※ 注意：請於試卷上依序作答，並應註明作答之大題及其題號。

I. In each pair of the following 3 questions, choose the best sentence (A or B in each question) that you think better fulfill the reporting format for academic writing: (5% each example, 15% totally).

1

(A) Drosophila's sex determination has been demonstrated by sex hormone concentration (Stuwart 2004). However, Stace's recent finding suggests sex determination is mainly controlled by environmental cues and SPE gene. No concrete conclusion can be made until now because they dealed with different kind of Drosophila's species.

(B) Stace (2005) speculate Drosophila's sex determination is mainly controlled by environmental cues and SPE gene. Drosophila's sex can also be controlled by sex hormone concentration (Stuwart 2004). Therefore no concrete conclusion can be made.

2

(A) Ordle (1998) found the DNA molecule can be altered by adding "STA" enzyme. He discovered this accidentally that STA happened to unwind DNA structure, rather than "STB", another enzymed supposed to added in one of his early experiments.

(B) Ordle (1998) found a kind of enzyme called "STA" which is very interesting in that it can alter DNA structure. He found this by accident. In one of his another experiment, he wrongly put "STA" instead of "STB" into solution. Then a strange result happened although he could not sort it out at the very beginning.

3

(A) The author argued that artificial insulin may have potential damage to high blood pressure patient (Trout 2001). Insulin's chemical reaction is to bind cell membrane and stimulate *PHYA* signal transduction pathway.

(B) Artificial insulin may have potential damage to high blood pressure patient (Trout 2001). The reason is because the *PHYA* signal transduction pathway can be wrongly induced by this kind of insulin.

II. Error recognition: Identify the one underlined usage that should be changed for correction in the following sentences and write down the correct usage instead (4% each, 20% totally).

For example:

Scientists say an enzyme in the brain that monitors energy in the cells also appear to regulate
(A) (B)
appetite and weights, a discovery that could lead to new treatments for obesity.
(C) (D)

Answer: (C) weight

見背面

4. Many people resist genetic modified foods since they think these food refinements may
(A) (B) (C)
be poison to them. In addition, these foods now sell to many Third World countries.
(D) (E)

5. Subtly, Maddison (1998) inferred that previous publications did not support his
(A) (B) (C)
preliminary results might be due to the problem of sampling.
(D) (E)

6. Our experimental design is far superior than any other methods in academic field.
(A) (B) (C)
Those who unable to carry out reliable replicates should try to take our suggestions.
(D) (E)

7. By dissolving ammonium salt in the extraction buffer helped the DNA from plant
(A) (B) (C) (D)
tissue segregate into aqueous layer.
(E)

8. Another way to mark the migrating ants in the population is to set up a catching trap.
(A) (B)
If this might harm to the ants, for instance, you can spread a dye along their path around
(C) (D) (E)
nest to mark individuals.

III. Write a small argument to reply a reviewer's comment on your recently submitted paper. Here below is the reviewer's comment. Suppose that although your data partly support this statement but it is really more speculative than a firm result. Write down your reply to convince the reviewer **(15%).**

Your writing:

- Page 14, lines 18-22. Our finding might indicate that populations occurring at higher latitude within a particular lake region were the source of the founders for the populations occurring at lower latitudes in the same lake region

Reviewer's comment

What are the evidences for this assertion?
The authors conclude this after to have cited Toledo (1982), who has studied historical changes in

接次頁

distribution of tropical vegetation in a continental scale. Is there any analysis showing that the genetic variation in a population is a subset of the variation harbored by other one?

9. Your reply?

IV. Select only ONE best answer to each question (2.5% for each, 50% totally).

※ 注意：本大題請於「選擇題作答區」依序作答。

Detecting range shifts and contractions is critical for determining the conservation priority of rare and declining taxa. However, data on rare species occurrences frequently lack precise information on locations and habitats and may present a biased picture of biogeographic distributions and presumed habitat preferences. Herbarium or museum specimen data, which otherwise could be useful proxies for detecting temporal trends and spatial patterns in species distributions, pose particular challenges. Using data from herbaria and Natural Heritage Programs on numbers of occurrences within individual municipalities (towns, cities, or townships), we quantified temporal changes in the estimated distributions of 110 rare plant species in the six New England (USA) states. We used the partial Solow equation and a nonparametric test to estimate the probability of observing multiple absences (gaps in the collection record) if a given population was actually still extant. Bayes' Theorem was used to estimate the probability that occurrences were misclassified as extinct. Using the probabilities obtained from these three methods, we eliminated taxa with high probabilities of pseudo-absence (that would yield an inaccurate profile of species distributions), narrowing the set for final analysis to 71 taxa. We then expressed occurrences as centroids of town polygons and estimated current and historical range areas (extents of occurrence as defined by α-hulls inscribing occurrences), mean distances between occurrences, and latitudinal and longitudinal range boundaries. Using a geographic information system, we modeled first, second, and third circular standard deviational polygons around the mean center of the historical range. Examining the distribution of current occurrences within each standard deviational polygon, we asked whether ranges were collapsing to a center, expanding, fragmenting, or contracting to a margin of the former range. Extant ranges of the species were, on average, almost 67% smaller than their historical ranges, and distances among occurrences decreased. Five New England hotspots were observed to contain >35% of rare plant populations. Extant occurrences were more frequently marginalized at the periphery of the historical range than would be expected by chance. Coarse-grained data on current and historical occurrences can be used to examine large suites of species to prioritize taxa and sites for conservation.

1. Where are the study sites?
   (a) California and Oregon
   (b) European countries
   (c) six New England states
   (d) Florida and North Carolina
   (e) Michigan and Ohio

2. What kind of data of used in this study?
   (a) Field collection
   (b) Laboratory data
   (c) Generated from simulation
   (d) Donated by amateurs
   (e) Museum collection

3. According to the paragraph, which of the following statements is incorrect?
   (a) Determining the conservation priority of rare and declining taxa can base on detecting range shifts and contractions.
   (b) Herbarium or museum specimen data could be useful proxies for detecting temporal trends and spatial patterns in species distributions

見背面

(c) Bayes' Theorem is a technique to estimate the probability of species occurrence
(d) GIS can be used to model species distribution
(e) Coarse-grained data on current and historical occurrences may not be useful in examining large suites of species to prioritize taxa and sites for conservation

4. What does "the hotspots" mean?
(a) Areas of low species richness
(b) Areas of high species richness
(c) Areas of low conservation value
(d) Areas of abundant population for certain species
(e) Areas of high priority

5. What does the term "coarse-grained data" refer to in the paragraph?
(a) Large scale data
(b) Small scale data
(c) Inaccurate data
(d) Herbarium specimen data
(e) Field collected data

Tree islands are centers of biodiversity within the Florida Everglades, USA, but the factors controlling their distribution, formation, and development are poorly understood. We use pollen assemblages from tree islands throughout the greater Everglades ecosystem to reconstruct the timing of tree island formation, patterns of development, and response to specific climatic and environmental stressors. These data indicate that fixed (teardrop-shaped) and strand tree islands developed well before substantial human alteration of the system, with initial tree island vegetation in place between 3500 and 500 calibrated years before present (cal yr BP), depending on the location in the Everglades wetland. Tree island development appears to have been triggered by regional- to global-scale climatic events at 2800 cal yr BP, 1600–1500 cal yr BP, 1200–1000 cal yr BP (early Medieval Warm Period), and 500–200 cal yr BP (Little Ice Age). These periods correspond to drought intervals documented in Central and South America and periods of southward displacement of the Intertropical Convergence Zone. The records indicate a coherence of climate patterns in both subtropical North America and the Northern Hemisphere Neotropics. Water management practices of the 20th century altered plant communities and size of tree islands throughout the Everglades. Responses range from loss of tree islands due to artificially long hydroperiods and deep water to expansion of tree islands after flow reductions. These data provide evidence for the rapidity of tree island response to specific hydrologic change and facilitate prediction of the response to future changes associated with Everglades restoration plans.

6. According to the paragraph, which of the following statements is incorrect?
(a) The greater Everglades ecosystem is located in Florida
(b) This study used pollen data to construct the patterns of development of tree islands
(c) The development of tree island was triggered by regional- to global-scale climatic events
(d) The loss of tree islands is attributed to artificially long hydroperiods and deep water to expansion of tree islands after flow reductions
(e) Water management practices of the last century didn't alter plant communities and size of tree islands throughout the Everglades

7. According to the paragraph, this study was conducted in
(a) Forests
(b) Wetlands
(c) Urban region
(d) Wooded areas
(e) River ecosystem

8. The Everglades restoration plan is a project to

接次頁

(a) Protect the nature beauty
(b) Promote the sustainability of the greater Everglades ecosystem
(c) Preserve the natureness of the Evergaldes
(d) Promote wildlife conservation
(e) Restore the original status of the greater Everglades ecosystem after human-induced impact

Dynamite or "blast" fishing is one of the most immediate and destructive threats to coral reefs worldwide. However, little is known about the long-term ecosystem effects of such blasts or the dynamics of recovery. Here, we examine coral reef recovery in the simplest case of acute single blasts of known age, as well as recovery from chronic blasting over greater spatial and temporal scales. Rubble resulting from single blasts slowly stabilized, and craters filled in with surrounding coral and new colonies. After five years, coral cover within craters no longer differed significantly from control plots. In contrast, extensively bombed areas showed no significant recovery over the six years of this study, despite adequate supply of coral larvae. After extensive blasting, the resulting coral rubble shifts in ocean currents, forming unstable "killing fields" for new recruits. While recently tested rehabilitation methods might be feasible on a small scale, human intervention is unlikely to be effective on large spatial scales, highlighting the need for effective management to prevent blast fishing in the first place.

9. What does the "dynamite fishing" mean?
(a) A fishing technique
(b) A fishing based on boat
(c) A fishing method using large quantity of nets
(d) A fishing technique based on explosive materials
(e) A less destructive approach to fishing

10. What is the conclusion of this study?
(a) Dynamite fishing is one of the most destructive threats to coral reef
(b) Coral reef can recover quickly from dynamite fishing
(c) Human intervention is not effective approach to large spatial scales restoration of coral reef
(d) After extensive blasting, the resulting coral rubble formed unstable "killing fields" for new recruits
(e) It takes only four year after blasting for the coral reef to restore to its original status

11. According the paragraph, to protect the coral reef, it is important to
(a) use dynamite fishing
(b) design effective management plan to prevent blast fishing in the first place
(c) minimize the use of dynamite in fishing
(d) protect marine resources
(e) leave as it is without human intervention

12. Do you know these is a coral reef site in Taiwan also under severe dynamite fishing threats?
(a) Kinmen
(b) Dongsha
(c) Penghu
(d) Green Island
(e) Kenting

While the importance of spatial scale in ecology is well established, few studies have investigated the impact of data grain on conservation planning outcomes. In this study, we compared species richness hotspot and representation networks developed at five grain sizes. We used species distribution maps for mammals and birds developed by the Arizona and New Mexico Gap Analysis Programs (GAP) to produce 1-km^2, 100-km^2, 625-km^2, 2500-km^2, and 10 000-km^2 grid cell resolution distribution maps. We used these distribution maps to generate species richness and hotspot (95th quantile) maps for each taxon in each state. Species

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composition information at each grain size was used to develop two types of representation networks using the reserve selection software MARXAN. Reserve selection analyses were restricted to Arizona birds due to considerable computation requirements. We used MARXAN to create best reserve networks based on the minimum area required to represent each species at least once and equal area networks based on irreplaceability values. We also measured the median area of each species' distribution included in hotspot (mammals and birds of Arizona and New Mexico) and irreplaceability (Arizona birds) networks across all species. Mean area overlap between richness hotspot reserves identified at the five grain sizes was 29% (grand mean for four within-taxon/state comparisons), mean overlap for irreplaceability reserve networks was 32%, and mean overlap for best reserve networks was 53%. Hotspots for mammals and birds showed low overlap with a mean of 30%. Comparison of hotspots and irreplaceability networks showed very low overlap with a mean of 13%. For hotspots, median species distribution area protected within reserves declined monotonically from a high of 11% for 1-km^2 networks down to 6% for 10 000-km^2 networks. Irreplaceability networks showed a similar, but more variable, pattern of decline. This work clearly shows that map resolution has a profound effect on conservation planning outcomes and that hotspot and representation outcomes may be strikingly dissimilar. Thus, conservation planning is scale dependent, such that reserves developed using coarse-grained data do not subsume fine-grained reserves. Moreover, preserving both full species representation and species rich areas may require combined reserve design strategies.

13. What does GAP mean
    (a) Gap Analysis Program
    (b) Geographic Analysis Program
    (c) Gop Analysis Program
    (d) Geographic Analytic Protection
    (e) Gap Analytic Protection

14. According to the paragraph, which statement is incorrect?
    (a) Hotspots for mammals and birds were highly overlapped
    (b) The spatial scale is important in ecological study
    (c) Conservation planning is scale dependent
    (d) MARXAN is a software designed for reserve selection
    (e) This study used data generated from GAP

15. What is the major conclusion of this study?
    (a) The spatial scale is important in ecological study
    (b) Hotspot and representation outcomes may be strikingly dissimilar
    (c) Map resolution has a profound effect on conservation planning outcomes
    (d) Reserves developed using coarse-grained data can subsume fine-grained reserves
    (e) Conservation planning is scale dependent and preserving both full species representation and species rich areas require combined reserve design strategies

Stable-isotope profiles of feathers can reveal the location or habitat used by individual birds during the molting period. Heterogeneity in isotope profiles will reflect heterogeneity in molt locations, but also heterogeneity in breeding locations, because spatial heterogeneity in molt locations will be congruent with spatial heterogeneity in breeding locations in species with high connectivity between breeding and molting sites. We used information on the congruence of spatial heterogeneity in molt and breeding location to study population processes in Barn Swallows (*Hirundo rustica*) from a region near Chernobyl, Ukraine, that has been radioactively contaminated since 1986; from an uncontaminated control region near Kanev, Ukraine; and from a sample of pre-1986 museum specimens used to investigate patterns prior to the nuclear disaster at Chernobyl, from both regions. Previous studies have revealed severe reductions in Barn Swallow reproductive performance and adult survival in the Chernobyl region, implying that the population is a sink and unable to sustain itself. Female Barn Swallows are known to disperse farther from their natal site than males, implying that female stable-isotope profiles should tend to be more variable than profiles of males.

接次頁

However, if the Barn Swallows breeding at Chernobyl are not self-sustaining, we would expect males there also to originate from a larger area than males from the control region. We found evidence that the sample of adult Barn Swallows from the Chernobyl region was more isotopically heterogeneous than the control sample, as evidenced from a significant correlation between feather $\delta^{13}C$ and $\delta^{15}N$ values in the control region, but not in the Chernobyl region. Furthermore, we found a significant difference in feather $\delta^{15}N$ values between regions and periods (before and after 1986). When we compared the variances in $\delta^{13}C$ values of feathers, we found that variances in both sexes from post-1986 samples from Chernobyl were significantly larger than variances for feather samples from the control region, and than variances for historical samples from both regions. These findings suggest that stable-isotope measurements can provide information about population processes following environmental perturbations.

16. Chernobyl is a site that
(a) the World's worst nuclear power accident occurred in 1986
(b) located in Europe
(c) has great landscape
(d) is a hotspot of great bird species
(e) is highly productive

17. Stable-isotope profiles of feathers can be used to detect
(a) the migration route of birds
(b) the presence of birds
(c) the location or habitat used by individual birds
(d) the immigration and emigration of birds
(e) the dispersal of birds

18. Which species did this study focus?
(a) Tree Sparrow
(b) Small mammal
(c) Swift Swallow
(d) Ground Sparrow
(e) Barn Swallow

19. Studies in the Chernobyl region after the accident have shown that
(a) no detectible change in Barn Swallow behavior
(b) minor reduction in Barn Swallow's survival rate
(c) no major change in Barn Swallow's dispersal pattern
(d) detectible change in reproductive reduction
(e) severe reductions in Barn Swallow reproductive performance and adult survival

20. The results of this study suggest that
(a) heterogeneity in isotope profiles will reflect heterogeneity in molt locations
(b) stable-isotope measurements provide information about population processes following environmental perturbations
(c) a non-significant difference in feather $\delta^{15}N$ values between regions and periods
(d) variances in both sexes from post-1986 samples from Chernobyl were significantly smaller than variances for feather samples from the control region
(e) the sample of adult Barn Swallows from the Chernobyl region was more isotopically homogeneous than the control sample

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