

HAZARDOUS AQUATIC ANIMALS

12

12.0 GENERAL

Many aquatic animals are potentially hazardous to divers. Although only a few present serious physical threats, the damage inflicted by others can seriously impair a diver's effectiveness. The material that follows discusses some of these animals. For convenience, hazardous aquatic animals have been classified as:

- those that abrade, lacerate, or puncture
- those that sting
- those that bite
- those that shock
- those that are poisonous to eat.

This classification has limitations: the categories overlap, and, although most hazardous species fall neatly into one or another, some of the classifications are arbitrary.

For a discussion of the treatment of injuries inflicted by hazardous aquatic organisms, see Section 18.

12.1 ANIMALS THAT ABRABE, LACERATE, OR PUNCTURE

The bodies of many aquatic animals are enclosed in sharp, pointed, or abrasive armor that can wound the exposed areas of a diver's body that come into forceful contact with these creatures. Included in this group of animals are such forms as **mussels, barnacles, sea urchins,** and **stony corals** (Figure 12-1). The wounding effect of contact between these animals and humans is intensified in aquatic habitats because human skin is softened by water. Although single encounters of this sort are unlikely to produce serious injury, repeated encounters during extended diving operations can produce multiple injuries that may become problems. Wounds continuously exposed to water resist healing, and careless divers may in time be incapacitated by an accumulation of ulcerated sores. Wounds are especially likely to be aggravated when working in the tropics. To compound the problem, secondary infections in such wounds are not uncommon. Thus, long-term diving projects can be crippled if participants fail to avoid these injuries, minor though they may initially seem.

12.2 ANIMALS THAT STING—VENOMOUS MARINE ANIMALS

A diverse array of otherwise unrelated animals is considered together in this section because their ability to

Figure 12-1
Sea Urchin *Echinothrix diadema* on a Hawaiian Reef



Photo Tony Chess

inject venom into other organisms poses a threat to divers in the water. The instrument of injection varies from the stinging cells of the coelenterates (hydroids, corals, anemones, and jellyfishes) to the spines on the bodies of crown-of-thorns starfish, sea urchins and fishes, radular teeth of cone shells, beaks of octopuses, bristles of annelid worms, and the fangs of snakes. Mere contact with the surface of some sponges can produce a severe dermatitis. The toxicity of the venom, as well as the amount of venom introduced, varies from one species to another and sometimes among individuals of the same species. Furthermore, humans may differ in their sensitivity to a given venom. The reactions of humans to marine animal stings may range from no noticeable reaction to mild irritation to sudden death. It is wise to become informed about and to avoid all marine organisms known to be venomous; occasional contact is inevitable, however, for even the most experienced divers.

12.2.1 Hydroids, Jellyfishes, Sea Anemones, and Corals

Grouped here are a variety of organisms that drift or swim slowly at the water's surface or at mid-depths.

They have gelatinous, semi-transparent, and often bell-shaped bodies from which trail tentacles armed with stinging cells, called nematocysts. In large specimens, these stinging tentacles may trail down as much as 100 feet into the water.

Nematocysts are characteristic of a large group of related, though superficially very diverse, marine animals known as **coelenterates**. In addition to the jellyfishes, the coelenterates also include the hydroids and stinging corals, considered below. Different coelenterates have different types of nematocysts, but all function similarly. When the animal is disturbed, the nematocyst forcefully discharges a venomous thread that, in some species, can penetrate human skin. The reactions of humans to the stings of hazardous coelenterates range from mild irritation to death.

Stinging hydroids occur on many reefs in tropical and temperate-zone seas. Typically, they are featherlike colonies of coelenterates (Figure 12-2) armed, like jellyfish, with nematocysts. Because colonies of these animals may be inconspicuous (they are often only a few inches high), they may go unnoticed. Except to the occasional person who is hypersensitive to their stings, hydroids generally are more of a nuisance than a hazard. Divers are most likely to be affected on the more sensitive parts of their bodies, such as the inner surfaces of their arms. Although clothing protects most of the body from the stings of hydroids, it will not protect against stings on the hands and face.

Stinging corals (Figure 12-3), often called fire coral, belong to a group of colonial coelenterates known as millepores. They are widespread on tropical reefs among the more familiar stony corals, which they superficially resemble. Contact with the nematocysts of millepores affects humans in about the same way as contact with the nematocysts of stinging hydroids. Common Florida and Bahama species have a characteristic tan-colored blade-type growth, with lighter (almost white) upper portions. *Millepora* may appear in the bladed or encrusting form over rock surfaces or on the branches of soft corals such as alcyonarians. The *Millepora* zone of the outer Florida Keys ranges from 10 to 25 feet deep.

Portuguese Men-o-War (Figure 12-4), which are grouped together in the genus *Physalia*, are colonial hydroids known as siphonophores. Siphonophores differ from the other forms considered here as jellyfish in that each organism is actually a colony of diverse individuals, each performing for the entire colony a specialized function such as swimming or capturing prey. A gelatinous, gas-filled float, which may be 6 inches or more in diameter, buoys the man-o-war at the surface, and from this float trail tentacles as long

12-2

Figure 12-2
Stinging Hydroid



Photo Tony Chess

Figure 12-3
Stinging or Fire Coral



Photo Morgan Wells

as 30 feet that bristle with nematocysts. Man-o-war stings can be dangerous to humans, so divers should stay well clear of these animals. Unfortunately, even the most careful diver can become entangled in a man-o-war tentacle, because these nearly transparent structures trail so far below the more visible float. It is

Hazardous Aquatic Animals

Figure 12-4
Portuguese Man-of-War



Photo Morgan Wells

especially difficult to detect fragments of tentacles that have been torn from the colony and are drifting free. The nematocysts on these essentially invisible fragments can be as potent as those on an intact organism, and chances are good that divers who repeatedly enter tropical waters will sooner or later be stung by one.

More properly regarded as jellyfish are a group of coelenterates known as **scyphozoans**, each individual of which is an independent animal. These include the common jellyfishes encountered by divers in all oceans. Although many can sting, relatively few are dangerous. One large jellyfish of the genus *Cyanea* (Figure 12-5) is often encountered by divers in temperate coastal waters of both the Atlantic and Pacific oceans. Divers should be aware that there is a chance of being stung even after they leave the water, because segments of the tentacles of these animals may adhere to the diver's

Figure 12-5
Large Jellyfish of Genus *Cyanea*



Photo Tony Chess

gloves, and touching the glove to bare skin, especially on the face, will produce a sting as painful as any received from the intact animal.

The most dangerous of the jellyfish belongs to a tropical subgroup of scyphozoans known as *cubomedusae*, or sea wasps. Sea wasps have an extremely virulent sting; one species in the southwest Pacific has caused death in humans. Fortunately, the more dangerous sea wasps are rarely encountered by divers.

Sea anemones of various species are capable of inflicting painful stings with their nematocysts. These animals frequently look like beautiful flowers, which may deceive people into touching them. The Hell's Fire sea anemone (*Actinodendron*), which is found in the Indo-Pacific region, is an example of such an anemone.

True corals are capable of inflicting serious wounds with their razor-sharp calcareous outer skeletons. Coral cuts are one of the most common hazards facing divers in tropical waters, and contact with corals should be carefully avoided. Divers should be equipped with leather gloves and be fully clothed when working among corals, because coral cuts, if not promptly and properly treated, can lead to serious skin infections.

12.2.2 Marine Worms

Marine worms that can be troublesome to divers are classified in a group known as polychaetes. Two types

Figure 12-6
Bristleworm



Photo Richard Rosenthal

reportedly inflict venomous wounds: bristle worms and blood worms.

Bristleworms (Figure 12-6), which divers often encounter when overturning rocks, have tufts of sharp bristles along their segmented bodies that, in many species, can be extended when the animal is irritated. It has not been established that these bristles are venomous, but there is evidence for at least some species that this is so.

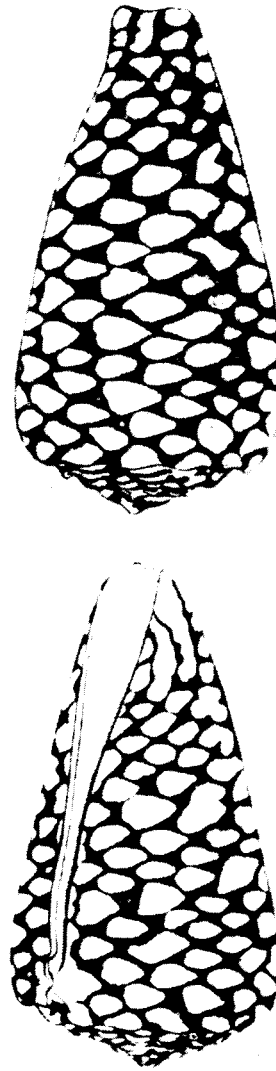
Blood worms burrow in mud or sand and some species can be a problem to divers who handle them. Their jaws contain venomous fangs, and their bite is comparable to a bee sting.

12.2.3 Cone Shells

Of the many diverse kinds of shelled mollusks in the sea, only some of the tropical cone shells are hazardous to divers (Figures 12-7 and 12-8). **Cone shells**, characterized by their conical shape, are an especially attractive hazard because collectors are drawn to the colorful shells of the most dangerous species. There are more than 400 kinds of cone shells, each with a highly developed venom apparatus used to stun the small animals that are its prey. The weapon of cone shells is thus an offensive rather than defensive one, a fact that helps to reduce the number of times people handling these shells are stung. Although only a relatively few

12-4

Figure 12-7
Cone Shell



Source: NOAA (1979)

of the cone shells are dangerous to divers, the stings of some can reportedly be deadly. Because cone shells inject their venom with a harpoonlike structure located at the narrow end of their shells, persons handling these animals should grasp them at the wide end.

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Figure 12-8
Anatomy of a Cone Shell

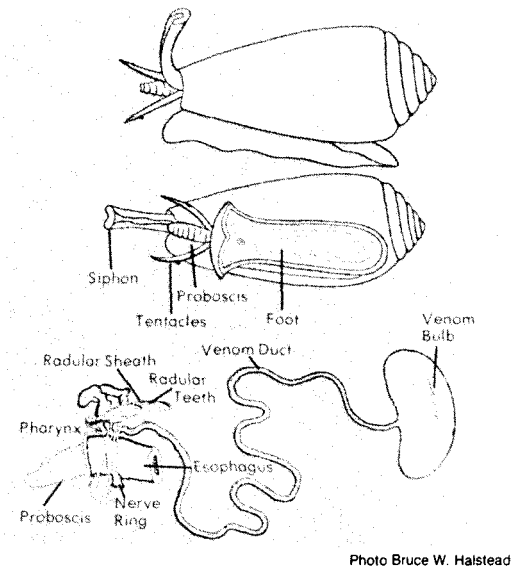


Photo Bruce W. Halstead

12.2.4 Octopuses

Octopuses are timid creatures that will take any opportunity to retreat from divers. Some species, however, can be hazardous to divers who attempt to handle them. When an octopus bites into prey with its parrotlike beak, venom enters the wound and subdues the prey. This venom normally is not toxic to humans, however. Although there have been relatively few cases of octopus bites in humans, one diver in Australia who allowed a rare blue-ring octopus to crawl over his bare skin was bitten on the neck and died within 2 hours. Because the bite of this species can be lethal, the Australian blue-ring octopus (Figure 12-9) should be carefully handled.

12.2.5 Sea Urchins

Among the more troublesome animals for divers working near tropical reefs are venomous **sea urchins**. This is especially true after dark, when visibility is reduced and many of the noxious sea urchins are more exposed than in daylight. Sea urchins may also be a problem in temperate waters, but the species in these regions lack the venom of the tropical species and therefore present a puncture rather than poisoning hazard.

Most difficulties with venomous sea urchins result from accidental contact with certain long-spined species. The smaller secondary spines that lie among the larger primary spines do the most damage; apart from

Figure 12-9
Rare Australian Blue-Ring Octopus

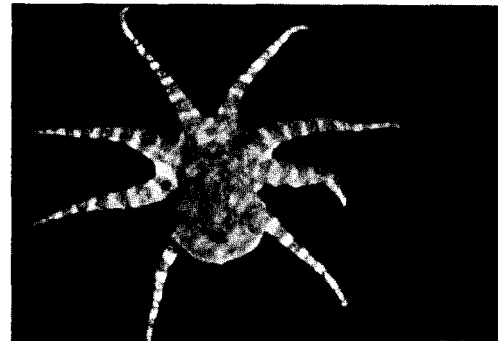


Photo Bruce W. Halstead

their venom, these spines invariably break off in the wound and, being brittle, frequently cannot be completely removed. Gloves and protective clothing afford some protection against minor brushes with these animals but do not help much when a diver strikes forcefully against them. To avoid painful injury when working close to venomous sea urchins, divers should avoid contact.

Some of the short-spined tropical urchins are reported to be hazardous because they have tiny pincerlike organs, called pedicellariae, that occur among their spines. Although some pedicellariae contain a potent venom, they are very small structures that probably do not threaten divers who incidentally come into contact with the urchins that carry them. When wearing gloves, one can handle these urchins without concern for their pedicellariae.

12.2.6 Fishes

Many fishes inflict venomous wounds. Most do so with their fin spines, but some wound with the spines located on their heads or elsewhere on their bodies. Generally these fishes injure only divers who deliberately handle or provoke them; however, some wound divers who unintentionally touch them or come too close.

Stingrays. Stingrays carry one or more spikelike spines near the base of their flexible tails, which they can use effectively against those who come in contact with them. Although these spines can inflict venomous puncture wounds similar to those of the fishes discussed above, they more often inflict a slashing laceration. Humans are most threatened when they are wading on sandy bottom in shallow water or swimming close to the bottom. Walking with a shuffling motion tends to frighten stingrays away. Stingrays are responsible for

more fish stings than any other group of fishes. Species of the family Dasyatidae present the greatest danger, combining as they do large size, the habit of lying immobile on the seafloor covered with sand, and a large spine that is carried relatively far back (compared to those of other stingrays) on a whiplike tail (Figure 12-10). Large rays of this type can drive their spines through the planks of a small boat or through a human arm or leg. Swimmers coming into contact with the bottom have been mortally wounded when struck in the abdomen by a dasyatid stingray lying unseen in the sand.

The urolophid, or round, stingrays have a short muscular caudal appendage to which the sting is attached; they are thus able to deliver severe stings with a whip of their tail. Many of the most common stingray envenomations are caused by round stingrays.

Less dangerous are stingrays of the family Myliobatidae, which includes the bat rays and eagle rays (Figure 12-11), even though these animals can be large and have long venomous spines on their tails. The spines of these species are at the bases of their tails rather than farther back and so are far less effective weapons than the spines of the dasyatid or urolophid rays. The myliobatid rays are also less cryptic than the dasyatids or urolophids: rather than lying immobile on the bottom most of the time, they more often swim through the midwaters, their greatly expanded pectoral fins flapping gracefully like the wings of a large bird. When on the seafloor, myliobatid rays usually root actively in the sand for their shelled prey, and thus are readily seen.

Scorpionfishes. Scorpionfishes are among the most widespread and numerous family of venomous fishes. The family, which numbers several hundred near-shore species, has representatives in all of the world's seas, but the most dangerous forms occur in the tropics. Scorpionfishes usually inject their venom with their dorsal fin spines and less often do so with the spines of their anal and pelvic fins.

Many scorpionfishes are sedentary creatures that lie immobile and unseen on the seafloor. An example is the **sculpin**, a common near-shore scorpionfish species of southern California. Another example, the **stonefish**, is common in the shallow, tropical waters of the western Pacific and Indian Oceans; this species has the most potent sting of all scorpionfishes and has caused deaths among humans. Although stonefish are not aggressive toward divers, their camouflage makes it easy to step on them unless special care is taken.

In contrast to the cryptic sculpin and stonefish, another group of scorpionfishes, the brilliantly hued **lionfishes**

Figure 12-10
Dasyatid Stingray

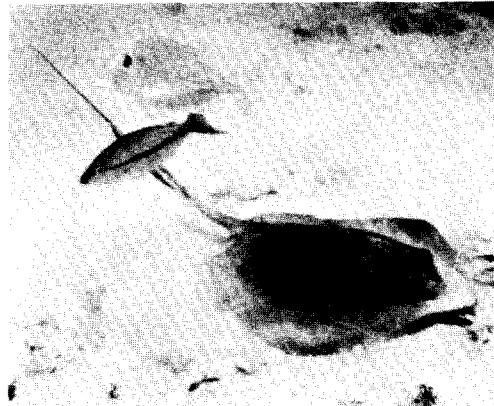


Photo Morgan Wells

Figure 12-11
Myliobatid Stingray



Photo Edmund Hobson

Figure 12-12
Lionfish



Photo Al Giddings

(Figure 12-12), stand out strikingly against their surroundings. Because lionfishes are beautiful animals that make little effort to avoid humans, inexperienced divers may be tempted to grasp hold of one. This could prove a painful mistake, because lionfish venom is especially potent.

Other fishes similarly armed with venomous fin-spines include: the **spiny dogfish**, family Squalidae; **weever fishes**, family Trachinidae; **toadfishes**, family Batrachoididae; **stargazers**, family Uranoscopidae; **freshwater and marine catfishes**, family Ariidae; **rabbitfishes**, family Siganidae; and **surgeonfishes**, family Acanthuridae. These fishes do not usually generate sufficient force to drive their venom apparatus into their victims; instead, the force is supplied by the victims themselves, who handle or otherwise come into contact with these fishes. A number of fishes, however, do actively thrust their venom apparatus into their victims, an action that often produces a deep laceration; fishes of this type are discussed next.

Surgeonfishes. As noted above, some surgeonfishes (Figure 12-13) can inflict venomous puncture wounds with their fin spines; these wounds are much like those produced by scorpionfishes and other similarly armed fishes. Many surgeonfishes can also inflict deep lacerations with knifelike spines they carry on either side of

Figure 12-13
Surgeonfish

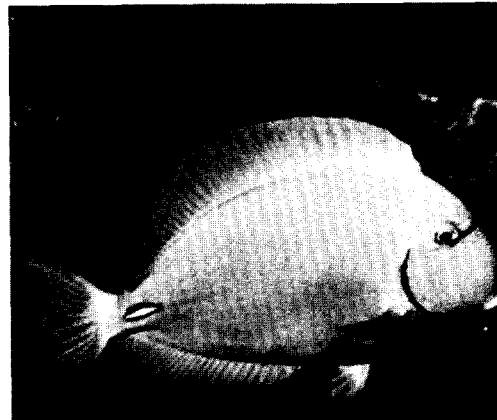


Photo Edmund Hobson

their bodies, just forward of their tails. Although not conclusive, there is evidence that these spines are venomous in at least some species. The more dangerous surgeonfishes, which belong to the genus *Acanthurus*, usually carry these spines flat against their bodies in integumentary sheaths; however, when threatened, these fish erect these spines at right angles to their bodies and attack their adversaries with quick, lashing movements of their tails. Divers injured by surgeonfishes have usually been hurt while trying to spear or otherwise molest them.

12.2.7 Reptiles

Venomous snakes are a more widespread hazard in fresh water than in the sea. The **cottonmouth water snake**, which has an aquatic bite known to have been fatal to humans, may be the most dangerous animal hazard that divers face in fresh water. This species, which is difficult to identify because of its highly variable coloration, does not show the fear of humans that is characteristic of most aquatic snakes. In regions inhabited by the cottonmouth, divers should avoid any snake that does not retreat from them. The best defense is a noiseless, deliberate retreat. Wet suits afford reasonably good protection but can be penetrated by the teeth of larger specimens. The diver should not attempt to strike back, since this practice may result in multiple bites. Although the evidence is not conclusive, the snake is believed not to dive deeper than about 6 feet. Another species to avoid is the **timber rattlesnake**, an excellent swimmer at the surface. Venomous **sea snakes** occur only in tropical regions of the Pacific and Indian

oceans. These reptiles have a highly virulent venom, but fortunately for divers they generally do not bite humans unless roughly handled. Sometimes a sea snake that is caught amid a netload of fishes will bite a fisherman, but generally they are not aggressive toward divers who meet them under water. Sea snakes are especially numerous in the waters near the East Indies. Sea snakes are the most numerous of all reptiles and are sometimes seen in large numbers in the open ocean. Divers most often see them amid rocks and coral, where they prey on small fishes (Figure 12-14). They are agile underwater swimmers, and divers should not lose respect for their deadly bite simply because they are reportedly docile.

12.3 ANIMALS THAT BITE

Serious injuries caused by the bites of non-venomous marine animals are rare. However, the possibility of such injury is psychologically threatening, partly because this hazard has been so widely publicized that many divers are distracted by it. It is important that working divers view this hazard realistically.

12.3.1 Fishes

Sharks have been given more sensational publicity as a threat to divers than any other animal, even though shark bites are among the most infrequent of all injuries that divers sustain in the sea. This notoriety is understandable; injuries from shark bites generally are massive and are sometimes fatal. Nevertheless, only a very few of the many species of sharks in the sea threaten humans.

The vast majority of sharks are inoffensive animals that threaten only small creatures like crabs and shellfish. However, some sharks that are usually inoffensive will bite divers who are molesting them; included here are such common forms as **nurse sharks** (family Orectolobidae) and **swell sharks** (family Scyliorhinidae). These animals appear docile largely because they are so sluggish, but large specimens can seriously injure a diver. Although any large animal with sharp teeth should be left alone, the sharks discussed below may initiate unprovoked attacks on divers.

Most sharks known to attack humans without apparent provocation belong to one of four families: the Carcharhinidae, which include the **gray shark**, **white-tip shark**, **blue shark**, and **tiger shark**; the Carchariidae, which include the **sand shark** (including the species called grey nurse shark in Australia, not to be confused with the animals called nurse sharks in American waters); the Lamnidae, which include the **mako shark** and **great**

Figure 12-14
Sea Snake

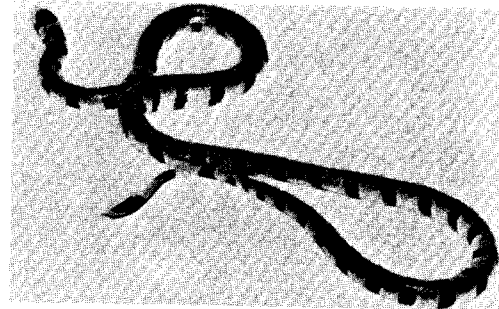


Photo John Sneed

Figure 12-15
Great White Shark



Photo Ron and Valerie Taylor

white shark (Figure 12-15); and the Sphyrnidae, which include the **hammerheads**. All of these are relatively large, active animals whose feeding apparatus and behavior give them the potential to injure divers seriously. Except for the hammerheads, whose name well characterizes their appearance, these sharks all look much alike to the untrained eye. The characteristics distinguishing them would certainly not impress most divers encountering them under water.

Figure 12-16
Gray Reef Shark



Photo Edmund Hobson

The **great white shark** is reputed to be the most dangerous of all sharks. This shark is credited with more attacks on humans than any other shark species. It attains a length of 20 feet or more.

The **gray reef shark** (Figure 12-16), numerous on tropical Pacific reefs, is typical of these potentially dangerous species. These sharks have repeatedly been incriminated in human attacks. Any creature over about 3 feet long that generally resembles this animal should be regarded cautiously, and if over about 8 feet long, it should be avoided—even if this requires the diver to leave the water. Sharks of these species that range between 3 and 7 feet in length are numerous in shallow tropical waters, and diving operations often cannot be performed unless the presence of sharks in the area is tolerated. When such sharks are in the vicinity, divers should avoid making sudden or erratic movements. Common sense dictates that no injured or distressed animals should be in the water, because these are known to precipitate shark attacks. When operations are conducted in the presence of sharks, each group of divers should include one person who keeps the sharks in view and is alert for changes in their behavior. The chances of trouble are minimal as long as the sharks swim slowly and move naturally. However, the situation becomes dangerous as soon as the sharks assume unnatural postures, such as pointing their pectoral fins

downward, arching their backs, and elevating their heads. The moment sharks show such behavior, divers should leave the water. Gray reef sharks are sometimes encountered in large numbers, and when in large groups they may become very aggressive if food is in the water.

Moray eels (Figure 12-17) are a potential hazard on tropical reefs, and a few species occur in the warmer temperate regions of California and Europe. They are secretive animals, with body forms highly specialized for life within reef crevices; they are only rarely exposed on the reef top. Although relatively few grow large enough to threaten divers seriously, some attain a size greater than 5 feet. The moray's powerful jaws, with long needlelike teeth, can grievously wound humans.

Divers injured by morays have usually been bitten when they are reaching into a reef crevice for some object; they were struck by a moray that probably felt threatened or perhaps mistook the diver's hand for prey. The moray will usually release its grip when it recognizes that it has taken hold of something unfamiliar, and if divers can resist the impulse to pull free, they may escape with no more than a series of puncture wounds. But such presence of mind is rare in such a situation, and divers often receive severe lacerations when wrenching their hands from between the backward-pointing teeth of the eel.

Figure 12-17
Moray Eel



Photo Edmund Hobson

Barracudas (Figure 12-18) are potentially dangerous fishes that occur widely in the coastal waters of tropical and subtropical seas. Often exceeding 4 feet in length and with long canine teeth in a large mouth, these fishes have the size and equipment to injure humans severely. Large barracuda often follow divers about, apparently to get a good look at the divers; it is important to remember that even the smallest diver is much larger than anything the barracuda is accustomed to eating. The barracuda's teeth are adapted for seizing the fish that are its prey; however, these teeth are ill-suited to tearing pieces from an animal as large as a human. Attacks on divers are most likely to occur where the barracuda has not had a good look at its victim. Where visibility is limited, for example, the barracuda may see only a moving hand or foot, which may be mistaken for prey. An attack may also occur when a diver jumps into the water, as when entering the sea from a boat. To a nearby barracuda, the diver's splash may simulate the splash of an animal in difficulty—and hence vulnerable—and the barracuda may strike without realizing what made the splash. Thus one should be especially alert in murky water to avoid unnecessary splashing when large barracudas may be present.

Other fishes that bite. Any large fish with sharp teeth or powerful jaws can inflict a damaging bite.

12-10

Generally, however, such fish are hazardous to divers only when they are handled. The **pufferfishes**, **wolfishes**, and **triggerfishes** can be especially troublesome in this respect. These fishes have teeth and jaws adapted to feeding on heavily armored prey, and large specimens are quite capable of biting off a human finger.

In the tropics, some of the larger **sea basses** can grow to more than 7 feet. These giant fish, including certain **groupers** and **jewfishes**, are potential hazards. Their mouths can engulf a diver, and there are reports that they have done so.

12.3.2 Reptiles

Reptiles that bite, including turtles, alligators, and crocodiles, are potential hazards to divers, both in freshwater and in the sea.

Turtles are frequently encountered by divers; however, although the larger individuals of some species can injure divers with their bites, these animals are not generally threatening. Although the larger marine turtles have occasionally inflicted minor injuries, several freshwater species are far more vicious and aggressive; these include the alligator snapping turtle and common snapping turtle of American fresh waters. The softshell turtle also may inflict a serious wound.

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Figure 12-18
Barracuda

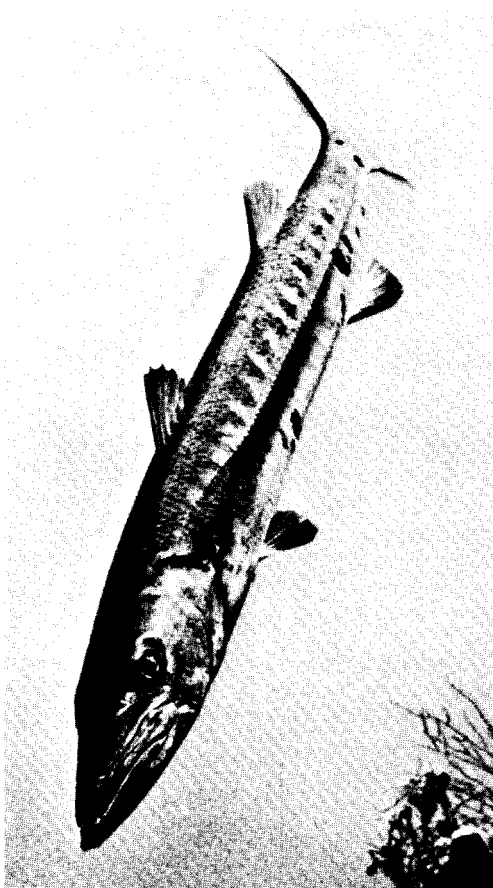


Photo Dick Clarke

Alligators that have been encountered by divers, including the American alligator, have not proved threatening. Nevertheless, the potential for serious injury exists, and divers should be cautious.

Crocodiles are more dangerous than alligators. A species in the tropical western Pacific that enters coastal marine waters is feared far more than sharks by the natives, and with good reason: it is known to have attacked and eaten at least one diver.

12.3.3 Aquatic Mammals

Juvenile and female seals and sea lions frequently frolic in the water near divers. Underwater encounters with sea lions can be expected if the animals are nearby during a dive. Their activity can be distracting or even

frightening, but it is rarely dangerous. Large bull seals and sea lions, although aggressive on the above-water rocks of their breeding rookery, apparently do not constitute a serious threat under water. A potentially greater danger when swimming with seals is being shot by a person hunting illegally. Some divers wear bright markings on their hoods for this reason. If bitten by a seal or sea lion, the diver should consult a physician, because some species may transmit diseases that are infectious among humans.

Common sense dictates that divers avoid large whales under water. Usually whales stay clear of divers, so that most incidents occur when divers put themselves in jeopardy by provoking the whales. Whales may be startled when a diver approaches too close and may strike a diver senseless in their sudden surge of evasive action.

Muskrats are potential hazards in fresh water. Usually they attack only if they believe themselves to be threatened; their bites produce only minor wounds. However, there is a serious danger that rabies can be contracted from muskrat bites, so in addition to seeking immediate medical advice, divers who are bitten should make every effort to capture or kill the animal for later examination.

12.4 ANIMALS THAT SHOCK

Among marine animals that produce an electric shock, the only one significantly hazardous to divers is the **electric ray**, which has representatives in all the oceans of the world. The **torpedo ray** of California (Figure 12-19), which can grow to 6 feet in length and weigh up to 200 pounds, is an example. These rays are shaped somewhat like a stingray, except that their "wings" are thick and heavy and their tails are flattened for swimming. Electric rays are slow-moving animals, and alert divers should have little trouble avoiding them. As is true of so many undersea hazards, these animals generally threaten only those divers who molest them. The electric ray's shock, which can be as large as 200 volts, is generated by modified muscles in the forward part of the animal's disc-shaped body. The shock, which is enough to electrocute a large fish, can jolt a diver severely.

12.5 ANIMALS POISONOUS TO EAT

Most seafoods are edible and nourishing; however, several of the most toxic substances known are sometimes found in marine organisms. Mollusk shellfish, such as clams, mussels, and oysters, are sometimes poisonous to eat. These shellfish become poisonous because they feed on toxic dinoflagellates, which are

Figure 12-19
Torpedo Ray

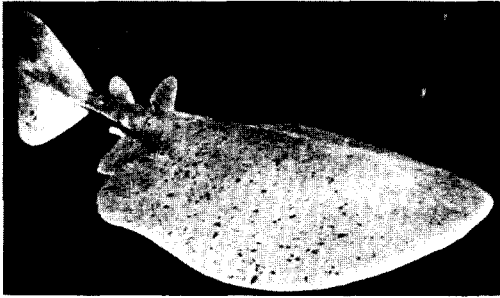


Photo Tony Chess

microscopic plankton. Most of these episodes of poisoning have occurred along the Pacific coast from California to Alaska; the northeast coast from Massachusetts to Nova Scotia, New Brunswick and Quebec; and in the North Sea countries of Britain and West Germany. It is advisable to check with local authorities to determine what periods are safe for eating mollusk shellfish. Violent intoxications and fatalities have also been reported from eating tropical reef crabs; these should not be eaten without first checking with the local inhabitants. Numerous species of tropical reef fishes are known to be poisonous to eat because they cause a disease known as ciguatera (see Section 18 for a discussion of ciguatera poisoning treatment). An edible fish in one locality may be deadly in another.

Figure 12-20
Examples of Pufferfish

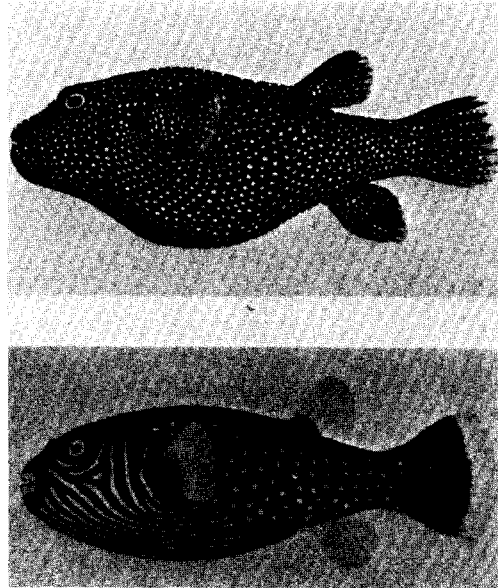


Photo Bruce W. Halstead

In addition, most pufferfish (Figure 12-20) contain a deadly poison known as tetrodotoxin, and puffers and related species should be carefully avoided.