CLAIMS:

1. A method for detecting a saxitoxin-producing dinoflagellate in a sample, the method comprising:

obtaining a sample for use in the method; and

analyzing the sample for the presence of one or more of a dinoflagellate saxitoxin A catalytic domain polynucleotide or a polypeptide encoded by said polynucleotide;

wherein:

the saxitoxin catalytic domain is selected from: saxitoxin A4 catalytic domain, or a fragment of a saxitoxin A4 catalytic domain; and

the presence of said polynucleotide or polypeptide indicates the presence of a saxitoxin-producing dinoflagellate in the sample.

2. A method for determining the absence of a saxitoxin-producing dinoflagellate in a sample, the method comprising:

obtaining a sample for use in the method; and

analyzing the sample for the presence of one or more of a dinoflagellate saxitoxin A catalytic domain polynucleotide or a polypeptide encoded by said polynucleotide;

wherein:

the saxitoxin catalytic domain is selected from: saxitoxin A4 catalytic domain, or a fragment of a saxitoxin A4 catalytic domain; and

the absence of said polynucleotide or polypeptide indicates the absence of a saxitoxin-producing dinoflagellate in the sample.

3. The method according to claim 1 or claim 2, wherein the polynucleotide comprises a saxitoxin A nucleotide sequence selected from those set forth in any one of SEQ ID NOS: 230-242 or a fragment of any one of those sequences.

4. The method according to claim 1 or claim 2, wherein the saxitoxin A4 catalytic domain sequence or fragment thereof comprises nucleotides 3115-4121 of the polynucleotide sequence set forth in SEQ ID NO: 3, nucleotides 3597-3721 of the polynucleotide sequence set forth in SEQ ID NO: 3, or a fragment of either sequence.

5. The method according to claim 1 or claim 2, wherein said analyzing comprises amplification of polynucleotides from the sample by polymerase chain

reaction.

6. The method according to claim 5, wherein said polymerase chain reaction utilises one or more primers consisting of a sequence set forth in any one of SEQ ID NOs: 198-199, 228-229, and 243-244.

7. The method according to claim 1 or claim 2, wherein the polypeptide comprises a saxitoxin A4 catalytic domain amino acid sequence as set forth in residues 947-1281 of SEQ ID NO: 4, or a fragment thereof.

8. The method according to claim 1 or claim 2, wherein the saxitoxin-producing dinoflagellate is from the Alexandrium, Pyrodinium or Gymnodinium genus.

9. The method according to claim 8, wherein the saxitoxin-producing dinoflagellate is selected from the group consisting of A. catenella, A. fundyense, A lusitanicum, A. minutum, A. ostenfeldii, A. tamarense, G. catenatum and P. bahamense var compressum.

10. A kit for the detection of a saxitoxin-producing dinoflagellate in a sample, the kit comprising at least one agent for detecting the presence of a dinoflagellate saxitoxin A catalytic domain polynucleotide or a polypeptide encoded by said polynucleotide, wherein the saxitoxin catalytic domain is selected from: saxitoxin A4 catalytic domain, or a fragment of a saxitoxin A4 catalytic domain.

11. A kit for the determining the absence of a saxitoxin-producing dinoflagellate in a sample, the kit comprising at least one agent for detecting the presence of a dinoflagellate saxitoxin A catalytic domain polynucleotide or a polypeptide encoded by said polynucleotide, wherein the saxitoxin catalytic domain is selected from: saxitoxin A4 catalytic domain, or a fragment of a saxitoxin A4 catalytic domain.

12. The kit according to claim 10 or claim 11, wherein the agent binds specifically to a polynucleotide comprising a saxitoxin A nucleotide sequence selected from those set forth in any one of SEQ ID NOS: 230-242 or a fragment of any one of those sequences.

13. The kit according to claim 10 or claim 11, wherein the saxitoxin A4 catalytic

domain sequence or fragment thereof comprises nucleotides 3115-4121 of the polynucleotide sequence set forth in SEQ ID NO: 3, nucleotides 3597-3721 of the polynucleotide sequence set forth in SEQ ID NO: 3, or a fragment of either sequence.

14. The kit according to claim 10 or claim 11, wherein the agent is a primer, probe or antibody.

15. The kit according to claim 10 or claim 11, wherein the agent is a primer consisting of a sequence set forth in any one of SEQ ID NOs: 198-199, 228-229, and 243-244.

16. The kit according to claim 10 or claim 11, wherein the agent binds specifically to a saxitoxin A4 catalytic domain amino acid sequence as set forth in residues 847-1281 of SEQ ID NO: 4, or a fragment thereof.

17. A primer pair for detecting a saxitoxin-producing dinoflagellate in a sample, wherein said primer pair consists of:

a first primer consisting of the polynucleotide sequence of SEQ ID NO: 198 and a second primer consisting of the polynucleotide sequence of SEQ ID NO: 199.

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CLAIMS:

1. A method for detecting a saxitoxin-producing dinoflagellate in a sample, the method comprising:

obtaining a sample for use in the method; and

analyzing the sample for the presence of one or more of a dinoflagellate saxitoxin A catalytic domain polynucleotide or a polypeptide encoded by said polynucleotide;

wherein:

the saxitoxin catalytic domain is selected from: saxitoxin A1 catalytic domain, saxitoxin A4 catalytic domain, or a fragment of a saxitoxin A1 or A4 catalytic domain; and

the presence of said polynucleotide or polypeptide indicates the presence of a saxitoxin-producing dinoflagellate in the sample.

2. A method for determining the absence of a saxitoxin-producing dinoflagellate in a sample, the method comprising:

obtaining a sample for use in the method; and

analyzing the sample for the presence of one or more of a dinoflagellate saxitoxin A catalytic domain polynucleotide or a polypeptide encoded by said polynucleotide;

wherein:

the saxitoxin catalytic domain is selected from: saxitoxin A1 catalytic domain, saxitoxin A4 catalytic domain, or a fragment of a saxitoxin A1 or A4 catalytic domain; and

the absence of said polynucleotide or polypeptide indicates the absence of a saxitoxin-producing dinoflagellate in the sample.

3. The method according to claim 1 or claim 2, wherein the polynucleotide comprises a saxitoxin A nucleotide sequence selected from those set forth in any one of SEQ ID NOS: 224-227, 230-242 and 247 or a fragment or variant of any one of those sequences.

4. The method according to claim 1 or claim 2, wherein the saxitoxin A4 catalytic domain sequence or fragment thereof comprises nucleotides 3115-4121 of the polynucleotide sequence set forth in SEQ ID NO: 3, nucleotides 3597-3721 of the polynucleotide sequence set forth in SEQ ID NO: 3, or a fragment or variant of either sequence.

5. The method according to claim 1 or claim 2, wherein the saxitoxin A1 catalytic domain sequence comprises nucleotides 160-1821 of the polynucleotide sequence set forth in SEQ ID NO: 1, nucleotides 277-2022 of the polynucleotide sequence set forth in SEQ ID NO: 3, or a fragment or variant of either sequence.

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6. The method according to any one of claims 1 to 5, wherein said analyzing comprises amplification of polynucleotides from the sample by polymerase chain reaction.

7. The method according to claim 6, wherein said polymerase chain reaction utilises one or more primers comprising a sequence set forth in any one of SEQ ID NOs: 198-199, 200-211, 228-229, and 243-244, or a fragment or variant of any one of those sequences.

8. The method according to claim 1 or claim 2, wherein the polypeptide comprises:

(i) a saxitoxin A1 catalytic domain amino acid sequence as set forth in residues 1-554 of SEQ ID NO: 2 or residues 1-582 of SEQ ID NO: 4, or a fragment or variant of either sequence; or

(ii) a saxitoxin A4 catalytic domain amino acid sequence as set forth in residues 847-1281 of SEQ ID NO: 4, or a fragment or variant thereof.

9. The method according to any one of claims 1 to 8, wherein the saxitoxin-producing dinoflagellate is from the *Alexandrium*, *Pyrodinium* or *Gymnodinium* genus.

10. The method according to claim 9, wherein the saxitoxin-producing dinoflagellate is selected from the group consisting of *A. catenella*, *A. fundyense*, *A lusitanicum*, *A. minutum*, *A. ostenfeldii*, *A. tamarense*, *G. catenatum* and *P. bahamense var compressum*.

11. A kit for the detection of a saxitoxin-producing dinoflagellate in a sample, the kit comprising at least one agent for detecting the presence of a dinoflagellate saxitoxin A catalytic domain polynucleotide or a polypeptide encoded by said polynucleotide, wherein the saxitoxin catalytic domain is selected from: saxitoxin A1 catalytic domain, saxitoxin A4 catalytic domain, or a fragment of a saxitoxin A1 or A4 catalytic domain.

12. A kit for the determining the absence of a saxitoxin-producing dinoflagellate in a sample, the kit comprising at least one agent for detecting the presence of a dinoflagellate saxitoxin A catalytic domain polynucleotide or a polypeptide encoded by said polynucleotide, wherein the saxitoxin catalytic domain is selected from: saxitoxin A1 catalytic domain, saxitoxin A4 catalytic domain, or a fragment of a saxitoxin A1 or A4 catalytic domain.

13. The kit according to claim 11 or claim 12, wherein the agent binds specifically to a polynucleotide comprising a saxitoxin A nucleotide sequence selected from those set forth in any one of SEQ ID NOS: 224-227, 230-242 and 247 or a fragment or variant of any one of those sequences.

14. The kit according to claim 11 or claim 12, wherein the saxitoxin A4 catalytic domain sequence or fragment thereof comprises nucleotides 3115-4121 of the polynucleotide sequence set forth in SEQ ID NO: 3, nucleotides 3597-3721 of the polynucleotide sequence set forth in SEQ ID NO: 3, or a fragment or variant of either sequence.

15. The kit according to claim 11 or claim 12, wherein the saxitoxin A1 catalytic domain sequence comprises nucleotides 160-1821 of the polynucleotide sequence set forth in SEQ ID NO: 1, nucleotides 277-2022 of the polynucleotide sequence set forth in SEQ ID NO: 3, or a fragment or variant of either sequence.

16. The kit according to any one of claims 11 to 15, wherein the agent is a primer, probe or antibody.

17. The kit according to any one of claims 11 to 16, wherein the agent is a primer comprising a sequence set forth in any one of SEQ ID NOs: 198-199, 200-211, 228-229, and 243-244, or a fragment or variant of any one of those sequences.

18. The kit according to claim 11 or claim 12, wherein the agent binds specifically to:

(i) a saxitoxin A1 catalytic domain amino acid sequence as set forth in residues 1-554 of SEQ ID NO: 2 or residues 1-582 of SEQ ID NO: 4, or a fragment or variant of either sequence; or

(ii) a saxitoxin A4 catalytic domain amino acid sequence as set forth in residues 847-1281 of SEQ ID NO: 4, or a fragment or variant thereof.

19. A primer pair for detecting a saxitoxin-producing dinoflagellate in a sample, wherein said primer pair comprises:

a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 198 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 199; or

a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 200 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 201; or

a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 202 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 203; or

a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 204 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 205; or

a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 206 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 207; or

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a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 208 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 209; or

a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 210 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 211; or

a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 228 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 229; or

a first primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 243 and a second primer comprising or consisting of the polynucleotide sequence of SEQ ID NO: 244.