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Cardiorespiratory responses to environmental hypoxia in the yellowtail, *Seriola quinqueradiata*

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Introduction

In japan, *Chattonella* (Rhaphidophycea) blooms have killed fish and shellfish, and resulted in extensive economic loss to commercial fisheries. It is generally agreed that fish mortality by *Chattonella* is due to suffocation. However, there is disagreement on cardiac responses of fish exposed *Chattonella,* as a potential cause for the suffocation. Endo et al. (1988, 1992) demonstrated that bradycardia was important in the killing of red sea bream by *C. marina.* In contrast, Ishimatsu et al. (1990) reported that bradycardia did not develop in yellowtail exposed to *C. marina* until shortly before death. Therefore, it is important to examine the cardiac responses of yellowtail during hypoxia and *Chattonella* exposure to elucidate the mechnism of fish mortality by *Chattonella.*

Materials and Methods

Fish : Yellowtail (*Seriola quinqueradiata*)
- Acclimated temperature : 25℃
- Anethesia : 0.05g/L benzocaine
- Exposure period : up to 210 min.

Measurement
- Respiratory variables : Arterial Po_2 (Pao_2)
  Arterial pH (pHa)
  Arterial O_2 content (Cao_2)
  Hematocrit value (Hct)
- Cardiovascular variables : Cardiac output (Q)
  Heart rate (HR)
  Stroke volume (SV)
  Arterial blood pressure (P_{DA})

Results and Discussions

1. Severe hypoxia elicited a reflex bradycardia within 30 min.
2. Cardiac output was maintained until arterial Po_2 reached 30 -40 mmHg, but decreased below this level.
3. Blood O_2 content, pH, and Hct value were maintained during the moderate hypoxia. However, when arterial Po_2 fell below 30 - 40 mmHg, blood O_2 content, pH decreased sharply, while Hct value increased.
4. The Po_2 level at which the cardiorespiratory changes occurred corresponds to So_2 of 72 - 81%.