

## マレーシアにおけるハイガイ養殖の生産阻害要因

Disincentive factors affecting stable aquaculture production of the blood cockle, *Anadara granosa*, in Malaysia

近年マレーシア半島西岸のハイガイ漁場で顕在化している、稚貝発生量の減少および養殖過程での大量死の要因を把握する。稚貝発生量減少は、過度の有機物負荷に伴う還元的環境が貝の性成熟不良を招いたことが原因であると考えられる。一方、大量死は、大量出水に伴う環境変化が貝の摂餌不良・栄養吸収阻害を引き起こしたことによる衰弱が主因であると判断される。

Recently, there has been a huge reduction in the number of spats in aquaculture grounds in the west coast of Peninsular Malaysia. Likewise, the farming process has been seriously affected by mass mortality. Our results suggested that high organic loading in aquaculture grounds was one failure factor in sexual maturation. Also, mass mortality was inferred from environmental changes associated with freshwater inflow that reduced feeding opportunities and from nutrient absorption disorders that may have led to the blood cockle's debilitated condition.

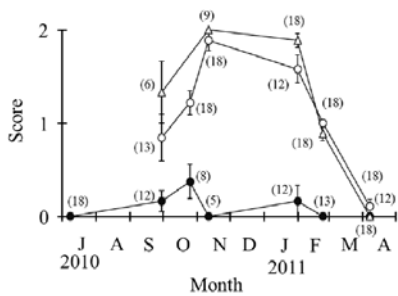


図1 肉眼観察によるハイガイの生殖腺部位の肥大状況

スコア、0:未発達、1:やや発達、2:顕著に発達、括弧内の数字は観察個体数、グラフ結果は、調査点 2と3(○と△)で生殖腺の顕著な発達が11月以降に見られるのに対し、調査点 1(●)では発達が見られない。平均値の誤差範囲は標準誤差を示す。

Fig. 1. Naked-eye observations of the visceral area covering the gonad of the blood cockle.

Score 0: immature, score 1: developing, and score 2: mature. Number in parentheses refers to the number of individuals used for observation. The graph shows that there was no gonad development at Station 1 (●), whereas significant development was observed at Stations 2 and 3 (○ and △). Error bar indicates standard error.

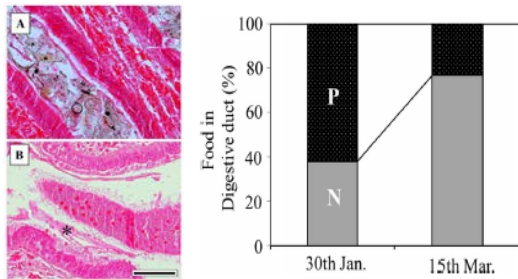


図3 大量死発生前後のハイガイ消化管内の餌の有無

写真は、餌あり: 餌で充満する消化管、餌なし: \*印は餌を含まない消化管。グラフは大量死発生後に餌を摂餌していない個体数の増加を示す。

Fig. 3. Presence and nonpresence of food in the digestive duct of the blood cockle before and after the mass mortality event. Photo A: digestive duct filled with food, Photo B: no food in the duct (asterisk shows the empty digestive duct.) Scale bar in photo: 100 μm. Graph data shows an increase in the number of individuals with empty digestive ducts after the mass mortality event.

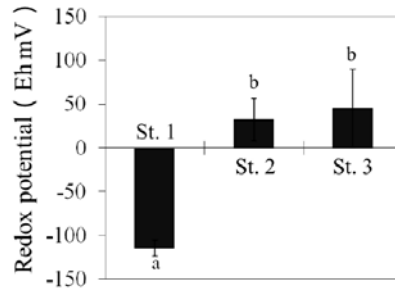


図2 酸化還元電位による養殖漁場海底表層の底質

調査点1では底質の著しい還元化が見られた。aとbの間には有意差(P<0.01)が認められる。調査は11月に実施した。平均値の誤差範囲は標準誤差を示す。

Fig. 2. Redox potentials in surface sediments around the blood cockle aquaculture grounds.

Significant reduction was detected at Station 1. Significant difference (P<0.01) was observed between a and b. This survey was conducted in November 2010 when gonad development was observed in Stations 2 and 3. Error bar indicates standard error.

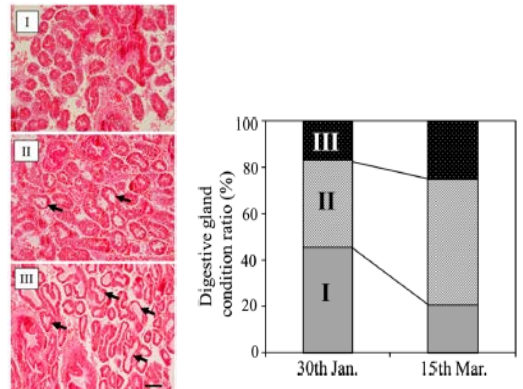


図4 大量死発生前後のハイガイ消化盲嚢上皮の状態

写真は、正常: 正常状態、一部: 一部に盲嚢上皮の扁平化(矢印)、広範: 広範な上皮の扁平化(矢印)。グラフは大量死発生後に盲嚢上皮が扁平化した個体数の増加を示す。

Fig. 4. Condition of epithelial cells in the digestive gland of the blood cockle before and after the mass mortality event.

Photo I: good condition, photo II: partial flattening of epithelial cells (arrows), photo III: substantial flattening of epithelial cells (arrows). Scale bar in photo: 100 μm. Graph data shows an increase in the number of individuals with flattened epithelial cells after the mass mortality event.