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FOOD 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

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The Fish and Wildlife Service frequently receives inquiries 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. This leaflet discusses the subject at greater length than is feasible in a letter.

The basic code of Jewish religious law is the Old Testament. The fundamental passage dealing with food products derived from 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; ye shall not eat of their flesh, and their carcasses ye shall have in detestation. Whatsoever hath no fins nor scales in the waters, that is a detestable thing unto you."

Note--This leaflet is a revision of Fishery Leaflet 8 (April 1946),
Fishes With Fins and Scales.

Study of this passage 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 species, have both fins and scales.

In the everyday language of the layman the word fish, either by itself or in combination, is generally applied to a great variety of very diverse animals that live in the water. For instance, colloquially such creatures as oysters, clams or mussels are generally designated collectively as shellfish. In the scientific classification of living things they belong to the Phylum Mollusca that comprises soft bodied, invertebrate animals most of which are encased in a hard calcareous shell. Also, such species as lobsters, crabs, shrimps or crayfish are generally called collectively shellfish because they are enveloped in a tough chitinous articulated outer covering. Technically these latter creatures belong to the Phylum Arthropoda comprising invertebrate animals that have legs and other appendages which are jointed and chitinous. Again, such large water animals as whales and porpoises are often popularly thought of as fish. Scientifically, however, these belong to the Class Mammalia that comprises animals which have a backbone, breathe by means of lungs and the females of which possess mammary glands by which they suckle their young during their early period of life, being in these respects like land mammals. This leaflet does not deal with any of the above aquatic animals. It treats only of the "true" fishes. Technically the latter belong to the Class Pisces. This large group of species may be described briefly as follows: they have a vertebral column or backbone, live and reproduce in the water and breathe by means of gills throughout life, and have fins except in a few instances. In ordinary language these species are often spoken of as "fin fishes," to distinguish them from such other groups of aquatic animals as are described above.

A fish fin is a comparatively thin membranous outgrowth from the body and is supported by slender bony or cartilaginous rods, called finrays. When the fin supports are stiff and pointed they are called spines. 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 most species may be divided into the following four primary classes: (1) ctenoid, (2) cycloid, (3) ganoid, and (4) placoid. The 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 very firmly attached to the skin and have tiny spinous projections that give sharkskin its feeling of roughness.

Scales of most fishes can be assigned to one of these four major classes, but in some species their structure is such that they cannot be placed readily in any one class. For example, some species have scales that are in the form of bony tubercles or platelets, in a variety of shapes, depending on the particular species. In some species the scales are intermediate in structure between the major classes. Also, some fishes have different kinds of scales on different parts of the body or head.

Scales vary widely in size between different species. In some, including the fresh-water eel, the butterfish, and the mackerel, 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 part of the body, and so on through gradations to those species in which virtually the entire surface of the body and fins is 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 so, 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.

Of the fishes most commonly sold in the market, those that have both fins and scales are listed on pages 6 to 9. 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. In scientific classification of fishes as well as other living things, every known species has a name that consists of two words. As the scientific names are relatively stable and do not differ with local usage, they are included in the list for the sake of clarity and precision. 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 or which depart widely in the structure of their scales from the great majority of species of fishes.

The fresh-water eel is a fish frequently thought to lack both fins and scales. The fins are low or short 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 and fins. The scales are of two kinds: (1) large ganoid scales in five rather widely separated longitudinal rows and (2) small tuberculoid scales in between.

Swordfish during the early juvenile stage of life have scales that are markedly specialized and rather unique. They are in the form of bony tubercles, or expanded compressed plate-like bodies. These scales are rough, having spinous projections at the surface, and they do not overlap one another as scales in most other fishes do. With growth the scales disappear and the larger fish, including those sold in the market, have no scales.

The paddlefish, also known as spoonbill catfish, a fresh water species found in the Mississippi drainage and adjacent waters, and the roe of which is often processed into caviar, has a smooth scaleless body, but the tail end of the fish has a lengthwise patch of narrow, elongate, spindle-shaped, flat scales that differ strikingly from the ordinary fish scales with which the layman is familiar. They are markedly unlike the scales that are classifiable in the four major groups outlined above.

Source of Cod and Other Liver Oils

Inquiries also are received as to the availability of cod-liver oil for consumption by Jews. The 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." Gadus morrhua is the well-known cod-fish, 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 standards of the United States Pharmacopeia, 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 sharkliver 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

(The notation "sp." signifies that more than one species in the same Genus or Family bear the same common name.)

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|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| Albacore; longfin tuna:
<i>Thunnus alalunga</i> | Bass, striped:
<i>Roccus saxatilis</i> |
| Alewife; river herring:
<i>Pomolobus pseudoharengus</i>
<i>Pomolobus aestivalis</i> | Bass, white:
<i>Roccus chrysops</i> |
| Amberjack:
<i>Seriola</i> sp. | Bass, yellow:
<i>Morone interrupta</i> |
| Anchovy:
<i>Engraulis mordax</i>
<i>Anchoa delicatissima</i>
<i>Anchoa compressa</i> | Bluefish:
<i>Pomatomus saltatrix</i> |
| Angelfish:
<i>Pomacanthus arcuatus</i>
<i>Angelichthys isabelita</i> | Blue runner; hardtail:
<i>Caranx crysos</i> |
| Barracuda:
<i>Sphyraena argentea</i> (Pacific coast)
<i>Sphyraena barracuda</i> (Atlantic coast) | Bonito:
<i>Sarda sarda</i>
<i>Sarda chiliensis</i> |
| Bass, black:
<i>Micropterus dolomieu</i>
<i>Micropterus salmoides</i> | Bowfin:
<i>Amia calva</i> |
| Bass, rock:
<i>Paralabrax</i> sp. (Pacific coast)
<i>Ambloplites rupestris</i> (Mississippi Valley and adjacent waters) | Buffalofish:
<i>Ictiobus</i> sp. |
| Bass, sea:
<i>Stereolepis gigas</i> (Pacific coast)
<i>Centropristes melanus</i> (Gulf of Mexico)
<i>Centropristes striatus</i> (Atlantic coast) | Burbot:
<i>Lota maculosa</i> |
| Bass, Sea, white (California):
<i>Cynoscion nobilis</i> | Butterfish:
<i>Poronotus triacanthus</i> |
| | Cabio:
<i>Rachycentron canadum</i> |
| | Carp:
<i>Cyprinus carpio</i> |
| | Cero:
<i>Scomberomorus regalis</i> |
| | Chub:
<i>Leucichthys</i> sp. (except <i>L. artedi</i>) |
| | Cisco:
<i>Leucichthys artedi</i> (Lake Erie) |
| | Cod:
<i>Gadus callarias</i> (Atlantic coast)
<i>Gadus macrocephalus</i> (Pacific coast) |

Crappie:
Pomoxis annularis
Pomoxis sparoides

Crevalle:
Caranx hippos

Croaker; hardhead:
Micropogon undulatus

Cunner:
Tautogolabrus adspersus

Cusk:
Erosme brosmo

Dolphinfish:
Coryphaena hippurus

Drum, black:
Pogonias cromis

Drum, fresh-water; sheepshead:
Aplodinotus grunniens

Drum, red:
Sciaenops ocellatus

Eel, fresh-water:
Anguilla rostrata

Eulachon:
Thaleichthys pacificus

Flounder:
Pleuronectidae sp.

Flyingfish:
Cypselurus sp.

Goldfish:
Carassius auratus

Greenfish:
Girella nigricans

Grouper:
Epinephelus sp.
Mycteroperca sp.

Grunt:
Haemulon sp.

Haddock:
Melanogrammus aeglefinus

Hake:
Urophycis sp. (Atlantic coast)
Merluccius productus (Pacific coast)

Halfmoon:
Medialuna californiensis

Halibut:
Hippoglossus hippoglossus

Halibut, California:
Paralichthys californicus

Hardhead:
Orthodon microlepidotus

Harvestfish:
Peprilus alepidotus

Herring; sardine (name used for canned small fish of Atlantic species):
Clupea harengus (Atlantic coast)
Clupea pallasii (Pacific coast)

Herring, lake:
Leucichthys artedi (Great Lakes except Lake Erie)

Hogchoker:
Achirus fasciatus

Hogfish (Florida):
Lachnolaimus maximus

Jewfish:
Promicrops itaiara

Kingfish (Florida):
Scomberomorus cavalla

Kingfish (California):
Genyonemus lineatus

Ladyfish:
Albula vulpes

Lingcod:
Ophiodon elongatus

Mackerel:
Scomber scombrus (Atlantic coast)
Scomber diego (Pacific coast)

Mackerel, frigate:
Auxis thazard

Mackerel, jack:
Trachurus symmetricus

Mackerel, king:
Scomberomorus cavalla

Mackerel, Spanish:
Scomberomorus maculatus

Mackerel, chub:
Scomber grex

Menhaden:
Brevoortia tyrannus

Mojarro:
Eucinostomas sp.

Mooneye:
Hiodon sp.

Moonfish:
Vomer setapinnis
Selene vomer

Mullet:
Mugil 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 (name applied to large specimens of pompano):
 Trachinotus falcatus
 Trachinotus carolinus
 Pickerel:
 Esox reticulatus
 Esox americanus
 Pigfish:
 Orthopristis chrysopterus
 Pike; jack:
 Esox lucius
 Pikeperch, blue; blue pike:
 Stizostedion glaucum
 Pikeperch, yellow; yellow pike:
 Stizostedion vitreum
 Pilchard (see also sardine):
 Sardinops caerulea
 Pinfish:
 Lagodon rhomboides
 Pollock:
 Pollachius virens
 Pompano (see also permit):
 Trachinotus sp. (Atlantic coast)
 Palometa simillima (Pacific coast)
 Porgy:
 Calamus sp.
 Porkfish:
 Anisotremus virginicus
 Quillback:
 Carpiodès sp.
 Rockfish:
 Sebastes sp. (Pacific coast)
 Roccus saxatilis (Atlantic coast)
 Rosefish; redfish; ocean perch:
 Sebastes marinus

Sablefish:
 Anoplopoma fimbria
 Salmon, Atlantic:
 Salmo salar
 Salmon, Pacific:
 King, chinook, or spring:
 Oncorhynchus tshawytscha
 Red, or sockeye:
 Oncorhynchus nerka
 Coho, or silver:
 Oncorhynchus kisutch
 humpback, or pink:
 Oncorhynchus gorbuscha
 Chum, or keta
 Oncorhynchus keta
 Sardine:
 Sardinops caerulea (Pacific coast)
 Clupea harengus (Atlantic coast; small canned fish)
 Sauger; pike:
 Stizostedion canadense
 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 oviceps
 Archosargus probatocephalus
 Sheepshead, fresh-water:
 Aplodinotus grunniens
 Sheepshead (Pacific coast)
 Pimelometopon pulcher
 Skipjack; striped tuna:
 Katsuwonus pelamis
 Skipper:
 Scomberesox saurus
 Smelt:
 Osmerus mordax (Atlantic coast and Great Lakes)
 Argentinidae sp. (Pacific coast)

Snapper, mangrove: *Lutianus griseus*
 Snapper, red: *Lutianus blackfordi*
 Snook: *Centropomus undecimalis*
 Sole (Pacific coast) *Psettichthys melanostictus*
 Spadefish: *Chaetodipterus faber*
 Splittail: *Pogonichthys macrolepidotus*
 Spot: *Leiostomus xanthurus*
 Squawfish: *Ptychocheilus oregonensis*
 Squeteague, gray; sea trout; weak-fish: *Cynoscion regalis*
 Squeteague, sand; sand trout: *Cynoscion arenarius*
 Squeteague, spotted; spotted sea trout: *Cynoscion nebulosus*
 Sturgeon: *Acipenser* sp.
 Sturgeon, shovel-nosed: *Scaphirhynchus platyrhynchus*
 Sucker: *Catostomidae* sp.
 Sunfish: *Lepomis* sp.
Centrarchidae sp.
 Swordfish: *Xiphias gladius*
 Tarpon: *Tarpon atlanticus*
 Tautog: *Tautoga onitis*
 Ten-pounder: *Elops saurus*
 Tilefish: *Lopholatilus chamaeleonticeps*
 Tomcod: *Microgadus tomcod* (Atlantic coast)
Microgadus proximus (Pacific coast)
 Tripletail: *Lobotes surinamensis*
 Trout, Dolly Varden: *Salvelinus malma*
 Trout, lake: *Cristivomer namaycush*
 Trout, steelhead: *Salmo gairdneri*
 Trout, see also squeteague
 Tuna, blackfin: *Thunnus atlanticus*
 Tuna, bluefin: *Thunnus thynnus*
 Tuna, little: *Euthynnus alletteratus*
 Tuna, longfin; see albacore
 Tuna, striped; see skipjack
 Tuna, yellowfin: *Thunnus albacares*
 Turbot: *Reinhardtius hippoglossoides*
Halistes carolinensis
 Whitefish: *Coregonus clupeaformis* (Great Lakes)
Caulolatilus princeps (Pacific coast)
 Whitefish, Menominee: *Prosopium quadrilaterale*
 Whiting: *Merluccius albidus*
Merluccius bilinearis
 Whiting, king: *Menticirrhus* sp.
 Wolffish: *Anarhichas lupus*
 Yellowtail: *Ocyurus chrysurus* (Atlantic coast)
Seriola dorsalis (Pacific coast)