

# Chapter 6. Environmental Diseases

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This chapter focuses on swimbladder stress syndrome and gas bubble disease, the two most common disorders due to adverse environmental conditions.

## **SWIMBLADDER STRESS SYNDROME (SBSS)**

Swimbladder stress syndrome (SBSS) is a malfunction of the swimbladder and is associated with a combination of abrupt changes in several environmental parameters. This syndrome has been a major limiting factor in fry production of *Epinephelus* sp. in Taiwan. It has also been reported in *E. bleekeri*, *E. coioides*, *E. lanceolatus*, *E. malabaricus*, *E. tauvina* and *Cromileptes altivelis* in Malaysia, Singapore and Thailand.

### **Causative agent:**

The causative agent is unknown, but the syndrome is associated with abrupt changes in water quality such as high ambient temperature, high ambient illumination, dense algal bloom that may cause oxygen depletion at night and supersaturation during the day. In Malaysia, this syndrome usually coincides with the monsoon season when there is upwelling of bottom sediments under the net cages.

### **Stages affected:**

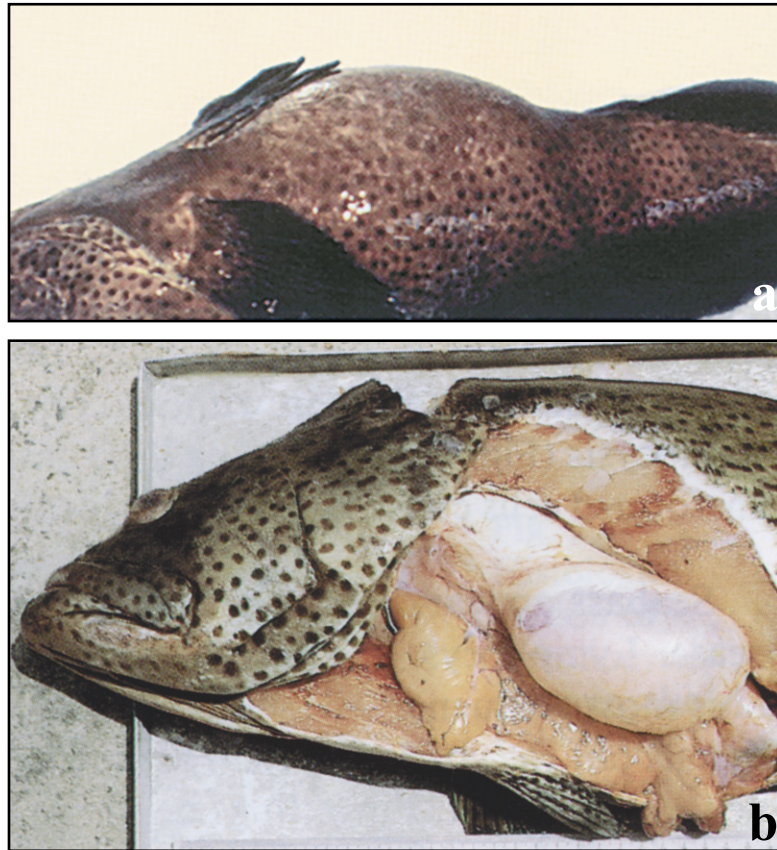
In the hatchery this syndrome occurs during metamorphosis. It also affects marketable-sized fish and broodstock.

### **Gross clinical signs:**

Affected fish exhibit hyperinflated swimbladder (Fig. 6-1), abdominal distention and swim in a head-down or sideward position near the water surface. There are bubbles in the gill lamellae.

### **Effects on host:**

Affected fish have bloated swimbladder, which results in positive buoyancy. This condition is not lethal to the fish but they eventually die of starvation, overexposure to direct sunlight or secondary bacterial infection.



**Fig. 6-1.** *Epinephelus coioides* broodstock showing hyperinflated swimbladder: External (a) and opened (b) appearance (Photos from APEC/SEAFDEC, 2001).

#### Transmission:

This syndrome is non-infectious.

#### Diagnosis:

The disease is diagnosed through gross examination of the swimbladder.

#### Preventive methods:

If marketable-sized fish are affected, it is best to harvest the stock and sell. Smaller fish, which are affected, must be removed to avoid secondary bacterial infection and mortalities. For broodstock, gently pierce the abdomen with a sterile hypodermic needle, then press the fish into the water to allow gas to escape with water pressure (Fig. 6-2). Remove the needle and dab the pierced site with 0.1% acriflavine before returning the fish to the holding facility. Fish recovers in 3-6 days with a success rate of 50%.

### **GAS BUBBLE DISEASE (GBD)**

Gas bubble disease (GBD) is due to supersaturation of dissolved gases, usually nitrogen and oxygen. All gases are more soluble in water at low temperatures. Solubility is diminished as temperature rises.



**Fig. 6-2.** Deflation of the swimbladder of *Epinephelus coioides* using a sterile needle.

#### **Causative agent:**

GBD is caused by a supersaturation of the water with the gas, nitrogen. Supersaturation occurs whenever the pressure of a gas in the water is higher than the pressure of the same gas in the surrounding atmosphere. It is also caused by the supersaturation of oxygen in water due to heavy algal blooms.

#### **Stages affected:**

This disease is common at the hatchery stage. It also affects broodstock.

#### **Gross clinical signs:**

Affected fish show bubbles in the eyes (causing exophthalmia or pop-eye)(Fig. 6-3a), body cavities, skin and gills (Fig. 6-3b). The bubbles can form in the gill lamellae and block blood flow resulting embolism of gill vessels. Affected fish also show erratic swimming patterns.

#### **Transmission:**

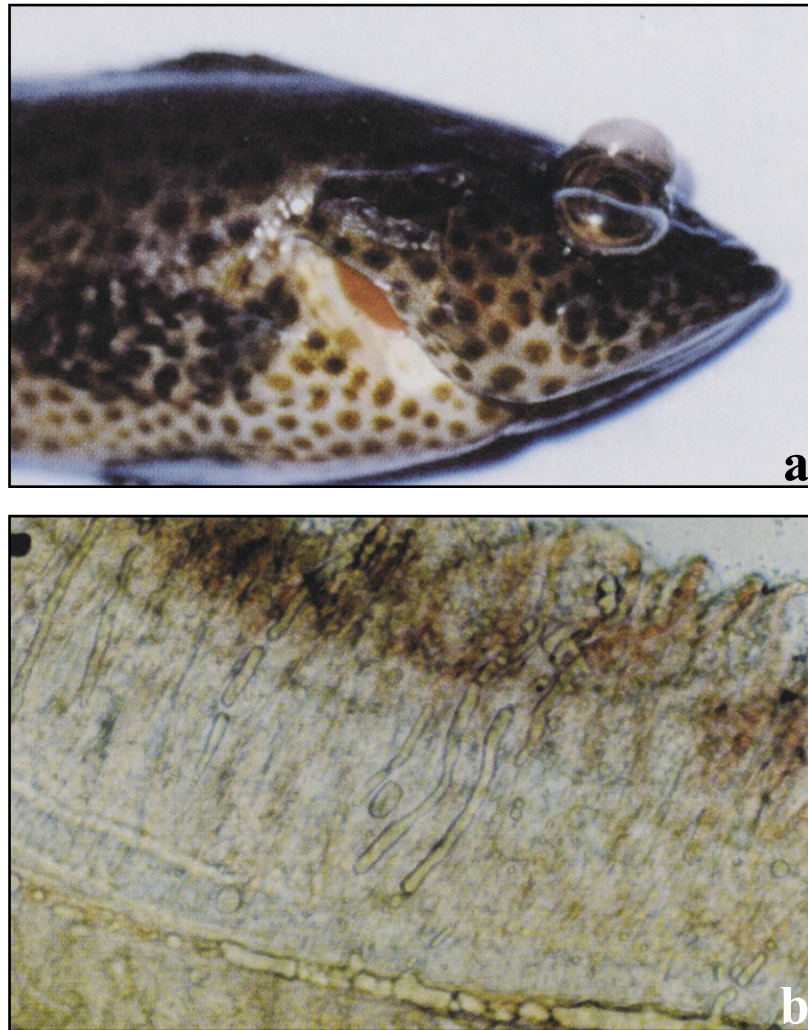
The disease is caused by an environmental factor, thus is non-infectious.

#### **Diagnosis:**

Wet mount examination of the gills and other organs under the microscope may show gas emboli within the bloodstream.

#### **Effects on host:**

Affected fish die due to embolism in blood, degeneration of the gill lamellae and bulging of the cornea. There is also an occurrence of abrupt mass mortalities.



**Fig. 6-3.** Gas bubble disease in *Epinephelus coioides*: a) Exophthalmia and b) gas bubble on gill filaments (Photos from Koesharyani et al., 2001).

#### Preventive and control methods:

To treat fish suffering from GDB, first weaken water supply and supply strong aeration to remove saturated nitrogen. Repair cracked pipe, and position intake pipe above the water surface to remove the nitrogen.

#### REFERENCES

- APEC/SEAFDEC. 2001. Husbandry and Health Management of Grouper. APEC, Singapore and SEAFDEC Aquaculture Department, Iloilo, Philippines. 94 p.
- Bondad-Reantaso, M.G., Kanchanakhan, S. and Chinabut, S. 2001. Review of grouper diseases and health management strategies for groupers and other marine finfishes. *In*: Report and Proceeding of APEC FWG 02/2000 "Development of a Regional Research Programme on Grouper Virus Transmission and Vaccine Development", M.G. Bondad-Reantaso, J. Humphrey, S. Kanchanakhan and S. Chinabut (eds.), p. 121-146. APEC/AHHRI/FHS-AFS/NACA, Bangkok, Thailand.

- Chong, Y.C. and Chao, T. 1986. Common Diseases of Marine Foodfish. Fisheries Handbook No. 2. Primary Production Department, Singapore. 34 p.
- Chua, T., Loo, J.J., Wee, J.Y. and Ng, M. 1993. Findings from a fish disease survey: An overview of the marine fish disease situation in Singapore. Singapore J. Pri. Ind. 2: 26-37.
- Danayadol, Y. and Kanchanapungka, S. 1989. Swimbladder syndrome disease in grouper (*Epinephelus malabaricus*). I. Occurrence and proposed primary cause. The Seminar of Fisheries 1989. Department of Fisheries, Thailand.
- Koesharyani, I., Roza, D., Mahardika, K., Johnny, F., Zafran and Yuasa, K. 2001. Manual for Fish Disease Diagnosis–II. Marine Fish and Crustacean Diseases in Indonesia. Gondol Research Station for Coastal Fisheries and Japan International Cooperation Agency, Indonesia. 49 p.
- Leong, T.S. 1998. Grouper culture. *In*: Tropical Mariculture, S.S. de Silva (ed.), p. 423-448. Academic Press, San Diego, U.S.A.
- Liao, I.C., Mao-Sen, S. and Chang, S.L. 1995. A review of the nursery and grow-out technique of high-value marine finfishes in Taiwan. *In*: Culture of High-value Marine Fishes in Asia and the United States, K.L. Main and C. Rosenfeld (eds.), p. 121-138. The Oceanic Institute, Hawaii, U.S.A.