

## ENGLISH SOLE

*PAROPHRYS VETULUS* (GIRARD, 1854)

NATURAL HISTORY SUMMARY BY BENNETT BUGBEE

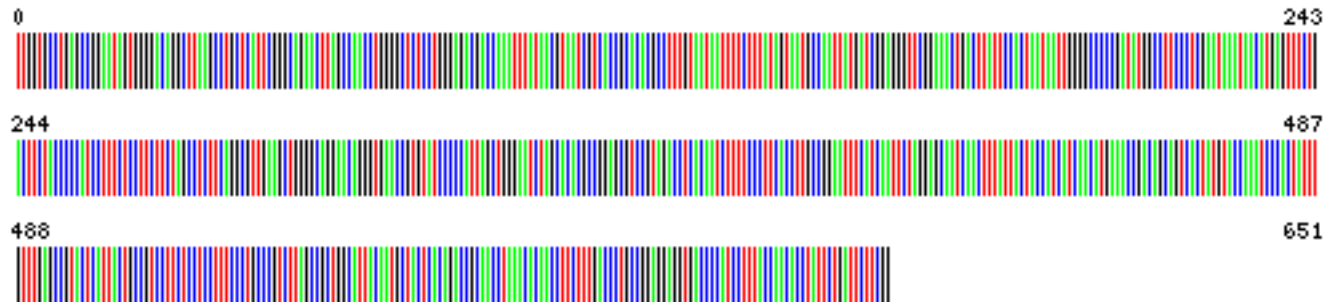


Figure 1. [Parophrys vetulus DNA Barcode](#) - Barcode of Life Database - BOLD Systems (Ratnasingham and Hebert 2007)

### Classification

**Kingdom:** Animalia

**Phylum:** Chordata

**Class:** Actinopterygii

**Order:** Pleuronectiformes

**Family:** Pleuronectidae

**Genus:** *Parophrys*

**Species:** *P. vetulus*

### Description

The English Sole (*Parophrys vetulus*) is a right eye flatfish that is typically brown to olive brown on the eye side. The non-eye side is much lighter, typically a yellowish white with some reddish spots around the operculum and about some of the scales (Washington Department of Fish and Wildlife n.d.). Coloration is used to be less conspicuous, to blend in with the sediment of the water it inhabits. The dorsal fin contains one spine and many soft rays extending from anterior of the top eye to near the tail; the anal fin is composed of soft rays extending from posterior the anus to the tail region as well, but both fins are not confluent with the homocercal truncate caudal fin (Cooper and Chapleau, 1998; Lassuy, 1989). The pectoral fin is reduced in size and extends outward from the body to function in steering the fish. Locomotion can be characterized as anguilliform, an oscillatory pattern of the anal and dorsal fin with some

tail movement used for quick bursts of speed. Its head is slightly elongated with a blunt snout, an asymmetrical mouth, and a narrow gape; the jaws are stronger on the blind side (Lassuy, 1989). The top eye is slightly posterior to the bottom eye. Scales overlap (imbricated) and become sharp/rough moving posteriorly (Lassuy, 1989; Washington Department of Fish and Wildlife n.d.). The lateral line is nearly straight with some curving around the pectoral fin and operculum (Washington Department of Fish and Wildlife n.d.).

### **Distribution**

English Sole inhabit the eastern Pacific Ocean along the Alaskan coast near the Bering Sea, down to Baja California, Mexico (Lamb and Edgell, 1986). Water temperature has been found to be a limiting factor on the geographic range of the species (Alderdice and Forrester, 1968). *Parophrys vetulus*' [range map](#) is available at Aquamaps, 2016.

### **Diet**

Various studies regarding the English Sole's diet have shown that its larvae consume appendicularians, tintinnids, copepods, juvenile bivalves and invertebrate eggs (Lassuy, 1989). Juveniles are more opportunistic benthic feeders, largely dependent on the season and locality of the organism (Collins, 1978; Toole, 1980). Hogue and Carey showed that the English Sole performs a sit-and-wait predation method along with an active sediment disturbance pattern. English Sole mainly consumes shallow-burrowing and surface-active prey like polychaetes, amphipods, and bivalve siphons (Hogue and Carey, 1982; Hulberg and Oliver, 1979).

### **Habitat and ecology**

English Sole adults prefer the sandy or muddy bottoms of marine systems ranging from 0 to around 550 meters, while larval and smaller juveniles occur in intertidal areas (Washington Department of Fish and Wildlife n.d.). Spawning English Sole adults make extensive migrations (Hart 1973). The sandy/muddy bottom allows them to burrow under a thin layer of sediment and blend in with the surrounding sediment which aids in predation and in avoiding predators. Ames et al. (1978) found that the upper lethal water temperature is around 26 °C with a reduction in growth rate arising around 17 °C

(Lassuy, 1989). Larvae are pelagic, dependent upon favorable patterns in the current to move to areas, like estuaries or open coastal waters, closer to the shore (Lassuy, 1989). As they age and grow, they move further from the shore to deeper waters where they settle as adults in sand or sand-mud substrates. The adults migrate from deeper waters in the winter to shallower depths in the summer (Demory et al. 1976).

Hybridization is common amongst flatfish with new species being described based on morphology and/or meristic intermediacy between the putative parent species (Garrett 2005). Hybrids live in and amongst the geographic range of the native English Sole. In 2005, Garrett described a new hybrid between *Isopsetta isolepis* (Butter Sole) and *Parophrys vetulus* (English Sole), collected in the Strait of Georgia and the Puget Sound, finding four putative parent species to the hybrid. Garrett hypothesized that the hybridization was due to an overlap of spawning time and depth between the two species (Garrett 2005). The English Sole is the most numerous of the pleuronectiform in the Puget Sound and has been associated with protozoan parasites like *Glugea stephani* along with *Trypanosoma pacifica*. *Glugea stephani* has been found to be temperature sensitive with low temperatures (10 °C) arresting, but not killing, the parasite's development and division (Olson 1981).

### **Reproduction and life cycle**

Spawning occurs in intermediate depth waters over sandy and muddy areas during all seasons, peaking typically in winter (Ketchen, 1956; Barss, 1976). Kruse and Tyler (1983) developed a model that demonstrated how the rate of gonadal development is associated with summer bottom temperatures. Spawning appears to be inhibited below 7.8 °C and delayed under rapid increases in bottom temperature (Alderdice and Forrester 1968; Orsi 1968). Eggs are buoyant in full strength sea water and hatching varies between 3.5 and 12 days, depending on temperature and salinity (Alderdice and Forrester 1968; Orsi 1968). Pelagic larval stage is found to be between 6-10 weeks as the English Sole migrates to nursery areas nearshore (Ketchen 1956; Laroche et al. 1982). Metamorphosis varies, but generally, English Sole will move further from shore as they become adults. Males mature in 2 to 3 years and females in 3 to 4 years

(Lassuy 2005). Studies have shown that females attain a larger body size (57.0 cm) than males (49.0 cm) (Hart 1973).

### **Conservation status**

The conservation status of the English Sole has not been evaluated by the International Union for Conservation of Nature (IUCN) Red List of Threatened Species. It is caught as both a commercial well as a game fish. There are currently no threats to the species but overfishing could become a problem.

### **Cultural significance**

English Sole have been an important commercial fish of the Eastern Pacific, exclusively by trawl nets, since as early as 1876 (Pearson and Owen 1992). Market demand in addition to restrictions on fisheries and trawl fishers have lowered the number of English Sole being fished commercially (NOAA Fisheries).

### **Specimen specific detail**

The English Sole (*P. vetulus*) specimen from the [Burton Ostenson Museum of Natural History](#) at Pacific Lutheran University (PLU) was collected on November 3, 1979 at a PLU Field Station in Manchester State Park by a Ranger Station ~0.25 mi north of Manchester Park, Pierce County. There are multiple organisms within the collection jar varying in size. All specimens are a light olive brown on the eye side with some evidence of darker spots. The blind side is more opaque and whitish with little to no markings. Eyes cannot be seen from the blind side.

### **Literature Cited**

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