

BIOLOGICAL ASPECTS OF A POTENTIAL SARDINE INDUSTRY
IN THE CARIBBEAN AREA,* WITH A KEY TO THE SPECIES

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Under the common name of "sardines" are known a number of fishes of the family Clupeidae some of which are commercially utilized for food. These fishes are usually canned and the way they are processed (in tomato sauce or oil) is familiar to everyone. In Europe, however, and especially in Spain and Portugal, sardines are also smoked and/or salted, and packed in wooden containers without going through the process of cooking.

Among the most important species in connection with the already existing sardine industry are included the well known California sardine (Sardinops caerulea) in America, and the European sardine (Sardinella aurita) in Western Europe. The so called "Maine sardine" is nothing but the young of the common northern Herring (Clupea harengus) not a true sardine and a species that does not occur in the Caribbean area. The California sardine is consumed locally in the United States and also exported to foreign countries, one of the most important markets being Latin America. The European sardine is also consumed in this country mostly in canned form, but the Latin American countries import great quantities of canned, smoked, and salted sardines from Spain, Portugal and the Scandinavian countries. It may be pointed out that Latin Americans are very fond of canned sardines, which they consider a delicacy as well as practical means of providing a quick and wholesome meal without too much fuss.

The purpose of the present paper is to point out the occurrence of Clupeid fishes or sardines in Caribbean waters, which present the combined advantages of accessibility, abundance, ease of capture, high food value and excellent flavor. It is obvious that the commercial exploitation of these species would be very advantageous from many points of view.

As far as I have been able to ascertain, these tropical American species have never been exploited commercially in a large scale, with the exception of Venezuela and Cuba, which recently, and as a result of the war, have begun to can one or two species. Relatively small quantities of sardines are sold locally in Caribbean fish markets, and those are mostly utilized as bait.

In addition to canning, salting and smoking, Caribbean sardines can be marinated in a way similar to that employed with the northern herring (Clupea harengus), with excellent results.

Very little is known about the life histories of Caribbean clupeids and it would be advisable to conduct at least a preliminary survey of the various populations before actual commercial exploitation is attempted.

The usual methods of capture employed for these fishes are seines and cast nets.

*For the purposes of this paper, the Caribbean area is understood to include Florida, the Gulf Coasts of the United States and Mexico, and the Caribbean coasts of Central and South America, in addition to the West Indies proper

A key, and a list including the known biological properties, abundance, methods of capture, etc., of each species is now offered.

KEY TO THE CARIBBEAN GENERA AND SPECIES
OF COMMERCIAL CLUPEIDS

The genera and species included in the following key are members of a group which is well distinguished from other clupeid fishes by possessing a short anal fin (less than 30 rays), no distinct median notch in the upper jaw, and a bilobed dermal fold on the vertical anterior edge of the cleithrum (rim of shoulder girdle).

1a. Gill rakers always more than 45 on lower limb of first arch.
Ventral scutes always more than 32.

2a. Last ray of dorsal fin not produced into a long filament.
Body slender; the length of the head greater than the greatest depth of the body.

1. Sardinella Anchovia

2b. Last ray of dorsal fin produced into a long filament. Body deeper; the length of the head less than the greatest depth of the body.

2. Opisthonema oglinum.

1b. Gill rakers always fewer than 45 on lower limb of first arch.
Ventral scutes never more than 32.

3a. Inner edge of palatines with a row of pointed teeth forming a cutting edge. Gill rakers 26 to 31, usually 27 to 29 on lower limb of first arch. Ventral scutes 25 to 29, usually 26 to 28. Distance between origins of pelvic and anal fins shorter, 3.7 to 5.0, usually 3.8 to 4.5 in standard length. Snout longer, 2.5 to 3.4, usually 2.6 to 3.3 in distance between origins of pelvic and anal fins. Scales not adherent, easily falling off from either fresh or preserved specimens. Humeral spot absent. Average length 82 to 140 mm.

3. Harengula humeralis

3b. Inner edge of palatines without teeth. Gill rakers 28 to 40, usually 29 to 39 on lower limb of first arch. Ventral scutes 28 to 32, usually 29 to 31. Distance between origins of pelvic and anal fins longer, 3.1 to 3.9, usually 3.3 to 3.7 in standard length. Snout shorter, 3.4 to 4.3, usually 3.5 to 4.2 in distance between origins of pelvic and anal fins. Scales adherent, not falling off from either fresh or preserved specimens, Humeral spot present, sometimes faint. Average length 42 to 91 mm.

4a. Gill rakers 28 to 34 usually 29 to 33. Body more slender, its greatest depth 2.9 to 3.6, usually 3.0 to 3.5 in standard length.

4. Harengula clupeola

4b. Gill rakers 30 to 40, usually 32 to 39. Body deeper, its greatest depth 2.3 to 3.3, usually 2.5 to 3.1 in standard length.

5. Harengula pensacola

1. Sardinella anchovia Cuvier and Valenciennes

Sardinella anchovia Cuvier and Valenciennes, Hist. Nat. Poiss., Vol. 20, 1847, p. 269, Rio de Janeiro; Martinique. Jordan and Everman, Bull. U. S. Nat. Mus., No. 47, pt. I, 1896, p. 429.

Sardinia pseudohispanica Poey, Memorias, vol. 2, 1860, p. 311, Cuba.

This species is very closely related to the European Sardinella aurita and practically nothing is known about its habits. It is fairly abundant at certain times of the year, occurring in rather large schools in bays, estuaries and in shallow water along low shores.

Several industrial firms in Venezuela are already canning this species with excellent results and the Venezuelan Government is now sponsoring an investigation of this and other clupeids, in cooperation with the Fish and Wildlife Service of the United States Department of the Interior.

Sardinella anchovia reaches a standard length of 150 mm. or more and is found throughout the entire Caribbean region sometimes straying northward to Cape Cod.

2. Opisthonema oglinum (Le Sueur)

Thread herring, Machuelo, Cailleu-tassart, Sprat

Megalops oglina Le Sueur, Jour. Acad. Nat. Sci., Phila., vol. I, 1817, p. 359, Rhode Island

Opisthonema oglinum, Jordan and Everman, Bull. U.S. Nat. Mus., No. 47, pt. I, 1896, p. 432.

Until recently, this species was almost exclusively used as bait, but during the latter part of the war it was successfully canned in Cuba. As far as I know, Cuba is the only country where commercial exploitation of this species has been attempted.

Very little is known of the habits of this species and its occurrence seems to be seasonal. It reaches a standard length of 200 mm, and although most abundant throughout the West Indies, it is found as far north as Rhode Island.

3. Harengula humeralis (Cuvier)

Pilchard, Loose-scaled sardine, Sardina de ley, Red-eared pilchard, Sprat,

Whitebill, Pincers.

Clupea humeralis Cuvier, Regne animal, 2nd ed., vol. II, poiss., p. 318, footnote 2.

Harengula maculosa Cuvier and Valenciennes, Hist. Nat. Poiss, vol. 20, 1847, p. 292, Martinique, Longley and Hildebrand, Carnegie Inst. Washington Publ., no. 535, 1941, p. 4.

Harengula sardina Poey, Memorias, vol. 2, 1860, p. 310, Cuba

Sardinella sardina, Jordan and Evermann, Bull. U.S. Nat. Mus., No. 47, pt. I, 1896, p. 430.

Harengula humeralis, Storey, Stanford Ichthyol. Bull, vol. 1, no. 1, 1938, p. 28.

This is the largest of the American species of Harengula and grows up to about 200 mm. in total length. It is fairly common throughout its range which comprises the Florida Keys southward to Brazil.

This species is used as bait as well as food, although it has been reported as slightly poisonous by some authors.

4. Harengula clupeiola

Pilchard, *Sardina escamuda*, Sprat, Petit caillieu

Clupea clupeola Cuvier, Regne animal, 2nd ed., vol. II, Poiss., p. 318, gootnote 2.

Clupea macrophthalma Ranzani, Novi Comment. Acad. Sci. Inst. Bonon., bol. 5, p. 320, pl. 23, figs. 1-4 Brazil.

Harengula macrophthalma, Longley and Hildebrand, Carnegie Inst. Washington Publ., no. 535, 1941, p. 10.

Harengula clupeola, Storey, Stanford Ichthyol. Bull. vol. 1, no. 1, 1938, p. 29.

This is the most widely distributed of the American species of Harengula and apparently the most abundant. It attains a relatively large size but large individuals are not often taken. The average standard length is 70 to 85 mm. and the largest specimen recorded measures 149 mm.

This species is found throughout the entire Caribbean area, from the Florida Keys southward to Brazil.

5. Harengula pensacolae Goode and Bean

Scaled sardine, Alewife, Pilchard, Shiner

Harengula pensacolae Goode and Bean, Proc. U.S. Nat. Mus., vol. 2, 1880, p. 152, Pensacola. Storey, Stanford Ichthyol. Bull., vol. 1, no. 1, 1938, p. 33.

This species forms a complex of closely related subspecies several of which are being described as new in a revision of the American species of Harengula by the author and now in press.

The typical subspecies is found throughout the Florida Keys and along the Gulf Coast of Yucatan. A second subspecies occurs along the Caribbean coast of Central America and in Jamaica, Hispaniola and Puerto Rico. A third subspecies is found along the Caribbean coast of South America southward to Brazil. Two additional local subspecies occur in western Cuba and the Isle of Pines respectively.

All the subspecies of H. pensacolae are superficially alike and are mostly distinguished by minor characters affecting the number of gill rakers, ventral scutes and the depth of the body.

It is interesting to note that in spite of its abundance throughout South Florida and the Gulf Coast, this species is very little known by fishermen in that area.

The average size attained by H. pensacolae and its subspecies is from 50 to 80 mm. in standard length.