

## CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

### MARK SCHEME for the May/June 2015 series

#### **9693 MARINE SCIENCE**

**9693/04**

Paper 4 (A2 Data-Handling and Free-Response),  
maximum raw mark 50

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

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Mark schemes will use these abbreviations:

<b>;</b>	separates marking points
<b>/</b>	alternatives
<b>()</b>	contents of brackets are not required but should be implied
<b>R</b>	reject
<b>A</b>	accept (for answers correctly cued by the question, or guidance for examiners)
<b>lg</b>	ignore (for incorrect but irrelevant responses)
<b>AW</b>	alternative wording (where responses vary more than usual)
<b>AVP</b>	alternative valid point (where a greater than usual variety of responses is expected)
<b>ORA</b>	or reverse argument
<b><u>underline</u></b>	actual word underlined must be used by candidate (grammatical variants excepted)
<b>max</b>	indicates the maximum number of marks that can be given
<b>+</b>	statements on both sides of the + are needed for that mark

<b>Question</b>	<b>Expected answers</b>	<b>Additional guidance</b>	<b>Marks</b>
<b>1 (a)</b>	<p>appropriate linear Y axis scale labelled mangrove area/ hectares x 1000 ;</p> <p>appropriate linear Y axis scale labelled CPUE / tonnes per boat day ;</p> <p>plots for mangrove area correct + key for line ;</p> <p>plots for CPUE correct + key for line ;</p> <p>two straight lines joining dots ;</p>		[5]
<b>(b)</b>	<ol style="list-style-type: none"> <li>1. as mangrove area decreases, CPUE decreases ;</li> <li>2. ref. time lag between mangrove area change and CPUE change ;</li> <li>3. between 1978 and 1982 a large increase in mangroves causes a small increase in CPUE ;</li> <li>4. other factors may be causing the CPUE decrease ;</li> <li>5. example of other factors, e.g. pollution from shrimp farms / overfishing ;</li> <li>6. (CPUE decline) may be a long term effect / takes a long time to recover ;</li> <li>7. manipulation of figures ;</li> </ol>		[max 4]

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<b>Question</b>	<b>Expected answers</b>	<b>Additional guidance</b>	<b>Marks</b>
<b>(c)</b>	1. (increased fish catches) improving income / employment ; 2. more food / more predictable food harvest ; 3. non-native species of fish / other species may increase / (idea of) over population of some fish species ; 4. (which) outcompete native species ; 5. (idea of) ecological imbalance / food chain effect ; 6. introduction of parasites ;		[max 4]
			<b>[Total 13]</b>
<b>2 (a)</b>	ref to 21.40 and 9.31 ; 2.30 ;		[2]
<b>(b)</b>	as diameter increase SA: Vol ratio decreases ;		[1]
<b>(c)</b>	lower SA: Vol ratio ; slow rate of diffusion / reduced diffusion ; require a steep diffusion gradient ; high metabolic rate of the egg ;	must have idea of gradient	[max 2]

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Question	Expected answers	Additional guidance	Marks
(d)	<p>high metabolic rate of fry ;</p> <p>high glucose / fat levels in yolk ;</p> <p>longer time before hatching ;</p> <p>requires more glucose / fat reserves ;</p> <p>lack of natural food in water ;</p> <p>yolk provides nutrients for first few weeks ;</p> <p>maternal health / age / size / diet ;</p> <p>affecting nutrients available ;</p> <p>number of eggs produced ;</p> <p>large numbers with small yolk / few eggs with larger yolks ;</p>	<i>accept converse for all pairs</i>	[max 2]
			<b>[Total 7]</b>
3 (a) (i)	<ol style="list-style-type: none"> <li>1. (DNA) promoter ;</li> <li>2. from ice fish / pout ;</li> <li>3. growth gene ;</li> <li>4. recombinant plasmids / vectors ;</li> <li>5. ref to endonuclease / ligase ;</li> <li>6. microinjection / electroporation ;</li> <li>7. into egg / early embryo ;</li> <li>8. selection of {eggs / fry} / use of marker genes ;</li> </ol>		[max 5]

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Question	Expected answers	Additional guidance	Marks
(ii)	<p><i>advantages:</i></p> <ol style="list-style-type: none"> <li>reach {market / harvest} size faster ;</li> <li>profitability / cheaper for consumers ;</li> <li>less food wastage ;</li> <li>less pollution ;</li> <li>reduce pressure on wild stocks ;</li> </ol> <p><i>disadvantages:</i></p> <ol style="list-style-type: none"> <li>escape into wild ;</li> <li>competition with wild salmon ;</li> <li>damage to food chains / webs ;</li> <li>loss of profit for fishermen ;</li> <li>negative public opinion / consumer resistance ;</li> </ol>		[max 5]
(b)	<ol style="list-style-type: none"> <li>(organic waste) decomposes ;</li> <li>bacterial (action) ;</li> <li>oxygen reduction ;</li> <li>death of fish / crustacean / shrimp (due to lack of oxygen) ;</li> <li>mineral release leading to algal bloom ;</li> <li>(ref to) eutrophication ;</li> <li>pathogenic bacteria / virus release ;</li> <li>detergents ;</li> <li>turbidity / sediment reducing photosynthesis ;</li> </ol>		[max 5]
			<b>[Total 15]</b>

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Question	Expected answers	Additional guidance	Marks
4 (a)	<p><i>for:</i></p> <ol style="list-style-type: none"> <li>maintaining / increasing biodiversity ;</li> <li>preserve ecological balance / food webs ;</li> <li>(the species) keeps populations of prey controlled ;</li> <li>(the species is) a food source / habitat ;</li> <li>human ethical “duty” / preserving species for future generations / preventing extinction ;</li> <li>(possible use as) food stock / medicine / commercial value ;</li> </ol> <p><i>against:</i></p> <ol style="list-style-type: none"> <li>high cost ;</li> <li>overpopulation / overconsumption of prey species / damage to other species ;</li> </ol>		[max 5]

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<b>Question</b>	<b>Expected answers</b>	<b>Additional guidance</b>	<b>Marks</b>
<b>(b)</b>	<ol style="list-style-type: none"> <li>1. fishing without reducing fish stocks / up to MSY ;</li> <li>2. restrict season / time of year / breeding times ;</li> <li>3. (fish reach) breeding age / reproductive maturity ;</li> <li>4. restrict method / use of pole and line ;</li> <li>5. have minimum mesh size to allow juveniles to escape ;</li> <li>6. restrict size (of fish) ;</li> <li>7. quotas ;</li> <li>8. restrictions on certain species ;</li> <li>9. refuge zones / restricted zones / nursery zones ;</li> <li>10. restrict boat days / boat sizes / engine size / fishing intensity ;</li> <li>11. marketing tools / promote eco-friendly catch ;</li> <li>12. monitor with air and sea patrols ;</li> <li>13. satellite monitoring ;</li> <li>14. catch inspections ;</li> <li>15. law enforcement (laws / fines / confiscations of boats and catches / imprisonment) ;</li> <li>16. licenses ;</li> </ol>		[max 10]
			<b>[Total 15]</b>