

The Elasmobranch Husbandry Manual: Captive Care of Sharks, Rays and their Relatives

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Chapter 2

Species Selection and Compatibility

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Abstract: The process of determining which species of elasmobranchs to obtain for an existing or new exhibit can be challenging. Species selection and compatibility are important aspects to consider when planning an elasmobranch display. The key factors in formulating a species list include exhibit goal, system design, species availability, species compatibility, and species potential for reproduction. When formulating a species list, it is prudent to discuss detailed species requirements and traits with an institution that already displays the animals in question.

The process of determining which species of elasmobranchs to obtain for an existing or new exhibit can be challenging. The interaction of each species with other elasmobranchs and other taxa (e.g., teleosts) is an important factor that must be considered. Generally speaking, these decisions should be based on the trials and experiences of other public aquariums, hobbyists, and researchers. There are roughly 400 species of sharks and 500 species of rays and skates (Compagno, 1999). According to the American Elasmobranch Society (AES) captive elasmobranch census, only about 150-200 species have been kept successfully in captivity. While aquariums are always trying to obtain and maintain new species, most of the information available on elasmobranchs in captivity is based on a relatively small number of species. This chapter is intended to serve as a guide for determining which species to select for an exhibit and their compatibility with other elasmobranchs, as well as other taxa.

SPECIES SELECTION

Elasmobranchs require unique husbandry methods for their long-term captive survival. Institutions or individuals planning to obtain and display elasmobranchs must consider these requirements from the outset of exhibit development. There are five key factors to consider when adding elasmobranchs to an

existing exhibit, or indeed when designing a new exhibit: exhibit goal, exhibit design, species availability, species compatibility, and species potential for reproduction.

Exhibit goal

The first step in determining what species of elasmobranchs to select is to create a clear exhibit goal or objective. One possibility is to design an exhibit themed around a given habitat. This type of exhibit is generally a multi-taxa display with elasmobranchs, teleosts, and sometimes sea turtles. An example would be a large Atlantic coral reef habitat with several species of sharks, rays, and many species of reef fishes. A second common design theme is taxonomic, i.e., a display designed specifically around a taxonomic group such as sharks or rays. Frequently, these displays are not geographically accurate, but they are successful at showing the large variation within a given group of animals. An additional display type combines elements from both of the above. This third display type contains similar taxonomic species from a broad geographical region, such as an exhibit showing sharks from the Atlantic Ocean. In this type of display it may be possible to present two shark species that usually live in different habitats and are rarely seen together in the wild. Having a clear objective for a display makes the selection of target species more manageable.

Exhibit design

Exhibit design is the single most important factor to consider when deciding the species of elasmobranchs to obtain. Exhibit size, shape, volume, and depth, are all areas to closely assess. To swim correctly, many elasmobranchs require an extensive, uninterrupted, horizontal swimming dimension (Stoskopf, 1993). Exhibit rockwork and décor is another important consideration. Some species, like the scalloped hammerhead shark (*Sphyrna lewini*), frequently injure their head and eyes on rough, rocky outcroppings (Violetta, pers. com.). In this case, the exhibit should be designed with large, open swimming areas, smooth décor, and rounded tank walls to prevent abrasions. The tiger shark (*Galeocerdo cuvier*), on the other hand, will orient its body along the outer walls of a display and constantly abrade its pectoral fins and lower caudal lobe on the smooth concrete surfaces (Crow and Hewitt, 1988; Dehart and Stoops, 1998). For this species, an exhibit should have rough rockwork protruding in an irregular fashion from all the tank walls, keeping the shark swimming in the middle of the exhibit away from obstructions.

Clearly the natural behavior and swimming patterns for each species should be used as a guide to determine whether or not it can be kept in an exhibit. The more closely an aquarium can mimic the animal's natural habitat, in both swimming area and structure, the better the animal's health will be. Obviously pelagic animals should be maintained in extremely large, open exhibits, while sedentary, benthic animals should be kept in a system with appropriate substrate such as sand or gravel. Exhibit design is discussed in more detail in Chapter 5 of this manual.

Species availability

In recent years the ability to obtain certain shark species is becoming increasingly difficult. Availability, or the lack thereof, often plays a role in determining a species list. Elasmobranchs can be collected by the staff of the aquarium or university, within the local area, or purchased through commercial collectors. Regardless of the method chosen, it is imperative to obtain all proper permits from local, federal, and international authorities before acquiring specimens.

There are distinct advantages for a facility that can collect its own specimens, but the institution must have the resources and be in the right locale.

This method generally implies a greater cost per animal and is frequently time consuming, but offers a chance for staff to get into the field, hand select individual specimens, and view the natural habitat of the species firsthand. Collecting methods are described in Chapter 7 of this manual.

There are many good commercial collectors who specialize in acquiring elasmobranchs. When dealing with a commercial collector ensure that they have all the appropriate permits. It is a good practice to check with other aquariums to verify a collector's credentials and experience. Permitting issues are discussed at length in Chapter 3 of this manual.

Another possible source for specimens is through surplus lists. For example, the American Zoo and Aquarium Association (AZA) releases a monthly surplus list to all member institutions. These animals are frequently donated to other AZA member institutions at no cost other than shipping. This is a great method for exchanging animals (and experiences) with other facilities and decreases the demand for wild-caught specimens.

Species compatibility

Compatibility refers to the interaction between an elasmobranch species and the other organisms within an exhibit. There are compatibility considerations both within and between elasmobranch species, and with bony fishes and invertebrates. Many species, such as the wobbegong shark (*Eucrossorhinus* spp. and *Orectolobus* spp.), have a tendency to eat almost any tank inhabitant that will fit in their mouths. The compatibility of individual species of elasmobranchs is discussed below in the section entitled "Species description."

Bony fishes and invertebrates will often be preyed upon in a community-style display. Bony fishes are the normal prey items of many elasmobranchs. It is therefore only natural that elasmobranchs in captivity will continue to feed on live display specimens from time to time. Predation can be minimized by selecting certain species of elasmobranchs that do well in a multi-taxa environment, and by feeding these specimens frequently. Providing places where smaller organisms can hide also helps reduce losses through predation.

Some shark species are even aggressive toward other sharks. One such example is the lemon shark (*Negaprion brevirostris*), which has been known to harass other species such as sand tiger sharks (*Carcharias taurus*) and sandbar sharks (*Carcharhinus plumbeus*). Sand tiger sharks, in turn, are piscivorous and will often consume smaller sharks on exhibit such as whitetip reef sharks (*Triaenodon obesus*) and blacknose sharks (*Carcharhinus acronotus*) (Smith, pers. com.; Thoney, pers. com.). Fortunately, only a few species display such behaviors. During reproductive cycles, typically non-aggressive individuals can become more aggressive (e.g., sand tiger sharks) (Gordon, 1993). Maintaining sharks in groups comprised of similar-sized animals will minimize aggression towards smaller individuals.

The compatibilities of different species have been summarized in Table 2.1. This matrix can be used as a rough guideline to determine the suitability of mixing different species within an exhibit. Size differences between elasmobranchs and other tank inhabitants is a key factor when dealing with compatibility and predation, but exhibit size and shape, species traits, etc., can play an important role. Specimens, within a species, will not always display the same or predictable behavior. Careful planning, research, and communication with other facilities will improve your chances of successfully maintaining a variety of shark, ray, and fish species within a single display.

The great white (*Carcharodon carcharias*), tiger, whale (*Rhincodon typus*), oceanic whitetip (*Carcharhinus longimanus*), blue (*Prionace glauca*), scalloped hammerhead, and great hammerhead (*Sphyrna mokarran*) sharks have specialized exhibit requirements (e.g., very large exhibit dimensions in the horizontal plane) and compatibility constraints, and communication with experienced institutions is strongly urged before attempting to maintain these species.

Species potential for reproduction

If captive breeding is considered an important objective for target elasmobranch species, reproductive behavior and physiology must be considered when formulating the species list. Captive reproduction of elasmobranchs is covered more completely in Chapters 16 and 17 of this manual.

SPECIES DESCRIPTION

This section provides a brief description of the most commonly held elasmobranchs, as well as a few key signature species which have proven difficult to maintain. Several volumes could be filled with a detailed description of all the elasmobranch species held in captivity, so this is an unavoidably broad overview. Species were selected using the AES captive elasmobranch censuses from 1997, 2000, and 2001. Table 2.2 summarizes the maximum size, hardiness, availability, compatibility, and geographical range of each species. A rating system is used for hardiness, availability, and compatibility. Not all specimens of a given species will necessarily behave in an established manner. Juveniles and adults are often different in terms of hardiness and compatibility.

Hardiness

The hardiness of a species describes how well it adapts to the rigors of the captive environment and is ranked on a scale of one to four as follows:

1. *Adapts readily* - Typically acclimates with ease to a new environment, has few problems adjusting to eating in captivity, and survives quarantine well.
2. *Adapts well* - Can be difficult to transport, but generally adapts well to captivity.
3. *Delicate* - Eventually acclimates to captivity, but may take longer to start eating, or have special quarantine requirements.
4. *Difficult* - These species are hard to maintain in captivity for an extended period of time. They frequently have trouble adapting to a confined environment, have trouble feeding in captivity, and often have chronic medical problems.

Availability

Availability describes how difficult the species is to obtain and is ranked on a scale of one to three as follows:

1. *Easy* - Frequently bred in captivity or is readily available in the wild.
2. *Average* - Not usually captive bred, but fairly abundant and available in the wild.
3. *Difficult* - Difficult to obtain, even in the wild, and often subject to government restrictions on their collection.

Table 2.1. Matrix showing the compatibility of different elasmobranch species. Select a species from the left-hand column (LHC) and compare to species on adjacent columns to the right. Specimen size differences, exhibit size, and inter- and intra-species variation will modify species compatibility. Key: **a** = target species (LHC) may prey upon or be aggressive toward compared species; **p** = target species (LHC) may be preyed on, or harassed by, compared species; **h** = target species (LHC) may be subject to harassment by teleosts; and **t** = target species (LHC) and compared species require different water temperature regimes.

	<i>Carcharias taurus</i>	<i>Carcharhinus acronotus</i>	<i>Carcharhinus leucas</i>	<i>Carcharhinus limbatus</i>	<i>Carcharhinus longimanus</i>	<i>Carcharhinus melanopterus</i>	<i>Carcharhinus perezi</i>	<i>Carcharhinus plumbeus</i>	<i>Carcharodon carcharias</i>	<i>Cephaloscyllium ventriosum</i>	<i>Chiloscyllium plagiosum</i>	<i>Chiloscyllium punctatum</i>	<i>Eucrossorhinus dasyopogon</i>	<i>Galeocerdo cuvier</i>	<i>Ginglymostoma cirratum</i>	<i>Hemiscyllium ocellatum</i>	<i>Heterodontus francisci</i>	<i>Heterodontus portusjacksoni</i>	<i>Mustelus canis</i>	
<i>Carcharias taurus</i>		a								t	a	a	a			a	t	t	a	
<i>Carcharhinus acronotus</i>	p		p						p	t	a	a		p		a	t	t		
<i>Carcharhinus leucas</i>		a		a		a				t	a	a	a			a	t	t	a	
<i>Carcharhinus limbatus</i>			p						p	t	a	a		p		a	t	t		
<i>Carcharhinus longimanus</i>																				
<i>Carcharhinus melanopterus</i>			p						p	t				p		a	t	t	t	
<i>Carcharhinus perezi</i>										t	a	a				a	t	t	a	
<i>Carcharhinus plumbeus</i>										t	a	a				a	t	t	a	
<i>Carcharodon carcharias</i>		a		a		a				a	a	a	a			a	a	a	a	
<i>Cephaloscyllium ventriosum</i>	t	t	t	t		t	t	t	p		t	t	t	t	t	t				
<i>Chiloscyllium plagiosum</i>	p		p						p	t								t	t	
<i>Chiloscyllium punctatum</i>	p		p						p	t								t	t	
<i>Eucrossorhinus dasyopogon</i>	p		p						p	t						a	t	t		
<i>Galeocerdo cuvier</i>										t								t	t	a
<i>Ginglymostoma cirratum</i>										t								t	t	
<i>Hemiscyllium ocellatum</i>			p						p	t			p					t	t	
<i>Heterodontus francisci</i>	t	t	t	t		t	t	t	p		t	t	t	t	t	t				
<i>Heterodontus portusjacksoni</i>	t	t	t	t		t	t	t	p		t	t	t	t	t	t				
<i>Mustelus canis</i>	p		p			t	t	t	p					p						
<i>Negaprion brevirostris</i>										t	a	a	a			a	t	t	a	
<i>Notorynchus cepedianus</i>	t	t	t	t		t	t	t			t	t	t	t	t	t				
<i>Orectolobus japonicus</i>			p						p	t	a	a				a	t	t		
<i>Orectolobus maculatus</i>			p						p	t	a	a				a	t	t		
<i>Orectolobus ornatus</i>			p						p	t	a	a				a	t	t		
<i>Prionace glauca</i>	t	t	t	t		t	t	t	p		t	t	t	t	t	t				
<i>Rhincodon typus</i>										t								t	t	
<i>Scyliorhinus retifer</i>	t	t	t	t		t	t	t	p		t	t	t	t	t	t				
<i>Scyliorhinus stellaris</i>	t	t	t	t		t	t	t	p		t	t	t	t	t	t				
<i>Sphyrna lewini</i>									p	t								t	t	a
<i>Sphyrna mokarran</i>																				a
<i>Sphyrna tiburo</i>			p						p	t								t	t	
<i>Squalus acanthias</i>			p			t	t	p	p				p							
<i>Stegostoma fasciatum</i>										t								t	t	
<i>Triaenodon obesus</i>			p							t								t	t	
<i>Triakis semifasciata</i>	t	t	t	t		t	t	t	p		t	t	t	t	t	t				
Benthic batoids			p						p											
Pelagic batoids			p						p											

Table 2.1 (continued). Matrix showing the compatibility of different elasmobranch species. Select a species from the left-hand column (LHC) and compare to species on adjacent columns to the right. Specimen size differences, exhibit size, and inter- and intra-species variation will modify species compatibility. Key: **a** = target species (LHC) may prey upon or be aggressive toward compared species; **p** = target species (LHC) may be preyed on, or harassed by, compared species; **h** = target species (LHC) may be subject to harassment by teleosts; and **t** = target species (LHC) and compared species require different water temperature regimes.

	<i>Negaprion brevirostris</i>	<i>Notorynchus cepedianus</i>	<i>Orectolobus japonicus</i>	<i>Orectolobus maculatus</i>	<i>Orectolobus ornatus</i>	<i>Prionace glauca</i>	<i>Rhincodon typus</i>	<i>Scyliorhinus retifer</i>	<i>Scyliorhinus stellaris</i>	<i>Sphyrna lewini</i>	<i>Sphyrna mokarran</i>	<i>Sphyrna tiburo</i>	<i>Squalus acanthias</i>	<i>Stegostoma fasciatum</i>	<i>Triaenodon obesus</i>	<i>Triakis semifasciata</i>	Benthic batoids	Pelagic batoids	Teleosts
<i>Carcharias taurus</i>		t	a	a	a			t	t			a	a			t	a	a	a
<i>Carcharhinus acronotus</i>	p	t				t		t	t							t			
<i>Carcharhinus leucas</i>		t	a	a	a	t		t	t			a	a		a	t	a	a	a
<i>Carcharhinus limbatus</i>	p	t				t		t	t							t			
<i>Carcharhinus longimanus</i>																	a	a	a
<i>Carcharhinus melanopterus</i>	p	t				t		t	t							t			
<i>Carcharhinus perezi</i>		t				t		t	t				a			t			
<i>Carcharhinus plumbeus</i>		t				t		t	t				a			t			
<i>Carcharodon carcharias</i>			a	a	a	a		a	a	a		a	a			a	a	a	a
<i>Cephaloscyllium ventriosum</i>	t		t	t	t		t			t	t	t		t	t				
<i>Chiloscyllium plagiosum</i>	p	t				t		t	t	p	p					t			h
<i>Chiloscyllium punctatum</i>	p	t				t		t	t	p	p					t			h
<i>Eucrossorhinus dasypogon</i>	p	t				t		t	t							t			a
<i>Galeocerdo cuvier</i>		t				t		t	t			a	a			t	a	a	a
<i>Ginglymostoma cirratum</i>		t				t		t	t							t			
<i>Hemiscyllium ocellatum</i>	p	t	p	p	p	t		t	t	p	p				p	t			h
<i>Heterodontus francisci</i>	t		t	t	t		t			t	t	t	t	t	t				h
<i>Heterodontus portusjacksoni</i>	t		t	t	t		t			t	t	t	t	t	t				h
<i>Mustelus canis</i>	p									p	p				p				
<i>Negaprion brevirostris</i>		t	a	a	a	t		t	t			a	a			t	a	a	a
<i>Notorynchus cepedianus</i>	t		t	t	t		t		a	t	t	t	t	t	t				a
<i>Orectolobus japonicus</i>	p	t				t		t	t							t			a
<i>Orectolobus maculatus</i>	p	t				t		t	t							t			a
<i>Orectolobus ornatus</i>	p	t				t		t	t							t			a
<i>Prionace glauca</i>	t		t	t	t		t			t	t	t		t	t				
<i>Rhincodon typus</i>		t				t		t	t							t			
<i>Scyliorhinus retifer</i>	t		t	t	t		t			t		t		t	t				h
<i>Scyliorhinus stellaris</i>	t	p	t	t	t	p	t			t		t		t	t				
<i>Sphyrna lewini</i>		t				t		t	t				a			t	a	a	a
<i>Sphyrna mokarran</i>													a			t	a	a	a
<i>Sphyrna tiburo</i>	p	t				t		t	t							t			
<i>Squalus acanthias</i>	p																		h
<i>Stegostoma fasciatum</i>		t				t		t	t							t			
<i>Triaenodon obesus</i>		t				t		t	t							t			a
<i>Triakis semifasciata</i>	t		t	t	t		t			t		t		t	t				
Benthic batoids	p									p									h
Pelagic batoids	p									p									

Compatibility

Compatibility describes the interaction of a target species with other inhabitants of an exhibit. This system pertains not only to their interaction with other elasmobranchs, but with bony fishes, invertebrates, and turtles as well. Compatibility is ranked on a scale of one to five as follows:

1. *No compatibility problems* - Good with other elasmobranchs and in a multi-taxa exhibit.
2. *Sedentary, bottom dwelling* - These species can have their fins or eyes picked by some teleosts such as butterflyfish and angelfish (especially *Chaetodon* spp., *Heniochus* spp., *Holacanthus* spp., and *Pomacanthus* spp). Other-wise, these species do well in multi-taxa exhibits.
3. *Timid, non-aggressive* - These species do not do well with other species of elasmobranchs of equal or larger size.
4. *Aggressive towards teleosts* - These species will harass and frequently eat teleosts, but interact well with other elasmobranch species.
5. *Aggressive towards others* - These species will harass and frequently eat smaller tank inhabitants (e.g., teleosts, rays, etc.). They will commonly bite other elasmobranch species. These species have larger space requirements than others.

CONCLUSIONS

The information in this chapter is to be used only as a guide. The elasmobranchs described represent some of the most common species held in captivity, as well as a few key signature species. When planning to acquire elasmobranchs for an existing or new display, it is prudent to discuss detailed species requirements and traits with an institution that already displays the species. The factors that need to be considered are exhibit goal, exhibit design, species availability, species compatibility, and whether or not there is a plan for breeding. The AES captive elasmobranch census is a good information source for finding institutions experienced with a specific species.

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Table 2.2. A brief description of elasmobranchs commonly held in aquaria and some key signature species that have proven difficult to maintain. Species were selected using the American Elasmobranch Society (AES) captive census from 1997, 2000, and 2001. All biological data was taken from Compagno (1984), and Froese and Pauly (2000), for the sharks and batoids respectively, except: 1 Carlson et al., 1999; 2 Last and Stevens, 1994; 3 Castro, 2000; 4 Snelson et al., 1988; 5 Mollet et al., 2002. Hardiness: (1) adapts readily; (2) adapts well; (3) delicate; and (4) difficult. Availability: (1) easy; (2) average; and (3) difficult. Compatibility: (1) No compatibility problems; (2) sedentary, bottom dwelling; (3) timid, non-aggressive; (4) aggressive towards teleosts; (5) aggressive towards others; and (-) unknown. Please refer to body text for a more detailed description of the indices for hardiness, availability, and compatibility.

Species name	Common name	Maximum Size	Hardiness	Availability	Compatibility	Range	Description
<i>Alopias nainarai</i>	spotted eagle ray	180 cm DW	3	2	1	Circumglobal in tropical waters.	Difficult to get through quarantine. Require more care than other rays.
<i>Carcharhinus acronotus</i>	blacknose shark	137 cm TL ¹	3	2	1	Western Atlantic in coastal temperate and tropical waters.	Delicate through quarantine, but hardy once acclimated.
<i>Carcharhinus leucas</i>	bull shark	340 cm TL	2	2	5	Circumglobal, in tropical and subtropical waters. Also occurs in fresh water.	Very aggressive species. Should be handled with care. Will eat rays and sharks.
<i>Carcharhinus limbatus</i>	blacktip shark	255 cm TL	3	2	1	Circumglobal, in tropical and subtropical continental waters.	Difficult to transport.
<i>Carcharhinus longimanus</i>	oceanic whitetip shark	300 cm TL	2	2	1	Circumglobal, pelagic in tropical waters.	Occasionally held species. Species does well in multitaxa display. Few long-term successes with this species.
<i>Carcharhinus melanopterus</i>	blacktip reef shark	180 cm TL	1	2	4	Inshore waters of the Indo-Pacific.	Commonly held species. Species does well in multitaxa exhibit.
<i>Carcharhinus perezi</i>	Caribbean reef shark	295 cm TL	3	2	4	Tropical inshore waters of the Caribbean.	Difficult to transport.
<i>Carcharhinus plumbeus</i>	sandbar shark	239 cm TL	2	2	1	Circumglobal, in coastal and pelagic temperate and tropical waters.	Commonly held species. Species does well in multitaxa exhibit.
<i>Carcharias taurus</i>	sand tiger shark	318 cm TL	1	3	4	Circumglobal, in temperate and tropical waters.	Commonly held species. Becoming hard to obtain in certain regions.
<i>Carcharodon carcharias</i>	great white shark	640 cm TL	4	3	-	Circumglobal in coastal waters.	Very difficult specimen to keep. Longest captivity to date is 16 days.
<i>Cephaloscyllium ventriosum</i>	swellshark	100 cm TL	1	1	1	Eastern Pacific in temperate and subtropical waters.	Commonly held species. Frequently breeds in captivity.
<i>Chiloscyllium plagiosum</i>	whitespotted bamboo shark	95 cm TL	1	1	2	Inshore Indo-West Pacific.	Bottom-dwelling species. Readily breeds in captivity.
<i>Chiloscyllium punctatum</i>	brownbanded bamboo shark	104 cm TL	1	2	2	Inshore West-Pacific.	Bottom-dwelling species. Does well in smaller exhibits.
<i>Dasyatis americana</i>	southern stingray	180 cm DW	1	1	2	Western Atlantic.	Commonly held species. Reproduces readily in captivity.
<i>Dasyatis centroura</i>	rountail stingray	220 cm DW	2	2	2	Eastern and Western Atlantic.	Large ray species that does well in captivity.
<i>Dasyatis sabina</i>	Atlantic stingray	45 cm DW ⁴	1	1	2	Northern West Atlantic.	Similar to southern stingray, but smaller.
<i>Eucrossorhinus dasypogon</i>	tasseled wobbegong	117 cm TL	3	2	4	Western South Pacific.	Will frequently prey on smaller exhibit inhabitants.
<i>Galeocerdo cuvier</i>	tiger shark	600 cm TL ²	4	2	3	Circumglobal, in temperate and tropical waters.	Extremely difficult species to transport and keep in captivity.
<i>Ginglymostoma cirratum</i>	nurse shark	280 cm TL ³	1	1	2	Western Atlantic.	Very common and hardy species in captivity.
<i>Hemiscyllium ocellatum</i>	epaulette shark	107 cm TL	1	1	2	Western South Pacific.	Bottom-dwelling reef species. Good for smaller exhibits.
<i>Heterodontus francisci</i>	horn shark	122 cm TL	3	2	1	Eastern Pacific in temperate and subtropical waters.	Will prey on invertebrates in captivity.

Table 2.2 (continued). A brief description of elasmobranchs commonly held in aquaria and some key signature species that have proven difficult to maintain. Species were selected using the American Elasmobranch Society (AES) captive census from 1997, 2000, and 2001. All biological data was taken from Compagno (1984), and Froese and Pauly (2000), for the sharks and batoids respectively, except: 1 Carlson et al., 1999; 2 Last and Stevens, 1994; 3 Castro, 2000; 4 Snelson et al., 1988; 5 Mollet et al., 2002. Hardiness: (1) adapts readily; (2) adapts well; (3) delicate; and (4) difficult. Availability: (1) easy; (2) average; and (3) difficult. Compatibility: (1) No compatibility problems; (2) sedentary, bottom dwelling; (3) timid, non-aggressive; and (4) aggressive towards teleosts; (5) aggressive towards others; and (-) unknown. Please refer to body text for a more detailed description of the indices for hardiness, availability, and compatibility.

Species name	Common name	Maximum Size	Hardiness	Availability	Compatibility	Range	Description
<i>Heterodontus portusjacksoni</i>	Port Jackson shark	165 cm TL	3	2	1	West South Pacific around Australia.	Will prey on invertebrates in captivity.
<i>Himantura uarnak</i>	honeycomb stingray	200 cm DW	1	2	2	Indo-West Pacific.	Hardy display species which has bred in captivity.
<i>Isurus oxyrinchus</i>	shortfin mako	394 cm TL	4	3	-	Circumglobal in oceanic and coastal temperate and tropical waters.	Species has proven difficult to keep long-term.
<i>Leucoraja erinacea</i>	little skate	54 cm DW	3	1	2	Northern West Atlantic.	Hardy once the animal acclimates and begins eating.
<i>Myliobatis aquila</i>	common eagle ray	183 cm DW	3	2	1	Eastern Atlantic and Mediterranean.	Can be sensitive to temperature extremes within its range.
<i>Myliobatis californica</i>	bat eagle ray	180 cm DW	1	1	2	Eastern Pacific.	Commonly parasitized by flukes at time of collection.
<i>Negaprion brevirostris</i>	lemon shark	340 cm TL	1	2	5	Western Atlantic in tropical inshore waters.	Can be an aggressive shark in captivity. Will eat rays.
<i>Notorynchus cepedianus</i>	broadnose sevengill shark	290 cm TL	1	2	1	Wide-ranging in temperate seas.	Have a tendency to abrade their rostrum in captivity.
<i>Orectolobus japonicus</i>	Japanese wobbegong	103+ cm TL	3	2	4	Western North Pacific	Will frequently prey on smaller exhibit inhabitants.
<i>Orectolobus maculatus</i>	spotted wobbegong	320 cm TL	3	2	4	Western Pacific.	Will frequently prey on smaller exhibit inhabitants.
<i>Orectolobus ornatus</i>	ornate wobbegong	288 cm TL	3	2	4	Western Pacific.	Will frequently prey on smaller exhibit inhabitants.
<i>Potamotrygon henlei</i>	bigtooth river stingray	35 cm DW	3	2	1	South America in freshwater rivers, mainly in Brazil.	Similar to <i>P. leopoldi</i> , but has spots on ventral edges of disc.
<i>Potamotrygon leopoldi</i>	white-blotched river stingray	50 cm DW	3	2	1	South America in freshwater rivers and specifically from the Rio Xingu basin.	Hardy display specimen.
<i>Potamotrygon motoro</i>	ocellate river stingray	100 cm DW	1	1	1	South America in freshwater rivers.	Very similar to <i>P. henlei</i> , but lacking ventral spots.
<i>Potamotrygon reticulatus</i>	spotted freshwater ray	32 cm DW	3	2	1	South America in freshwater rivers.	A common and hardy species that has bred in captivity.
<i>Prionace glauca</i>	blue shark	383 cm TL	4	2	3	Oceanic and circumglobal in temperate and tropical waters.	A fairly common captive species with much variation in color and pattern.
<i>Pristis pectinata</i>	smalltooth sawfish	550 cm TL ²	3	3	4	Circumglobal in inshore and intertidal waters.	Very delicate species. Do not last long in captive environment. Tend to abrade fins and rostrum on perimeter of exhibit.
<i>Pteroplatytrigon violacea</i>	pelagic stingray	80 cm TL ⁵	1	2	1	Circumglobal, pelagic in tropical and temperate waters.	Protected species which is very difficult to obtain.
<i>Raja binoculata</i>	big skate	244 cm DW	3	1	2	Northern Pacific.	Swims constantly. The only truly pelagic dasyatiid.
<i>Raja eglanteria</i>	clearnose skate	65 cm DW	3	1	2	Northern West Atlantic.	Very large skate. Hardy once the animal acclimates and begins eating.
<i>Raja rhina</i>	longnose skate	140 cm DW	3	1	2	Eastern Pacific.	Hardy once the animal acclimates and begins eating.

Table 2.2 (continued). A brief description of elasmobranchs commonly held in aquaria and some key signature species that have proven difficult to maintain. Species were selected using the American Elasmobranch Society (AES) captive census from 1997, 2000, and 2001. All biological data was taken from Compagno (1984), and Froese and Pauly (2000), for the sharks and batoids respectively, except: 1 Carlson et al., 1999; 2 Last and Stevens, 1994; 3 Castro, 2000; 4 Snelson et al., 1988; 5 Mollet et al., 2002. Hardness: (1) adapts readily; (2) adapts well; (3) delicate; and (4) difficult. Availability: (1) easy; (2) average; and (3) difficult. Compatibility: (1) No compatibility problems; (2) sedentary, bottom dwelling; (3) timid, non-aggressive; (4) aggressive towards teleosts; (5) aggressive towards others; and (-) unknown. Please refer to body text for a more detailed description of the indices for hardness, availability, and compatibility.

Species name	Common name	Maximum Size	Hardness	Availability	Compatibility	Range	Description
<i>Rhina ancylostoma</i>	bowmouth guitarfish	270 cm TL	1	2	2	Indian Ocean and Western Pacific in tropical waters.	Common and hardy species.
<i>Rhincodon typus</i>	whale shark	1200 cm TL	4	3	1	Circumglobal in tropical oceanic and coastal waters.	Very difficult species to keep due to large size and feeding methods.
<i>Rhinobatos lentiginosus</i>	Atlantic guitarfish	75 cm TL	3	2	2	Western Atlantic.	Possible heavy parasite problems at time of collection.
<i>Rhinobatos productus</i>	shovelnose guitarfish	170 cm TL	3	1	2	Eastern Pacific.	Can be difficult to get through quarantine.
<i>Rhinoptera bonasus</i>	cownose ray	105 cm DW	3	1	1	Eastern and Western Atlantic.	Good multitaxa species. Males can be extremely aggressive towards females at mating time.
<i>Scyliorhinus retifer</i>	chain dogfish	47cm TL	2	2	1	Western North Atlantic.	A good species for smaller exhibits. Will breed in captivity.
<i>Scyliorhinus stellaris</i>	nursehound	162 cm TL	1	1	1	Eastern North Atlantic.	Tendency to swim along perimeter of exhibit.
<i>Sphyrna lewini</i>	scalloped hammerhead	370 cm TL	4	3	3	Circumglobal in temperate and tropical waters.	Can be a delicate species to keep and transport. Tendency to abrade head.
<i>Sphyrna mokarran</i>	great hammerhead	600 cm TL	4	3	3	Circumglobal in tropical inshore and pelagic habitats.	Can be a delicate species to keep and transport. Tendency to abrade head.
<i>Sphyrna tiburo</i>	bonnethead	150 cm TL	3	2	1	Western Atlantic and Eastern Pacific.	Delicate through quarantine, but hardy once acclimated.
<i>Squalus acanthias</i>	spiny dogfish	160 cm TL	3	2	1	Circumglobal in antetropical regions.	Frequently swim around perimeter of display with rostrum out of water.
<i>Stegostoma fasciatum</i>	zebra shark	354 cm TL	1	1	2	Indo-West Pacific in tropical inshore waters.	Excellent exhibit species. Can suffer eye damage from certain teleost species.
<i>Taeniura lymna</i>	bluespotted ribbontail ray	30 cm DW	4	1	2	Indo-West Pacific.	Difficult to feed in captivity. Long-term survival is rare.
<i>Triaenodon obesus</i>	whitetip reef shark	160 cm TL	1	1	4	Indo-Pacific in tropical inshore waters.	Can be aggressive towards rays and teleosts.
<i>Triakis semifasciata</i>	leopard shark	180 cm TL	2	1	1	Eastern North Pacific in temperate waters.	Delicate through quarantine, but hardy once acclimated.
<i>Urolophus halleri</i>	Haller's round ray	56 cm DW	1	2	2	Eastern Pacific.	Hardy species.
<i>Urobatis jamaicensis</i>	yellow stingray	36 cm DW	1	1	2	Western Atlantic in tropical waters.	Very common captive species. Good for smaller displays.