★ 第 I, II 大題，請在「非選擇題作答區」作答

I. 中翻英：請將下文中十三個劃底線的粗體中文辭彙翻譯成英文，所有翻譯必須配合其原文文義，以小寫印刷體書寫，潦草者不予計分。所有的辭彙均以名詞或動名詞回答，必須拼字正確才能得分。

各類生態系(包括沙漠、**疏林草原**、森林、**苔原**、極地、溼地和內陸水域、海洋等)提供人類各樣的物資與服務，包括：(1)**支援**服務：例如初級和次級**生產力**、生物多樣性、各類物品、原料以及支援其他服務的基礎。(2)**供應**服務：例如產品、食物、纖維、藥品和化粧品等。(3)**調節**服務：例如碳**吸存**、調節氣候、對抗自然**災害**、淨化空氣與水源、調控病蟲害等。(4)文化服務：滿足人類精神層面、美學的需求。然而自上個世紀以來，日益加劇的氣候變遷、各類**擾動**(洪水、乾旱、野火、蟲害、海洋**酸化**)和人類導致的環境變化(土地利用、污染、過度利用資源(如**過漁**)、引進外來**入侵種**等)對全球各類生態系都產生嚴重的**衝擊**。

中文詞彙之英譯 (每題 2 分)

1. 疏林草原
2. 苔原
3. 支援
4. 生產力
5. 供應
6. 調節
7. 吸存
8. 災害
9. 擾動
10. 酸化
11. 過漁
12. 入侵種
13. 衝擊

見背面

II. 英翻中：請將下文中的十二個劃底線的粗體英文辭彙翻譯成中文，所有的翻譯必須配合其原文文義。全部以正楷書寫，潦草者不予計分。

Pesticides applied on land are commonly transported by **runoff** or spray drift to aquatic ecosystems, where they are potentially toxic to fishes and other nontarget organisms. Pesticides add to and interact with other **stressors** of ecosystem processes, including surface-water **diversions**, losses of **spawning** and rearing habitats, nonnative species, and harmful **algal blooms**. Assessing the **cumulative effects** of pesticides on species or ecological functions has been difficult for historical, legal, conceptual, and practical reasons. To explore these challenges, we examine current-use (modern) pesticides and their potential connections to the abundances of **pelagic** fishes in the San Francisco **Estuary** (California). Declines in **delta** smelt (*Hypomesus transpacificus*), Chinook salmon (*Oncorhynchus tshawytscha),* and other species have triggered mandatory and expensive management actions in the **urbanizing** estuary and agriculturally productive Central Valley. Our **inferences** are transferable to other situations in which toxics may drive changes in ecological status and trends. (cited from "BioScience 62(4):428-434, 2012")

英文詞彙之中譯 (每題 2 分)

1. **Pesticide**
2. **runoff**
3. **stressor**
4. **diversions**
5. **spawning**
6. **algal bloom**
7. **cumulative effects**
8. **pelagic**
9. **Estuary**
10. **delta**
11. **urbanizing**
12. **inferences**

III. Multiple choice questions. Select the best answer to the following questions, then write the answer on your Answer Sheet (each 2 points for a total of 50 points)

※ 注意：選擇題請於試卷之「選擇題作答區」依序作答。

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Macroecological patterns such as the species–area relationship, the species-abundance distribution, and the species–time relationship exhibit regular behavior across ecosystems and taxa. However, determinants of these patterns remain poorly understood. Emerging theoretical frameworks for macroecology attempt to understand this regularity by ignoring detailed ecological interactions and focusing on the influence of a small number of community-level state variables, such as species richness and total abundance, on these patterns. A 15-year rodent removal experiment was conducted to evaluate the response of three different macroecological patterns in two distinct annual plant communities (summer and winter). Changes in richness and abundance were coupled with significant shifts in macroecological patterns. Because altering species interactions only impacted macroecological patterns when the state variables of abundance and richness also changed, we suggest that, in this system, local-scale processes primarily act indirectly through these properties to determine macroecological patterns.

1. According to the above paragraph, which of the following studies is not a macroecological research?
   A. Species richness of breeding birds in Taiwan
   B. Latitudinal gradient of Species richness of birds in Asia
   C. Island biogeography of birds
   D. Distribution pattern of barnacle along the coast of China
   E. Population dynamics of a rodent species

2. Which of the following statement is incorrect?
   A. The species–area relationship show regular behavior across ecosystems and taxa.
   B. The species-abundance distribution exhibit regular behavior across taxa.
   C. The species–time relationship present regular behavior across taxa and ecosystems.
   D. Species–area relationship and the species–time relationship are typical studies in macroecology.
   E. The understanding on the factors that determining macroecological patterns is well known.

3. The theoretical frameworks for macroecology emphasize the study of
   A. environmental factors that affect the pattern.
   B. population dynamics.
   C. interaction of community.
   D. niche partitioning.
   E. life history.

4. The 15-year rodent removal study found that
   A. changes in rodent richness were related to seasons.
   B. changes in rodent abundance were correlated with season.
   C. changes in species richness and abundance were coupled with significant shifts in macroecological patterns.
   D. changes in species richness were independent from other outside factors.
   E. changes in abundance were dependent on species richness.

5. The main conclusion of this study indicated that

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A. macroecological patterns were free from community influence.
B. macroecological patterns were determined by local-scale processes that primarily acted indirectly.
C. macroecological patterns were independent of local-scale processes.
D. macroecological patterns were highly influenced by local processes.
E. macroecological patterns were affected by community processes.

Although abiotic and biotic factors can interact to shape the spatial niche of a species, studies that explore the interactive effects of both at a local scale are rare. We demonstrate that one of the main axes (perch height) characterizing the spatial niche of a common lizard, *Anolis sagrei*, varies according to the interactive effects of weather and the activity of a larger predatory lizard, *Leiocephalus carinatus*. Results were completely consistent: no matter how favorable the weather conditions for using the ground (mainly characterized by temperature, humidity, wind speed, rain), *A. sagrei* did not do so if the predator was present. Hence, great behavioral plasticity enabled *A. sagrei* to adjust its use of space very quickly. The results are the first field demonstration for anoles (and possibly for other animals as well) of how time-varying environmental conditions and predator presence interact to produce short-term changes in utilization along a major niche axis.

6. According to the paragraph, which of the following statements is true?
A. Abiotic factors interact with the species to shape its spatial niche.
B. Biotic factors interact with the species to build its spatial niche.
C. Abiotic and biotic factors can interact to shape the spatial niche of a species.
D. Physical factors are not important in shaping the spatial niche of a species.
E. Biotic factors, such as top-down control, are not important in niche study.

7. The species *Leiocephalus carinatus* is
A. a large herbivore.
B. a tiny lizard.
C. a carnivore.
D. a toad.
E. a herbivore lizard.

8. The species *Anolis sagrei*
A. is a predator.
B. has great behavioral plasticity to adjust its use of space quickly.
C. does not have great behavioral plasticity.
D. lives in urban area.
E. is a large herbivorous toad.

9. The main conclusion of this study might be
A. *Leiocephalus carinatus* eat *Anolis sagrei*.
B. the interactive effects of weather and the activity of a larger predatory is important in shaping the spatial niche of a species.
C. a field test of lizard behavior is important to study the resource partitioning pattern.

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D. *Anolis sagrei* adjusts its use of space very quickly in unfavorable weathers.
E. how time-varying environmental conditions and predator presence interact to produce short-term changes in utilization along a major niche axis

Tropical deforestation continues to cause population declines and local extinctions in centers of avian diversity and endemism. Although local species extinctions stem from reductions in demographic rates, little is known about how habitat fragmentation influences survival of tropical bird populations or the relative importance of survival and fecundity in ultimately shaping communities. We analyzed 22 years of mark–recapture data to assess how fragmentation influenced apparent survival, recruitment, and realized population growth rate within 22 forest understory bird species in the Usambara Mountains, Tanzania. This represents the first such effort, in either tropical or temperate systems, to characterize the effect of deforestation on avian survival across such a broad suite of species. Long-term demographic analysis of this suite of species experiencing the same fragmented environment revealed considerable variability in species' responses to fragmentation, in addition to general patterns that emerged from comparison among species. Across the understory bird community as a whole, we found significantly lower apparent survival and realized population growth rate in small fragments relative to large, demonstrating fragmentation effects to demographic rates long after habitat loss. Demographic rates were depressed across five feeding guilds, suggesting that fragmentation sensitivity was not limited to insectivores. Seniority analyses, together with a positive effect of fragmentation on recruitment, indicated that depressed apparent survival was the primary driver of population declines and observed extinctions. We also found a landscape effect, with lower vital rates in one mountain range relative to another, suggesting that fragmentation effects may add to other large-scale drivers of population decline. Overall, realized population growth rate (λ) estimates were <1 for most species, suggesting that future population persistence, even within large forest fragments, is uncertain in this biodiversity hotspot.

10. The population declines in the centers of avian diversity and endemism is due to
A. local extinctions in the summer breeding grounds.
B. invasion of exotic species.
C. extreme weather events.
D. tropical deforestation.
E. climate change.

11. The term 'Endemism' indicates that
A. the species are indigenous to a place and are also found elsewhere.
B. the species is the ecological state of not being unique to a defined geographic location.
C. the species is indigenous to a place and cannot be found elsewhere.
D. the species has cosmopolitan distribution.
E. the species has unique ecological state.

12. This research was conducted in
A. Asia
B. Europe
C. Africa
D. North America
E. Australia

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13. Which of the following statements is incorrect?
A. The data used included a 22 years' mark–recapture field collected data.
B. The 22 forest understory bird species were categorized in one guild.
C. The parameters measured include survival, recruitment, and realized population growth rate.
D. Demographic rates of studied bird species were depressed.
E. The study areas were located in the Usambara Mountains, Tanzania.

14. This study found that
A. future population persistence is certain in the study area.
B. the study areas are within large forest fragments and are not the biodiversity hotspot.
C. fragmentation effects may add to other large-scale drivers of population decline.
D. a positive effect of fragmentation on recruitment depressed was the primary driver of population declines.
E. local species extinctions stem from reductions in demographic rates.

Extreme weather events, such as droughts and heat waves, are expected to become more severe and more frequent in the coming years, and understanding their impacts on demographic rates is of increasing interest to both evolutionary ecologists and conservation practitioners. An individual's breeding probability can be a sensitive indicator of the decision to initiate reproductive behavior under varying environmental conditions, has strong fitness consequences, and can be considered the first step in a life history trade-off between allocating resources for breeding activities or self-survival. Using a 14-year time series spanning large variation in climatic conditions and the entirety of a population's breeding range, we estimated the effects of extreme weather conditions (drought) on the state-specific probabilities of breeding and survival of an endangered bird, the Florida Snail Kite (*Rostrhamus sociabilis plumbeus*). Our analysis accounted for uncertainty in breeding status assignment, a common source of uncertainty that is often ignored when states are based on field observations. Breeding probabilities in adult kites (>1 year of age) decreased during droughts, whereas the probability of breeding in young kites (1 year of age) tended to increase. Individuals attempting to breed showed no evidence of reduced future survival. Although population viability analyses of this species and other species often implicitly assume that all adults will attempt to breed, we find that breeding probabilities were significantly <1 for all 13 estimable years considered. Our results suggest that experience is an important factor determining whether or not individuals attempt to breed during harsh environmental conditions and that reproductive effort may be constrained by an individual's quality and/or despotic behavior among individuals attempting to breed.

15. Which of the following is not an extreme weather event?
A. Droughts
B. Heat waves
C. A typhoon occurred in April
D. Heavy rainfall
E. Warm weather in the summer in the northern hemisphere

16. Population viability analyses is typically used in
A. ecosystem study.
B. community ecology study.
C. conservation study.

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D. food chain study.
E. biogeography study.

17. The effects of drought on the breeding and survival of the Florida Snail Kite is
A. the probability of breeding in young kites tended to decrease.
B. the probability of breeding in adult kites tended to increase.
C. breeding probabilities in adult kites decreased during droughts.
D. breeding probabilities in adult kites decreased during heat waves.
E. breeding probabilities in adult kites increased during droughts.

Predators can influence the structure and function of ecosystems by altering the composition or behavior of herbivore communities. Overexploitation of predators, therefore, may lead to habitat loss by altering important top-down interactions that facilitate habitat-forming species. In seagrass beds, top-down control of algal growth by mesograzers appears to facilitate seagrass production. The indirect consequences of higher-order trophic interactions, however, remain unclear. Although predators may limit the beneficial effects of algal mesograzers, it is also possible that they limit the abundance of invertebrates that consume and foul seagrasses. We used experimental enclosure and exclosure cages to explore the direct and indirect effects of microcarnivorous fishes on epifaunal invertebrates, epiphytic loads, and seagrass growth in a natural eelgrass (*Zostera marina*) bed in San Diego Bay, California, USA. Contrary to expectations, when fishes were excluded, invertebrate abundance increased by 300–1000%, fouling on eelgrass leaves increased by 600%, and eelgrass production declined by 50%. Despite high densities of predators in enclosures, subsequent effects did not differ from ambient conditions. When predators were excluded, however, abundances of epifauna (including tube-building crustaceans and an eelgrass-grazing limpet) increased dramatically, resulting in reduced seagrass production. Our results are supported by several studies of eelgrass communities in the northeastern Pacific, characterized by coastal upwelling, inverse estuaries, and a voracious seagrass-consuming limpet. These strong, positive, indirect effects of microcarnivores on seagrass production contrast with the beneficial mesograzer paradigm, highlighting the need for hypotheses to be tested across a variety of ecosystems with varying biophysical characteristics.

18. The typical of food chain of a seagrass bed may be
A. Seagrass→Microcarnivorous fishes→Epifaunal invertebrates
B. Microcarnivorous fishes→Epifaunal invertebrates→Seagrass
C. Seagrass→Epifaunal invertebrates→Microcarnivorous fishes
D. Epifaunal→Carnivorous invertebrates→Microcarnivorous fishes
E. Seagrass epifaunal→Microcarnivorous invertebrates→Fishes

19. Which of the following location in Taiwan has seagrass beds?
A. North coast
B. East coast
C. West coast
D. Coast of Dongsha Island
E. Coast of Kinmen

20. Which of the following statement about seagrass beds is not true?

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A. Habitats for limpet, crustaceans, sea turtles, and fishes.
B. Supporting the growth of albacore, a tuna species.
C. A foundation species that supports diverse species.
D. The ecosystem function is similar to the tropical rain forests.
E. A good place to study food chain dynamics.

21. According to the above paragraph, overexploitation of predator may lead to
A. altering important bottom-up interactions that facilitate habitat-forming species.
B. changes in top-down interactions that destruct habitat-forming species.
C. loss of habitat.
D. changes in habitat formation.
E. changes in food structure of an ecosystem.

22. The term 'epifauna' includes
A. herbivores
B. microcarnivorous fishes
C. sea turtles
D. seagrasses
E. tube-building crustaceans and an eelgrass-grazing limpet

North America is both a source and sink of atmospheric carbon dioxide (CO_2). Continental sources – such as fossil-fuel combustion in the US and deforestation in Mexico – and sinks – including most ecosystems, and particularly secondary forests – add and remove CO_2 from the atmosphere, respectively. Photosynthesis converts CO_2 into carbon as biomass, which is stored in vegetation, soils, and wood products. However, ecosystem sinks compensate for only ~35% of the continent's fossil-fuel-based CO_2 emissions; North America therefore represents a net CO_2 source. Estimating the magnitude of ecosystem sinks, even though the calculation is confounded by uncertainty as a result of individual inventory- and model-based alternatives, has improved through the use of a combined approach.

23. According the above paragraph, North America
A. is a sink of CO_2.
B. is a net CO_2 source.
C. converts more CO_2 and is a source of CO_2.
D. adds more CO_2 to the atmosphere and is a sink of CO_2.
E. has many forests that emit of CO_2.

24. Which of the following is the sink of CO_2?
A. deforestation in Mexico
B. combustion of fossil-fuel
C. deforestation in the US
D. use of fossil-fuel by cars

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E. photosynthesis

25. How much ecosystem sinks compensate for the continent's fossil-fuel-based CO_2 emissions in North America?
   A. 5%
   B. 25%
   C. 35%
   D. 45%
   E. 55%