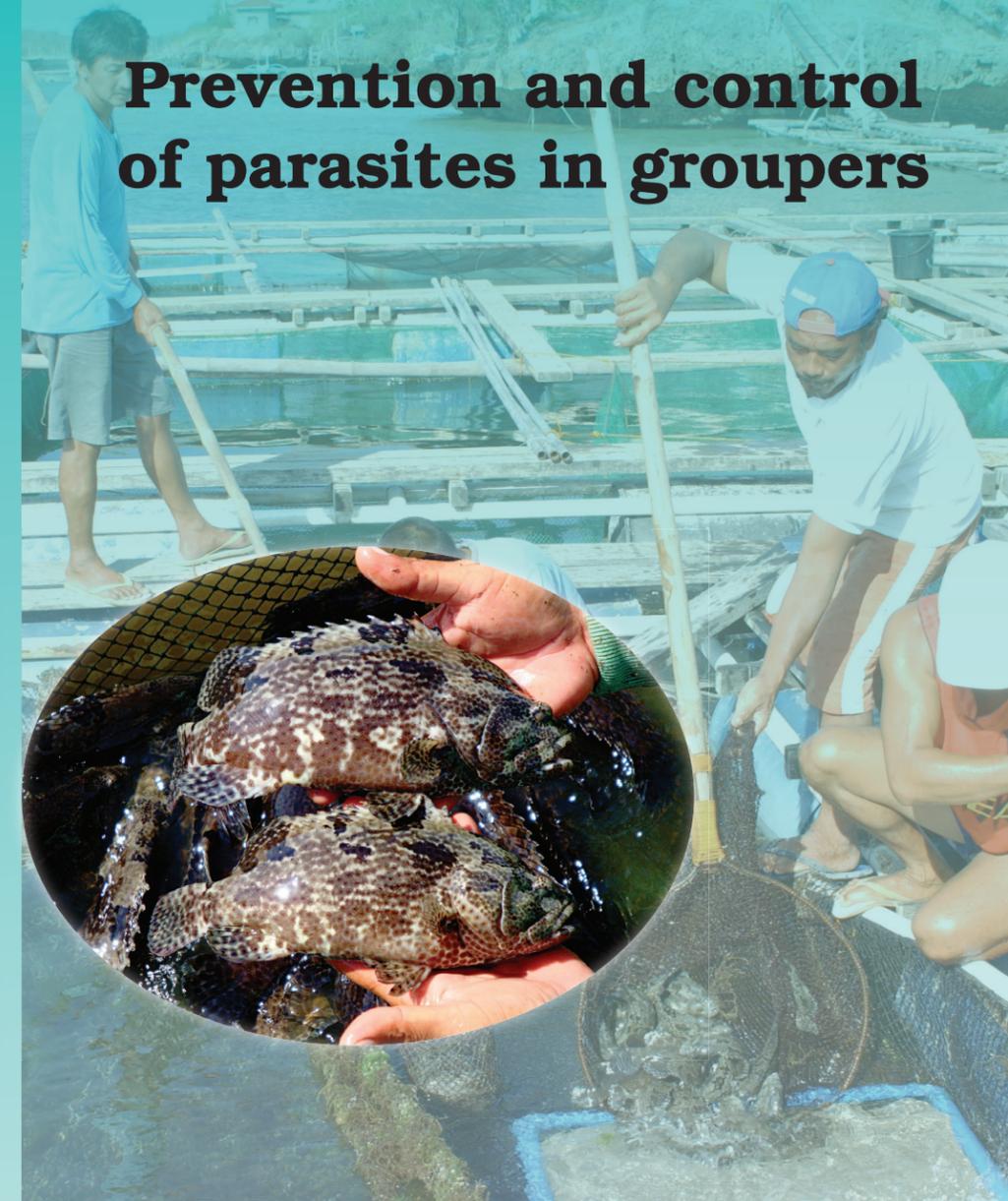


# Prevention and control of parasites in groupers



## Prevention and control of parasites

Physical, environmental and chemical methods may be used to prevent and control parasitic diseases.



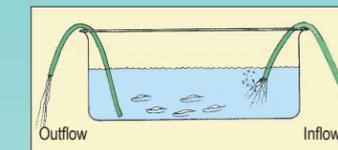
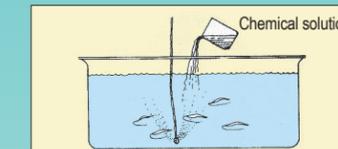
Physical methods may involve creating physical barriers to prevent contact between the parasite and the fish; the removal of the sources of the parasite; or subjecting the parasite to adverse conditions like increased or low temperature.

- Scrub the tank thoroughly with a brush and filter the rearing water with fine net.

Environmental methods may include proper hatchery or pond design; good water quality; employing sanitary practices; and avoiding stocks from being stressed.



- Install disinfection rugs and trays at the entrances of hatchery facilities.



Chemical methods may include the disinfection of rearing water, feeds and other materials used for culture; and chemotherapy, which employs drugs or chemicals for treating parasitic infestation.

- When dipping infected fish in a chemical bath for a short period, add the chemical solution to the holding tank with the fish. Let the fish remain in the solution depending on the recommended soaking time for the chemical used.
- After treatment, either replace the tank with clean rearing water or transfer fish into parasite-free tanks

## References



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	DIDYMOZOID DIGENEANS	NEMATODES	CRUSTACEANS	LEECHES
	<p>Didymozoid digeneans (in yellow capsules) on gill arch of <i>E. coioides</i></p>	<p>Nematodes on parenchyma of digestive organ of coral leopard grouper <i>Plectropomus leopardus</i></p>	<p>Caligid copepods on body surface of <i>C. altivelis</i> appear as white patches</p>	<p>Leech (Tagalog name 'linta') infestation pectoral fin of <i>E. coioides</i> broodstock</p>
What is it?	This infection is caused by parasitic flatworms which form opaque-white to yellow capsules or cysts on the gills of infected fish. The capsules contain tubular, long, thread-like worms tightly and neatly arranged and packed inside.	Nematode infection is caused by reddish or black, usually 1-2 cm long, unsegmented roundworms, attached on fins, inside the mouth, muscle, parenchyma of digestive organs and gonads of affected fish	This infection, which affect grouper in the nursery, grow-out and broodstock stages, is caused by ectoparasitic crustaceans. Caligids, also known as sea lice, are transparent, oval in shape, with segmented bodies covered by shell with jointed appendages, up to 5 mm in length and 1.6 mm in width.	This infection is caused by ectoparasitic brownish-black leeches, 8-15 mm long, the elongated, muscular and cylindrical body narrows at both ends containing suckers. They are attached on the body surface, fins, eyes, nasal, branchial and opercular cavities of fish
What are the causative organisms?	<ul style="list-style-type: none"> <li>• <i>Gonapodasmius epinepheli</i> (may reach up to 80 cm long)</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Philometra</i> spp. (mature stage may reach up to 20 cm long)</li> <li>• <i>Anisakis</i> spp.</li> <li>• <i>Raphidascaris</i> spp.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Caligus epidemicus</i></li> <li>• <i>Caligus</i> spp.</li> <li>• <i>Lepeophtheirus</i> spp.</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Rhexanella</i> sp.</li> </ul>
How is it transmitted?	Through feeding on infected intermediate hosts such as gastropod molluscs, small crustaceans, small fishes	Through feeding of infected intermediate host or trash fish	Through infected fish and water, predisposed by poor water exchange	Through infected fish and water, predisposed by high stocking density and poor water quality
What are its symptoms?	<ul style="list-style-type: none"> <li>• Small, opaque-white to yellow cysts on the first gill arch</li> <li>• Hyperplasia (abnormal increase in the number of cells) of the gill lamellae</li> </ul>	<ul style="list-style-type: none"> <li>• Emaciation; discolored body surface; swollen intestine; reduced growth</li> <li>• Sterility (if the reproductive organs are affected)</li> </ul>	<ul style="list-style-type: none"> <li>• White patches on body surface, fins and gills of infected fish</li> <li>• Lumpy body surface</li> <li>• Infected areas have no scales, and are hemorrhagic or ulcerated</li> <li>• Erosion of skin and muscles</li> <li>• Mass mortality, if secondary bacterial infection is present</li> </ul>	<ul style="list-style-type: none"> <li>• Loss of appetite; slow growth</li> <li>• Reduced opercular movement</li> <li>• Fish rubs its body against objects</li> <li>• Destruction of affected tissues of the host fish</li> </ul>
What are the preventive and control measures?	<ul style="list-style-type: none"> <li>• Eliminate gastropod mollusks, which serve as intermediate hosts of the parasite, from the culture facility</li> </ul>	<ul style="list-style-type: none"> <li>• Do not feed cultured stocks with infected trash fish</li> <li>• Eliminate copepods, which serve as intermediate hosts, from the culture system</li> <li>• Dry the pond bottom thoroughly. Disinfect culture facilities with quicklime</li> <li>• Filter the water to be used for rearing fish</li> </ul>	<ul style="list-style-type: none"> <li>• Provide sufficient water exchange</li> <li>• Treat the fish with freshwater bath for 10-15 minutes</li> <li>• For chemical treatment, use hydrogen peroxide at 150 ppm for 30 minutes or formalin at 200-250 ppm for an hour with strong aeration</li> <li>• Transfer treated fish to a parasite-free facility</li> </ul>	<ul style="list-style-type: none"> <li>• Remove and crush isopods manually</li> <li>• Treat the fish in formalin at 200 ppm for 30-60 minutes with strong aeration</li> <li>• Spray nets used for rearing fish with 1% formalin, then transfer fish to a clean, parasite-free facility</li> <li>• Dry the pond for several weeks, then apply lime</li> </ul>

Aquaculture environments suitable for the growth and reproduction of fish could also harbor disease agents such as parasites. With more intensive aquaculture production comes more potential diseases.

Parasites in fish could either be ectoparasites or endoparasites. Ectoparasites live on the external surfaces of the host fish, while endoparasites live in the internal organs.

A wide variety of parasites have been identified to cause significant economic losses in marine fish culture. Most of these parasites are difficult to control effectively with a single measure. The control of parasites is dependent on culture systems of marine fish, knowledge of the life cycle of the parasite, and availability of effective treatment methods.

The following are the major parasites of grouper:

• **Protozoans**

These are one-celled microorganisms with specialized structures for movement, feeding and attachment. Four types of protozoans cause diseases in marine fish:

- 1 Dinoflagellates - are ectoparasites with long, hairlike structures called flagella which they use for movement
- 2 Ciliates - are ectoparasites equipped with short, fine outgrowths called cilia for movement
- 3 Myxosporeans - are composed of several spore shell valves. They are obligate parasites, which means they cannot live outside the host fish
- 4 Microsporidians - are intracellular parasites with one-celled spores containing sporoplasm and a coiled polar filament

• **Monogeneans**

These are ectoparasites. Monogeneans are equipped with a haptor, which is an organ of attachment with hooks and/or suckers. They infect the skin and gills of fish

• **Didymozoid digeneans**

These parasitic flatworms measuring up to 80 cm form capsules or cysts on the gills of marine fish

• **Nematodes**

These are endoparasitic roundworms with unsegmented bodies. Measuring 1-2 cm long, adult nematodes are big enough to be seen without a microscope

• **Crustacean parasites**

There are two major crustacean parasites in grouper:

- 1 Caligid copepods - are shell-covered ectoparasites with segmented bodies with jointed appendages
- 2 Isopods - are crustaceans whose bodies are divided into narrow segments. They are also equipped with a pair of eyes

• **Leeches**

These are ectoparasites whose bodies have striations or ridges. They have muscular body walls, and are equipped with two suckers for feeding and movement

This flyer shows some of the parasitic diseases affecting groupers, its causes, signs, and most importantly, measures that can be undertaken to prevent and control the diseases.

**PROTOZOANS**

**Amyloodioniosis**



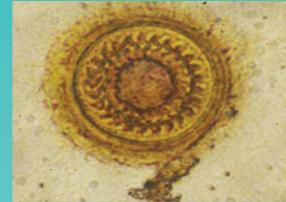
Humpback grouper *Cromileptes altivelis* with amyloodioniosis, shown with pale gills

**Cryptocaryonosis**



Cryptocaryonosis manifested as white spots on body surface of greasy grouper *Epinephelus tauvina*

**Trichodiniosis**



*Trichodina* sp. from body surface of infected orange spotted grouper *E. coioides*

**Brooklynelliosis**



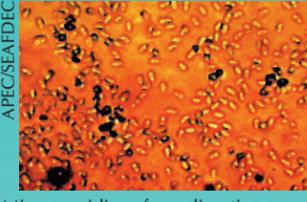
Extensive damage on body surface and subcutaneous bleeding in infected *E. tauvina*

**Renal sphaerosporosis**



Myxosporeans in kidney of Malabar grouper *E. malabaricus*

**Microsporidiosis**



Microsporidians from digestive organ tissues of grouper

**MONOGENEANS**

**Skin**



Skin monogeneans appear opaque white on caudal fin of humpback grouper *Cromileptes altivelis*

**Gill**



*Pseudorhabdosynochus lantauensis* on gill filaments of orange-spotted grouper *Epinephelus coioides*

What is it?	Amyloodioniosis, also known as velvet disease, is caused by brownish or yellowish, pear- or oval-shaped dinoflagellate, attached singly or in clusters of 2-4 individuals on the fish body surface or gills. Gray patches on the skin and gills of fish is one of its characteristics	Also known as white spot disease, cryptocaryonosis is caused by round or oval, motile ciliate. Whitish or grayish spots can be observed on the skin and gills of diseased fish	This disease is caused by ciliates called trichodinids that live outside the body surface and gills of the host fish. Trichodinids have saucer-shaped body, surrounded by cilia around its perimeter. It is a commonly found in intensive aquaculture systems	This disease is caused by a motile ectoparasitic ciliate, with a bean-shaped body and with long parallel lines of cilia that beat in wave-like motion	This infection is caused by a myxosporean that invades the kidney, liver, gall bladder, intestine, spleen and blood cells of fish. Mature spores are subspherical to spherical in shape containing two round polar capsules	This disease is caused by protozoans called microsporidians	This infection is caused by capsalid flatworms which infect the body surface and eyes of fish. Capsalid flatworms are oval in shape, 2-6 mm long, 0.8-4 mm wide, with a pair of sucker on the anterior margin, a disc-like attachment organ called opisthaptor armed with hooks on the posterior end, and two pairs of eye spots behind the anterior sucker.	This infection is common during the nursery, grow-out, and broodstock culture of groupers is caused by flatworms, 1-5 mm long, which attach to the gill filaments of infected fish
What are the causative organisms?	• <i>Amyloodinium ocellatum</i> (15-70 x 80-350 $\mu$ m)	• <i>Cryptocaryon irritans</i> (60-450 $\mu$ m diameter)	• <i>Trichodina</i> sp. (45-78 $\mu$ m diameter) • <i>Trichodinella</i> sp. (24-37 $\mu$ m diameter) • <i>Tripartiella</i> sp. (up to 40 $\mu$ m diameter)	• <i>Brooklynella hostilis</i> (36-86 x 32-50 $\mu$ m)	• <i>Sphaerospora epinepheli</i> [7.8-10 $\mu$ m (length) x 12.3-14.5 $\mu$ m (thickness) x 7-9.5 $\mu$ m (width)]	• <i>Glugea</i> sp. • <i>Pleistophora</i>	• <i>Benedenia epinepheli</i> • <i>Benedenia</i> spp. (1.8-9.5 mm x 0.82-2.5 mm) • <i>Neobenedenia girellae</i> • <i>Neobenedenia</i> spp. (3.3-6.1 x 1.8-3.7 mm)	• <i>Pseudorhabdosynochus</i> spp. • <i>Megalocotyloides</i> spp. • <i>Diplectanum epinepheli</i> spp.
How is it transmitted?	From fish to fish, predisposed by high stocking density, high organic matter in water, and handling stress	Through infected fish and water, predisposed by high stocking density, low water temperature, high organic load, handling stress	Through infected fish, water, contaminated farm equipment, live feed	Through infected fish and water, predisposed by high stocking density, poor water quality, handling stress	Transmission uncertain; predisposing factors are poor water quality, high stocking density, lack of quarantine	Through oral ingestion of spores of the parasite, predisposed by poor water quality and poor nutrition	Through infected fish and water, predisposed by overlapping generation of cultured fish, high stocking density	Through infected fish and water, predisposed by overlapping generation of cultured fish, high stocking density
What are its symptoms?	• White patches or dusty appearance of the skin and gills, with the skin turning darker in color and the gills turning pale • Excessive mucus production • Fish rubs its body against objects • Abnormal swimming, gasping and uncoordinated movements	• Whitish or grayish spots (0.10-0.35 mm diameter) on skin and gills • Abnormal swimming, lethargy, loss of appetite • Body of the fish turns darker in color, and hemorrhagic • Bulging of the eyes, which also turn opaque or hemorrhagic • Increased movement of gill cover • Fish rubs its body against objects	• Excessive mucus production of the gills and skin • Pale gills; frayed fins • Fish rubs its body against objects • Increased movement of gill cover • High mortalities among young fish	• Extensive damage to the skin and gills of infected fish; subcutaneous bleeding • Fish rubs its body against objects • Mass mortality of fry and fingerlings in heavy infection	• Destruction of the kidney, liver, gall bladder, intestine, spleen and blood cells • Loss of balance; the fish may float or turn upside down. • Bleeding of the mouth, skin and also in the swim bladder. • Swollen abdomen	• Swollen abdomen • Presence of brown to black nodules of varying sizes in fat tissue and internal organs	• Fish rubs its body against objects • Bleeding of the skin of heavily infected fish • Abnormal swimming behavior • Loss of appetite, lethargy • Blindness occurs if the parasite invades the eyes	• Loss of appetite • Abnormal swimming behavior • Respiration becomes affected by extensive damage to gill epithelium • Body surface becomes dark, with increased mucus production • Hemorrhagic lesions on the body surface
What are the preventive and control measures?	• Filter the water used for culture • Disinfect the water with ultraviolet irradiation • Immerse the fish in a freshwater bath • For chemical treatment, use 200 ppm hydrogen peroxide for 1 hour with strong aeration, or 0.5-0.75 ppm copper sulfate for 3-6 days, or 100-300 ppm formalin for 30-60 minutes with strong aeration • Transfer treated fish to a parasite-free tank twice at a 3-day interval	• Maintain the fish in freshwater for one hour for 2-3 days • For chemical treatment, use 0.5 ppm copper sulfate for 5-7 days with strong aeration. Replace the treated water daily • Transfer infected fish to parasite-free tanks	• Treat the fish in a freshwater bath for 1 hour for 3 days • Formalin may also be used at 25-30 ppm for 1-2 days, or 200 ppm for 30-60 minutes with strong aeration	• Treat the fish in a freshwater bath for 1 hour for 3 days • Formalin may also be used at 100-200 ppm for 30-60 minutes for 2-3 days with strong aeration	• Discard diseased fish • Ensure efficient water exchange in the culture system • Quarantine new stock • Disinfect inflow water by ultraviolet irradiation	• Avoid feeding stocks with contaminated trash fish • Disinfect the culture system using chlorine or iodine solutions • Ensure good water exchange • Isolate and destroy diseased stocks	• Treat the fish in freshwater bath for 5-30 minutes, depending on the tolerance of the fish • Dislodge skin monogeneans from the skin and gills by immersing fish in 150 ppm hydrogen peroxide for 10-30 minutes with strong aeration	• Treat the fish in 150-200 ppm hydrogen peroxide for 30-60 minutes provided with strong aeration, or in 100-200 ppm formalin for 30-60 minutes for 3 days with strong aeration