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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9031063082

MARINE SCIENCE **9693/03**

Structured Questions **October/November 2013**

Paper 3

1 hour 30 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 on both sides of the paper.
You may use a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

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

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.

Electronic calculators may be used.

This document consists of **15** printed pages and **1** blank page.

1 The distribution of sea grasses was investigated in a coastal area of Florida. Fig. 1.1 shows the results of this investigation.

For Examiner's Use

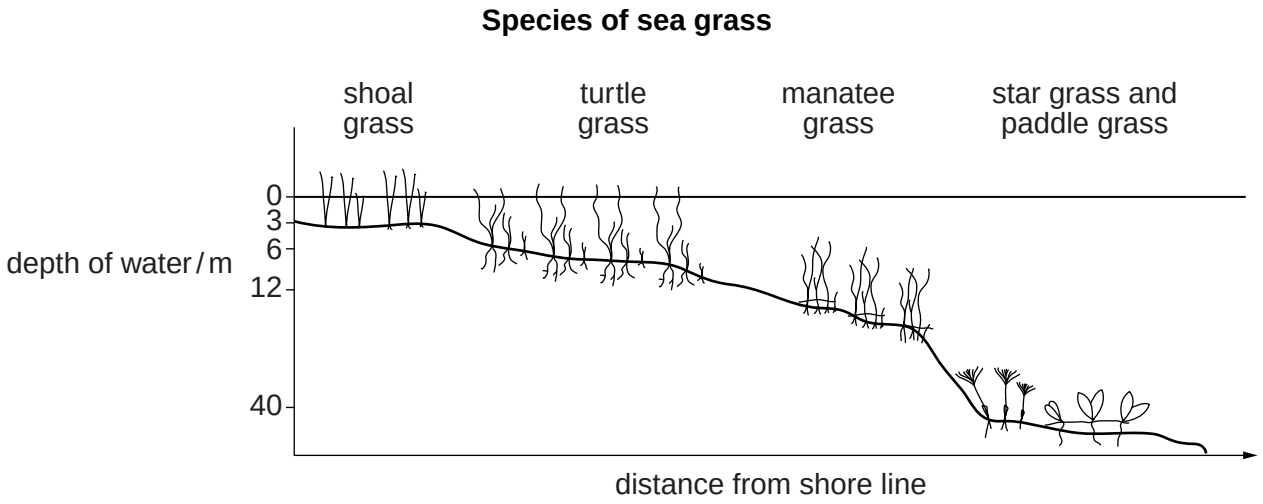

Fig. 1.1

(a) (i) Using the information in Fig. 1.1, describe the distribution of sea grasses.

.....

.....

.....

.....

.....

.....

.....

.....[4]

(ii) Suggest **two** environmental factors, other than depth, that may influence the distribution of sea grasses.

1 .....

.....

2 .....

.....[2]

(b) Two features of sea grass are

1 long horizontal stems with roots extending into the sea bed
2 thin ribbon-like leaves

For Examiner's Use

(i) Suggest how each of these features allows sea grass to survive in coastal areas.

feature 1 .....

.....

.....

feature 2 .....

.....

.....[2]

(ii) Suggest how the presence of sea grass helps to reduce coastal erosion.

.....

.....[1]

(iii) Sea grass and coral are often found in the same areas. Sea grass has a high nutrient requirement for both nitrogen and phosphorus. Coral grows well in clear, nutrient-poor water.

Suggest how the presence of sea grass provides a suitable environment for the growth of coral.

.....

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 12]

[Turn over

2 (a) (i) State what is meant by the term *osmoregulation.*

.....

.....[1]

(ii) Fig. 2.1 shows the movement of water and ions between the body of a marine bony fish and its environment.

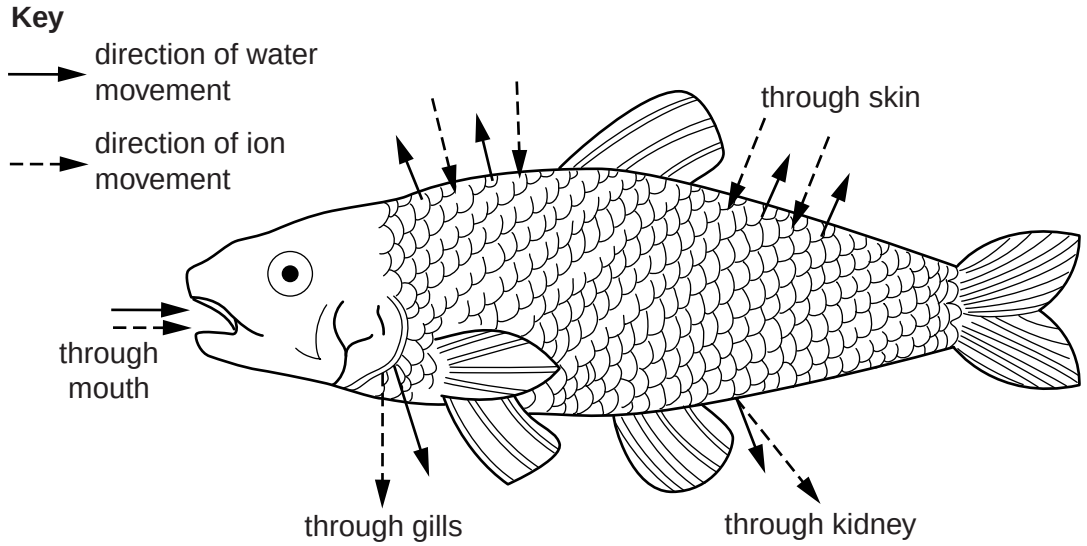

Fig. 2.1

With reference to Fig. 2.1, and your own knowledge, describe osmoregulation in this fish.

.....

.....

.....

.....

.....

.....

.....[4]

(b) (i) State what is meant by the term *euryhaline.*

.....

.....[1]

(ii) Give **one** example of a euryhaline fish.

.....[1]

Fig. 2.2 shows the movement of water and ions through the skin and mouth of a euryhaline fish in fresh water.

For Examiner's Use

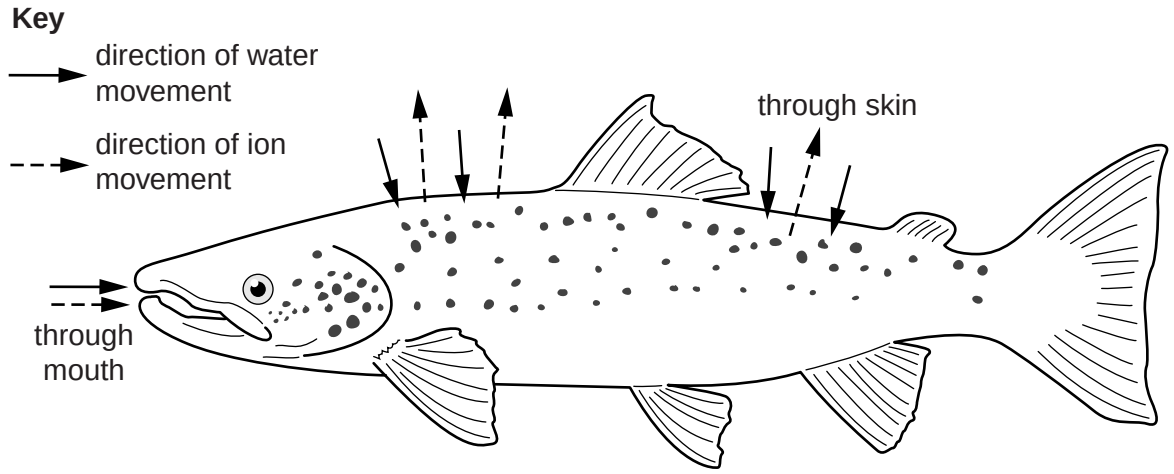

Fig. 2.2

(iii) On Fig. 2.2, draw arrows to show the direction of movement of ions and water through the gills. [2]

(iv) Explain the movement of ions and water through the skin of the fish.

.....

.....

.....

.....[2]

[Total: 11]

3 Fig. 3.1 shows the main stages in the life cycle of a grouper.

For Examiner's Use

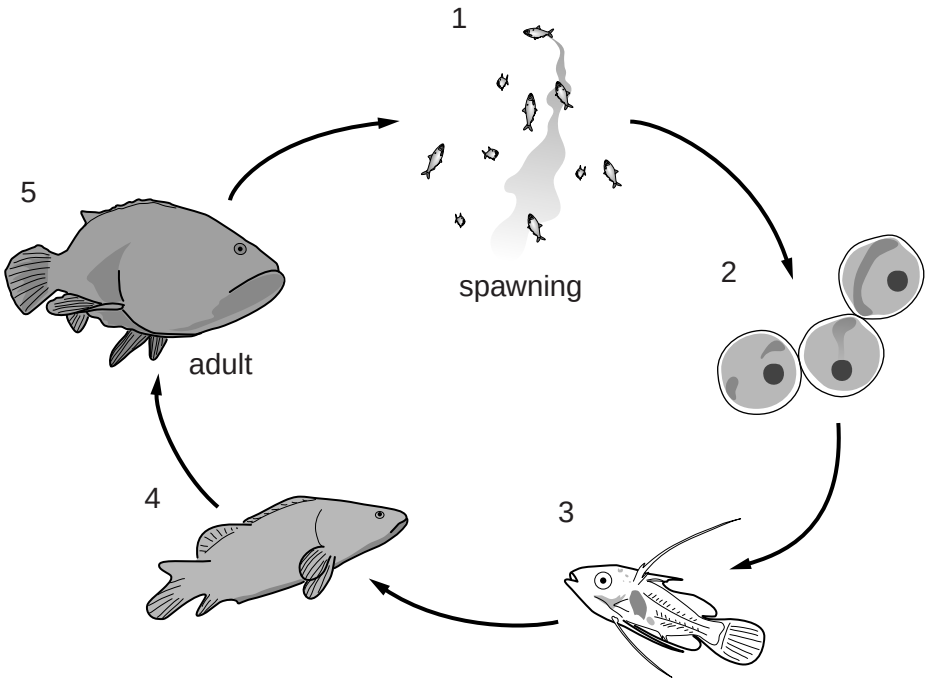

Fig. 3.1

(a) (i) Identify each of the stages labelled 2, 3 and 4 in Fig. 3.1.

2 .....

3 .....

4 ..... [3]

(ii) Complete Table 3.1 by stating the habitat in which each stage is found.

Table 3.1

stage	habitat
1	
2	
3	
4	

[4]

(b) Describe the similarities and differences between the life cycle of a grouper and the life cycle of a tuna.

For Examiner's Use

Similarities .....

.....

.....

.....

Differences .....

.....

.....

.....[3]

[Total: 10]

4 **(a)** Fig. 4.1 shows the concentration of carbon dioxide measured in the air from 1960 to 2010 at a monitoring station in Hawaii.

For Examiner's Use

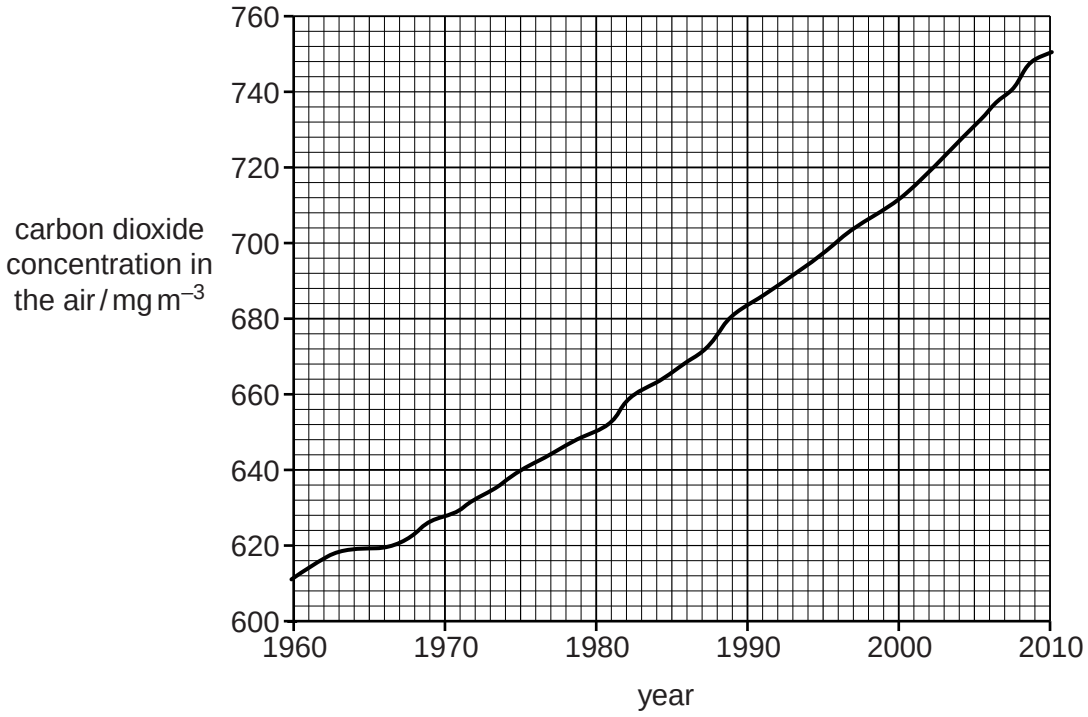

Fig. 4.1

(i) State the trend shown by Fig. 4.1.

.....

.....[1]

(ii) Calculate the mean rate of change of carbon dioxide concentration per year in the air during these fifty years. Show your working.

[2]

For Examiner's Use

(iii) State **three** ways in which human activity could have contributed to this change in carbon dioxide concentration.

1 .....

.....

2 .....

.....

3 .....

.....[3]

(iv) State **one** piece of evidence that suggests that this change in carbon dioxide concentration may not have been entirely caused by human activity.

.....

.....[1]

(b) Describe how this change in carbon dioxide concentration in the air could affect the marine environment.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....[5]

[Total: 12]

5 **(a)** Read the information about the supply of food for species produced by aquaculture.

For Examiner's Use

Data produced by the Fisheries and Agriculture Organization of the United Nations (FAO) shows that the world production of food for people by aquaculture increased from less than 1 million tonnes in 1950 to 52.5 million tonnes in 2008. It is predicted to continue to increase.

Most aquaculture systems provide food for the cultivated species by using fish from wild stocks, especially herring, anchovy, pilchard, mackerel and whiting. These are sometimes used as live fish, or sometimes processed to produce fish meal and fish oil.

Approximately one third of the world fish catch is used to produce fish meal and fish oil. Aquaculture uses over 85% of the fish meal and just over 50% of the fish oil produced.

The wild fish requirements to produce 1 kg of three farmed carnivorous species are listed.

- Marine shrimp 2 kg
- Salmon 4 kg
- Tuna 22 kg

Omnivorous and herbivorous fish, such as Tilapia and catfish, and filter feeders such as oyster and clams, can use food from plant sources so the requirement for fish meal and fish oil is limited. Trials using plant based food sources have not been successful for carnivorous fish.

(i) In 2000, Chile produced 263 000 tonnes of salmon by aquaculture.

If only wild fish were used to feed the salmon, calculate the number of tonnes required.
(1 tonne = 1000 kg.) Show your working.

[2]

(ii) Suggest why there is concern about the use of wild fish for feeding cultivated fish.

.....

.....

.....

.....

.....[3]

(iii) Suggest **one** way in which aquaculture could continue to expand without increasing the demand for fish meal and fish oil.

.....

.....[1]

(b) Kelp is a source of iodine and algin, which are used in a variety of ways, such as food processing, cosmetic manufacture and medicine.

For Examiner's Use

Fig. 5.1 shows two possible locations for an aquaculture development for cultivating kelp.

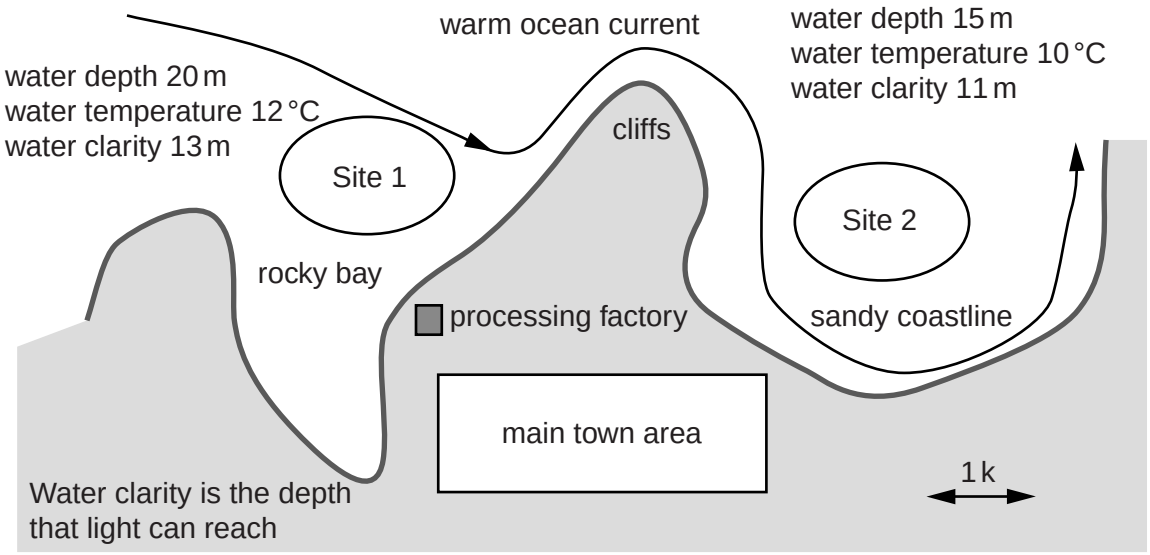

Fig. 5.1

(i) Describe the features that are suitable for kelp aquaculture at **both** sites.

.....

.....

.....

.....

.....

.....[3]

(ii) Explain why site 1 may be more suitable than site 2.

.....

.....

.....

.....

.....

.....[3]

[Total: 12]

6 Data about the type of species and quantity of each species of fish obtained from the sea for food production are collected yearly. When the quantity for a species falls below ten percent of the original catch, the species is said to be 'collapsed'.

For Examiner's Use

Fig. 6.1 shows the percentage of species collapsed between 1950 and 2006 and the predicted long term trend.

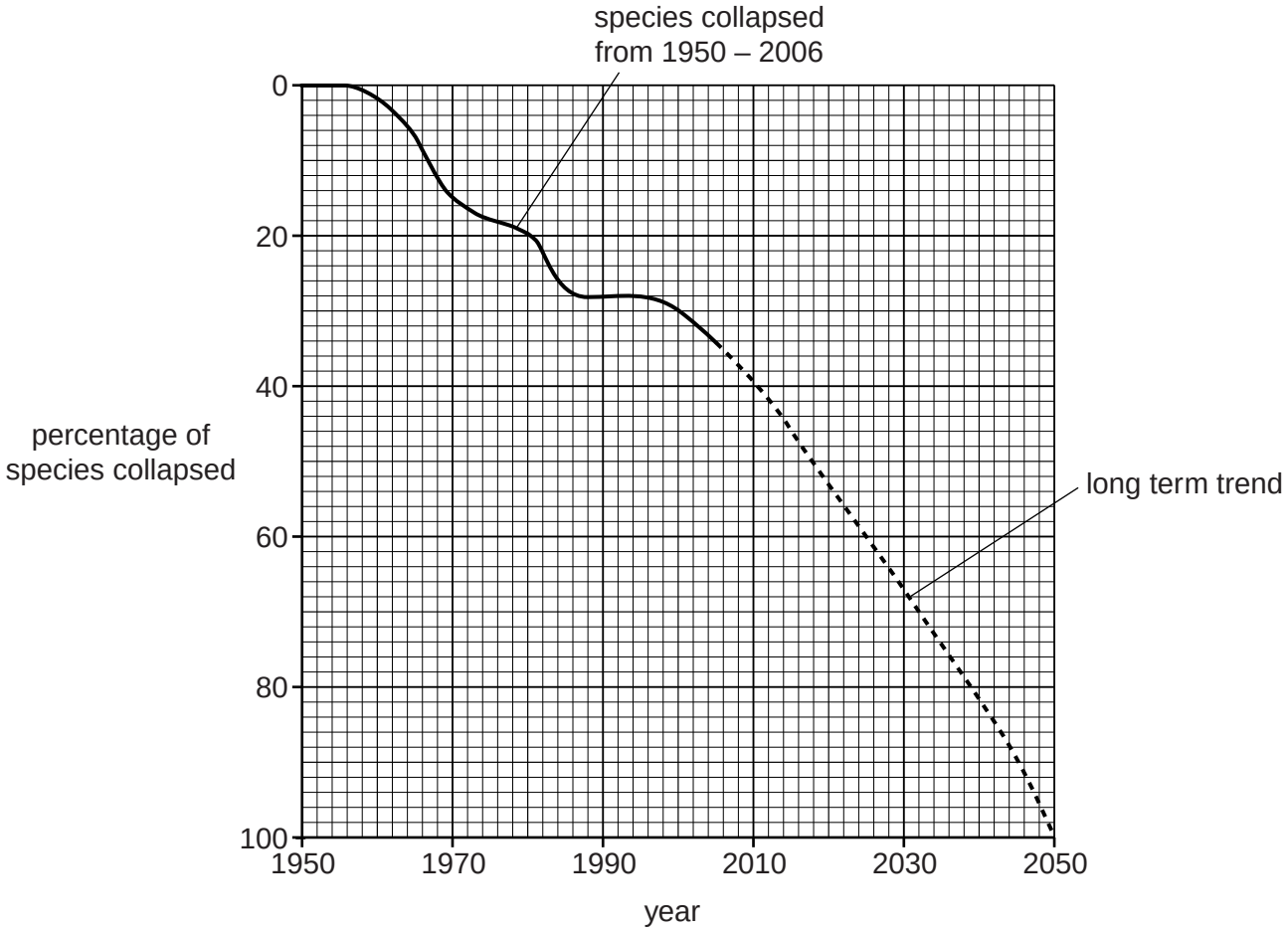

Fig. 6.1

(a) (i) Use Fig. 6.1 to find the predicted percentage of species collapsed by 2020.

.....[1]

(ii) Calculate the mean rate of percentage species collapse between 1950 and 2006. Give your answer to two significant figures.

[2]

(iii) Suggest an explanation for the collapse of these species.

.....

.....

.....

.....

.....

.....[3]

(b) One way in which wild fish stocks might be replenished is by releasing juvenile fish from cultivated stock.

Suggest **two** possible harmful effects of this method of replenishment.

1 .....

.....

2 .....

.....[2]

(c) **(i)** In 2006, Malaysia started a programme of mangrove replanting in an area that had previously been cleared for agriculture.

Suggest why mangrove replanting may improve wild fish stocks.

.....

.....

.....

.....[2]

(ii) State **two** other advantages of replanting mangroves.

1 .....

.....

2 .....

.....[2]

[Total: 12]

7 The dotted lines on Fig. 7.1 surround an area of the world called the Coral Triangle.

For Examiner's Use

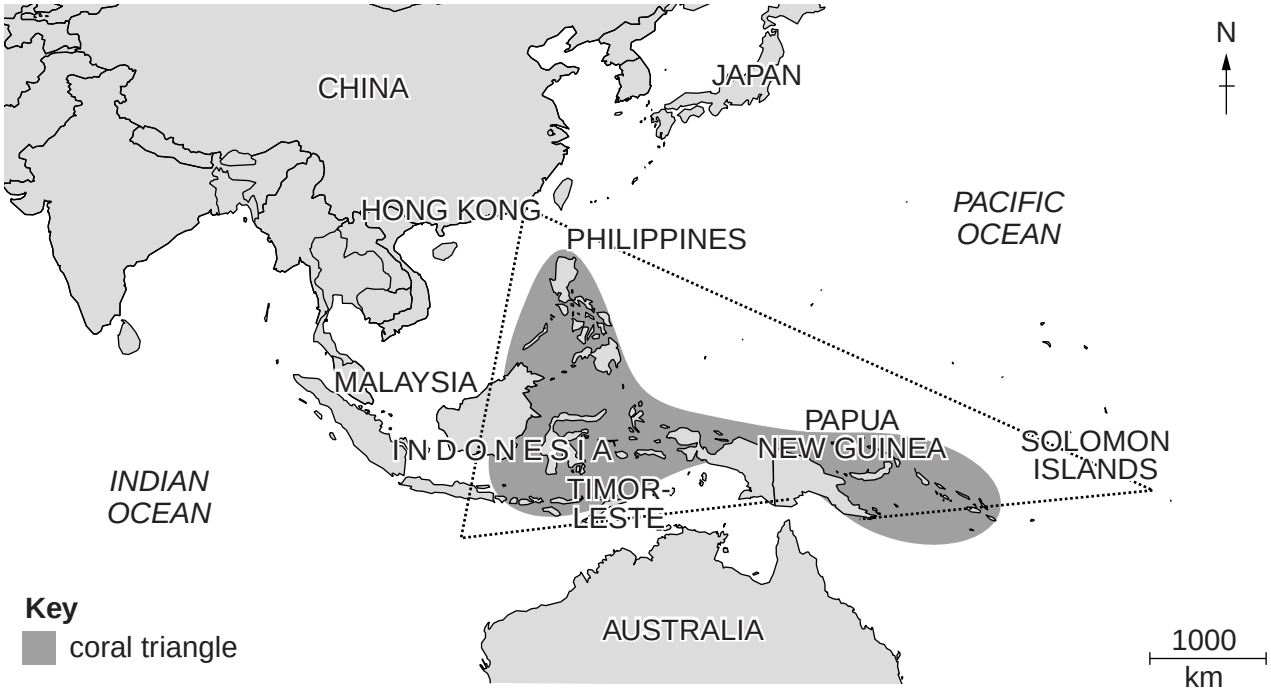

Fig. 7.1

According to a press release from the WWF in 2010, this region contains 75% of all known coral species, over half of the world's reefs, 40% of the world's reef fish species and six of the world's seven species of marine turtles.

A study in the marine reserve Komodo showed that half of the 200 species of reef building corals are under threat due to damage from illegal blast fishing.

Another study by the WWF in 2008 showed that the coral triangle is also being exploited by the trade in live-fish food. Fish are stunned, taken from the reef and kept live for food.

Historically, live-fish have always been traded on a small scale in this part of S.E. Asia, but recently the market has increased greatly in China, Hong Kong, Malaysia and Singapore.

Describe arguments for and against the conservation of areas such as the Coral Triangle.

(a) arguments for conservation

.....

.....

.....

.....

.....

.....

.....[3]

(b) arguments against conservation

For Examiner's Use

.....

.....

.....

.....

.....

.....

.....[3]

[Total: 6]

BLANK PAGE