UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

7998116654

MARINE SCIENCE **9693/02**

Paper 2 AS Data Handling and Free Response **May/June 2008**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams, graphs or rough work.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

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1	
2	
3	
4	
Total	

This document consists of **9** printed pages, **6** lined pages and **1** blank page.

Section A

1 In October 1998, Hurricane Mitch caused much damage to the mangrove swamps on the Pacific coast of the Honduras. This area contains many shrimp farms, and these were also damaged. People involved in shrimp aquaculture were keen to help restore the mangroves, as this could benefit their industry.

The restoration programme began with an investigation into the factors affecting mangrove distribution in the area.

(a) The distribution and height of mangrove trees was investigated at two sites, Oxidacion and Pedregal.

- Oxidacion is on the shoreline of a small river where the waste from shrimp farms flows into the water.
- Pedregal is an estuary on the same river system as Oxidacion.

At each site, counts and measurements were made at 10 m intervals at varying distances from the open water, beginning inland and working towards the open water. At Oxidacion, measurements of salinity were also made at five sites.

The results are shown in Fig. 1.1.

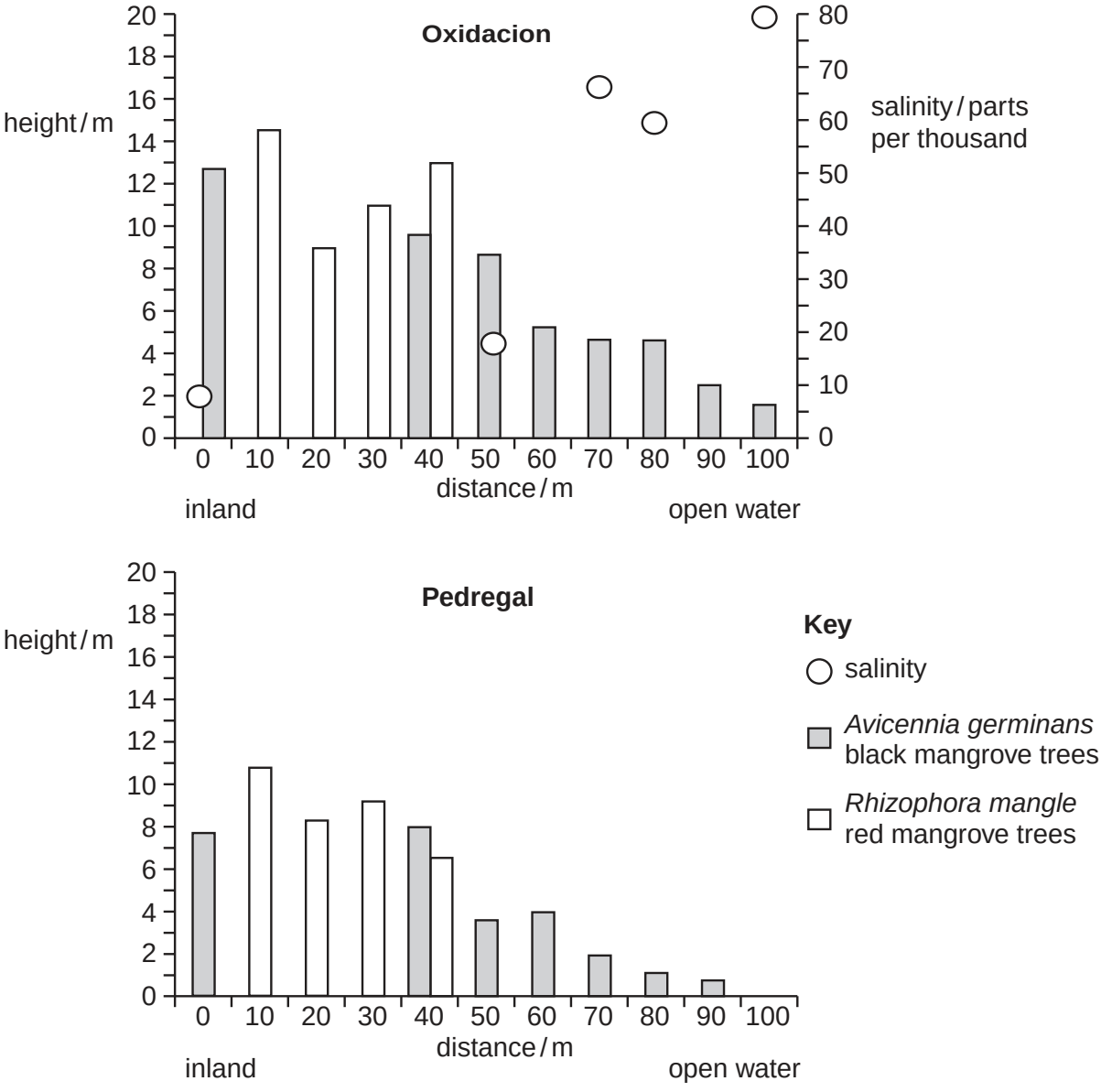

Fig. 1.1

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(i) Compare the distribution of black mangrove trees and red mangrove trees at Oxidacion.

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..... [2]

(ii) Compare the results for black mangrove trees at Oxidacion and at Pedregal.

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..... [2]

(b) The researchers analysed the data shown in Fig. 1.1 and then put forward the following hypothesis:

Black mangrove trees can tolerate higher salinity than red mangrove trees.

(i) Do you consider that the results support this hypothesis? Explain your answer.

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..... [1]

(ii) Outline a **laboratory-based** experiment that the researchers could do to test their hypothesis.

Your answer should include reference to the control of variables, and the collection of quantitative results.

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..... [4]

(c) The researchers also measured the ratio of carbon to nitrogen, C:N, in the mud in which the mangrove trees were growing.

At both Oxidacion and Pedregal, measurements were taken at three points in the mangrove swamp:

- at the inland edge of the swamp
- in the middle of the swamp
- at the outer edge of the swamp, next to the open water.

Their results are shown in Fig. 1.2. A high C:N ratio indicates poor availability of nutrients.

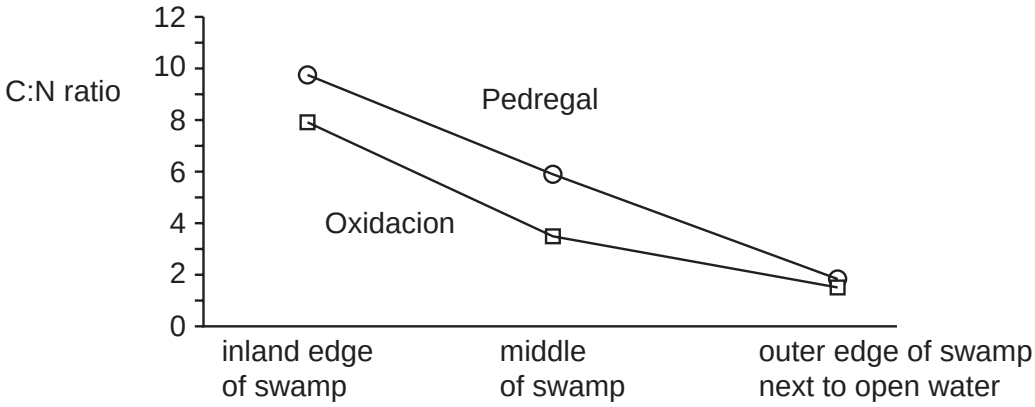

Fig. 1.2

Suggest a reason for:

(i) the changes in C:N ratio from the inland edge to the outer edge of the mangrove swamp,

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..... [1]

(ii) the differences between the C:N ratio at Pedregal compared with Oxidacion.

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..... [1]

(d) Suggest why the restoration and regrowth of the mangrove swamps could help the shrimp farming industry.

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..... [1]

[Total: 12]

2 Fig. 2.1 shows the differences in surface water temperatures in the southern Pacific Ocean in a 'normal' year and in an El Niño year.

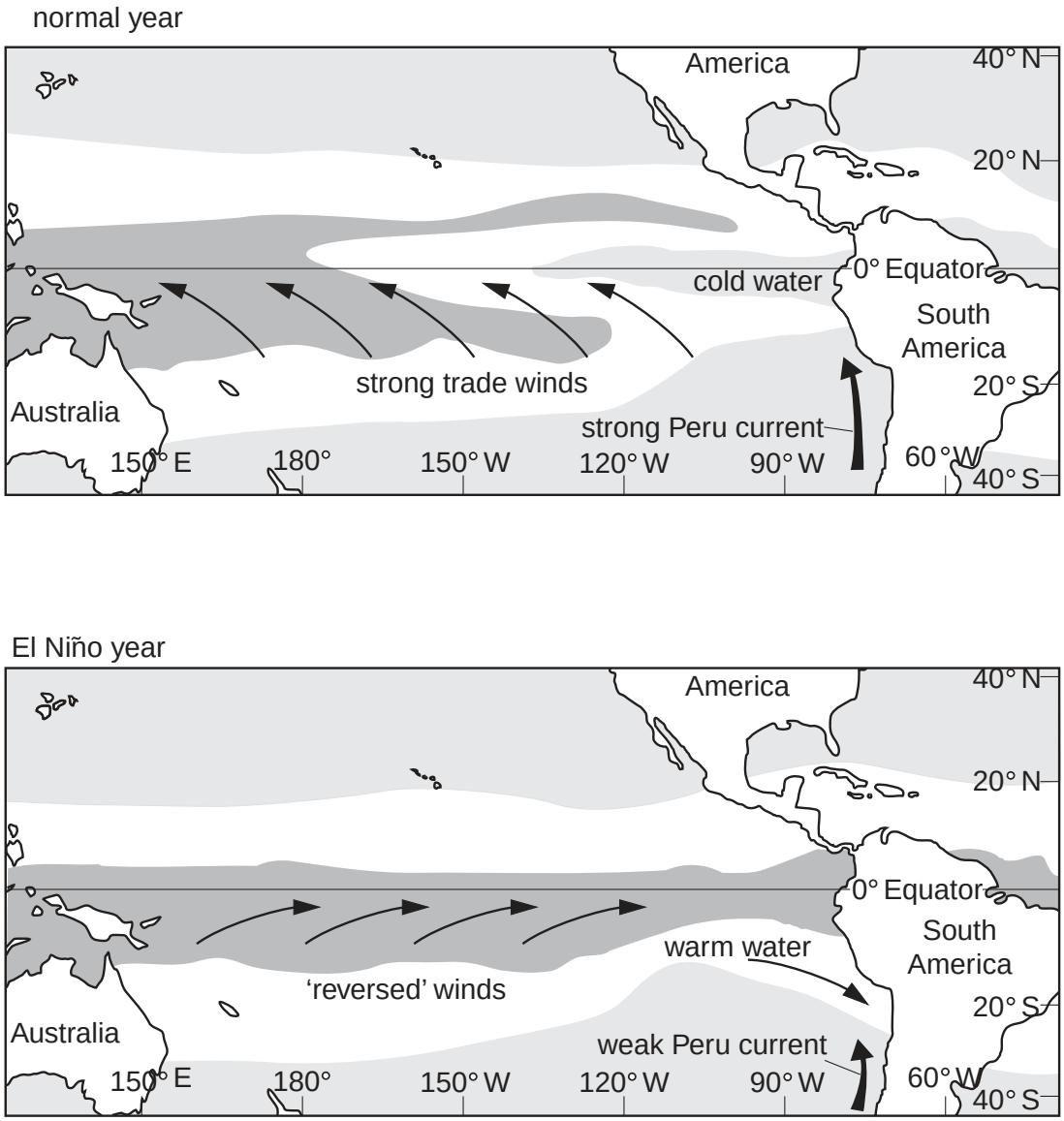

Fig. 2.1

Fig. 2.2 shows the temperature of the water between 0 and 200 m depth, at the equator at a latitude of 110 °W, between July 1981 and June 1983.

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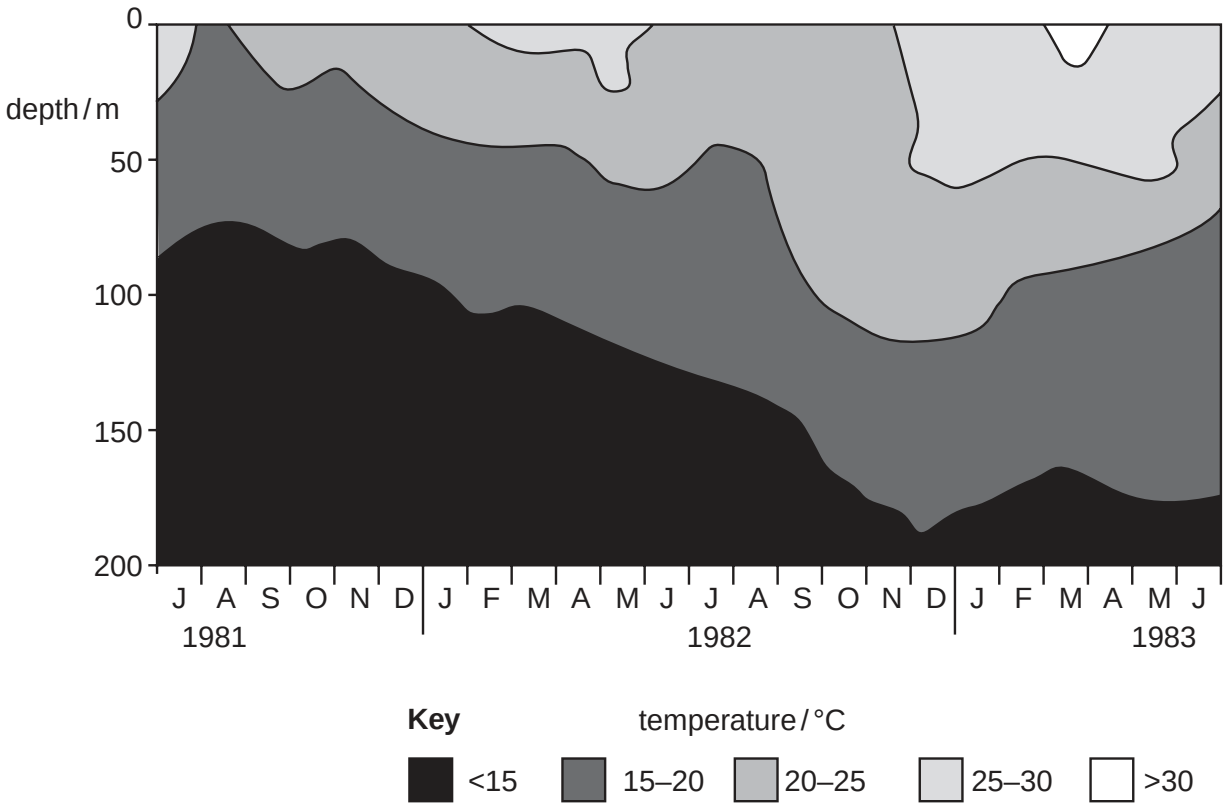

Fig. 2.2

(a) With reference to Fig. 2.1 and Fig. 2.2, state which year or years were El Niño years. Explain your answer.

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..... [2]

(b) The change in surface temperatures in an El Niño year is thought to be a result of the change in direction of the trade winds.

Explain how this can cause the differences in surface temperatures between a normal year and an El Niño year shown in Fig. 2.1.

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..... [2]

(c) During an El Niño year, there is often severe drought in eastern Australia.

With reference to Fig. 2.1, explain how this may be brought about.

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..... [2]

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(d) The western coast of South America usually provides a rich harvest of anchovies and other fish, but this does not happen in an El Niño year.

With reference to Fig. 2.1 and Fig. 2.2, explain the reasons for this drop in fish catches.

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..... [2]

[Total: 8]

Section B

Answer both questions in this section.

3 **(a)** Explain the meaning of the term *ecosystem*. [2]

(b) Describe the relationship between corals and zooxanthellae. [7]

(c) Discuss the possible reasons for the very high biodiversity on coral reefs. [6]

[Total: 15]

4 **(a)** Explain how hydrothermal vents are produced. [7]

(b) Describe the unusual food web that exists at deep sea hydrothermal vents. [8]

[Total: 15]

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