# 18. Classification, Biodiversity and Conservation

## 18.2 Biodiversity

## Paper 4

Marking Scheme

## Q1.

| | | |
|---|---|---|
| (c)(i) | *G. hapalotricha* $\frac{n}{N} = 0.194$ **and** $\left(\frac{n}{N}\right)^2 = 0.037$ ;<br><br>$\left(\frac{n}{N}\right)^2$ total = 0.272 ;<br><br>*D* = 0.728 ; | **3** |
| (c)(ii) | undisturbed / higher D, has, larger / higher / more, (food), diversity / variation ; | **1** |

## Q2.

| | | |
|---|---|---|
| (b)(i) | *any* ***three*** *from:*<br><br>**1** measures / gives information about, air, quality / pollution ;<br>**2** other species may be harmed by, sulfur dioxide / acid rain / decrease in lichen (abundance / diversity) ;<br>**3** *ref. to* food web / species that feed on lichens ;<br>**4** AVP ; | **3** |

## Q3.

| | | |
|---|---|---|
| (d) | (24 × 29) ÷ 8 ;<br>= 87 ; | **2** |

## Q4.

| | | |
|---|---|---|
| (a)(i) | **1** (self-contained unit containing) community of / all / different, organisms / populations / species, **and** their interactions ;<br>**2** (with the) biotic and abiotic, environment / factors **OR** with each other and with the physical environment ; | **2** |
| (a)(ii) | role / function, of a species within its, ecosystem / habitat ; | **1** |
| (b)(i) | (interrupted belt) transect ; | **1** |
| (b)(ii) | *were assessed:*<br>**1** abundance / density / (%) frequency / % cover, of (selected) species ;<br><br>*not assessed:*<br>**2** number / range, of (different), ecosystems / habitats ;<br>**3** genetic, variation / diversity (within each species) ; | **3** |

## Q5.

| | | |
|---|---|---|
| (a) | 1 dye / paint / clipping fur / collar / electronic chip ;<br>2 death / birth / reproduction ;<br>3 Lincoln ;<br>4 repeated / replicated ; | **4** |

## Q6.

| | | |
|---|---|---|
| (a) | 1 number of / range of (different), ecosystems / habitats ;<br>2 number of species and their relative abundance ; | **2** |

| | | |
|---|---|---|
| (c)(i) | *Anopheles* ; | **1** |
| (c)(ii) | three / 3 ; | **1** |

## Q7.

| | | |
|---|---|---|
| (a)(ii) | **1** $\frac{29000-7000}{2000-1950}$ **or** $\frac{29000-7000}{50}$ $\frac{22000}{50}$ ;<br>**2** 440 ; | **2** |

## Q8.

| | | |
|---|---|---|
| (a) | *any **three** from:*<br>1 marking, not harmful (described) / cannot be removed (described) ;<br>2 constant population size ;<br>3 no, births / deaths (described)<br>**or**<br>no, immigration / emigration / migration ;<br>4 (sufficient time for) marked individuals to mix with rest of population ;<br>5 (penguins are) mobile ; | **3** |

## Q9.

| | | |
|---|---|---|
| (a)(iv) | *insects*<br>$\frac{1024\,945}{1438\,805}(\times 100)$ ;<br>71 ;<br><br>*ecf – accept 1 mark if wrong data chosen*<br><br>e.g. $\frac{\text{insects}}{\text{arthropods}}$ $\frac{1024\,945}{1191770}(\times 100) = 86$<br><br>$\frac{\text{arthropods}}{\text{animals}}$ $\frac{1191770}{1438\,805}(\times 100) = 83$ | **2** |

## Q10.

| | | |
|---|---|---|
| (a) | *Fig. 5.1:* species ;<br><br>*Fig. 5.2:* genetic ;<br><br>*Fig. 5.3:* habitat / ecosystem ; | **3** |

| | | |
|---|---|---|
| (b)(i) | *plants:*<br>1 quadrats ;<br><br>2 transects ;<br><br>3 *ref. to* use, ACFOR / Braun-Blanquet<br>**or**<br>estimate percentage cover (of species)<br>count species<br>calculate plus species abundance<br>record species density<br>AW species frequency ;<br><br>*insects:*<br>4 pooters / pitfall traps / nets / light traps / sugar traps ;<br><br>5 mark-release-recapture ;<br><br>*accept in either section:*<br><br>6 (identification) keys ; | **4** |
| (b)(ii) | *estimate biodiversity:* Simpson's index (of biodiversity) ;<br><br>*test relationship:* Pearson's linear correlation coefficient / Spearman's rank correlation ; | **2** |

| | | |
|---|---|---|
| (c) | *any **three** from:*<br><br>*negative*<br>1 smaller crop area so lower yield ;<br><br>2 prairie strip insects may feed on crop ;<br><br>3 (so) less, profit / income ; *must be linked to mp1 or mp2*<br><br>*positive*<br>4 (soil) more fertile / described, so higher yield ;<br><br>5 less / no, fertiliser / phosphorus compounds / nitrogen compounds, used ; **ignore** minerals<br><br>6 (so) more, profit / income<br>**or**<br>reduction in expenses ; *must be linked to mp4 or mp5* | **3** |

## Q11.

| | | |
|---|---|---|
| (a) | *any **four** from:*<br>1 use random sampling (technique) ;<br>2 repeat and find mean / multiply estimates up for whole area ;<br>3 (frame) quadrats to measure, plants / vegetation / stationary organisms ;<br>4 detail of using quadrat ;<br>5 mark-release-recapture for (named) animals ;<br>6 detail of, trapping / marking, (named) animals ;<br>7 calculate / use, Simpson's index (of diversity) ;<br>8 species richness and, (relative) abundance / species evenness ;<br>9 AVP ; | **4** |

## Q12.

| | | |
|---|---|---|
| (a) | *any **four** from:*<br>1 *ref. to* use of quadrats ;<br>2 *ref. to* size (of quadrat) ;<br>3 grid marked out ;<br>4 use of random number generator<br>5 measure species frequency ;<br>6 use of key *or* Braun Blanquet / other named, scale ;<br>7 measure, species abundance / percentage cover ;<br>8 repeat sampling ;<br>9 both sites treated the same ; | **4** |
| (b)(i) | 0.23 and 0.05 ; | **1** |
| (b)(ii) | $\Sigma (n \div N)^2 = 0.19$ ;<br>$D = 0.81$ ; | **2** |
| (b)(iii) | field **A** has a higher species diversity than field **B** ; | **1** |

## Q13.

| | | |
|---|---|---|
| (a) | *any **five** from:*<br>**1** mark–release–recapture ;<br>**2** capture (sample of) rats **and** count them ;<br>**3** *ref. to* humane traps ;<br>**4** mark so as to not adversely affect rats<br>**or**<br>describe method of marking such as, tagging / using dyes ;<br>**5** return to where they were caught / AW ;<br>**6** allow time to mix (with population) / AW ;<br>**7** capture second sample ;<br>**8** count number caught **and** number marked ;<br>**9** population size estimate ($M_1$) =<br>$\frac{\text{number in first sample } (N_1) \times \text{number in second sample } (N_2)}{\text{number in second sample that are marked } (M_2)}$ ;<br>**10** AVP ; e.g. repeat | **5** |

| | | |
|---|---|---|
| (b)(i) | $r_s = 1 - \left(\frac{6 \times 164}{8^3 - 8}\right)$<br>**or**<br>$= 1 - \left(\frac{984}{504}\right)$<br>**or**<br>$= 1 - 1.95$ ;<br>$r_s = -0.95$ ; | **2** |
| (b)(ii) | there is a strong correlation ;<br>negative correlation / as the altitude increases the mean height of the soft rush decreases ; | **2** |

## Q14.

| | | |
|---|---|---|
| (a) | *any **three** from:*<br>1 functional / self-contained / specific, entity / unit / area ;<br>2 community (of organisms) / all living organisms of all species / all populations of organisms ;<br>3 *ref. to* interactions ;<br>4 abiotic / physical, and, biotic / biological, factors ; **A** living and non-living<br>5 *idea that* linked by, energy flow / mineral cycling / food webs / food chains / nutrient cycle ; | **3** |
| (b) | niche ;<br>species ;<br>abiotic ; | **3** |

**Q15.**

| | | |
|---|---|---|
| (a) | 1 **C** ;<br>2 greater / highest / most, number of (plant + insect) species / species richness ;<br>3 greater / highest / most, number of habitats ; | **3** |
| (b) | area **A** because if one species, increases / decreases (in abundance), this may affect the whole, community / food web / ecosystem ; | **1** |
| (c) | *any **one** from:*<br>1 species may have, medicinal / economic / aesthetic, benefits ;<br>2 (to maintain) genetic diversity / genetic variation / alleles ;<br>3 *ref. to* ethical / moral / stewardship ; | **1** |