

= California spiny lobster =

The California spiny lobster (*Panulirus interruptus*) is a species of spiny lobster found in the eastern Pacific Ocean from Monterey Bay , California to the Gulf of Tehuantepec , Mexico . It typically grows to a length of 30 cm (12 in) and is a reddish @-@ brown color with stripes along the legs , and has a pair of enlarged antennae but no claws . The interrupted grooves across the tail are characteristic for the species .

Females can carry up to 680 @,@ 000 eggs , which hatch after 10 weeks into flat phyllosoma larvae . These feed on plankton before the metamorphosis into the juvenile state . Adults are nocturnal and migratory , living among rocks at depths of up to 65 m (213 ft) , and feeding on sea urchins , clams , mussels and worms . The spiny lobster is eaten by various fish , octopuses and sea otters , but can defend itself with a loud noise produced by its antennae . The California spiny lobster is the subject of both commercial and recreational fishery in both Mexico and the United States , with sport fishermen using hoop nets and commercial fishermen using lobster traps .

= Description =

In common with all spiny lobsters , the California spiny lobster has two large , spiny antennae , but no large claws on its legs . The California spiny lobster is one of the largest spiny lobster species , and grows up to 60 centimeters (24 in) long , but does not usually exceed 30 cm (12 in) . Males can weigh up to 7 @.@ 4 kilograms (16 lb) . , with the record being a 16 lbs . , 1 oz. male caught off Catalina island in 1968 . The upper side of the animal is brownish red , without the paler bands or spots seen in some other spiny lobsters . The legs are a similar color , but with one or more lighter streaks running along their length .

Males and females of all ages can be distinguished by the position of the two round genital openings or gonopores . In females , they are at the bases of the third pair of pereopods , while in males they are at the base of the fifth (last) pereopods , furthest from the head and the closest to the abdomen . Mature females have a small claw on the fifth pereopod , and enlarged pleopods .

= Distribution =

The California spiny lobster is found in parts of the Gulf of California , and along the Pacific coast of the length of the Baja California peninsula , extending as far north as San Luis Obispo Bay , California . There are occasional records from Monterey Bay , but the water there is too cold for the California spiny lobster to breed , and it is thought that any adult found in Central California arrived as a larva during El Niño years .

California spiny lobsters live on rocky substrates , at depths of up to 65 meters (213 ft) . Although they can be found in shallow water , including tide pools , they are more frequent in deeper waters . Juveniles generally inhabit rocky habitats at a depth of 0 ? 4 m (0 ? 13 ft) with dense plant cover , especially the surf grass *Phyllospadix torreyi* .

= Ecology and behavior =

California spiny lobsters are nocturnal , hiding in crevices during the day , with only the tips of their long antennae showing , as a means of avoiding predators . Towards dawn , the spiny lobsters form aggregations , which they maintain until dusk . At night , they emerge and feed on sea urchins , clams , mussels and worms . This activity is important in limiting sea urchin populations , and so maintaining healthy seabed communities .

Natural predators of the California spiny lobster include bony fish such as the California sheepshead , giant sea bass and cabezone , sharks including the horn shark and leopard shark , octopuses and sea otters . In response to an approaching predator , spiny lobsters including the California spiny lobster can produce a loud noise using the stick @-@ slip phenomenon , akin to a bowed instrument . The bases of the antennae act as a plectrum , which is rubbed over a file on the

edge of the antennular plate . If a predator is very close , spiny lobsters will flex their muscular tail in order to escape the predator , backwards .

There is an annual migration , in which spiny lobsters enter shallower water in spring and summer , and head out to deeper water in fall and winter , reaching depths as great as 240 ft (73 m) , perhaps to avoid the effects of winter storms .

= = Life cycle = =

Female California spiny lobsters reach sexual maturity at a length of 65 ? 69 millimeters (2 @. @ 6 ? 2 @. @ 7 in) , which is typically at an age of 5 ? 9 years ; males are sexually mature after 3 ? 6 years . Because all the hard parts are lost at each molt , the life span of mature spiny lobsters is uncertain ; they are thought to live for 50 years or more .

Spiny lobsters do not have the gonopods (first pleopods modified for reproduction) that occur in clawed lobsters and crabs , and females do not have a deep pocket on the sternum in which to store sperm . Instead , a spermatophore is transferred directly from one of the male 's gonopores to the sternum of the female . The male gonopore is , however , adorned with a " penile process " , which is straight and serrated , with a small " hairbrush " . The sternum of mature females has three " windows " on the last three segments , which uniquely among *Panulirus* species , span both halves of the sternum . These windows are softer than the rest of the exoskeleton , and are thought to help the male locate the correct location to place the tar @-@ like spermatophore .

After mating , the fertilized eggs are carried on the female 's pleopods until they hatch , with between 120 @, @ 000 and 680 @, @ 000 carried by a single female . The eggs begin coral red , but darken as they develop to a deep maroon . When she is carrying the eggs , the female is said to be " berried " . The eggs are ready to hatch after 10 weeks , and spawning takes place from May to August , The larvae that hatch (called phyllosoma larvae) do not resemble the adults . Instead , they are flat , transparent animals around 14 mm (0 @. @ 55 in) long , but as thin as a sheet of paper . The larvae feed on plankton , and grow through ten molts into ten further larval stages , the last of which is around 30 ? 32 mm (1 @. @ 2 ? 1 @. @ 3 in) long . The full series of larval molts takes around 7 months , and when the last stage molts , it metamorphoses into the puerulus state , which is a juvenile form of the adult , albeit still transparent . The puerulus larvae settle to the sea floor when the water is near its maximum temperature , which in Baja California is in the fall .

The diet of the juveniles is varied , but comprises mostly amphipods and isopods , together with coralline algae and the plant *Phyllospadix* . When available , the juveniles prefer to eat crabs .

= = Fishery = =

In his original description , John Witt Randall noted that the California spiny lobster is " used as food by the natives " of Upper California . The California spiny lobster is now the most economically important lobster on the American West Coast . Sport fishing may account for up to half the entire catch , while most of the commercial catch comes from lobster traps , with smaller amounts coming from the use of trammel nets or by trawling . The major fishing area is west of Baja California , and imports from Mexico to the United States are twice the amount produced in California .

= = = Sport fishing in California = = =

Recreational fishermen are allowed to catch lobsters with hoop nets or by SCUBA diving or free @-@ diving ; almost all come from California , with only small numbers from other U.S. states . The California Department of Fish and Game estimates that recreational fishers caught more than 200 @, @ 000 spiny lobsters in the first half of the 2008 / 2009 season , amounting to around 280 @, @ 000 pounds (130 @, @ 000 kg) , compared to commercial fishermen , who caught a total of 580 @, @ 000 lb (260 @, @ 000 kg) in the same time .

The California Department of Fish and Game sets and enforces a number of regulations pertaining to recreational fishing of spiny lobsters :

Open season for California spiny lobster runs from the Saturday before the first Wednesday in October until the first Wednesday after March 15 .

No implements other than hoop nets may be used ; no one person may have more than 5 nets and no vessel may use more than 10 hoop nets . When fishing from land , each fisherman is limited to two hoop nets .

Lobster fishers may not land more than seven California spiny lobsters on any given day , and may not have more than seven in their possession at any time .

Fishers must carry a lobster gauge , and any lobster smaller than the minimum landing size must be returned to the sea immediately . The minimum size is a carapace length of 3 1/4 inches (82 @. @ 6 mm) , measured along the midline from the rear of the eye socket between the horns , to the end of the carapace . This is equivalent to a total body length of 20 centimeters or 7 @. @ 9 inches .

To fish for spiny lobster south of Point Arguello , a sport fishing license with ocean enhancement stamp must be displayed or kept nearby .

A report card for the season must be bought , filled in and returned before April 30 after the season ends .

Commercial and recreational traps must not be interfered with .

= = = Commercial fishing in California = = =

The open season for commercial fishing begins on the first Wednesday in October and runs until the first Wednesday after the 15th of March . Commercial fishermen may use individually buoyed traps , but may not dive for lobsters .

For those using lobster traps , the fishing effort is greatest at the beginning of the permitted season in California , and peters out towards the end of the season , 24 weeks later . Although the fishing effort becomes better concentrated on areas with more spiny lobsters during the season , the fishing efficiency (catch per unit effort) nonetheless decreases throughout the season .

= = = Fishing in Mexico = = =

In Mexico , spiny lobsters are an important commercial resource , representing the fifth most valuable fishery , worth US \$ 18 million . Three species are exploited along the Pacific coast of the Baja California peninsula , but the catch of 744 t of the California spiny lobster makes up 95 % ? 97 % of the total , with only small quantities of *Panulirus inflatus* and *Panulirus gracilis* . The fishing rights are held by 26 local co @-@ operatives .

The main legal restrictions on fishing for California spiny lobster in Mexico are a minimum landing size of 82 @. @ 5 mm (3 @. @ 25 in) , the prohibition of catching berried females , and a closed season : from February 16 to November 15 , fishing for spiny lobsters is prohibited in a region which moves south along Mexico 's Pacific coast during the season .

The Mexican fishery for the California spiny lobster was the first Latin American fishery to be awarded the Marine Stewardship Council 's sustainable fishery ecolabel , and the species is classed as Least Concern on the IUCN Red List .

= = Names = =

Panulirus interruptus is called the California spiny lobster by the Food and Agriculture Organization , but a number of other local , vernacular names exist , including California lobster , California marine crayfish , and red lobster in the United States , and langosta colorada and langosta roja in Mexico . The preferred common name of the United States Fish and Wildlife Service is simply spiny lobster .

John Witt Randall described the species in the Journal of the Academy of Natural Sciences of Philadelphia in 1840 , based on material given to him by Thomas Nuttall . The exact locality is not known , being given only as " Upper California " , but the most likely sources are the places where

Nuttall was most active , namely Santa Barbara and San Diego . The specific epithet interruptus refers to the grooves on the abdominal tergites , which are interrupted in this species . Although originally placed in the genus Palinurus , the California spiny lobster was later transferred to Adam White 's new genus Panulirus , together with other spiny lobsters that have long flagella on their first antennae .

= = Related species = =

The California spiny lobster is one of 19 species in the genus Panulirus , which is one of several genera of spiny lobsters whose names are anagrams of the original spiny lobster genus , Palinurus . Its closest relatives are not the other species that occur in the East Pacific , but rather Panulirus argus from the Caribbean Sea and West Pacific species such as Panulirus japonicus , Panulirus marginatus , Panulirus pascuensis , Panulirus cygnus and Panulirus longipes ; this relationship has been recovered from comparative studies of adult and larval morphology , as well as from molecular phylogenetics , using the sequences from cytochrome c oxidase and 16S ribosomal RNA genes .

The California spiny lobster can be differentiated from the other species in the genus by the interrupted grooves across the abdomen ; other species either lack grooves , or have grooves which span the entire body segment .