

**THE REX SOLE**

**Compiled by  
Michael J. Hosie**

**INFORMATIONAL REPORT 76-2**

**Oregon Department of Fish and Wildlife**

**February 1976**

## INFORMATIONAL REPORT - REX SOLE

### INTRODUCTION

The rex sole has been an important flatfish in Oregon's trawl fishery since its beginning in the 1930's. This fish is easily recognized by its characteristic long pectoral (chest) fin on the eyed side of the body.

Oregon landings of rex sole have gradually increased over the years. Initially rex sole were important primarily in the trawl fishery for mink food. However, trawl landings of rex sole for human food have steadily increased, with 3.4 million pounds being landed in the northeastern Pacific in 1974. Of that, Oregon's share was 1.3 million pounds, making rex sole Oregon's fourth most important commercial flatfish by weight. The largest share, 1.4 million pounds, was landed in California.

Biological information from rex sole landed in Oregon was not gathered until the early 1960's. Information obtained on a sporadic basis included length, weight, sex, age and maturity. The data obtained from this sampling has supplied a substantial body of knowledge on this flatfish.

### REPRODUCTION

Off the Oregon coast, rex sole females are  $7\frac{1}{2}$  inches long and about four years old when they first spawn. Most females are mature at  $9\frac{1}{2}$  inches; about five years old. At 12 inches long and nine years old, they are all mature.

Males first mature at 5 inches long when about two years old, with full maturity occurring at 8 inches and about five years. The sexes can be easily distinguished by "candling". Females held against the light show a long tapering ovary from the stomach cavity backward. Absence of this tapering "shape" indicates a male.

Rex sole, unlike many other flatfish, apparently have no specific spawning sites. Most spawning however, occurs between 50 and 150 fathoms. The period of spawning extends from January through June off northern Oregon, and peaks in March and April.

The number of eggs produced by a single female increases greatly with size of the fish. A 9½ inch female will produce about 3,900 eggs while a 23¼ inch female can have as many as 238,000 eggs.

## EARLY LIFE HISTORY

### Eggs and Larvae

Rex sole eggs are about 1/10 inch in diameter. After being released by a female and fertilized by a male fish near the sea bed the eggs rise into the water column, assuming a pelagic planktonic existence. Time to hatching is unknown, but probably occurs within a few weeks after spawning.

At hatching, rex sole are about 1/4 inch long and are called larvae. The larvae are pelagic for about a year in the water column before settling to the bottom. Off Oregon, rex sole larvae are most common at 15-45 miles offshore, but have been collected out to 105 miles offshore.

While in the water column these eggs and larvae are at the mercy of ocean currents, making this the most critical period in the life of flatfish. For example, scientists have found for plaice in the North Sea that up to 80% of the eggs and larvae die per month. This compares to only 10-20% dying per month for one year old plaice and only 10% per year for ages 5-15.

We believe that the mortality occurring during the egg and larval phase of rex sole fluctuates tremendously from year to year. Such fluctuations in mortality result in either a weak or strong brood (year class) from any one year's spawning. For example, rex sole hatched in 1961 were more abundant after assuming a bottom existence than those hatched in many other years. This year class was also dominant for several other species of fish.

Before the larvae settle to the bottom, they undergo drastic changes in form. When first hatched they appear snake-like with nine characteristic black pigment bars

along each side of the body. As each larva develops, the left eye gradually "migrates" over to the right side of the head; the black bars fade away; and the body widens.

### Juveniles

Most larvae are about 2 inches long when they assume a bottom life. They are now called juveniles. Off Oregon, this "settling out" occurs primarily in the winter months (about a year after hatching) on the upper continental shelf.

By mid-summer of their first year on the bottom, young rex sole are found over a large area of the continental shelf, mostly between 15 and 80 fathoms. By fall, these juveniles will have grown to about 3½ inches in length.

## ADULT LIFE HISTORY

### Distribution and Abundance

Rex sole range from southern California to the Bering Sea. However, they are most abundant from San Francisco northward to the Queen Charlotte Islands off Canada.

Adults occupy a wide range, on the bottom from about 10 to 400 fathoms. They show a preference for a muddy-sand bottom, but also frequent both sand and mud bottoms. This is unlike many other species of flatfish, making rex sole probably the most widely distributed sole on the continental shelf and upper continental slope off Oregon.

During a 1971-1974 trawl survey by the Oregon Department of Fish and Wildlife between the Columbia River and Cape Blanco, in 10-110 fathoms, rex sole was second in numbers (to English sole) and third in poundage of all flatfish caught. In this area, biologists estimated a rex sole population of 27 million pounds, out of a total flatfish population weighing 177-186 million pounds.

### Age and Growth

Age is determined by counting annual winter rings laid down on the otolith (ear bone). These annual rings (called hyaline zones) are narrow translucent bands formed

during the winter when the fish grow more slowly than in other months.

Rex sole off Oregon are known to live to at least 23 years of age. This fish was a 23½-inch long female weighing 2¼ pounds. However, rex sole of this age and size are rare.

At age three, when they enter the trawl fishery, they are about 6½-inches long. At this age, females begin to grow faster than males and this size-age difference increases throughout the life of the fish. At 11 inches in length 60-70% of rex sole are utilized by fishermen using 4½-inch mesh nets. This fish size corresponds to about age eight for females and age ten for males. Females over 14½-inches (about 15 years and 3/4-pound) and males over 12-inches (about 12 years and 3/10 pound) are uncommon in trawl catches.

#### Migrations

Little is known about the migratory habits of rex sole. There have been few recoveries from rex sole tagged off California, Oregon, and British Columbia. This probably occurred because the species is delicate and does not survive handling well. Of about 2,500 rex sole tagged off northern Oregon in 1970, only 15 were recaptured. The maximum movement was 29 nautical miles, with 2.2 years the longest time at liberty. These results suggest only limited movement. However, tag recoveries were too few to justify definite conclusions.

#### Feeding Habits

Larval rex sole feed on planktonic animals. Once on the bottom however, this flatfish feeds primarily on small invertebrates, including polychaete worms and amphipods. The small mouth of this species precludes it eating bigger animals.

#### THE FISHERY

There is no specialized trawl fishery for rex sole off Oregon. While distribution of this species is wide, it rarely concentrates in large numbers in anyone location. Thus rex sole are caught in small quantities on virtually the entire Oregon continental

shelf. This is unlike other flatfish, such as Dover sole, English sole, or petrale sole which do form large concentrations and are fished upon specifically at certain times of the year. Areas of major Oregon commercial catches are adjacent to the Columbia River and from the southern corner of Heceta Bank south to Cape Blanco. This coincides roughly with centers of other flatfish fisheries.

From a 1974 study conducted aboard Oregon drag boats, we documented that a certain portion of flatfish were discarded at sea. For rex sole only 59% of the females and 25% of the males were utilized. This low utilization rate was due to market-imposed limits on length of fish accepted for processing and sale. Most of the discarded fish were over 9½ inches and 5 years of age, the size and age when greater than 50% are sexually mature.

From data collected on groundfish surveys between the Columbia River and Cape Blanco, in 10-110 fathoms, we estimated there were 10-13 million pounds of usable rex sole. From this, we estimate that a sustainable yield of 1.9-2.7 million pounds for the fishery. The average commercial catch from this area was only 0.6-0.8 million pounds. Hence, there is room for additional harvest of rex sole off Oregon.

Rex sole are in little danger of being overexploited by the Oregon drag fleet. Their small size at maturity combined with the commonly used 4½-inch trawl mesh precludes overharvest.

#### PROCESSING AND MARKETING

Rex sole, unlike many other flatfish, generally are not filleted after being delivered to a processing plant. Instead, rex sole are eviscerated, with the head, side fins, and skin on the blind side of the body removed. This gives the processor a 35-45% recovery by weight, much higher than if the fish were filleted. This operation is called "rexing", a technique sometimes used on other species of small flatfish such as Pacific sanddab.

After processing, rex sole are primarily used in the fresh fish market. This species is considered by seafood connoisseurs to possess an appetizing delicate flavor and there is a high demand by consumers.