

# Considerations for Treatment of Large Zoologic Collections: Fish



Claire D. Erlacher-Reid, DVM, DACZM

## KEYWORDS

- Fish • Immersion • Nutrition • Parasites • Quarantine • Salinity • Vaccines
- Water quality

## KEY POINTS

- The health of the environment is intimately connected to the health and medical care of aquatic species.
- Fish health should be maintained by ensuring appropriate husbandry and nutrition for the housed aquarium species. Medications may be delivered orally, by immersion, topically, or by injection.
- Prevention and early diagnosis of infectious diseases are recommended by establishing a thorough quarantine and preventative medicine protocol.
- Treatments for fish are generally multimodal involving environmental and/or nutritional management first, followed by targeted pharmacologic treatment to control a specific pathogen if needed.
- The relationship between and among water quality parameters, targeted pathogens, aquarium species, and medications should be investigated thoroughly before selecting a treatment regimen.

## INTRODUCTION

Aquatic species live most or all their lives in water; therefore, the health of the environment is intimately connected to the health and medical care of these species. Understanding and maintaining appropriate nutrition, temperature, water quality, filtration, substrate, and stocking density are necessary to sustain health. Most diseases of fish are secondary opportunistic infections; therefore, it is recommended to establish a thorough quarantine and biosecurity protocol (**Box 1**) to reduce the risks of introducing infectious diseases to an established aquarium system.<sup>1–4</sup> Implementing a thorough routine preventive medicine protocol (**Box 2**) will also facilitate diagnosis and guide treatment and/or management decisions for when health concerns of established aquarium collections do present.

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Zoological Operations, Department of Veterinary Services, SeaWorld Orlando, 7007 Sea World Drive, Orlando, FL 32821, USA

E-mail address: [Claire.Erlacher-Reid@SeaWorld.com](mailto:Claire.Erlacher-Reid@SeaWorld.com)

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**Box 1****Quarantine considerations for fish maintained in public display aquaria**

All new incoming fish species should be placed in quarantine for a minimum of 30 days (45–60 days usually recommended for cold water species).

*Entrance and exit examinations*

Entrance and exit examinations on a subset of the population (approximately 2%–5%) should occur within 1 week of quarantine arrival and 1 week before quarantine departure. The following criteria should be met when possible during both of those examinations:

- Visual inspection;
- Body weight;
- Skin scrape (with or without fin clip) wet mount examination;
- Gill clip wet mount examination when feasible;
- Blood sampling for hematology and plasma biochemistry, especially in moray eel and elasmobranch species (not recommended in fish <8 cm total length); and
- Thorough necropsy of all deceased fish when possible, including postmortem wet mount samples of skin scrapes, fin clips, gill biopsies, and all internal organs.

*Treatments*

Treatment protocols should be designated by veterinary staff. This may include prophylactic treatment of quarantine fish to prevent parasite introduction to established systems (eg, praziquantel, formalin, fenbendazole, copper, etc) and/or specific treatment based on diagnostic examinations.

*Medical records*

Written or computerized records should be maintained for each system documenting the following criteria daily to monitor trends during the quarantine period:

- Water quality parameters;
- Number of mortalities;
- Treatments administered (eg, dose, duration/frequency, and route); and
- Estimated percentage of food intake for the population.

*Biosecurity*

- Fish should ideally be quarantined in an isolated facility located away from collection animals.
- Teleost fish, elasmobranchs, and invertebrate species should be quarantined in separate systems by taxa when possible.
- There should be designated staff members assigned to work only in the quarantine facility. Alternatively, if that is not possible, collection fish should be handled first prior to employees entering the quarantine facility for the day.
- Foot baths should be maintained at all quarantine entryways and exits, and if possible, between systems.
- Designated nets and equipment should be assigned to each system. Alternatively, if that is not possible, gloves, hand washing stations, and net disinfection stations should be readily available and easy to access.

*Data from* Hadfield CA, Clayton LA. Fish quarantine: current practices in public zoos and aquaria. *J Zoo Wildl Med* 2011;42:641–50; and Hadfield CA. Quarantine of fish and aquatic invertebrates in public display aquaria. In: Miller RE, Fowler ME, editors. *Zoo and wild animal medicine: current therapy*, 7th edition. St Louis (MO): Elsevier; 2012. p. 202–9.

**PATIENT EVALUATION AND DIAGNOSTICS**

Diagnostics should first consist of evaluation of the environment, water quality, nutrition, and visual observation of the species. **Table 1** provides general guidelines for what may be considered acceptable water quality ranges in many species of fish,

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