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# FISHES WITH FINS AND SCALES

## The Anatomy of Fishes in its Bearing on the Requirements of Certain Religious Dietary Regulations, with a Note on the Source of Cod and Other Liver Oils

By Isaac Ginsburg, Aquatic Biologist,
Division of Fishery Biology

The Fish and Wildlife Service frequently receives inquiries as to whether certain fishes are kosher; that is, whether they may be included in the category of food permitted by the laws of the Jewish religion. To discuss the subject at greater length than is feasible in a letter is the purpose of this leaflet.

The basic code of Jewish religious law is the Old Testament. The fundamental passage dealing with the subject of food products derived from the water is found in Leviticus 11: 9-12 (text from English Translation of the Bible (p.130) issued by the Jewish Publication Society, Philadelphia, 1922), which reads as follows:

"These may ye eat of all that are in the waters: whatsoever hath fins and scales in the waters, in the seas, and in the rivers, them may ye eat. And all that have not fins and scales in the seas, and in the rivers, of all that swarm in the waters, and of all the living creatures that are in the waters, they are a detestable thing unto you, and they shall be a detestable thing unto you; you shall not eat of their flesh, and their carcasses you shall have in detestation. Whatsoever hath no fins nor scales in the waters, that is a detestable thing unto you."

Study of this reference may raise questions as to the exact meaning and the adequacy of the translation from the original Hebrew text, especially when considered from the viewpoint of our present-day knowledge of anatomy. The Talmud and the post-Talmudic rabbinical treatises deal with the Jewish interpretation of the Old Testament, and controversial Jewish religious questions should be referred to a Rabbi for final decision.

From communications received by the Fish and Wildlife Service, it is evident, however, that any fish that has both fins and scales is unquestionably classified as kosher. Fortunately most of the food fishes, especially the commercial varities, have both fins and scales.

A fish fin is a comparatively thin membranous outgrowth from the body and is supported by slender bony or cartilaginous rods, called finrays. Most fishes have five fins, the names and locations of which are as follows: (1) Pectoral, on the side behind the head; (2) ventral, generally on the belly; (3) dorsal, on the back; (4) anal, on the ventral side behind the vent; and (5) caudal, the tail fin. The pectoral and ventral fins are symmetrically paired, like the limbs of a land animal, and the other three are unpaired. In some fishes the dorsal fin is split, forming two or three fins, one behind the other, and in a few the anal is likewise split. In some species one or more of the usual complement of fins may be lacking. The fins differ greatly in size according to species, some being very small, but in nearly all cases they are large enough to be seen with the naked eye. A few species, chiefly of scientific interest and not usually used for food, have minute or rudimentary fins.

The question is rarely raised by the layman as to whether a certain fish has fins, but this is not the case as regards scales, because there is such diversity in their structure, size, number, and developmental history in the multitude of species. Many doubtful cases may be decided by first determining what constitutes a scale. Although it is difficult to condense this information into a few brief paragraphs that will be readily understandable, the more prominent points may be set forth.

In all cases a scale begins to develop in the very young fish as a papilla, or pimple-like outgrowth of the skin, although the final structure will differ according to species. The scales of all known species may be divided into the following four primary classes: (1) Ctenoid, (2) cycloid, (3) ganoid, and (4) placoid. The great majority of fishes have either ctenoid or cycloid scales.

Ctenoid scales have minute spinelike projections at their exposed edges. Because of these projections the scales feel rough when the fish is stroked with the finger tips from the tail forward. By this test, with some practice one is usually able to decide whether the scales are ctenoid. A black bass, for example, has ctenoid scales.

Cycloid scales lack the minute spines and have edges that are generally rounded. The carp and herring are examples of species bearing cycloid scales.

Comparatively few species now living possess ganoid scales, but fossil remains of fishes uncovered in layers of rock show that ganoid scales were common among species that lived in past ages. Those scales are thicker and heavier than either the cycloid or the ctenoid. The sturgeon is an example of a present-day species having ganoid scales.

Placoid scales are characteristic of sharks. They are embedded in the skin and have tiny spinous projections that give sharkskin its feeling of roughness.

Most scales can be assigned to one of these four classes, although in some fishes their structure is such that they cannot be readily placed entirely in any one class. For example, some species have scales that are more nearly allied to the ctenoid or cycloid, but in form they have the appearance of bony tubercles. Also in some species the scales are intermediate in structure between the major classes.

Scales vary widely in size between different species. In some, including the fresh-water eel, the butterfish, and the makerel, they are either minute or notably small, while in the carp they are large. When all species are considered, there are all gradations of scale size, and fishes cannot be divided consistently into groups on this basis. Also, no matter where the line is drawn, there will always be intermediates that may be placed in either one of two adjacent groups.

Fishes also differ widely in the number of scales and the extent to which these cover the body. Some species have but two scales, others have four, still others have a small patch of scales covering but a small fraction of the body, and so on through gradations to those species in which virtually the entire surface of the body and fins are covered.

Another matter to be considered is that of individual variability as between members of the same species. The old saying that "no two blades of grass are exactly alike" applies also to fishes. In some species, especially those having but few scales, their number and extent is virtually constant. In most species there is only a moderate degree of variability. In others, however, variations in individuals are pronounced, and the difference between extremes of the same species is striking. A notable example is the carp, in a majority of which the scales cover virtually the entire body, but in many cases more or less incompletely, and there are all degrees of extent of scale covering between the extremes. It is interesting to note that in the carp, which appears to be universally considered a kosher fish, some individuals have no scales at all.

Of the fishes most commonly sold in the market, those that have both fins and scales are listed on pages 5 to 8. In using this list it should be borne in mind that the common names of fishes vary in different sections. The specific names in this list are those most generally used. It is impracticable to give a complete tabulation of common names to show differences in local usage. Some of these fishes may appear to lack either fins or scales, but upon close inspection these structures will be discovered. Following are the more striking examples of species about which inquiries are most often received:

The fresh-water eel is a fish frequently thought to lack both fins and scales. The fins are low but may easily be detected. The scales are minute and not readily apparent on a fish just out of water, though readily visible when it is allowed to dry.

The presence of scales on the tuna, mackerel, and butterfish is sometimes questioned. These fishes have very small scales that often tend to fall off after the fish is captured, but some usually adhere and may be seen upon inspection.

The sturgeon is a controversial species, although it has scales of the ganoid type and also fins.

The swordfish when young has tuberculoid scales but with growth these disappear and the market-size fish has no scales.

## Source of Cod and Other Liver Oils

Inquiries also are received as to the availability of cod-liver oil for consumption by Jews. This question may be narrowed to a consideration of the source of cod-liver oil; that is, whether it comes from a fish having fins and scales. For answer we must turn to the United States Pharmacopeia, in this country the official book on drug standards, which are enforced by Federal laws. The Pharmacopeia (Eleventh revision, p. 261-262) defines cod-liver oil as "The . . . fixed oil obtained from fresh livers of Gadus morrhua . . . and other species of the family Gadidae." The Gadus morrhua is the well-known codfish, and this, together with other species of the family Gadidae have fins and scales. Consequently, cod-liver oil that is prepared according to Pharmacopeia standards is derived from fishes having both fins and scales and presumably is kosher. The letters "U.S.P." on the label of a container of cod-liver oil means that the oil is guaranteed to have been prepared according to the standard of the United States Pharmocopeia, and any adulteration of such oil subjects both the producer and retailer to prosecution under the Federal pure food and drug laws.

In the last few years the use of various vitamin products has become widespread, and the liver oils of species other than those belonging to the family Gadidae have entered into the preparation of such products. Common among these are halibut-liver oil, which is derived from a species having both fins and small cycloid scales, and shark-liver oil, derived from the livers of sharks of various species. Sharks have fins and scales, but the scales are placoid and their structure differs from that of most other fishes.

## Partial List of Common Food Fishes That Have Both Fins and Scales

(Common and scientific names as shown in publications of the Fish and Wildlife Service)

Albacore:
Germo alalunga.
Alewife:
Pomolobus pseudoharengus.
Pomolobus aestivalis.
Amberjack:
Seriola sp.
Anchovy:
Engraulis mordax.
Anchoviella delicatissma.
Anchoviella compressa.
Angelfish:
Pomacamthus arcuatus.
Angelichthys isabelita.
Barracuda:
Sphyraena argentea (Pacific coast).
Sphyraena barracuda (Atlantic coast).
Bass, black:
Micropterus dolomieu.
Micropterus salmoides.
Bass, rock:
Paralabrax sp. (Pacific coast).
Ambloplites rupestris (Mississippi River, Great Lakes drainage, and tributaries).
Bass, sea:
Stereolepis gigas (Pacific coast).
Centropristes striatus (Atlantic coast).
Bass, sea, white (California):
Cynoscion nobilis.
Bass, striped:
Roccus saxatilis.
Bass, white:
Roccus chrysops.
Bass, yellow:
Morone interrupta.
Bluefish:
Pomatomus saltatrix.
Blue runner; hardtail:
Caranx crysos.
Bonito:
Sarda sarda.
Sarda chilensis.
Bowfin:
Amia calva:
Buffalofish:
Ictiobus sp.
Burbot:
Lota maculosa.
Butterfish:
Poronotus triacanthus.
Cabio:
Rachycentron canadum.
Carp:
Cyprinus carpio.
Cero:
Scomberomorus regalis.
Chub:
Leucichthys sp. (except L. artedi in Great Lakes).
Cisco:
Leucichthys artedi (Lake Erie).
Cod:
Gadus macrocephalus (Pacific coast).
Gadus callarias (Atlantic coast).
Crappie:
Pomoxis annularis.
Pomoxis sparoides.
Crevalle:
Caranx hippos.
Croaker:
Micropogon undulatus.
Cunner:
Tautegolabrus adspersus.
Cusk:
Brosmius brosme.
Dolphinfish:
Coryphaena hippurus.
Drum, black:
Pognias cromis.
Drum, fresh-water; sheepshead:
Aplodinotus grunniens.
Drum, red:
Sciaenops ocellatus.
Eel, fresh-water:
Anguilla rostrata.

Eulachon:
Thaleichthys pacificus.
Flounder:
Pleuronectidae sp.
Flyingfish:
Cypsilurus californicus.
Garfish:
Tylosurus sp.
Ablennes sp.
Goldfish:
Carassius auratus.
Greenfish:
Girella nigricans.
Grouper:
Epinephelus sp.
Mycteroperca sp.
Grunt:
Haemulon sp.
Haddock:
Melanogrammus aeglifinus.
Hake:
Urophysis sp. (Atlantic coast).
Merluccius productus (Pacific coast).
Halfmoon:
Medialuna californiensis.
Halibut:
Hippoglossus hippoglossus.
Halibut (California):
Paralichthys californicus.
Hardhead:
Orthodon microlepidotus.
Harvestfish:
Peprilus alepidotus.
Herring:
Clupea harengus (Atlantic coast).
Clupea pallasii (Pacific coast).
Herring, lake:
Leucichthys artedi (Great Lakes except Lake Erie).
Hogchoker:
Achirus fasciatus.
Hogfish:
Lachnolaimus maximus (Florida).
Jewfish:
Promicrops itaiara.
Kingfish:
Scomberomorus cavalla.
Kingfish (California):
Genyoneumus lineatus.
Ladyfish:
Albula vulpes.
Launce:
Ammodytes americanus.
"Lingcod":
Ophiodon elongatus.
Mackerel:
Scomber scombrus (Atlantic coast).
Scomber diege (Pacific coast).
Mackerel, frigate:
Auxis thazard.
Mackerel, horse:
Trachurus symmetricus.
Mackerel, Spanish:
Scomberomorus maculatus.
Mackerel, thimble-eyed:
Scomber colias.
Menhaden:
Brevoortia tryannus.
Minnow:
Cyprinidae sp.
Mojarro:
Eucinostomas sp.
Mooneyes:
Hiodon sp.
Moonfish:
Vomer setipinnis.
Selene vomer.
Mullet:
Mugil sp.
Mummichog:
Fundulus sp.
Muttonfish:
Lutianus analis.
Paddlefish:
Polyodon spathula.
Parrotfish:
Scaridae sp.
Perch, silver:
Bairdiella chrysura.
Perch, white:
Morone americana.
Embiotocidae sp. (Pacific coast).
Perch, yellow:
Perca flavescens.
Permit:
Trachionotus goodei.
Pickerel:
Esox reticulatus.
Esox americanus.

Pigfish:
Orthopristis chrysopterus.
Pike; jack:
Esox lucius.
Pikeperch, blue; blue pike:
Stizostedion vitreum glaucum.
Pikeperch, yellow; yellow pike:
Stizostedion vitreum vitreum.
Pilchard:
Sardinia caerulea.
Pilotfish:
Seriola sp.
Pinfish:
Lagodon rhomboides.
Pollock:
Pollachius virens.
Pompano:
Trachinotus sp. (Atlantic coast).
Palometa simillimus (Pacific coast).
Porgy:
Calamus sp.
Porkfish:
Anisotremus virginicus.
Quillback:
Carpoides sp.
Roach:
Notemigonus crysoleucas.
Rockfish:
Sebastodes sp. (Pacific coast).
Roccus saxatilis (Atlantic coast).
Rosefish; redfish:
Sebastes marinus.
Sablefish:
Anaplopoma fimbria.
Salmon, Atlantic:
Salmo salar.
Salmon, Pacific:
King, chinook, or spring:
Oncorhynchus tschawytscha.
Red, or sockeye:
Oncorhynchus nerka.
Coho, or silver:
Oncorhynchus kisutch.
Humpback, or pink:
Oncorhynchus gorbuscha.
Chum, or keta:
Oncorhynchus keta
Sauger; pike:
Stizostedion canadense.
Scamp:
Mycteroperca phenas.
Scup:
Stenotomus chrysops.
Sea gar:
Tylosurus sp.
Sea robin:
Prionotus sp.
Shad:
Alosa sapidissima.
Shad, gizzard:
Dorosoma cepedianum.
Shad, hickory:
Pomolobus mediocris.
Sheepshead, salt-water:
Archosargus probatocephalus.
Sheepshead, fresh-water:
Aplodinotus grunniens.
Sheepshead (Pacific coast):
Pimelometopon pulcher.
Silversides:
Menidia sp.
Skipjack:
Euthynus pelamis.
Skipper:
Scomberesox saurus.
Smelt:
Osmerus mordax (Atlantic coast and Great Lakes).
Argentinidae sp. (Pacific coast).
Snapper, mangrove:
Lutianus griseus.
Snapper, red:
Lutianus blackfordii.
Snook:
Centropomus undecimalis.
Sole (Pacific coast):
Psettichthys melanostictus.
Spadefish:
Chaetodipterus faber.
Splittail:
Pogonichthys macrolepidotus.
Spot:
Leiostomus xanthurus.
Squawfish:
Ptychocheilus oregonensis.

Squeteague, gray; sea trout:
Cynoscion regalis.
Squeteague, spotted; spotted sea trout:
Cynoscion nebulosis.
Squirrelfish:
Deplectrum formosum.
Sturgeon:
Acipenser sp.
Sturgeon, shovel-nosed:
Scaphirhynchus platorynchus.
Sucker:
Catostomidae sp.
Sunfish:
Lepomis sp.
Centrarchidae sp.
Swordfish:
Ziphias gladius.
Tang:
Hepatus sp.
Tarpon:
Tarpon atlantious.
Tautog:
Tautoga onitis.
Ten-pounder:
Elope saurus.
Tilefish:
Lopholatilus chamaeleonticeps.
Tomcod:
Microgadus tomod (Atlantic coast).
Microgadus proximus (Pacific coast).
Trout, Dolly Varden:
Salvelinus malma.
Trout, lake:
Cristivomer namaycush.
Trout, steelhead:
Salmo gairdneri.
Tripletail:
Lobotes surinamensis.
Tuna:
Thunnus thynnus.
Tuna, yellowfin:
Neothunnus macropterus.
Turbot:
Reinhardtius hippoglossoides.
Balistes carolinensis.
Whitefish:
Coregonus clupeaformis (Great Lakes)
Caulolatilus princeps (Pacific coast).
Whitefish, Menominee:
Prosopium quadrilaterale.
Whiting:
Merluccius bilinearis.
Whiting, king:
Menticirrhus sp.
Wolffish:
Anarrchichas lupus.
Yellowtail:
Ocyurus chrysurus (Atlantic coast).
Seriola dorsalis (Pacific coast).