
Denmark
Phone : +45 86 25 18 11
Fax : +45 86 25 81 73
E-mail : pa@bioconsult.dk</p> |

ALGAL BLOOM REPORTS – ENGLAND AND WALES

1. Location: Fowey estuary (Cornwall, South Coast)
2. Date of occurrence: 23rd June - early August
3. Peak cell concentration: 384,000 cell per litre
4. Effects: PSP in bivalve flesh samples (72.8 mg/100 g)
5. Causative species: *Alexandrium tamarense*
6. Environment: no data.
7. Advected population or in situ growth: no data.
8. Previous occurrence: Yes
9. Individual to contact:
I.Laing
CEFAS
Conwy Laboratory
Benarth Road
Conwy, LL32 8UB

ALGAL BLOOM REPORTS – ENGLAND AND WALES

1. Location: Blyth, North-east England
2. Date of occurrence: late June – mid October
3. Peak cell concentration: 19,500 cells per litre on 14th July
4. Effects: none – DSP toxins in flesh samples at another site (Holy Island) further North
5. Causative species: *Dinophysis* spp, mainly *D.acuta*
6. Environment: no data.
7. Advected population or in situ growth: no data.
8. Previous occurrence: Yes
9. Individual to contact:
I.Laing
CEFAS
Conwy Laboratory
Benarth Road
Conwy, LL32 8UB

ALGAL BLOOM REPORTS – ENGLAND AND WALES

1. Location: Liverpool Bay
2. Date of occurrence: June and July
3. Peak cell concentration: 400,000 cell per litre
4. Effects: non toxic
5. Causative species: *Noctiluca scintillans*
6. Environment: no data.
7. Advected population or in situ growth: 'brown slicks', 2-3 nautical miles long.
8. Previous occurrence: Yes, regular annual occurrence
9. Individual to contact:
I.Laing
CEFAS
Conwy Laboratory
Benarth Road
Conwy, LL32 8UB

HARMFUL ALGAL BLOOMS IN FINLAND IN 1997

TOXIC CYANOBACTERIA

Location	Northern Baltic Proper and the Gulf of Finland
Dates	July-August
Effects	2 dogs died, weaker symptoms reported for several humans and domestic animals
Management	Warning and information in mass media
Causative species	<i>Nodularia spumigena</i> , <i>Aphanizomenon flos-aquae</i> , <i>Anabaena spp.</i>
Environment	open and coastal sea
Advected population	
Previous occurrence	a yearly phenomenon
Additional comments	Exceptionally warm and shiny summer. The most extensive and prolonged blooms recorded in the Baltic Sea. Toxic (nodularin) everywhere, where tested. Exceptionally high PO ₄ (0.05-0.1 µmol/l) in the surface waters due the release of PO ₄ from anoxic bottom waters and sediment.
Individual to contact	Eija Rantajarvi Finnish Institute of Marine Research P.O.Box 33 FIN-00931 Helsinki Finland tel. +358-9-613941 email: eija.rantajarvi fimr.fi

PRYMNESIUM PARVUM

Location	oligohaline coastal lake Vargsundet in Åland, SW Finland
Dates	late June and early July 1997
Effects	almost total fish kill
Management	
Causative species	<i>Prymnesium parvum</i>
Environment	temp. > 20°C, max 24°C. Salinity ca. 2 psu. Exceptionally warm and sunny summer.
Advected population	
Previous occurrence	June 1990 in another small oligohaline basin.
Additional comments	
Individual to contact	Tore Lindholm Husö Biologiska Station FIN-22220 Emkarby Åland Finland fax. +358-18-32744

HARMFUL ALGAL BLOOM IN NORWAY 1997

Diarrhetic Shellfish Toxins

In 1992 a regular monitoring of algae and control of shellfish toxicity by mouse bioassay along the Norwegian coast, were established. The 1997 results from this programme concerning Diarrhetic Shellfish Toxins are summarised.

<u>LOCATION</u>	<i>Dinophysis</i> spp. were recorded all along the Norwegian coast but most numerous along the south coast and in the innermost part of the Sognefjord at the west coast.
<u>DATES</u>	Toxins in mussels were recorded only at three stations. At two stations along the coast of Skagerrak in May only low levels were detected once at each station. In the Sognefjord at the west coast higher toxin levels were recorded in August and September, but the mouse bioassay demonstrated interference with toxins giving cramps.
<u>EFFECTS</u>	Toxins recorded above the action level according to mouse bioassay.
<u>MANAGEMENT DECISIONS</u>	Harvesting was locally banned. The public was warned against picking toxic mussels.
<u>CAUSATIVE SPECIES</u>	Most probably <i>Dinophysis</i> spp., with <i>D. acuminata</i> and <i>D. acuta</i> as the most potent species.
<u>ENVIRONMENT</u>	The problem occur over a wide range of temperatures and salinities.
<u>ADVECTED POPULATION</u>	Along the southern coast there are some evidence that the algae and toxin problems are spread by advection. But along the west coast the "hot spots" seems to be rather patchy which indicate local concentration of the algae and/or <i>in situ</i> growth.
<u>PREVIOUS OCCURRENCES</u>	A few more dubious historical records. A yearly, more or less large scale and long lasting phenomenon since 1984 according to mouse bioassay. The phenomenon has never been so extensively monitored as since 1992. The problems in 1997 were less than average.
<u>INDIVIDUAL TO CONTACT</u>	Einar Dahl, Institute of Marine Research, Research Station Flødevigen, N-4817 His, NORWAY tel. +47 370 59000, fax. +47 370 59001 E.mail: einar.dahl@imr.no

HARMFUL ALGAL BLOOM IN NORWAY 1997

Paralytic Shellfish Toxins

In 1992 a regular monitoring of algae and control of shellfish toxicity by mouse bioassay along the Norwegian coast were established. The results from this monitoring programme concerning Paralytic Shellfish Toxins in 1997 are summarised.

<u>LOCATION</u>	<i>Alexandrium</i> spp. occurred almost all along the coast, but most numerous along the west coast. Toxins above action level were recorded at single stations all along the coast from the Swedish to the Russian border.
<u>DATES</u>	When considering the whole coast, paralytic toxins in mussels above the action level were recorded in the whole period April - October 1997. The toxicity seem to come later in the season in northern Norway. Selected recordings of toxicity in 1997: 15700 MU/100g were recorded at on the north-west coast in May, and 800 MU/100g near the Russian border in September.
<u>EFFECTS</u>	Toxins recorded above the action level (200 MU/100g) according to mouse bioassay.
<u>MANAGEMENT DECISIONS</u>	Harvesting was locally banned. The public was warned against picking toxic mussels.
<u>CAUSATIVE SPECIES</u>	<i>Alexandrium</i> spp. Highest concentrations recorded were about 5 000 cells/L.
<u>ENVIRONMENT</u>	No information
<u>ADVECTED POPULATION</u>	Mainly due to <i>in situ</i> growth ?
<u>PREVIOUS OCCURRENCES</u>	A few historical records. More or less regular occurrences along the west coast the recent years, however, the spatial and temporal extent may vary significantly from one year to another. In 1997 toxic mussels were for the first time recorded in our northernmost county, Finnmark, at the Russian border.
<u>INDIVIDUAL TO CONTACT</u>	Einar Dahl, Institute of Marine Research, Flødevigen Marine Research Station, N-4817 His tel. +47 370 59000, fax. +47 370 59001. E.mail: einar.dahl@imr.no

PORTUGAL (1997)

DSP

DSP toxins were detected at, Minho, Lima, Aveiro, Mondego estuaries, Óbidos lagoon; Ericeira, Formosa Lagoon and Algarve coast however most of the positive bioassay results were native with HPLC, nevertheless bivalves harvest by species and regions was closed.

1. and 2. Location and data of occurrences

- Minho estuary: June 3 - Oct. 2 and Oct. 23 on
- Lima estuary: March 20 - April 18 ; June 4- July 31 and August 12 on
- Aveiro Lagoon: March 17 - April 18; May 13 - July 21 and July 24 -Nov. 27.
- Mondego estuary: March 17 - April 18; June 19 - Sept. 29 and Oct. 24 - Nov. 27.
- Óbidos Lagoon: Feb. 20 - April 18; April 29 - July 10; Aug. 20 - Nov. 27 and Dec. 2.- Jan. 13
- Ericeira: Feb. 19 - March 3; March 18 - April 18; Aug. 12 - 27 and Oct. 24 On
- Sagres: Jan. 1 - 15; Feb. 25 - May 13 and Oct. 24 on.
- Formosa Lagoon: Sept. 12 on
- Algarve litoral: July 4 - Oct. 7

3. **Effects:** Apart from the Algarve litoral (Faro region) where also *Spisula solida* was affected, mostly mussels (*Mytilus edulis*) have given positive results with the mice bioassay. In the case of mussels (*Mytilus edulis*) from Algarve, there are now several months that they are not analyzed, because they have not commercial value and the harvest is banned.

DSP toxins were determined both by the mouse bioassay and through HPLC.

4. **Management decisions:** Harvest of species giving positive results with mouse bioassay were closed..

5. **Causative species:** *Dinophysis* cf. *acuminata* , *D. acuta* and/or *Prorocentrum lima*

The highest detected concentrations (cells/l) were:

- Minho estuary and litoral North: *D. cf. acuminata* 400 (Oct. 6); *D. acuta* 1350 (Oct. 6) and *P. lima* 500 (Sept. 2).
- Lima estuary *D. cf. acuminata* 800 (Sept. 29); *D. acuta* 350 (Sept. 29).
- Aveiro Lagoon: *D. cf. acuminata* 1000 (April 7); *D. acuta* 400 (Sept. 22)
- Mondego estuary: *D. cf. acuminata* 170 (Feb. 2)
- Óbidos Lagoon: *D. cf. acuminata* 1000 (Feb. 19)
- Sagres: *D. cf. acuminata* 800 (June 6)
- Formosa Lagoon: *D. cf. acuminata* 1300 (Aug. 27)
- Algarve litoral: *D. cf. acuminata* 6400 (July 30).

6. Environment:

Temperature range: 16° - 21°C

Salinity range: 24 - 36‰

7. **Advected population or *in situ* growth:** Most probably a combination of both.

8. **Previous occurrences:** Since 1987, the first year of confirmed occurrence, the problem has occurred every year, with a break in 1993. This year the most affected areas were Minho estuary, Aveiro Lagoon , Mondego estuary, Óbidos Lagoon and Algarve including Sagres and Ria Formosa Lagoon..

9. **Individual to contact:** Maria Antónia de M. Sampayo and Maria da Graça Vilarinho
IPIMAR
Av. Brasília
1400 Lisboa
PORTUGAL

Phone: 351 1 3017361

Fax: 351 1 3015948

E-mail: asampayo@ipimar.pt

PSP (1997)

Only at Espinho littoral, northern coast, the clam *Tellina crassa* presented values over . 80 µg/100g

1. and 2.- Location and date of occurrence:

Northern coast (Espinho littoral) 102.3 µg/100g (Oct. 6)

3. Effects: Only the clam *Tellina crassa* presented values over . 80 µg/100g

(This species, which is not commercially important, it was for the first time monitored and it is showing that it presents constant PSP toxins, even when other species from the same area are absolutely clean. We think that *Tellina crassa* is eating cysts from the sediment, while the other species are mostly filtrating the water).

4. Management decisions: Bivalve species with PSP values over 80 µg/100g closed to harvest.

5. Causative species: The causative species was *Gymnodinium catenatum*.

The highest detected concentration (cells/l) was:

– Northern coast (Espinho): 1000 (Oct. 7)

6. Environment: Temperature range: 17° - 20 °C Salinity range: 34 - 37⁰/00

7. Advected population or *in situ* growth: In this case mostly *in situ* growth.

8. Previous occurrences: Since 1986 , with a break in 1991, *G. catenatum* has been the responsible species for PSP at the Portuguese coastal zone. In 1993 and 1994 all the coast has been affected beginning in the South and spreading to the North. In 1995 the main affected area was Algarve coast, in an extensive way, covering all littoral, sea Lagoons and Estuaries.

Last year only very restricted areas and only some bivalve species at Mondêgo Estuary, Algarve coast and Formosa Lagoon were affected for a short time. This year the event was even more localized and only one species reached value over 80 µg/100g , never high values but keeping toxicity for long time (the species *Tellina crassa* was for the first time analyzed this year).

9. Individual to contact: Maria Antónia de M, Sampayo and Maria da Graça Vilarinho IPIMAR Av. Brasília 1400 Lisboa PORTUGAL

Phone: 351 1 3017361
Fax: 351 1 3015948
E-mail: asampayo@ipimar.pt

ASP (1997)

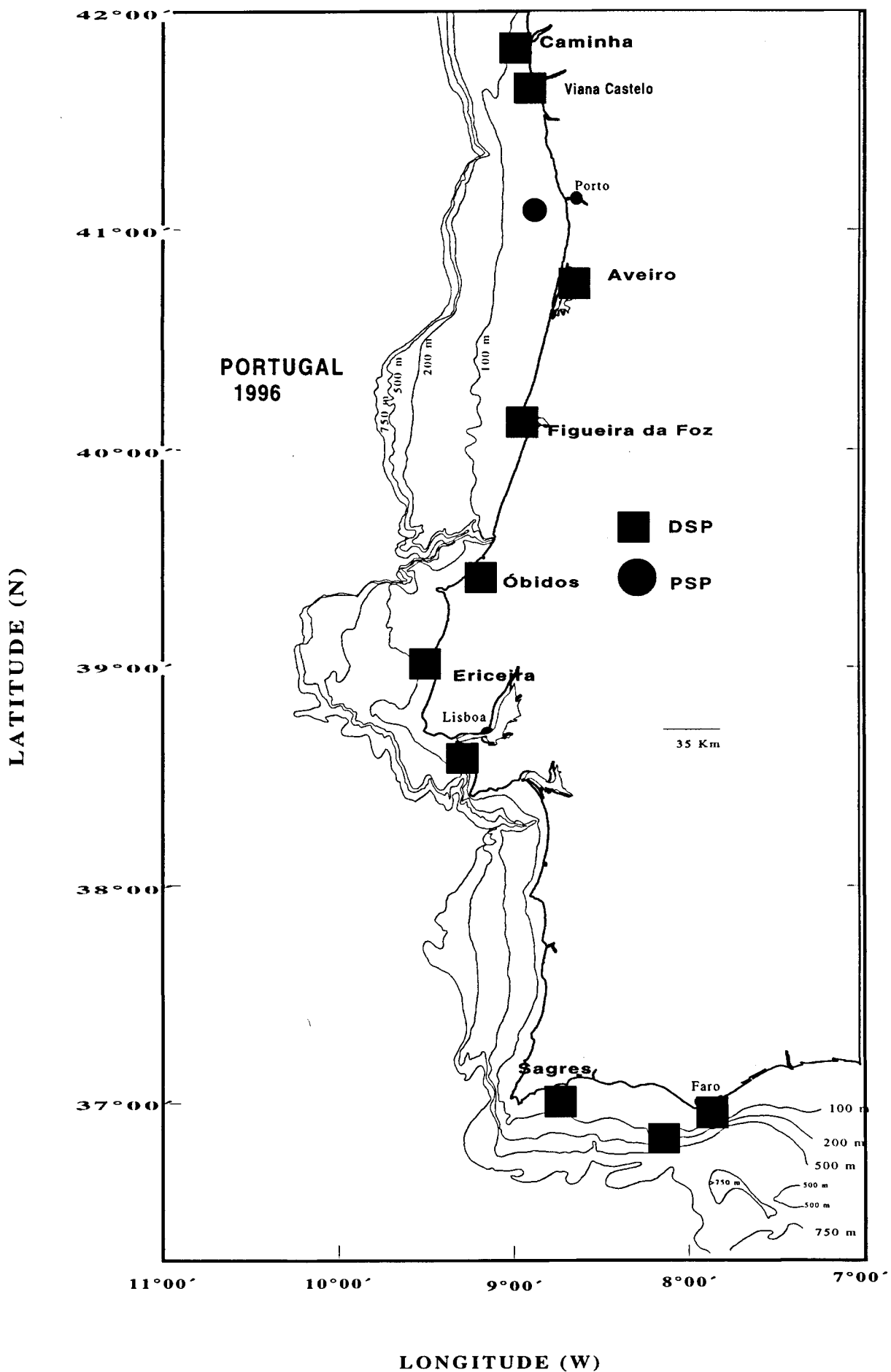
Domoic acid was detected in very small amounts $< 20 \mu\text{g/g}$ in almost every bivalve species all around the portuguese coast for short periods scattered in time and coincident with the occurrence of *Pseudo-Nitzschia* spp mainly *P. australis* in concentrations below 100 000 cell/l.

7. Advected population or *in situ* growth: Most probably a combination of both.

8. Previous occurrences: The first detected occurrence of Domoic acid in bivalves over $20 \mu\text{g/g}$ was in smooth callista (*Callista chione*) in 1995 as reported.

9. Individual to contact: Maria Antónia de M. Sampayo and Maria da Graça Vilarinho
IPIMAR
Av. Brasília
1400 Lisboa
PORTUGAL

Phone: 351 1 3017361
Fax: 351 1 3015948
E-mail: asampayo@ipimar.pt



HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. Location: Kittery to Stonington, Maine.

2. Date of Occurrence: June 4, 1997 shellfish closure for mussels, clams, oysters, carnivorous snails and whelks - New Meadows River

June 5, 1997 shellfish closure of above extended from Basin Point, Harpswell to Bald Head, Phippsburg

June 6, 1997 Closure to harvest of mussels and carnivorous snails from Kittery to Cape Elizabeth

June 18, 1997 Basin Pt. to Bald Head closure repealed

September 22, 1997 Kittery to Cape Elizabeth closure repealed

3. Effects: PSP in above

4. Management Action: Affected areas closed to the harvest of above mentioned

5. Causative Species: *Alexandrium tamarens*

6. Environment:

7. Advected Population or In Situ Growth:

8. Previous Occurrences: Generally a yearly occurrence, since 1958, when monitoring began.

9. Additional Comments:

10. Individual to Contact: John W.. Hurst, Jr.
Laurie L. Bean
Department of Marine Resources
West Boothbay Harbor, ME 04575

Algal Bloom Reports - United States - 1997

1. Locations: West Neck Bay, Shelter Island. Located within the Peconic Estuary System, on the eastern end of Long Island, New York.
2. Dates of Occurrence: From May to mid-June with concentrations ranging from 1.6×10^3 to 3.8×10^5 cells/ml.
3. Effects: Impacts on various shellfish species (scallops, hard clams, & mussels) and on submerged aquatic vegetation (eelgrass) have previously been reported. Other effects are aesthetic - water discoloration and reduced transparency.
4. Management Decisions: Continue weekly monitoring program.
5. Causative Species: *Aureococcus anophagefferens*
6. Environment:
Temperature: 12 - 22 deg.C
Salinity: 25 - 27 ppt
Dissolved oxygen: 7.0 - 9.0 mg/l
Water column stability: mixed
7. Advected population or in-situ growth: in-situ growth
8. Previous Occurrences: The bloom was present throughout the entire Peconic system from 1985 through 1987, with densities occasionally exceeding 10^6 cells/ml. Cell numbers declined through 1988 and 1989, and were generally undetectable during 1990 with the exception of those from West Neck Bay. During 1991, densities of up to 2×10^6 cells/ml occurred in Flanders Bay and West Neck Bay. During 1992, numbers approached 8.5×10^5 cells/ml in Coecles Harbor and 10^6 cells/ml in West Neck Bay. It occurred briefly in May of 1994 in Flanders Bay (up to 1.4×10^4 cells/ml) and in Great Peconic Bay (1.1×10^4 cells/ml). During 1995 concentrations exceeded 10^6 cells/ml at 12 of 31 stations sampled, with a peak value of 1.7×10^6 recorded in July.
9. Additional comments:
10. Individual to Contact:

Dr. Robert Nuzzi
Bureau of Marine Resources
Suffolk County Dep't. of Health Services
Riverhead, New York 11901
516-852-2082

Algal Bloom Reports - United States - 1997

1. Locations: Shinnecock Bay, New York. The bloom was present throughout much of the bay, with highest concentrations found in the westernmost portion.

2. Dates of Occurrence: During the month of September with concentrations exceeding 5×10^5 cells/ml.

3. Effects: Impacts on various shellfish species (scallops, hard clams, & mussels) and on submerged aquatic vegetation (eelgrass) have previously been reported. Other effects are aesthetic - water discoloration and reduced transparency.

4. Management Decisions: Continue monitoring as possible.

5. Causative Species: *Aureococcus anophagefferens*

6. Environment: Temperature: 15 - 17 deg.C
Salinity: 28-31 ppt
Dissolved oxygen: 7.0 - 8.0 mg/l
Water column stability: mixed

7. Advected population or in-situ growth: in-situ growth

8. Previous Occurrences: 1989: $< 2.3 \times 10^4$ cells/ml
1990: $< 10^3$ to 9.6×10^5 cells/ml
1991: $< 10^3$ to 9.7×10^5 cells/ml
1992: $> 1.3 \times 10^6$ cells/ml
1993: up to 1.8×10^5 cells/ml
1994: up to 3.8×10^4 cells/ml
1995: $> 1.1 \times 10^6$ cells/ml
1996: $> 3.3 \times 10^5$

9. Additional comments:

10. Individual to Contact:

Dr. Robert Nuzzi
Bureau of Marine Resources
Suffolk County Dep't. of Health Services
Riverhead, New York 11901
516-852-2082

Algal Bloom Reports - United States - 1997

1. Locations: Great South Bay, New York. The bloom was present throughout much of the bay with highest concentrations found in its central portion.

2. Dates of Occurrence: From June to December, with peak concentrations ranging from 2.3×10^4 to 4.7×10^5 cells/ml occurring in late June. Thereafter concentrations ranged from $< 10^3$ to 3.9×10^4 .

3. Effects: Impacts on various shellfish species (scallops, hard clams, & mussels) and on submerged aquatic vegetation (eelgrass) have previously been reported. Other effects are aesthetic - water discoloration and reduced transparency.

4. Management Decisions: Continue monitoring as possible.

5. Causative Species: *Aureococcus anophagefferens*

6. Environment: Temperature: 5.5-27.0 deg.C
Salinity: 20-28 ppt
Dissolved oxygen: 6.0-10.5 mg/l
Water column stability: mixed

7. Advectioned population or in-situ growth: in-situ growth

8. Previous Occurrences: 1985, 1986: $> 10^6$ cells/ml
1988: 10^3 - 5×10^5 cells/ml (June-Aug)
1989: $< 2.5 \times 10^4$ cells/ml (April-Sept)
1990: $< 1 \times 10^4$ cells/ml (May-Dec)
1991: $< 10^4$ cells/ml (Jan-June)
1992: 10^3 - 10^6 cells/ml (Jan-Dec)
1993: $< 10^3$ - 2.6×10^5 cells/ml (Jan-Mar, Aug-Nov)
1994: up to 10^6 cells/ml (June-July) up to 1.2×10^4 cells/ml (Aug-Oct)
1995: 2.8×10^5 to $> 10^6$ cells/ml in July
1996: 1.3×10^4 to 1.8×10^5

9. Additional comments:

10. Individual to Contact:

Dr. Robert Nuzzi
Bureau of Marine Resources
Suffolk County Dep't. of Health Services
Riverhead, New York 11901
516-852-2082

Algal Bloom Reports - United States - 1997

1. Locations: Moriches Bay, New York. The bloom was present throughout the bay, with highest concentrations generally found in the easternmost portion.

2. Dates of Occurrence: From May through December with concentrations ranging from 10^3 to 10^5 cells/ml. Peak values were recorded in October, although sampling wasn't performed during the month of June when peak densities have occurred in the past.

3. Effects: Impacts on various shellfish species (scallops, hard clams, & mussels) and on submerged aquatic vegetation (eelgrass) have previously been reported. Other effects are aesthetic - water discoloration and reduced transparency.

4. Management Decisions: Continue monitoring as possible.

5. Causative Species: *Aureococcus anophagefferens*

6. Environment:
Temperature: 15 - 24 deg.C
Salinity: 25-30 ppt
Dissolved oxygen: 6.0 - 9.0 mg/l
Water column stability: mixed

7. Advected population or in-situ growth: in-situ growth

8. Previous Occurrences:
1989: $< 10^3$ to 1.3×10^4 cells/ml
1990: 1.4×10^3 to 7.3×10^5 cells/ml
1991: 5×10^3 to 6.3×10^5 cells/ml
1992: 5×10^4 to 1.5×10^6 cells/ml
1993: $< 10^3$ to 1.7×10^5 cells/ml
1994: 5×10^3 to 1.4×10^5 cells/ml
1995: 8×10^3 to 1.8×10^6 cells/ml
1996: $< 10^3$ to 5×10^5

9. Additional comments:

10. Individual to Contact:

Dr. Robert Nuzzi
Bureau of Marine Resources
Suffolk County Dep't. of Health Services
Riverhead, New York 11901
516-852-2082

HAZARDOUS ALGAL BLOOMS IN THE UNITED STATES - 1997

1. Location:

Barnegat Bay, New Jersey

2. Date of Occurrence:

Approximately early May through the third week of August

3. Effects:

Two aquaculture facilities in southern Barnegat Bay (Tuckerton Bay area) experienced feeding inhibition of their clams, *Mercuraria mercenaria*, for a two month period. Effect on natural fauna and flora was not determined.

4. Management Decision:

Continue surveillance

5. Causative Species:

Aureococcus anophagefferens

6. Environment:

Barnegat Bay system formed by barrier islands extends about 48 km along the New Jersey coast. It ranges from 2.0 to 6.5 km in width. Water depth is shallow, averaging 1.3 m in the northern half to 2.0 m in the southern half.

7. Advection Population or in situ Growth:

This bloom considered in situ growth

8. Previous Occurrences:

Previous confirmed occurrence, 1995

9. Additional Comments:

1997-1998 overwintering population suggests likelihood of future outbreak.

10. Individual to Contact:

John Mahoney, NMFS, Highlands, NJ; Paul Olsen, NJDEP, Trenton, NJ.

1997 BARNEGAT BAY BROWN TIDE SYNOPSIS

Barregat Bay experienced another major confirmed *Aureococcus anophagefferens* brown tide in 1997. This was the second such outbreak in three years. The bloom was present and intense throughout the bay by mid-May. At this time, 11 of 15 samples from various locales contained cell numbers of 100K ml^{-1} or greater; the highest level found was 576K cells ml^{-1} . Greatest prevalence was in the southern half of the Bay. The bloom persisted with generally lower cell numbers through June (13 of 34 samples contained cell numbers of 100k ml^{-1} or greater), again especially in the southern half of the bay. Highest levels found by the end of this month were 400K-500K cells ml^{-1} . The bloom apparently was in definite decline about the third week of July. Available information suggests crash of the bloom in early August; despite this, significant cell concentration (11K cells ml^{-1}) was encountered at the end of the month. Two aquaculture facilities in southern Barnegat Bay (Tuckerton Bay area) experienced feeding inhibition of their clams, *Mercenaria mercenaria*, for a two month period. Effect of the bloom on natural flora and fauna unfortunately was not determined. Monthly surveillance of *Aureococcus* in Barnegat Bay from November 1997 shows that the species overwintered in levels of ca. 1K-10K cells ml^{-1} , despite weekly nor'easter storms during February.

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

- 1. Location:** Chesapeake Bay, Eastern Shore, Maryland and surrounding areas
- 2. Dates of Occurrence:** Summer, 1997, largely August & September
- 3. Effects:** Fish kills (approx. 50,000 total), human health reports under investigation
- 4. Management Action:** Portions of the Pocomoke River (Maryland) closed to fishing and recreational activities
- 5. Causative Species:** *Pfiesteria piscicida* and other *Pfiesteria*-like dinoflagellates that include *Cryptoperidinopsis* (nov.gen, nov.sp.)
- 6. Environment:** Eutrophic, poorly flushed, brackish waters prone to hypoxic conditions. Note events in warmest months (>25C).
- 7. Advected Population or In situ Growth:** In situ growth. Evidence of cysts and benthic amoeba stage.
- 8. Previous Occurrences:** Suspected links to previous fish kills in the Chesapeake Bay and other similar habitats in mid-Atlantic states.
- 9. Additional Comments:** K. Steidinger is currently working on the taxonomy of the *Pfiesteria*-like dinoflagellates isolated from fish kill sites in North Carolina, Maryland and surrounding areas.
- 10. Individual to Contact:**
Pat Tester
National Marine Fisheries Service, NOAA
101 Pivers Island Road
Beaufort NC 28516
Email: Pat.Tester@NOAA.Gov

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. **Location:** Pokomoke River, Maryland
2. **Dates of Occurrence:** August 6-12, 1997
3. **Effects:** Fish kill, fish with lesions
4. **Management Decision:** River closure, extensive monitoring, human health surveys
5. **Causative Species:** *Pfiesteria piscicida*
6. **Environment:** River
7. **Advected Population or In situ Growth:** *In situ*
8. **Previous Occurrences:**
9. **Additional Comments:** The Pokomoke River is a tributary to the Chesapeake Bay
10. **Individual to Contact:**
Robert Magnien
Maryland Dept. of Natural Resources
580 Taylor Avenue
Annapolis, MD 21401

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

- 1. Location:** Pokomoke River, Virginia
- 2. Dates of Occurrence:** August 26, 1997
- 3. Effects:** Fish kill, fish with lesions
- 4. Management Decision:** River closure, extensive monitoring, human health surveys
- 5. Causative Species:** *Pfiesteria piscicida*
- 6. Environment:** River
- 7. Advected Population or In situ Growth:** *In situ*
- 8. Previous Occurrences:** None
- 9. Additional Comments:** The Pokomoke River is a tributary to the Chesapeake Bay
- 10. Individual to Contact:**
Harold Marshall
Biology Department
Old Dominion University
Norfolk, VA 23529-0266

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. **Location:** Chicamacomico River, Maryland
2. **Dates of Occurrence:** September 14, 1997
3. **Effects:** Fish with lesions
4. **Management Decision:** Extensive monitoring
5. **Causative Species:** *Pfiesteria piscicida*
6. **Environment:** River
7. **Advected Population or In situ Growth:** *In situ*
8. **Previous Occurrences:**
9. **Additional Comments:** The Chicamacomico River is a tributary to the Chesapeake Bay
10. **Individual to Contact:**
Robert Magnien
Maryland Dept. of Natural Resources
580 Taylor Avenue
Annapolis, MD 21401

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1977

1. **Location:** Florida's east and west coast. Areas _____.
2. **Date of Occurrence:** Summer 1977 to ongoing on the west coast, mostly offshore; January 1998 on the east coast in Palm Beach County.
3. **Effects:** Fish kills, manatee mortalities (≈ 16) on the southwest coast; human respiratory irritation on the east and west coasts; and shellfish bed closures along the west coast.
4. **Management Decision:** Closure of shellfish beds until shellfish meats < 20 MU.
5. **Causative Species:** *Gymnodinium breve*.
6. **Environment:** Offshore initiation on broad continental shelf, with transport to inshore estuarine waters by winds and currents.
7. **Advected Population or *in situ* Growth:** Advected from offshore; populations between 30-35 miles constant for several months on west Florida shelf.
8. **Previous Occurrences:** See report for 1996, which lists previous years.
9. **Additional Comments:** Through a federal partnership (NOAA, EPA, NSF, and others) sponsoring a federal program called ECOHAB, the program ECOHAB Florida will study and model the development and transport of *G. breve* blooms on the west coast of Florida.
10. **Individual to Contact:** Karen A. Steidinger, Ph.D.
Senior Research Scientist
Florida Department of Environmental Protection
Florida Marine Research Institute
100 8th Avenue SE
St. Petersburg, FL 33701-5095

Tel.: 813-896-8626
Fax: 813-823-0166
e-mail: steidinger_k@epic7.dep.state.fl.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1977

1. **Location:** Florida east coast (St. Johns River and St. Lucie Estuary). Area _____.
2. **Date of Occurrence:** Summer 1996 (St. Johns River) and winter 1977 (St. Lucie Estuary).
3. **Effects:** Fish lesions and ulcers; principally mullet, but other species such as snook, jack crevalle, and sheepshead affected also.
4. **Management Decision:** Monitor toxic event.
5. **Causative Species:** A new *Pfiesteria*-like organism that is a new genus and species ("Cryptoperidiniopsoid") is suspected of stressing the fish, leading to fish skin sloughing and invasion of tissue by bacterial and fungal pathogens. The same species also occurs in Maryland and North Carolina.
6. **Environment:** Salinity from 0 to >20‰ depending on freshwater flow; shallow water inlet or lagoon areas.
7. **Advected Population or *in situ* Growth:** *in situ* in brackish water habitat.
8. **Previous Occurrences:** 1985 and 1987/1988 in St. Johns River; 1979/1980 in St. Lucie Estuary.
9. **Additional Comments:** This occurred in an El Nino year after heavy rainfall and release of fresh water to these two east coast areas.
10. **Individual to Contact:** Dr. Jan Landsberg
Research Administrator II
Department of Environmental Protection
Florida Marine Research Institute
100 8th Avenue SE
St. Petersburg, FL 33701-5095

Tel.: 813-896-8626
Fax: 813-823-0166
e-mail: landsberg_j@epic7.dep.state.fl.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES—1997

LOUISIANA

1. Location: Lake Pontchartrain (a very large, shallow, brackish water body north of New Orleans)
2. Date of Occurrence: Spring and Summer, 1997, peaked on 6/15/97
3. Effects: Extreme water discoloration (maximum chlorophyll concentrations 880 µg/liter). Two out of six samples taken at peak of bloom contained >10mg/liter microcystins (Carmichael, pers. comm.), two contained trace amounts, and two were below the limit of detection.
4. Management Action: Lake closed to recreational activities such as swimming, sailing, water skiing, and jet skiing by Louisiana Department of Health and Hospitals.
6. Causative Species: *Anabena* cf. *circinalis*, *Anabena* sp., and *Microcystis* sp. *Anabena* cf. *circinalis* was by far the most abundant and occurred most frequently.
7. Advectioned Population or *In situ* Growth: *In situ* growth (see additional comments).
8. Previous Occurrences: In 1995 a smaller, but still substantial bloom of *Anabena* cf. *circinalis* occurred when there was an accidental opening of the spillway (see below). Anecdotal reports of earlier blooms suggest that such blooms occur periodically in response to openings of the spillway, flooding events due to local runoff, and to increased development on the north shore of the Lake.
9. Additional Comments: As a result of high water levels in the Mississippi River, the Army Corps of Engineers opened the Bonnet Carré Spillway to relieve pressure on levees in New Orleans. High nutrient Mississippi River water flowed into Lake Pontchartrain for a month, starting on Feb. 19, 1997. While numbers of the bloom organisms increased immediately, growth accelerated after 5/16/97, reached a peak on 6/15/97 and then slowly declined into the fall. The bloom was stimulated by the increased availability of N and P. The presence of increased numbers of heterocysts, absence of akinetes, and concentrations and ratios of N/P in the water as the bloom declined indicated that the bloom was limited by nitrogen.
10. Individual to Contact: Dr. Quay Dortch
Louisiana Universities Marine Consortium
8124 Highway 56
Chauvin, LA 70344
Phone: 504/851-2800
FAX: 504/851-2874
E-mail: qdortch@lumcon.edu

HARMFUL ALGAL BLOOMS IN THE UNITED STATES—1997

LOUISIANA

1. Location: All shelf and estuarine waters examined to date. The highest numbers (10^6 cells/liter) and the highest frequency of occurrence are observed on the shelf in the plume of the Mississippi River. Lower numbers (10^3 cells/liter) and lower frequency of occurrence are observed in the Terrebonne Bay estuary (west of the Mississippi River). In estuaries east of the Mississippi River, the numbers are similar to Terrebonne Bay, but the frequency of occurrence is less.
2. Date of Occurrence: They occur all year in the plume of the Mississippi River, with a peak in April. In the Terrebonne Bay estuary they are present primarily in the winter. There is not enough data to assess the seasonal occurrence in other areas.
3. Effects: Domoic acid measurements not yet available for 1997. In selected samples from 1996, toxin contents averaged 12.41 pg/cell (Doucette, pers comm.). The average toxin/cell of the estuarine samples was five times greater than that of the shelf samples. However, because the abundance of *Pseudo-nitzschia* spp. is so much greater on the shelf, the amount of domoic acid per liter would not be significantly different between shelf and estuarine sites.
4. Management Action: None
6. Causative Species: *Pseudo-nitzschia multiseries*, *P. delicatissima*, *P. pseudodelicatissima*, *P. pungens*, (*P. subfradulenta*, *P. cf. americana*)
7. Advected Population or *In situ* Growth: *In situ* growth
8. Previous Occurrences: Spatial and temporal occurrence patterns repeated every year since 1990 in Mississippi River plume, since 1993 in Terrebonne Bay estuary.
9. Additional Comments: Abundances this year were one to two orders of magnitude lower than in previous years.
10. Individual to Contact: Dr. Quay Dortch
Louisiana Universities Marine Consortium
8124 Highway 56
Chauvin, LA 70344
Phone: 504/851-2800
FAX: 504/851-2874
E-mail: qdortch@lumcon.edu

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. Location: Initial bloom occurred along the south Texas coastline from Port Mansfield to Port Isabel, with major fish kills occurring along these beaches. Red Tide did enter the lower Laguna Madre and Corpus Christi and Aransas bays.

2. Date of Occurrence: The red tide is estimated to have started 18 September. Remnant populations were found lingering in Corpus Christi Bay until January 19, 1998. Small, localized fish kills were common through December 1997.

3. Effects: Coastal fisheries staff estimate that the red tide began on September 18 and has killed 14.3 million fish on the Texas coast. Most of the fish are small fish, less than six inches long, including Gulf menhaden, Atlantic bumper, striped mullet, and scaled sardine.

4. Management Decision:
Shellfish bans in coastal bays and estuaries initiated.

5. Causative Species:

Gymnodinium breve

6. Environment:

Coastal marine

7. Advected Population or In situ Growth:

Adverted population.

8. Previous Occurrences:

August 1996

9. Additional Comments:

10. Individual to Contact:

Dean A. Stockwell
University of Texas at Austin
Marine Science Institute
750 Channel View Dr.
Port Aransas, Texas 78373

Phone: 512 749 6705
E-mail: dean@utmsi.zo.utexas.edu

HARMFUL ALGAL BLOOMS IN THE UNITED STATES: 1997

1. **Location:** South of Point Conception: Santa Barbara County, Los Angeles County, and San Diego County.
2. **Date:** Late January through March in Santa Barbara; Throughout March in Los Angeles and San Diego counties.
3. **Effects:** Unusual low level toxicity between late January and March.
4. **Management Action:** Increased shellfish and phytoplankton monitoring.
5. **Causative Species:** *Alexandrium catenella*. Routine phytoplankton monitoring detected low numbers of *Alexandrium* periodically throughout the region.
6. **Environment:** Variable. Phytoplankton community along the southern California coast contained a mixture of diatoms and dinoflagellates, with each group fluctuating in dominance between January and March. By March the assemblage had stabilized as a dinoflagellate-dominated community (i.e., *Gonyaulax polyedra*), typical of this area during the spring and summer.
7. **Advected/In Situ:** Unknown. Fluctuation of phytoplankton specie composition between diatom-dominated and dinoflagellate-dominated assemblages suggests a cycle of upwelling and relaxation events throughout this three-month period. A stable, relaxed condition developed by April, which is typical for this region.
8. **Previous Occurrences:** Infrequent occurrences of low level PSP toxicity along the southern California coast. The last episodes of PSP toxicity above the alert level of 80 ug/100 g tissue were in 1989 (Santa Barbara) and 1991 (Los Angeles).
9. **Additional Comments:**
10. **Contact:** Gregg Langlois
California Department of Health Services
Marine Biotoxin Program
2151 Berkeley Way, Room 118
Berkeley, CA 94704
510-540-3423
510-540-2716 (Fax)
glangloi@ix.netcom.com

HARMFUL ALGAL BLOOMS IN THE UNITED STATES: 1997

1. **Location:** Marin County Coast, north of the Golden Gate.
2. **Date:** Late July through the end of September.
3. **Effects:** Highest concentrations of PSP toxicity (3000 ug) were detected in mid-August.
4. **Management Action:** One of the most productive commercial oyster growing areas (Drakes Estero) in California was initially placed on batch release, then completely closed due to elevated toxin concentrations. Another commercial growing area (Tomaes Bay) was on alert, then closed briefly on a precautionary basis. A special quarantine on all sport-harvested bivalves along the Marin and Sonoma county coastline was in effect for two months.
5. **Causative Species:** *Alexandrium catenella*. Routine phytoplankton monitoring detected low numbers of *Alexandrium* one week prior to the onset of toxicity in Marin. *Alexandrium* was abundant from late July through August.
6. **Environment:** Warm, stable surface waters characteristic of a relaxed state following spring upwelling.
7. **Advection/In Situ:** Advection likely. Sea surface temperatures (SST) from offshore buoys indicate a continued warming trend throughout the summer months. Satellite imagery of SST's show the advection of a warm water mass onto the nearshore Marin County coast in mid-July. Associated with this warming trend was an increase in PSP toxicity from undetectable levels (July 16) to 130 ug/100 g tissue within seven days (July 23). Concentrations reached 1200 ug two days later (July 25).
8. **Previous Occurrences:** Alert levels of PSP toxicity routinely occur in this region each year.
9. **Additional Comments:**
10. **Contact:** Gregg Langlois
California Department of Health Services
Marine Biotxin Program
2151 Berkeley Way, Room 118
Berkeley, CA 94704
510-540-3423
510-540-2716 (Fax)
glangloi@ix.netcom.com

HARMFUL ALGAL BLOOMS IN THE UNITED STATES: 1997

1. **Location:** Humboldt County Coast, northern California.
2. **Date:** Late-July through the end of September.
3. **Effects:** Highest concentrations of PSP toxicity (130 ug) were detected in late July. Low level toxicity occurred through September.
4. **Management Action:** Increased shellfish and phytoplankton monitoring.
5. **Causative Species:** *Alexandrium catenella*. Routine phytoplankton monitoring detected low numbers of *Alexandrium* sp. one month prior to the onset of toxicity. *Alexandrium* was never dominant or abundant during this time.
6. **Environment:** Warm, stable surface waters characteristic of a relaxed state following spring upwelling.
7. **Advection/In Situ:** Advection likely. Sea surface temperatures (SST) from offshore buoys indicate a continued warming trend throughout the summer months. Satellite imagery of SST's show the advection of a warm water mass onto the nearshore coast in mid-July. Associated with this warming trend was the onset of PSP toxicity.
8. **Previous Occurrences:** Low levels of PSP toxicity are common in this region each year. However the duration of low level toxicity, and the duration of *Alexandrium*'s presence in this region, was highly unusual.
9. **Additional Comments:**
10. **Contact:** Gregg Langlois
California Department of Health Services
Marine Biotoxin Program
2151 Berkeley Way, Room 118
Berkeley, CA 94704
510-540-3423
510-540-2716 (Fax)
glangloi@ix.netcom.com

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. Location: Central Puget Sound, Washington
2. Date of Occurrence: 14-29 July 1997
3. Effects: Killed about 100,000 Atlantic salmon in net pens
4. Management Decision: Fish farm decided to move pens
5. Causative Species: *Heterostigma akashiwo*
6. Environment: Temperature ca 15.5 C; salinity 26; rain occurred early in the month (8-10 July) and then no precipitation for 10 days. Air temperature ranged between 18 and 28 C, mostly about 22 C.
7. Advected Population or in situ Growth: Probably advected from adjacent shallow bays and then in situ growth
8. Previous Occurrence: summer, 1990
9. Additional Comments: About 300,000 fish escaped when some pens tore while being moved. Local sports fishers were urged by the Washington Department of Fish and Wildlife to catch the fish using any method, including hands, fishing rod, nets, or beach seines, but a regular state saltwater fishing license was required. The Washington Pollution Control Board considers Atlantic salmon (*Salmo salar*) to be a pollutant when they escape from the pens. In mid-bloom, investigators counted ca. 40 million cells/liter, but cell number depended on tidal cycle. First cysts were found on 22 July.
10. Individual to Contact:

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. **Location:** Southern Puget Sound, Washington
2. **Date of Occurrence:** 4 November 1997. In mid-March 1998, some areas were still closed.
3. **Effects:** Closure for recreational and commercial shellfish harvest; there were no illnesses. Toxin level went to 6799 at one site, the highest seen in the state since 1978.
4. **Management Decision:** Widespread closure
5. **Causative Species:** *Alexandrium catenella*
6. **Environment:** Water temperature in early November at one closed site was about 13 C.
7. **Advected Population or in situ Growth:** Probably in situ growth
8. **Previous Occurrence:** early December, 1991 at some sites
9. **Additional Comments:** Long chains of *Alexandrium* were seen in fresh samples collected at Allyn (northern Case Inlet), but by the next day, only single cells were seen. Single cells had been seen in phytoplankton samples since early September. It is thought that the bloom started in late October, but mussels weren't checked until December. In northern Puget Sound, *Alexandrium* blooms occurred earlier in the year (May - November). It is possible that the southern Puget Sound strain is different from northern strains and tolerates colder weather.
10. **Individual to Contact:** Mr. Frank Cox
Washington Department of Health
Office of Shellfish Programs
P.O. Box 47824
Olympia, WA 98504-7824

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. **Location:** Grays Harbor and Willapa Bay, Washington state Pacific coast
2. **Date of Occurrence:** Grays Harbor closed on 12 November 1997; Willapa Bay closed on 13 November 1997; both bays reopened in mid-December.
3. **Effects:** Closure for commercial oyster harvest. Toxin levels ranged from 84 to 341 µg.
4. **Management Decision:** Both bays closed. Went to lot testing. If a lot was toxic, the harvested oysters were returned to the bed and the bed closed until two successive clean tests, seven days apart.
5. **Causative Species:** *Alexandrium catenella*
6. **Environment:** Water temperature at adjacent beaches in early November was ca. 13-17 C.
7. **Advected Population or in situ Growth:** Not known for sure, but thought to be in situ growth; if so, this is different from other occasions when harmful species were thought to enter the estuaries as incursions from the open ocean.
8. **Previous Occurrence:** 1984 in the estuaries, but PSP occurred in razor clams on adjacent beaches in the spring and fall of 1992.
9. **Additional Comments:** Long chains of *Alexandrium* were seen in samples collected from beaches ca. 50 miles north of the estuaries. The PSP did not affect razor clams on Pacific coast beaches adjacent to and between Grays Harbor and Willapa Bay. This is unusual because razor clams on open beaches are often affected by both PSP and domoic acid when no toxin occurs within the estuaries.
10. **Individual to Contact:** Mr. Frank Cox
Washington Department of Health
Office of Shellfish Programs
P.O. Box 47824
Olympia, WA 98504-7824

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. **Location:** Penn Cove, Whidbey Island, Washington
2. **Date of Occurrence:** Bloom already in progress when first samples were collected about 10 July 1997, lasted through August.
3. **Effects:** None; toxin levels in mussels remained less than 3 μg (non-detect - 3) throughout the bloom.
4. **Management Decision:** None
5. **Causative Species:** *Pseudo-nitzschia multiseries*, *P. pungens*, *P. pseudodelicatissima*, and *P. australis*
6. **Environment:** Bloom possibly initiated by freshwater runoff from Skagit River, relatively high winds, rain, and increased air temperature; possibly sustained by wind shift, relatively light winds, and sunny weather; also neap tides caused reduced mixing.
7. **Advected Population or in situ Growth:** probably in situ growth
8. **Previous Occurrence:** At least in July 1992
9. **Additional Comments:** Cell counts to 13 million cells/liter
10. **Individual to Contact:** Dr. Vera Trainer
National Oceanic and Atmospheric Administration
Northwest Fisheries Science Center
2725 Montlake Blvd. E.
Seattle, WA 98112

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. **Location:** New Jersey: Raritan and Sandy Hook Bays, adjacent coastal areas of Monmouth County
2. **Dates of Occurrence:** May to early June, early July to September
3. **Effects:** Brownish discoloration and suspension in water, deposits of brown floc at various shore locations; subsequent hypoxia (as low as 0.5 mg l^{-1} in late August) in nearshore New York Bight one to nine miles off Monmouth and northern Ocean Counties,* also off Raritan Bay south shore; only a few very localized fish kills detected.
4. **Management Decision:** Increased surveillance by NJDEP, USEPA (Region II), and the Monmouth County Health Dept.
5. **Causative Species:** Diatoms: *Skeletonema costatum*, *Chaetoceros* sp. and *Leptocylindrus minimus* dominant; max. species count to 8×10^4 cells ml^{-1} in bay; *Thalassiosira* spp. *Cerataulina pelagica*, *Asterionella glacialis* and several others subdominant; a few sporadic flagellate pulses intermittent.
6. **Environment:** Bay: temperature 16.5 (spring) to 25.0°C ., salinity 21.0 - 27.7 ‰, max. chlorophylla 97.0 ml^{-1} secchi reading to 0.4 (0.1)M; ocean: 14.6 - 23.9°C ., 28.3 - 31.7 ‰, secchi to 1.0 M
7. **Advected Population or In situ Growth:** In situ growth
8. **Previous Occurrences:** Chronic annual blooms
9. **Additional Comments:** * No measurements taken beyond nine miles
10. **Individual to Contact:**
Paul Olsen
New Jersey Dept. of Environmental Protection
Bureau of Water Monitoring
P.O. Box 427
Trenton, NJ 08625

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. **Location:** New Jersey: Barnegat Bay and Little Egg Harbor (westward of Barnegat Inlet and southward to Tuckerton).
2. **Dates of Occurrence:** Late May - early June through September
3. **Effects:** Golden brown to greenish brown water discoloration; temporary growth cessation in juvenile hard clams (*Mercenaria mercenaria*); some die-off of eelgrass (*Zostera marina*.)
4. **Management Decision:** Increased surveillance; more intensive monitoring planned.
5. **Causative Species:** Chrysophyte (*Aureococcus anophagefferens*) (late May-early July), chlorophyte *Nannochloris atomis* (July through September¹); maximum observed picoplankton count 2.6×10^6 cells ml^{-1} on 8/20.
6. **Environment:** Salinity: 22.3-28.6 (31.6)0/00; chlorophylla 10.0-24.1 (35.6) ml^{-1}
Temperature: 14.9-24.4°C
7. **Advected Population or In situ Growth:** In situ growth; *A. anophagefferens* initially advected (?)
8. **Previous Occurrences:** Intense *N. atomus* blooms have occurred annually at least since 1985; first detected bloom of *A. anophagefferens* in 1995, second in 1997.
9. **Additional Comments:**
10. **Individual to Contact:**
Paul Olsen
New Jersey Dept. of Environmental Protection
Bureau of Water Monitoring
P.O. Box 427
Trenton, NJ 08625

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. **Location:** New Jersey: southern coast - Atlantic County and northern Cape May County (Ocean City).
2. **Dates of Occurrence:** Late August to September (approx. 8/24-9/2).
3. **Effects:** Brilliant green water coloration, dark green suspension and floc deposit on beaches; some minor irritation to bathers.
4. **Management Decision:** Continued surveillance; local bathing advisory.
5. **Causative Species:** Dinoflagellate *Gyrodinium aureolum*
6. **Environment:** Salinity: 30.8 - 32.3 ‰
Chlorophylla 36.8-173.0 mg l⁻¹
Temperature: 22.1-23.6°C
7. **Advected Population or In situ Growth:** Initially advected (?) population
8. **Previous Occurrences:** 1984-1985, 1996
9. **Additional Comments:**
10. **Individual to Contact:** Paul Olsen
New Jersey Dept. of Environmental Protection
Bureau of Water Monitoring
P.O. Box 427
Trenton, NJ 08625

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. Location: Horse Island, 1.7 miles long, in Stephens Passage off the east coast of Mansfield Peninsula, 12 miles SW of Juneau. 58°15'15"N., 134°43'30"W.

2. Date of Occurrence: 9/17/97

3. Effects: One person experienced dizziness and numbness in face. Three people ate clams but only one had any symptoms.

4. Management Decision: Press Release - general warning about harvesting on unapproved/unclassified beaches.

5. Causative Species: Suspect *Alexandrium*. PSP concentration of 674 mg/100 grams was seen in butter clams (*Saxidomus giganteus*)

6. Environment: Specific growing area during and before this incident had experienced a long period of no rain and warm weather. One specific bay reported a temperature of 55 degrees F. at a depth of 50 feet. Also surface water and temperatures were < 60°-65° F at this same site. Oysters were reported to be spawning at this site.

7. Advected Population or In situ Growth:

8. Previous Occurrences:

9. Additional Comments:

10. Individual to Contact: Michael J. Ostasz
Shellfish Coordinator, Seafood Program
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, ALASKA 99515
Tel: (907) 269-7638
Fax: (907) 269-7510
Email: mostasz@envircon.state.ak.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

- 1. Location:** Kachemak Bay, East area in Kachemak Bay, Alaska
Near Homer. Area encompasses from 59° 45'36"N., to 59°29'10" N. and 151° 38'30"W.
- 2. Dates of Occurrence:** 8/11/97 - Report of illness received from recreational sport digger in area; 8/11/97 - monitoring program showed high psp with mussels
- 3. Effects:** Product eaten:
Clams/mussels/rice ----- 196 mg/100 gms
Clams/mussels ----- 154 mg/100 gms
- 4. Management Decision:** Closed area to mussels on 8/13/97
Closed area to all shellfish on 8/20/97
- 5. Causative Species:** Alexandrium
- 6. Environment:** Specific growing area during and before this incident had experienced a long period of no rain and warm weather. One specific bay reported a temperature of 55 degrees F. at a depth of 50 feet. Also surface water and temperatures were < 60°-65° F at this same site. Oysters were reported to be spawning at this site.
- 7. Advected Population or In situ Growth:**
- 8. Previous Occurrences:** 8/96 and 7/90
- 9. Additional Comments:** Area reopened for mussels and oysters on 9/17/97
- 10. Individual to Contact:**
Michael J. Ostasz
Shellfish Coordinator, Seafood Program
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, ALASKA 99515
Tel: (907) 269-7638
Fax: (907) 269-7510
Email: mostasz@envircon.state.ak.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES — 1997

ALASKA

1. **Location:** Larsen Bay, Kodiak Island, Alaska
(On West Shore of Uyak Bay) 57°32'30"N, 153°58'40"W
2. **Date of Occurrence:** 7 June 1997
3. **Effects:** Three people ill. Two people received medical treatment and hospitalized overnight.
Butterclams were eaten (10-12) cooked.
Alaska Dept. of Environmental Conservation Palmer Lab. tested out samples at 470 µg/100 grams. Classic symptoms included tingling, lip numbness, and weakness.
4. **Management Decision:** Press Release.
5. **Causative Species:** *Alexandrium*
6. **Environment:**
7. **Advected Population or In Situ Growth:**
8. **Previous Occurrences:** One death occurred by PSP in area the same day.
9. **Additional Comments:**
10. **Individual to Contact:** Michael J. Ostasz
Shellfish Coordinator, Seafood Program
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, ALASKA 99515
Tel: (907) 269-7638
Fax: (907) 269-7510
E-Mail: mostasz@envircon.state.ak.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES — 1997

ALASKA

1. **Location:** Point Gardner in Southeast Alaska.
(Southern tip of Admiralty Island, 10 miles southeast of Baranof.)
57°01'N, 134°37'W
2. **Date of Occurrence:** 14 June 1997
3. **Effects:** Two people experienced classic symptoms of perioral numbness, extremity tingling and headache. Ate mussels and required U.S. Coast Guard Assistance. Hospitalized at Sitka, Alaska.
4. **Management Decision:** N/A
5. **Causative Species:** Suspected *Alexandrium* for a clinical PSP determination.
6. **Environment:**
7. **Advected Population or In Situ Growth:**
8. **Previous Occurrences:**
9. **Additional Comments:** Area in the past has shown dungeness crab (viscera) with PSP levels 770 µg/100 grams.
10. **Individual to Contact:** Michael J. Ostasz
Shellfish Coordinator, Seafood Program
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, ALASKA 99515
Tel: (907) 269-7638
Fax: (907) 269-7510
E-Mail: mostasz@envircon.state.ak.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES — 1997

1. **Location:** Kodiak Island, Alaska
near Karluk (East Coast of Kodiak Island) 57°34'10"N, 154°27'30"W
2. **Date of Occurrence:** 7 June 1997
3. **Effects:** 1 person dead after consuming 7-8 clams. Time period 2 hours.
Butterclams ---> > 8500 micrograms/100 grams
Littlenecks ---> > 1300 micrograms/100 grams
4. **Management Decision:** Press Release Warning About PSP to General Public.
5. **Causative Species:** *Alexandrium*
6. **Environment:**
7. **Advected Population or In Situ Growth:**
8. **Previous Occurrences:** General area has shown high levels with dungeness crab viscera.
9. **Additional Comments:**
10. **Individual to Contact:** Michael J. Ostasz
Shellfish Coordinator, Seafood Program
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, AKASKA 99515
Tel: (907) 269-7638
Fax: (907) 269-7510
E-Mail: mostasz@envircon.state.ak.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

- 1. Location:** Point Louisa: point of land, on E. shore of Stephens Passage, 0.8 miles SW of Fairhaven and 12 miles NW of Juneau, AK (58°22'25"N., 134°43'30"W.)
- 2. Date of Occurrence:** 11/16/97
- 3. Effects:** Two out of three people had symptoms (perioral numbness, tingling, nausea and vomiting plus flushing sensation, headache, and floating sensation). Symptoms within 30 minutes.
- 4. Management Decision:** Press release warning about harvesting.
- 5. Causative Species:** Littlenecks had 33µg/100 grams and butter clams had 201 µg/100 grams of psp toxin.
- 6. Environment:**
- 7. Advected Population or In situ Growth:**
- 8. Previous Occurrences:** None
- 9. Additional Comments:** First time we've seen an outbreak of psp in November.
- 10. Individual to Contact:**
Michael J. Ostasz
Shellfish Coordinator, Seafood Program
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, ALASKA 99515
Tel: (907) 269-7638
Fax: (907) 269-7510
Email: mostasz@envircon.state.ak.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

- 1. Location:** Amalga Harbor: 0.2 miles across, on W. shore of Favorite Channel, 1 mile N. of Pearl Harbor and 19 miles NW of Juneau, AK (58° 29'30"N., 134°47'20" W.)
- 2: Dates of Occurrence:** November 23, 1997
- 3. Effects:** One person ill after consuming two clams while tasting a chowder made of steamed clams and their juice. Person became dizzy within 5 minutes and numbness followed within 15 minutes. Person treated by hospital staff.
- 4. Management Decision:** Press release warning about harvesting.
- 5. Causative Species:** Suspect *Alexandrium*, but clam chowder tested negative for psp toxin which further underscores the variability of toxin levels within a single batch of clams.
- 6. Environment:**
- 7. Advected Population or In situ Growth:**
- 8. Previous Occurrences:** Amalga Harbor has shown high levels of psp toxin with clams >200 $\mu\text{g}/100$ in 1986.
- 9. Additional Comments:** First time we've seen psp epidemiology in November in Alaska.
- 10. Individual to Contact:**
Michael J. Ostasz
Shellfish Coordinator, Seafood Program
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, ALASKA 99515
Tel: (907) 269-7638
Fax: (907) 269-7510
Email: mostasz@envircon.state.ak.us

HARMFUL ALGAL BLOOMS IN THE UNITED STATES - 1997

1. Location: Kasianna Island: 1 mile across, 3 miles NW of Sitka, Alaska (57°05'N., 135° 24"W.) and Crescent Bay: 0.3 miles across on W.coast of Baranoff Island, E. of Sitka (57°03'00"N., 135°19'30" W.)

2. Dates of Occurrence: November 24, 1997

3. Effects: One person ill (dizziness and mild numbness of lips) after consuming four clams. Clams were harvested on November 14 from Kasianna Island and then hung for several days to "flush" in Crescent Bay. Clams were given to individual but immediate family who had eaten some of the product had no ill effects. Cooked clams were from the individual while frozen clams were from the donor family.

4. Management Decision: Press release warning about harvesting.

5. Causative Species: Suspect *Alexandrium*

Butterclams (raw)	43 μ g/100 gm.	} psp levels detected
Butterclams (cooked)	61 μ g/100 gm.	
Littlenecks (raw)	32 μ g/100 gm.	
Littlenecks (cooked)	32 μ g/100 gm.	

6. Environment:

7. Advected Population or In situ Growth:

8. Previous Occurrences: None

9. Additional Comments: Represents a cluster of cases seen for the first time in November in Alaska.

10. Individual to Contact: Michael J. Ostasz
Shellfish Coordinator, Seafood Program
State of Alaska
Department of Environmental Conservation
555 Cordova Street
Anchorage, ALASKA 99515
Tel: (907) 269-7638
Fax: (907) 269-7510
Email: mostasz@envircon.state.ak.us