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3

Changing ecosystems

3.1 Characteristics of the Antarctic ecosystem

The data below shows climate data for the American Amundsen-Scott station at the South Pole and for Manaus in the Amazon.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
South Pole (°C)	-28.2	-40.9	-54	-57.3	-57	-58	-59.7	-60	-54.9	-51.1	-38.3	-25.8	
Manaus, Amazon (°C)	28	28	28	27	28	28	28	29	29	29	29	28	

(Source: South Pole, Cool Antarctica.com; Manaus, *Philip's Modern School Atlas*)

1 a State the meaning of the term 'annual temperature range'.

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b Calculate the annual temperature range for the American Amundsen-Scott station at the South Pole and for Manaus in the Amazon.

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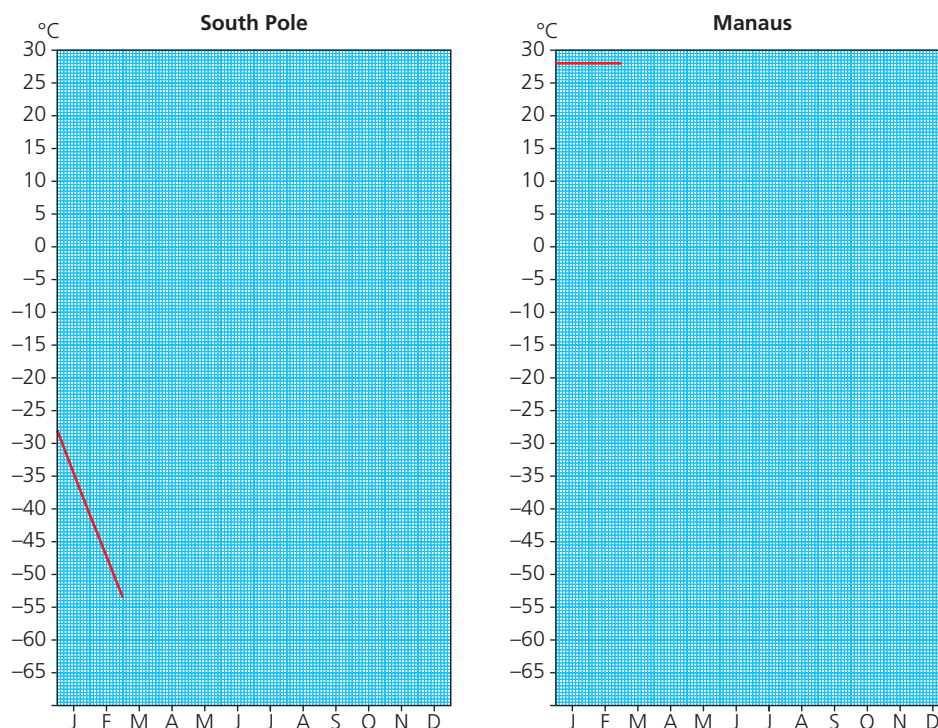
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c Calculate the average annual temperature for the South Pole and Manaus.

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2 a On the graphs below, complete the plot of mean average monthly temperature for the American Amundsen-Scott station at the South Pole and for Manaus in the Amazon.



3 CHANGING ECOSYSTEMS

- b Contrast the variations in the temperatures for the two locations.

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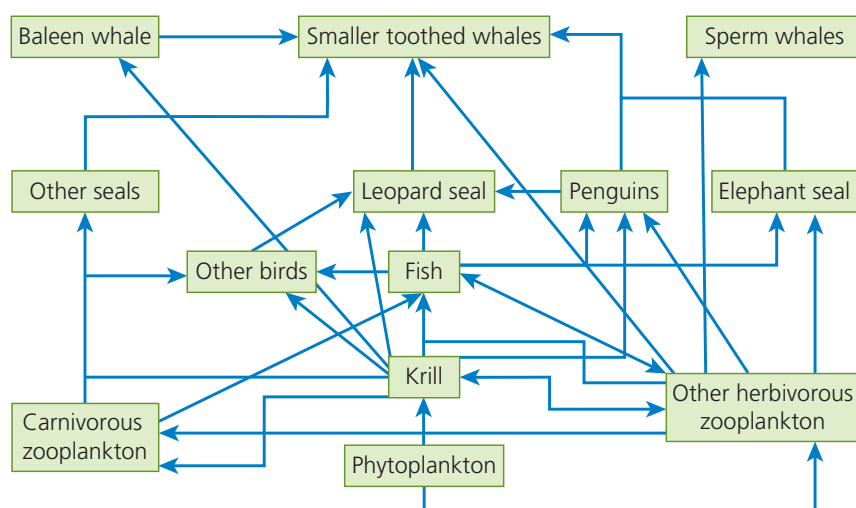
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The diagram below shows a food web in Antarctica.



- 3 State the type of environment in which this ecosystem is found.

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- 4 State the source of energy in this environment.

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- 5 Distinguish between food webs and food chains.

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6 In the diagram above, identify

a a producer

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b a herbivore

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c a primary predator/carnivore

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d a secondary predator/carnivore

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e the top carnivore in the ecosystem

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7 Using examples, outline the relationship between abiotic and biotic factors.

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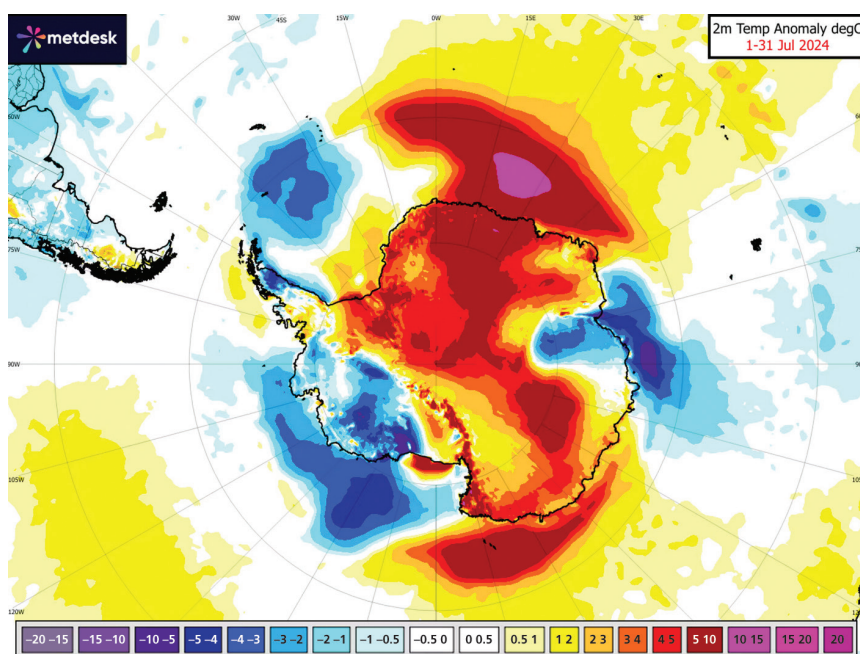
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3.2 Threats to the Antarctic ecosystem and how they can be managed

In July 2024, ice sheets in Antarctica experienced many temperature anomalies, such as temperatures that were significantly different from what would be expected for that time of year. Ground temperatures were, on average, 10°C above normal for July, and on some days they were as much as 28°C higher than expected. This happened as the world experienced 12 months of average temperatures of 1.5°C higher than pre-industrial level. Climate models have long suggested that the most significant impacts of global climate change would be in high latitude areas including Antarctica. Such warming could lead to the collapse of ice sheets. The heatwave was the second to hit Antarctica in two years. In March 2022, a spike of 39°C caused an ice sheet the size of Rome to collapse. Having less sea ice in the Southern Ocean and warmer temperatures in the ocean could produce warmer winters over Antarctica. Heatwaves over Antarctica are becoming more frequent.



[Source: Türkiye Today, 2024]

- 1 a Using an atlas, or other resource, describe the areas that experienced a reduction in temperature in Antarctica of -2.1°C or more in July 2024.

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- b Using an atlas, or other resource, describe the areas that experienced an increase in temperature in Antarctica of 4°C or more in July 2024.

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2 a Explain the term 'temperature anomaly'.

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b State how much higher average 2m temperatures were in July 2024 than the average for Antarctica.

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c State the maximum temperature anomaly that occurred in Antarctica in July 2024.

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3 Identify **two** impacts of increased temperatures on Antarctica's environment.

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4 Suggest the potential link between global climate change and increased temperatures in Antarctica.

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5 Name the countries that claim a right to Antarctica.

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6 According to the Antarctic Treaty, how should Antarctica be used?

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7 Outline the environmental protection offered by the Madrid Protocol.

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3 CHANGING ECOSYSTEMS

- 8 According to the Convention for the Conservation of Antarctic Marine Living Resources, how should fishing be conducted?

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- 9 How is whaling regulated in Antarctica?

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- 10 Outline the objectives of the UN Convention on the Law of the Sea.

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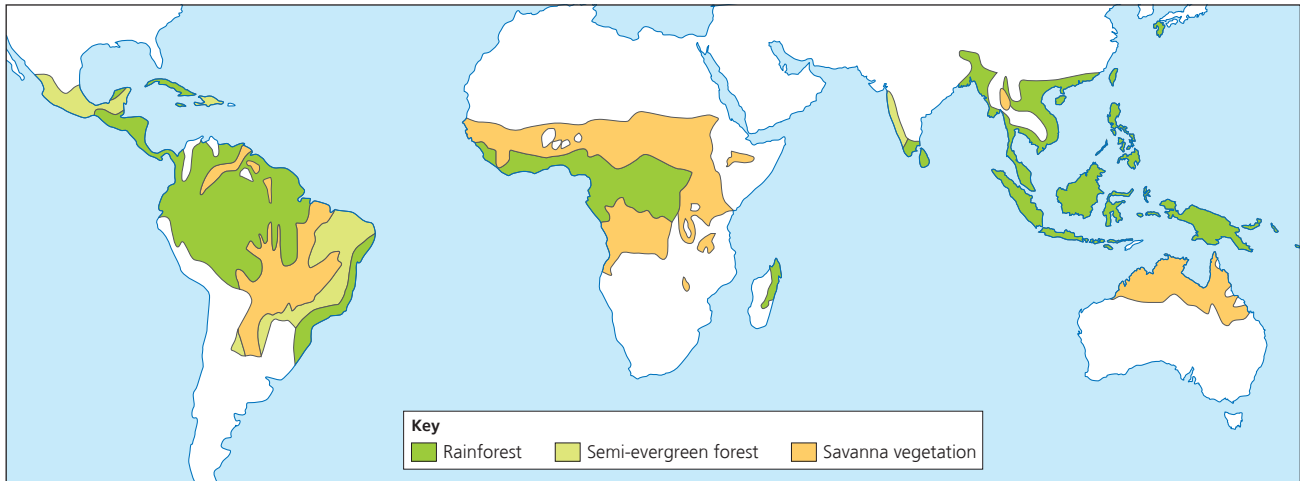
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3.3 Characteristics of the tropical rainforest ecosystem



1 Describe the location of areas of tropical rainforest.

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2 Identify the type of pressure system that is associated with areas of tropical rainforest.

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3 State the likely climatic conditions of this environment.

a Temperature

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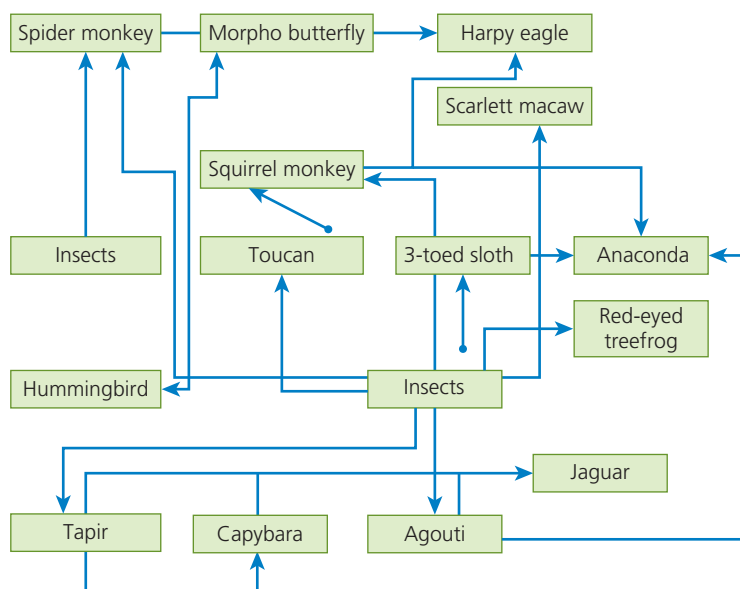
b Rainfall

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3 CHANGING ECOSYSTEMS

The diagram shows a rainforest food web.



4 For areas of tropical rainforest, identify:

a a primary producer

.....

b a herbivore

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c a carnivore

.....

5 Suggest why Harpy eagles and jaguars depend on different food sources.

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