

Agonidae – The Poachers

By Susan McDougall

With a sloped nose that resembles that of a much larger fish, the old Sturgeon Poacher lowers her hefty body to the bottom of the sea. Above her resting place, near the surface waters, she had spent a more buoyant youth. But with age, her armor had grown heavier, and as with elderly animals everywhere, her habits more sedentary. Yet no matter how weighted down, she must eat, and so she scours the muddy floor with sensitive whiskers, searching for a meal of buried worms, shrimps, and other tiny creatures. To move, large pectoral fins scrape the bottom; to escape a hunter, a twist of the tail pushes her forward. But she need not worry about small predators, as their assaults barely dent her armored plates. Only the larger ones pose a threat, for they can swallow her stout body whole.

If fossils were abundant, clues to the evolution of fishes, the most plentiful vertebrates on the planet, might be deciphered. But this is not the case, and thus teasing out the origins of body armor, such as that worn by the poachers, is difficult. Today, heavily armored fish are uncommon, although spines are borne by many. In the past, however, many that were covered in stiff plates died out, for reasons as difficult to determine as the origins of their armor. Today, the thickly clad poachers are more recent additions to the fish community.

Composed of 20 genera and 47 species, the Agonidae Family is a marine, cold-water group of bottom fish. They are distinguished by their heavy, bony plates, an armor that restricts their mobility but provides protection. Less than three inches in length, the smallest species, from Japan, is *Bothragonus occidentalis*, while the largest reaches a maximum of 17 inches (42 cm). Known as the Dragon Poacher (*Cercis japonica*), this heavy species ranges as far east as the Bering Strait.

Most poachers live in deep water, with a maximum depth of 4,200 feet (1,280 m) recorded. Of the 14 species that visit the Salish sea, most are rare or infrequently collected. The most common species — observed in both the eastern and western ends of the Strait — is the Sturgeon Poacher (*Podothecus accipenserinus*.) Three other species reside in these cold deep waters in small numbers; these are the Smooth Alligatorfish (*Anoplagonus inermis*), the Northern Spearnose Poacher (*Agonopsis vulsa*), and the rare Pricklebreast Poacher (*Stellerina xyosterna*).

The Agonidae are members of the Perciformes order, the largest group of vertebrates on Earth, with over 160 families and 10,000 species. The order is divided into several suborders; the Agonidae belong to the Cottoidei, the so-called “mail-cheek” fishes. With nine families, most Cottoidei species are moderate-sized fish, most often without scales. Many have spiny skins or bony plates. A few species inhabit freshwater, but most are saltwater fish, living near continental shelf, and ranging from subarctic to temperate waters, typically in depths of less than 985 feet (300 m).

With 54 species, the Agonidae are a moderate-sized Cottoidei family, exceeded in numbers only by sculpins and snailfish. The name comes from the Greek for “without” and “descent” or “origin.” Armored with bony plates that are arranged in rows and groups and are imbricated (overlapping) but not particularly flexible. Agonidae species lack swim bladders and have small mouths, with little protruding barbels beneath. Their large eggs are adhesive and demersal. These fish are not of commercial interest, although they are sometimes dried and sold as souvenirs. Two species are present in South America, but most are native to the Northern Hemisphere, typically in cool waters, including the Arctic.

The majority of poacher species have two dorsal fins, the first with spines, and the second with soft rays. Their caudal fin is usually quite small, and the pectoral fins are sometimes thickened; this stiffness

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enables the “walking” which is their primary means of locomotion on the ocean floor. Male Agonidae tend to be more brightly colored than females, with larger fins.

Although their bony plates offer protection, such a covering is heavy, making movement difficult. Juveniles are spiny but lightweight enough to allow foraging in the water column, and to permit a slow descent towards bottom during the day. As they mature, their plates stiffen and increase in area, eventually altering a lifestyle from a dynamic one to a more sedentary existence near the bottom of the sea, a place suitable for their heavy bodies. There they move slowly by undulating their pectoral fins and feeding on crustaceans and worms. The stiffer armor does give the adults at least one advantage. They can move more quickly than the juveniles, “sprinting” away from danger.

Sturgeon Poacher (*Podothecus accipenserinus*)

The most common Agonidae family member in the Strait, the scientific genus name of the Sturgeon Poacher refers to a groove at the base of the pelvic fin; “podo” means “foot” and “thecus” is “box.” The species’ name, “accipenserinus” acknowledges a similarity of the head to that of the sturgeons, which are members of the Acipenseridae family.

With a maximum size of 13 inches (33 cm) and a weight of 6 ounces (166 gr), the Sturgeon Poacher ranges from the northern Bering Sea south along the coast to Point Reyes, California. It is found at depths of 7-984 feet (2-300 m) but is most common in shallow water. Juveniles are particularly inclined to this habitat, finding shelter in eelgrass or kelp, or sometimes on bare substrate; adults may also be present in kelp beds.



Sturgeon Poacher (*Podothecus accipenserinus*)

The Sturgeon Poacher has a pointed mouth, and many whiskers around the chin and snout, which is sloped, much like a sturgeon. The elongated body tapers to a long peduncle and caudal fin. A large head further distinguishes this fish. The Sturgeon Poacher is brown to gray above, with a white, yellow, or orangish belly; large males have a black spot on the anal fin. There are 8-10 spines on the first dorsal fin. The bony plates overlap and enlarge as the fish grows. This poacher may live 11 years, typically spawning in spring to summer. They consume benthic invertebrates, sometimes small fish, and are in turn preyed upon by fish, birds, and sea lions.

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Northern Spearnose Poacher (*Agonopsis vulsa*)

The Northern Spearnose Poacher genus name, *Agonopsis*, is derived from “agonus,” meaning “without joints” in reference to the overlapping fused plates, and “opsis,” meaning “appearance.” “Vulsa” is Latin for “shorn” or “beardless” in reference to the lack of cirri (little fleshy appendages) on the snout.

Found throughout the Strait, including Sequim Bay, the common name acknowledges the sharply pointed snout which has two pairs of spines. The plates are four to six-sided polygons, each with a spine. Composed of trabeculae (rows of connective tissue) that give the fish a weblike appearance, the plates are heavy but porous. The head is small, as are the teeth, but like other poachers, the body is elongated. There are two dorsal fins, the first with several spines, and two large eyes are positioned near the top of the head, each lined with rows of small spines above the eyeball. The small bone that forms the lower eye socket (the lachrymal) also exudes spines. The plates overlap somewhat and are arranged in rows along the body as well as in front of pelvic fins, which have a single spine and are white on the edges. Reaching 8 inches in length (20.3 cm), this poacher is dark brown to brownish-yellow above, creamy white below, with dark saddles or bars, and barring on the fins. The caudal fin is dark.

Small and slow, nevertheless this is a fish that is sufficiently prickly to invoke caution in a potential predator. The spines and armor may also complicate extraction of a poacher from a crevice where it might hide when threatened.

The Northern Spearnose Poacher ranges from the northern Gulf of Alaska to Point Loma, California. It is a nocturnal species of soft substrate, found at depths of 16 – 1,289 feet (5 – 393 m). This poacher is sometimes observed in intertidal waters. Yet as with other poachers, little is known about the details of its life.

Smooth Alligatorfish (*Anoplagonus inermis*)

Although relatively rare in the Strait, the Smooth Alligatorfish has been collected in Dungeness Bay and Port Angeles Bay. The genus name “Anoplagonous” refers to the spineless armor (“anoplos” means “unarmed”) of this small poacher, and “agonus” means “without joints,” in acknowledgement of the overlapping body plates.

The Smooth Alligatorfish reaches a length of approximately 6 inches (15 cm). It lacks dorsal spines and is the only poacher in the Salish Sea with one dorsal fin, rather than two. The caudal fin is rounded, and the body very long and slender, with a small head and pointed snout that terminates in a tiny mouth and a protruding lower jaw. Large eyes and narrow conical teeth, arranged in bands, add to the unusual look of this poacher. However, it does not have the barbels and cirri present on many of its relatives. The pectoral fins are fleshy, with three of the rays free of membranes. The Smooth Alligatorfish is brown above and brownish-gray below, with a dark band from the snout to the base of the pectoral fin. Other bars and mottling characterize the fish; the caudal fin is darkened, vertical dark bars accent the pectoral fins, a band runs from the snout to the base of the pectoral, and other spots and faint dark bars mark the body.

Ranging from the Bering Sea to Point Arena, California, this is a demersal species, found at depths of 26-335 feet (8-102 m). It is most common on rocky substrates but tolerates freshwater to some extent and is occasionally present in estuarine habitat. Little is known of its life history, although researchers believe it spawns in late winter or spring, like other poachers.

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Pricklebreast Poacher (*Stellerina xyosterna*)

Ranging from Icy Bay, Alaska to central Baja California, this is a rare species in the Strait and the Salish Sea as well. Named for the naturalist Georg Wilhelm Steller who journeyed to the Aleutians with the famous explorer Vitus Bering in 1740, the species name meanings “to scrape” and “breast” (sternon), in reference to the prickly breast.

The Pricklebreast Poacher is long and narrow, reaching a maximum length of 6.5 inches (16.5 cm). It has two dorsal fins, with spines on the one closest to the head, which is small and depressed. A tiny, pointed snout is underlain by a large lower jaw, accented with a single barbel; there is a nasal spine as well. The caudal fin is rounded and expanded towards the end. Small eyes are positioned near the top of the head. The overlapping body plates have spines, but plates are absent on the breast, which is covered with prickles. This poacher is dark brown above, whitish below and sometimes speckled on the pectoral fins.

The Pricklebreast Poacher occurs in muddy or sandy habitats from 16 - 246 feet (5 - 25 m). Like the other poachers in the Strait, few details are available for this species.

Armor – Not for Defense Only

Made of materials that ranged from chainmail, a suit of interlocked iron rings, to leather, to iron and bronze, throughout human history, body armor provided a means of defense against physical attack. The vision of a medieval knight riding off to war on a great steed (able to carry the man and his heavy armor) is incomplete without picturing a ponderous body armor and, to complete the image, a pointed helmet. And one need not look so deep into history; whereas in the past armor was primarily of military use, today police and guards wear thickened protection as well, as does the occasional private citizen. Iron may have been replaced by other materials, but the goal is the same — protection.

A scaled fish is clothed in a rugged armor of its own, as these shiny attachments provide defense against predators, and are an effective covering against physical elements, such as abrasive rocks and sand. Studies of fish scales seek to answer how such lightweight, durable, and flexible materials also enable a mobility that may be applicable to human armor. Perhaps scales bear a closer resemblance to the chain mail worn by knights. Yet although rugged and thick, even this covering could not protect against every weapon, and exposed parts were always particularly vulnerable.

And so it is with fish. Many have spines on their fins or snouts, an effective deterrent against a predator seeking to engulf the fish head-on, but most fish are not completely armored. As with the knight, flexibility can be compromised by materials. Speed is reduced by stiffness and weight, making pursuit of prey and escape from predators a problematic balancing act. Thus, armored fish are uncommon, as most fish species are naked or covered with lightweight, thin scales.

With a long evolutionary record of their presence on earth, the thousands of scaled fish species are living proof that this ancient adaptation is a good idea, as modern researchers are learning. However, adaptations like the development of scales did not arise independent of environmental factors but rather were driven by them. Physical and biological realities, such as the availability of suitable habitat, the necessity for speed when hunting (and escaping), and the drive to reproduce — all have played a role in fish evolution. Other more subtle factors include the chemical balance of the water (is it rich in oxygen?) and its effect on evolutionary processes, water temperatures, presence of other species, camouflage, and protection from abrasion on the sea bottom.

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The persistence of the scale for millions of years and its common presence today is surely an indicator of success, but as mentioned above there are many factors that can promote other solutions. For fish that scour the ocean floor, slow movement when hunting may serve as well, or better, than fast. An increased availability of prey on the bottom may open a new “niche,” which along with other adaptative advantages may bring fish to deeper habitats and potentially slow them down. But there is danger in this potentially rich, more sedentary life. A slow, bottom-dwelling fish becomes vulnerable to quick-moving predators which it may fail to notice in its perambulations. Enhanced protection would increase survival in this scenario, and thick, overlapping plates offer an answer, if not a perfect one. Lost are the scales of a pelagic life, while after a time of naked vulnerability the new fish becomes clothed in thick, but pliable armor that even a weighted medieval knight would have appreciated. Add a few spines, and like a stout sword, the little fish lays in the mud, her tough exterior and bristly head giving her a chance against hungrier, bigger predators.

This scenario of a fish settling to the bottom in search of prey, or in response to other factors, implies that scales preceded plates in the evolution of fishes. Researchers believe that is the case, and indeed that it is a one-way street; once scales are lost, they are not reacquired.

Yet at least one “experimental” group of fish, often considered as a “bright candle” that burned out, were both armored and scaleless. These fish swam in the seas for over 50 million years, sharing the waters with those that have persevered on the planet – well-known groups such as sharks – beginning over 400 million years ago. This was the Placoderm class of armored fish; the name means “flat plate” and “skin.” Without living descendants today, their form was a curious combination of armored joints, plating on the head and neck, and naked skin on the rest of the body. Most had toothless gums. Some were very large, measuring nearly 23 feet (7 m), while others were tiny, less than an inch.

Although considered an evolutionary dead end, placoderms continue to be researched for their evolutionary importance as a primitive branch of jawed fish. The earliest placoderms evolved after the first scaled fish appeared but coinciding with the ongoing changes characteristic of those fish as well. Primarily bottom fish, some may have been active predators; such fish had streamlined armor, enabling them to rise quickly above the ocean floor in pursuit of prey.

Fossils are sometimes fragmentary, but enough have been collected to provide a record of the morphology of these ancient fish, including sufficient information to divide them into several orders. Placoderms were both diverse in morphology and adapted to a variety of habitats. There were ray-like placoderms, chimaera-like placoderms, some with big mouths, and placoderms with a form much like a flounder, complete with the eyes on one side of the head. These fish clearly diversified during their long sojourn which eventually ended near the close of the Devonian Period, approximately 360 million years ago. The Placoderm extinction may have resulted from increased competition or changes in the environment, or possibly as casualties of a mass extinction event that exterminated many water-based and land animals.

The Persistence of Armor

Today, it is the lineage of the “ray-finned” fish, most of them scaled, and with an evolutionary record that also extends to more than 400 million years ago that dominates the world’s fresh and salt waters. But scaling is not always complete; some fish are clothed with a combination of scales and naked skin, others are partially armored, while those, such as the poachers, are covered or nearly so with platelike structures of varying thickness.

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As with the armored soldier, the thick body plates borne by poachers seem most important for defense. Examinations of individual fish have revealed punctures in the bony plates, an indication of possible predation or perhaps competition with other poachers. Unfortunately, the armor may prove inadequate against a fish with a large enough gape to engulf the entire poacher. And most poacher species are small.

Mobility and stiff plating would seem to conflict, but poachers are capable of quick acceleration, particularly with their tails, but more commonly use their pectoral fins for a rowing motion. The more flexible juveniles often employ their caudal fins for quick acceleration. For these young fish, the lighter weight armor has a hydrodynamic benefit, with the spines present on each plate slowing the rate of descent through the water column.

Relatively secure in their ocean bottom home, adult poachers do not bear the most flexible armor nor the lightest, but they do represent a lifestyle with a deep evolutionary record. And the placoderms, with their partial armor, may have gone extinct, but they embodied new features that place them in an important position in the long sojourn of fish on the planet. It can be hoped that the habitat on the sea floor remains amenable to the poachers in the rapidly changing dynamics of a new world over which, as with their predecessors, they have little control.

With six-sided irreplaceable bony plates, overlapping like those of a seahorse but stiff and more confining than their cousins, the bottom-dwelling poacher nevertheless can move quickly. This short sprint has its advantages, as does a return to the cold sea floor when a predator has been evaded or a morsel of food obtained. Their life proceeds at a slower pace, where most of the time a small fish can escape notice altogether. In the water column above distant relatives – scaly fish – rush around. If they were to grow tired of their frenetic pace and settle to the bottom, they too might relinquish the flashy scales for more a hefty protection.