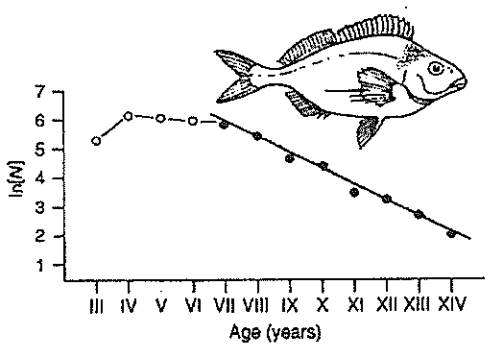
國立臺灣大學 107 學年度碩士班招生考試試題

答案請填寫於試卷內，附上題號，並依序作答。可用中文或英文作答。

一、選擇題（每格 2 分，共 40 分；答案請填寫於試卷內，請勿試題上作答）

1) The correlation between biological parameters (e.g., growth, age-at-maturity, and natural mortality) across species has been widely used to evaluate the status of data-poor fish stocks. Given that the natural mortality of fish species I is larger than fish species II, it implies that fish species I has [**A**] growth rate and [**B**] age-at-maturity than fish species II.

2) The thick black line of the following figure is called [**C**]. It is a breakdown of different age groups of fish, showing the decrease in numbers of fish caught as the fish become older and less numerous or less available, which is often used to estimate the [**D**] of an exploited fish population.



3) The quantity of fish caught (in number or in weight) with one standard unit of fishing effort is called [**E**]; e.g. number of fish taken per 1,000 hooks per day or weight of fish, in tons, taken per hour of trawling. This quantity is often considered an index of fish biomass (or abundance).

4) A stock is considered [**F**] when exploited beyond an explicit limit beyond which its abundance is considered "too low" to ensure safe reproduction; [**G**] is a generic term used to refer to the state of a stock subject to a level of fishing effort or fishing mortality such that a reduction of effort would lead to an increase in the total catch.

5) In population ecology and fisheries, [**H**] is the largest average yield (catch) that can theoretically be taken from a species' stock over an indefinite period under constant environmental conditions. It is usually measured in tonnes.

6) Fish other than the primary target species that are caught incidental to the harvest of the primary species is called [**I**]. While [**J**] is to release or return fish to the sea, dead or alive, whether or not such fish are brought fully on board a fishing vessel.

7) The number of fish added to the exploitable stock, in the fishing area, each year, through a process of growth (e.g., the fish grows to a size where it becomes catchable) or migration is called [**K**] while the [**L**] is the total biomass of fish of reproductive age during the breeding season of a stock.

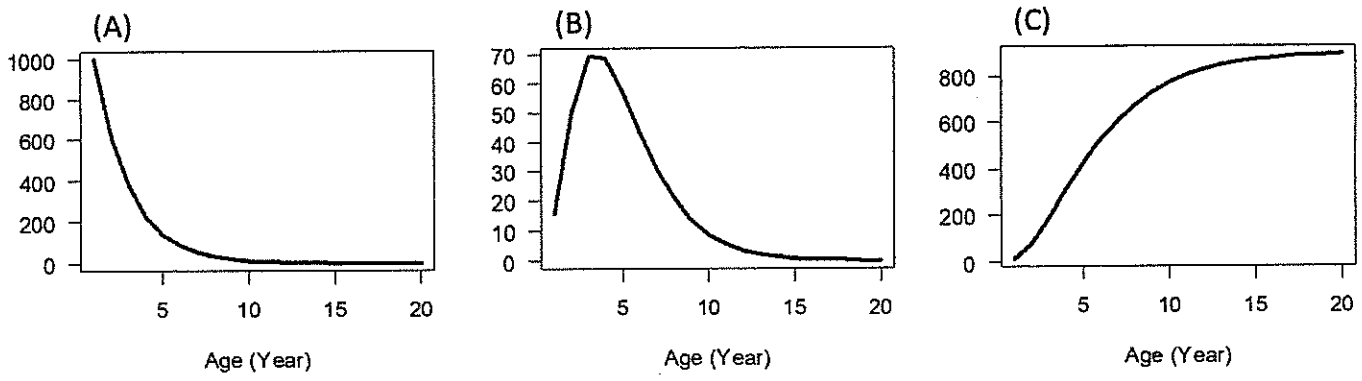
8) The [**M**], $L_t = L_\infty(1\text{-}\exp[-K\times(t\text{-}t_0)])$, is the most widely used model to describe the expected size-at-age t (L_t) and is especially important in fisheries studies. This growth function has three parameters: L_∞ = [**N**]; K = [**O**]; and t_0 = [**P**].

見背面

Choose the appropriate answers for **A-P** from the following candidate:

(1) overfishing (2) overfished (3) slower (4) faster (5) younger (6) older (7) retention curve (8) catch curve
(9) maximum sustainable yield (10) maximum economic yield (11) total mortality (12) discard (13) bycatch
(14) Surplus production model (15) von Bertalanffy growth model (16) Gompertz growth model
(17) age-at-zero length (18) age-at-50% maturity (19) spawning stock biomass (20) virgin biomass
(21) recruitment (22) the average maximum size (23) yield-per-recruit (24) catch-per-unit-effort
(25) growth rate coefficient (26) catchability coefficient

9) The x-axis for all three figures below are ages. Identify the y-axis for these figures: figure [**Q**] describe average individual growth pattern. Figure [**R**] shows cohort survival pattern. Finally, figure [**S**] show age-specific stock biomass. Based on these figures, it is best harvesting the population around age [**T**, please insert a number].



二、問答題（共 60 分）

1) （10 分）Please explain the difference between "growth overfishing" and "recruitment overfishing".

2) （15 分）What is "food web"? How does fishing alter ecosystem structure or function through food web? What is the "Ecosystem-based fishery management"?

3) （10 分）The below figure is an example of North Sea fish distribution (*Lumpenus lampretaeformis*) which has shifted north with climatic warming and the relationships between mean latitude and 5-year running mean winter bottom temperature. Please explain why the fish distribution has responded markedly to recent increases in sea temperature? How to incorporate fish distribution shifts into a fisheries management context?

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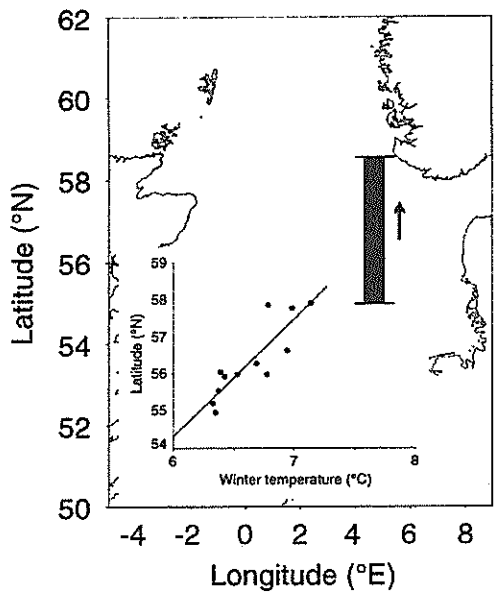
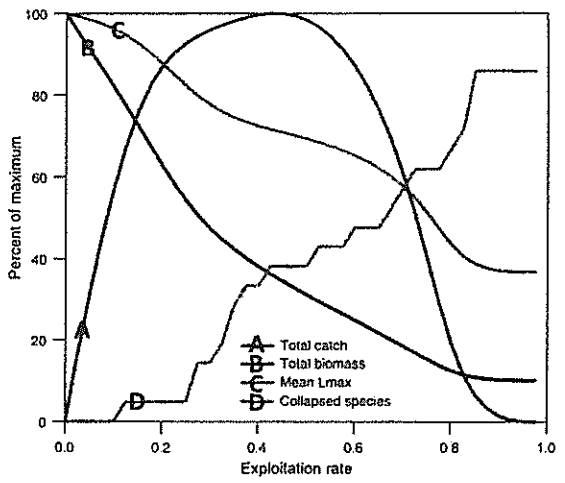


4) （15 分）Below figure is an example of the effects of increasing exploitation rate on a model fish community. Exploitation rate is the proportion of available fish biomass caught in each year. Mean Lmax refers to the average maximum length that species in the community can attain. Collapsed species are those for which stock biomass has declined to less than 10% of their unfished biomass. Three key objectives for the current fishery management are: (1) maintaining biodiversity; (2) maintaining high catch; (3) maintaining high employment. How to achieve each of the three objectives by controlling the exploitation rate? Please give explanation for your answer.



5) （10 分）Maturation schedules for many exploited fished are observed to decrease; e.g., the age-at-maturity for Atlantic cod *Gadus morhua* in the Arctic Ocean from 8 to 6 years old. Give two potential mechanisms to explain the changes of maturation schedules.

試題隨卷繳回