Cambridge International AS & A Level

**Cambridge International Examinations**
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

*0117687992*

**MARINE SCIENCE** **9693/04**

Paper 4 A2 Data-Handling and Free-Response **October/November 2014**

**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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

**Section A**
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

**Section B**
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

| For Examiner's Use | |
|---|---|
| 1 | |
| 2 | |
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| 4 | |
| Total | |

This document consists of **11** printed pages and **1** blank page.




CAMBRIDGE International Examinations

## Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

**1** Shrimp fishing generally requires the use of small mesh trawling nets. This results in an increased catch of non-target species, otherwise known as bycatch.

Research into the different species found in the bycatch of *Nephrops* (Dublin Bay prawn) fishing was carried out by the Belgian fisheries ministry. The findings are shown in Table 1.1.

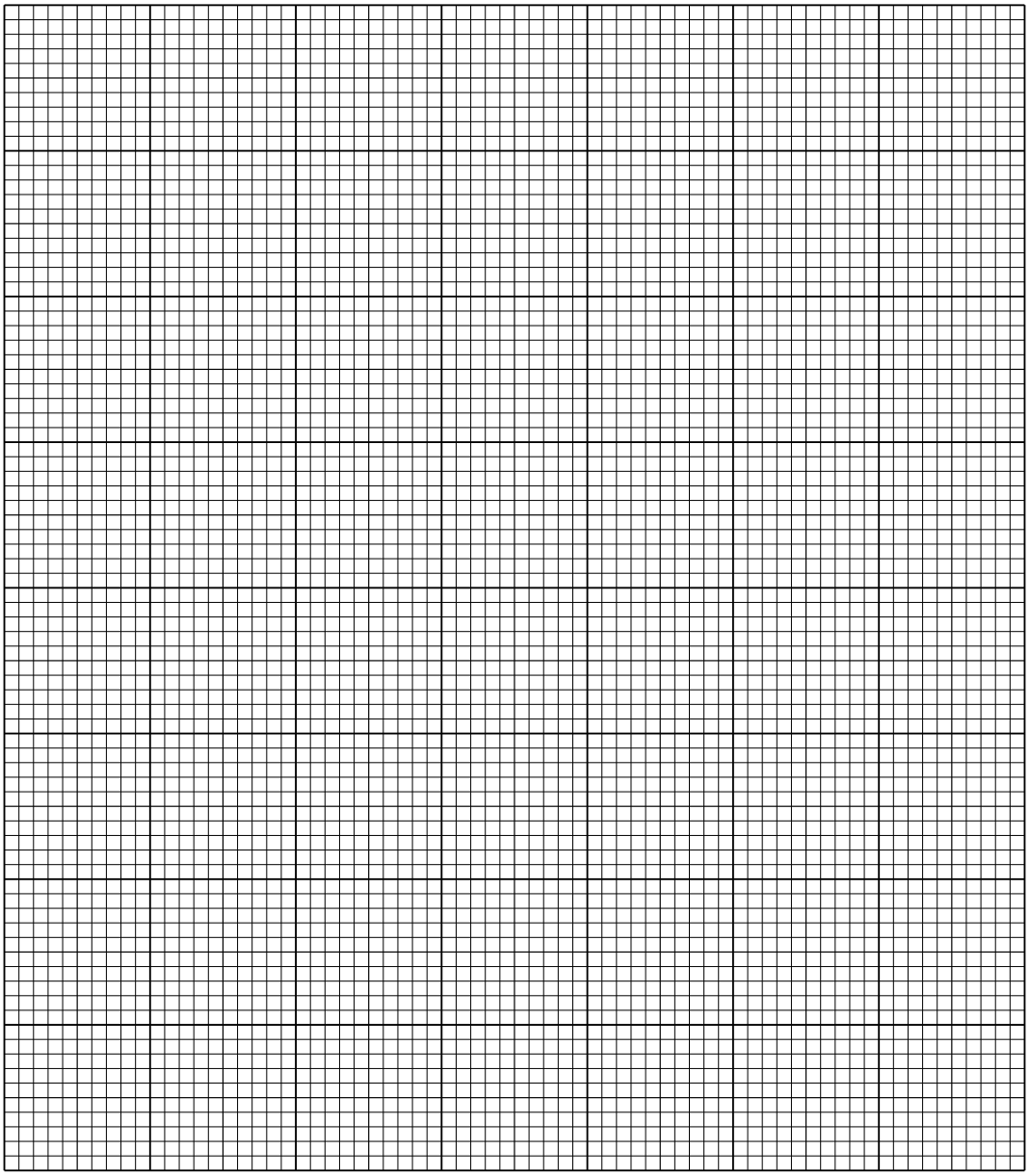
**Table 1.1**

| species | landings / tonnes | percentage of total landing |
|---|---|---|
| *Nephrops* | 552 | 35.2 |
| plaice | 421 | |
| whiting | 153 | 9.8 |
| sole | 115 | 7.3 |
| cod | 80 | 5.1 |
| rays | 44 | 2.8 |
| other | 203 | 12.9 |
| **Total** | **1568** | **100.0** |

**(a)** Calculate the percentage of the landing that was plaice.

Record it in Table 1.1. [1]

**(b)** Plot a graph showing how percentage of total landing varies with different species.



[4]

**(c)** In a separate study, the effect of size of mesh of the trawl nets on the mean length of fish in the bycatch was investigated.

Trawlers were selected randomly across all seasons and the mean length of the fish measured and compared with the size of mesh of the nets being used. The results are shown in Fig. 1.1.

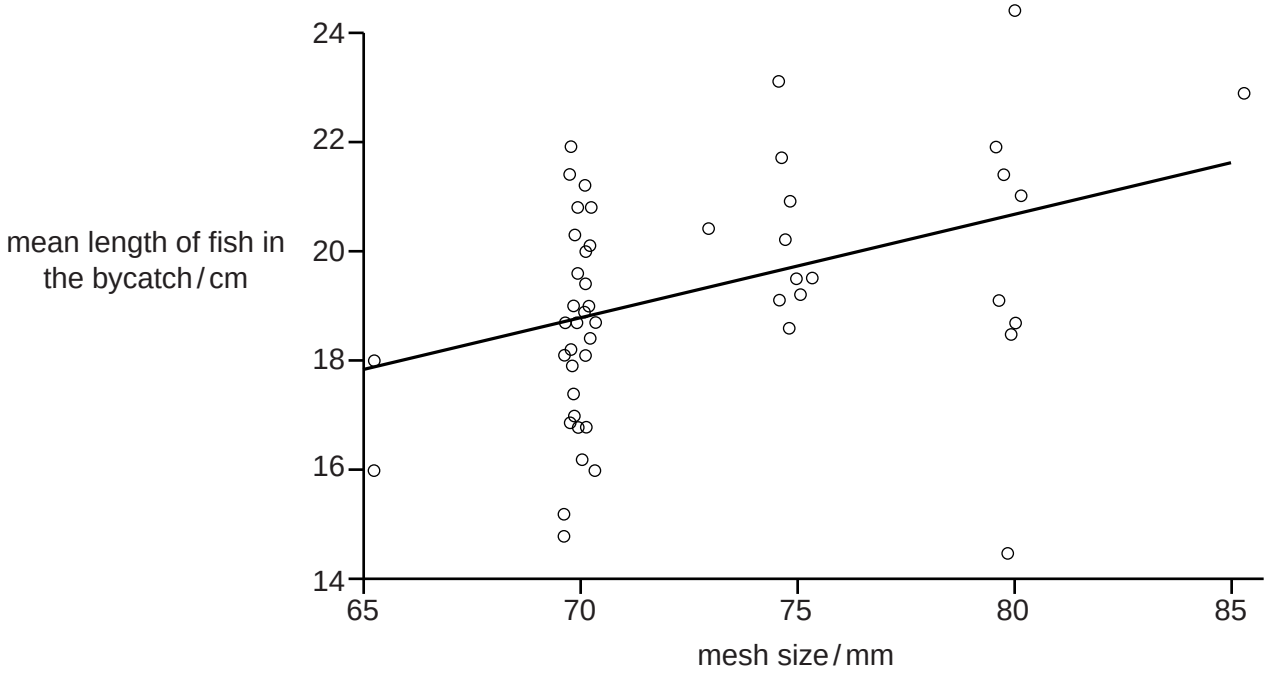



**Fig. 1.1**

**(i)** Describe the effect of increasing mesh size on the mean length of fish in the bycatch and evaluate the strength of the correlation.

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**(ii)** Suggest an explanation for the effect of mesh size on the mean length of fish in the bycatch.

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**(d)** Many of the species of fish found in the bycatch are of high commercial value. They are often discarded because governments place restrictions on fish quotas, and on the size of fish that may be landed.

Discuss the benefits and drawbacks of governments placing these restrictions on fishing fleets.

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[Total: 12]

**2** An investigation was carried out into the effects of salinity on the metabolism of a coral containing zooxanthellae.

A piece of coral was placed into a solution with a salinity of 3.6% and exposed to a range of light intensities.

The change in concentration of oxygen in the saline solution was measured after 30 minutes exposure to each light intensity.

The experiment was repeated with saline concentrations of 3.8% and 4.0%.

The results are shown in Fig. 2.1.

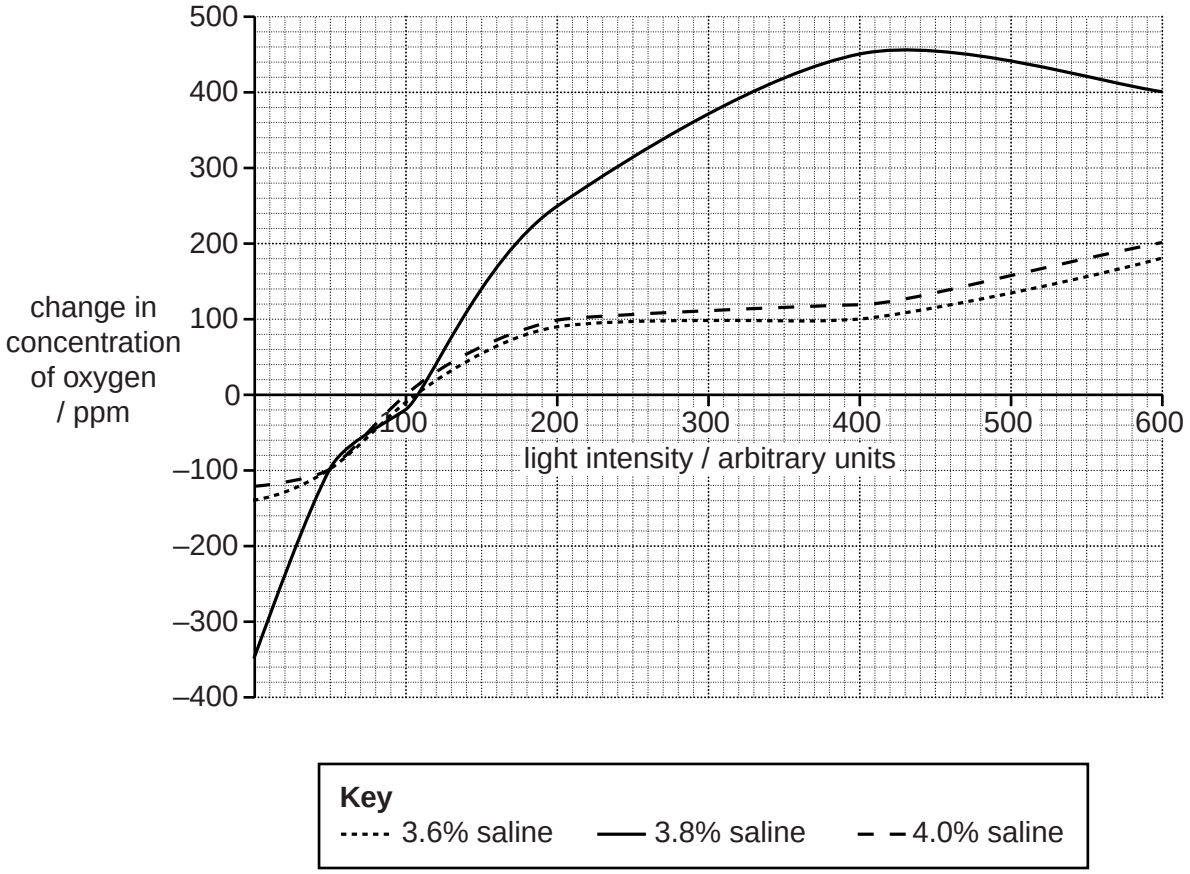


**Fig. 2.1**

**(a)** Describe the effect of increasing light intensity on the change in concentration of oxygen in the 3.8% saline solution.

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**(b)** Describe the effect of increasing salinity on the change in concentration of oxygen in the saline solutions.

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**(c)** Suggest an explanation for the effect of increasing salinity on the change in concentration of oxygen in the saline solutions.

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[Total: 8]



**[Turn over**

## Section B

Answer **all** questions in this section.

Write your answers in the spaces provided.

**3** **(a)** Explain, with specific examples, why large marine animals need specialised gas exchange surfaces.

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**(b)** Describe how efficient gas exchange is achieved in the grouper.

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**4** **(a)** The ship sturgeon is a species of sturgeon fish that until relatively recently was found in large numbers in the Aral Sea, a landlocked sea in central Asia. It was highly sought after by fishing industries that were abundant in the area.

The Aral Sea has shrunk because of poor management of irrigation systems, and the salinity has risen dramatically.

In order to prevent extinction of the ship sturgeon, fish were removed and placed into a nearby lake which did not previously contain the ship sturgeon. Eventually, it is planned to return the fish to the Aral Sea when conservation programmes have successfully restored the water levels.

Outline the arguments for and against preventing the extinction of the ship sturgeon. Suggest what factors the conservationists must consider before commencing the project.

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**(b)** Explain how the oil industry can have an impact on marine ecosystems.

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