

can be collected by gently scraping a glass coverslip over the surface of the fish. If the fish is not going to be sacrificed, be sure to keep the area sampled to a minimum. Areas of particular interest should be lesions, bumps, or ulcers. As in other species, the edge of an abnormal area is most suitable for examination. Fin biopsies can be taken by gently snipping a section of fin and preparing a wet mount. Any abnormal or frayed area is best. Wet mounts of gill filaments, skin mucus, and fin edge can be examined, without staining, at 100x and 400x with a light microscope. Parasites can be identified by their movement or shape. A number of references are available to assist you in learning to identify different organisms (see Recommended Reading). In addition to identification of organisms, it is important to assess the number of organisms present and the general condition of the tissue being examined, particularly the condition of gill filaments (Figure 2).

Fecal Examination

Intestinal parasitism can be of concern in a number of popular species of aquarium fish, including many freshwater cichlids and tropical marine reef fish. A fecal sample can sometimes be collected by gently squeezing the abdomen of the fish. If the fish has been anorectic, however, this may not work well. If the fish is anesthetized to ease handling, collection of a fecal sample can often be accomplished during induction as defecation is common at this time. If the fish is to be necropsied, intestinal contents can be examined with a light microscope after the abdominal cavity has been opened. A negative fecal does not mean that the fish is free of parasites, as some parasites inhabit the anterior portions of the intestinal tract. However, a positive result indicates that parasites are present, although it may be difficult to assess severity of the infestation.

Necropsy

Many breeders will be willing to sacrifice several fish from a population for complete necropsy in order to obtain a more accurate diagnosis than could be obtained from examination of a live fish. It is important to communicate clearly with the client before the decision to euthanize a fish is made. Euthanasia can be readily accomplished by using an overdose of MS-222 or by simply severing the spinal cord. The principal advantages of complete necropsy are that it provides a means of obtaining tissue samples for bacterial or viral culture as well as for histologic examination. Of these, bacterial cultures are the most important for routine problems. Bacterial cultures should be taken from posterior kidney and other organs as indicated. Brain cultures are particularly important if the fish shows signs of neurologic disease (i.e., spinning, convulsing, etc.). Bacterial cultures should be sent to a laboratory familiar with fish samples. Most bacteria of fish grow best at 25°C rather than 37°C and may not key out properly with identification kits used for mammalian samples.

COMMON DISEASES

Bacterial Diseases

Bacterial diseases are common in fish; however, in most cases it is prudent to determine why the fish was susceptible to bacterial invasion. Poor water quality, dirty conditions, and excessive parasitism often predispose fish to bacterial infections. With the exception of *Streptococcus*, which is rare, most bacterial infections of fish are caused by gram negative organisms. *Aeromonas hydrophila* is the most common bacterial pathogen infecting warmwater fish. The disease often presents with low to moderate levels of mortality, hemorrhage of fins and skin, and fluid accumulation. *Pseudomonas fluorescens* can mimic *A. hydrophila* infections in warmwater fish. A closely related disease that is common in goldfish and koi carp is *Aeromonas salmonicida*, which can cause a chronic, fibrinous peritonitis in some fish. Members of the genus *Vibrio* are the most common bacterial pathogens of marine fish, and clinical presentation is very similar to *A. hydrophila* infection of freshwater fishes.

Occasionally, *Streptococcus* or *Edwardsiella ictaluri* will be isolated from the brain of fish showing signs of neurologic disease, often manifest by spinning. *Edwardsiella tarda* and *P. putrefaciens* are occasionally isolated from malodorous ulcers on fish and can cause systemic disease. *Flexibacter columnaris* is a bacterium that infects epithelial surfaces and is a common cause of "fin rot." External infections of *F. columnaris* can be presumptively identified with a light microscope. Long flexing rods typical of the organism can be seen at 400x. Ordal's is a special medium used for isolation of columnaris bacteria. Bacterial culture and antibiotic sensitivity testing is extremely important for pet fish. Trypticase Soy Agar with 5% bovine or ovine blood is ideal for primary isolation of most bacteria. Mueller Hinton medium is effective for most sensitivity testing.

Parasitic Diseases

Experience at the University of Florida suggests that the most common infectious disease problems of pet fish are parasitic. Goldfish and koi, for example, are commonly presented with heavy infestations of monogenetic trematodes on the gills and skin. Monogenes can occur on any species; however, goldfish, koi, and discus (an Amazon cichlid) seem highly susceptible. Monogenes are easily recognized as flatworms visible under low power (40x) with a light microscope. They move in an inchworm fashion and attach to host epithelium with hooks. *Ichthyophthirius multifiliis*, commonly called "ich," is a ciliated protozoan that is an obligate parasite of fish. Ich is very large (1000µm) and easily seen using low power (40x). It appears as a large, dark organism covered with cilia. It has a horseshoe-shaped macronucleus and moves in