



# BEACH ECOLOGY COALITION

To enhance ecosystem conservation  
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## Protecting California Grunion on Sandy Beaches

Karen Martin, PhD

[Karen.Martin@pepperdine.edu](mailto:Karen.Martin@pepperdine.edu)

<https://grunion.org>

### Executive Summary

The purpose of monitoring for California Grunion during and after spawning runs is to preserve this native, endemic species by protecting its vulnerable eggs buried under beach sand. When working on California shorelines, care should be taken to avoid disturbing the incubating grunion eggs either directly or indirectly. The best way to do this is to avoid working in the areas where and when the eggs are present. Since the eggs are patchy in distribution, pale in color, small, and buried under several inches of sand, it is not an easy task to locate them.

California Grunion *Leuresthes tenuis* spawn on California beaches, out of water during semilunar high tides, from March through August. Their eggs are hidden under a shallow layer of sand and incubate above the mean high tide line, until hatched when washed away by the semilunar high tides of the next new or full moons.

From March through August, assume California Grunion nests are present on a sandy beach unless there is current information to the contrary. Because the eggs are hidden under sand, it is safest to assume they are present, and use the Grunion Grooming Protocol on the upper beach. Plan to do large projects outside of grunion season, from late August to March, if possible.

Identify the height of the highest semilunar high tide line by either leaving some wrack, noting a cut bank or scarp, or marking the location in some way shortly after the new and full moon.

Avoid any mechanized maintenance, construction work, driving, or other form of sand disturbance seaward of the semilunar highest high tide line on shore during grunion spawning season. During grunion season, work only shoreward of the highest tide line.



Grunion run on shore, out of water. Eggs remain buried under beach sand throughout incubation.

Photo: M. Studer

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Grunion spawn when they ride on waves to emerge on the beach. The female digs into the wave-washed sand with her tail, releasing her eggs, while one or more males curl around her on the surface, releasing milt (sperm) for external fertilization. The adults then return to the sea, leaving the eggs behind, under a blanket of sand on the beach until the rising tides of the next new or full moon.

*Photo: A. Liu.*

## **Areas where grunion are likely to run**

Grunion spawn in sand. They appear on man-made and natural beaches, in fine or coarse-grained sand, near and far from sea walls and bluffs. Grunion may run on sandy patches in between cobble patches. They are attracted to freshwater outflows, and their larvae may live in harbors and bays. The presence of lights, especially steady ones from houses, piers, or street lights, does not deter spawning. However, people noisily chasing after the grunion and waving lights around may disturb or even stop a run.

Grunion ride waves onto coastal beaches. They also spawn in areas where waves are small or nonexistent, such as within sheltered bays. Grunion may swim up a stream or river channel during a spawning run, and occasionally one may find adult grunion stranded in an outfall channel. Adult grunion do not breathe air, and will not survive if stranded too long out of water.

Grunion may spawn on any and every part of sandy beaches over the course of their spring and summer spawning season, March through August. In a specific location they sometimes favor a particular part of the beach, but this location may move over time.

## **Areas where grunion are NOT likely to run**

Grunion will not spawn in areas completely covered by rock or cobble. Very coarse pebbles or rip rap do not support spawning although very coarse sand is sometimes acceptable. In some areas, cobble areas may be interspersed with swaths of sand. In these locations, the grunion will target the sandy areas and avoid the cobble areas when spawning. Beaches with cobbles early in the seasons may become sandier during summer due to natural, season sand movement. Suitability for spawning may change substantially across the season at beaches with mixed substrates.

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Grunion will not spawn in areas where beaches are too narrow to allow them to emerge at high tides. However, they may spawn on sandy beaches covered by the highest tides but exposed as the tide drops. These runs may occur later in the night at more inhospitable beaches.

## Avoiding injury to grunion eggs

The best way to avoid injuring grunion eggs on shore is to schedule large projects outside of their spawning season. No grunion runs occur from late August to early March, and work on shore during fall and winter should not impact the grunion population.

Grunion may spawn on any sandy beach from southern California to Tomales Bay, including within San Francisco Bay. During the spawning season, March through August, grunion nests are assumed to be present unless there is information to the contrary.

During grunion season, avoid any mechanized maintenance, construction work, or other form of sand disturbance seaward of the semilunar highest high tide line on shore. Working shoreward of the semilunar highest high tide line will not impact grunion unless it causes increased sand transport onto the intertidal area where eggs are buried, potentially suffocating them or preventing them from emerging to hatch.

To identify the highest tide line, plan to leave some wrack at the tideline following a semilunar highest tide. On a beach with a cut bank, the cut itself is the high tide line. Grunion often spawn right up against the wall of a sand scarp. For a beach with a flat area that grades into a sloping face, stop grooming at the top of the curve, where the beach begins to incline.





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Grunion Grooming Protocol, Pacific Beach, San Diego. Note the formation of the natural slope on the beach face. Grooming takes place only shoreward of the highest tide line. *Photo: K. Martin*

## Monitoring Grunion During Spawning Runs

The best and most effective way to monitor for the presence of grunion eggs is to observe the shore during the nights and times of forecast grunion runs.

<https://wildlife.ca.gov/Fishing/Ocean/Grunion#28352306-2024-runs>

The timing of potential grunion spawning runs is reasonably predictable, based on the tidal cycle and phases of the moon. The forecast schedule is posted every year by the California Department of Fish and Game and Grunion.Org. However, the number of grunion that may show up, and the specific places they will run on a given night, are quite variable. None may show up for two nights, then large runs may occur for the next one or two nights in a row.

Grunion may appear on shore on the nights of full or new moons, and some or all of the following 3 to 4 nights. Each night, if the grunion are going to run, they generally appear within a 2 hour window of time starting at the highest tide. Tide times become later by about 50 minutes each day. When monitoring for spawning grunion, trained observers should plan to be on the beach on the night of the new or full moon and the following three nights, for 2 hours each night, starting at the time of the highest tide. This gives the most accurate picture of the number of fish spawning and the specific locations of nests.

If grunion are not seen for any of the four nights of monitoring in the specific area of concern, one can presume that no eggs are present in the sand at that location for those particular two weeks. However, grunion may return to spawn at the next spawning time two weeks later, so monitoring must continue to take place every new and full moon, every two weeks, during a project.

## Monitoring for nests and eggs after a run

Occasionally, direct evidence may be seen on the sand surface the morning after some runs. One may notice lines on the sand, "tracks" left by grunion skittering about, or holes that held spawning females. One may see a few bright orange eggs turned up on the surface or in the wrack. Feeding birds may indicate the presence of the buried clutches. By using all of these cues you may occasionally be able to find grunion eggs on shore. However, these signs rarely occur, and even when they do, they disappear within a few hours after sunrise. Meanwhile the eggs and nests are still present, buried under the surface.

The sand surface dries within a day after the run, and the grunion eggs are not under water again until the tides rise over a week later with the next new or full moon phase. Within the first few days following a spawning run, the eggs maintain their bright orange color. However, soon the yolk is





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used up and the eggs become transparent with a silver tint, very similar in color to the sand itself. Then they are extremely difficult for anyone to locate, but they are still vulnerable to disturbance.

**Finding eggs requires intense effort and involves some uncertainty, and is not recommended for inexperienced grunion egg hunters.** The best time to locate grunion eggs on shore is to look for them the morning immediately following a spawning run, in an area reported to have runs. Eggs are 1.65 mm in diameter, about 0.1 inch. They occur in clutches of hundreds to a few thousand per nest. The extent of area on the beach with nests may be small or large, and the nests may be spaced close together or far apart. Finding one clutch of grunion eggs usually indicates that many more are present, even though they may not easily be found. If one clutch is found, presumably there are many more. Eggs may be found very near the sand surface, or buried 10 to 30 cm (4 to 12 inches) deep.



*Three clutches of Grunion eggs uncovered. Photo: A. Martin*



Mission Beach, San Diego, showing the Grunion Grooming Protocol. Note the dry sand on the surface in the intertidal zone within days after the run.  
*Photo: K Martin.*



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## **Beach Maintenance Protocol During Grunion Season** **by Dennis Simmons, Beach Manager for the City of San Diego (retired)**

The “What” requires the training and direct involvement of the staff that provide services on the ocean front beaches. For the staff in San Diego this knowledge was gained by their participation with Dr. Martin and her assistants during the study in 2002 and following years, with literally hands-on training. Indicators of grunion eggs in the sand include presence of dead grunion, shorebirds feeding on the grunion, nest holes in the sand, the tracks on the sand surface from grunion activity, eggs on the sand surface, and birds foraging for eggs by digging in the sand. All staff assigned to the ocean front look for these signs on several mornings after the full and new moons throughout grunion season. All beaches are inspected for signs of grunion every time there is a predicted run, whether or not grunion ran there the previous predicted date. In addition, citizen volunteers monitor San Diego beaches during grunion runs and report their data to Dr. Martin, who independently verifies their information and then shares it with the beach manager immediately. Signs are present only briefly but the eggs remain hidden under the sand.

Once we establish that there are eggs on the beach “Where” they are in relation to the high tide line allows us to draw a maintenance line related to the contour of the beach, undulations in the sand, and the amount of surge. A shallow flat beach allows an easily detected straight line to be set where as a steep undulating beach presents more of a challenge. Another factor is the stability of the shoreline; in San Diego the amount of cut or build on a particular beach can be significant during the spring and early summer. The eggs may be right next to the tide line or 6 feet away, so identifying as many nesting sites as possible along the beach allows more accuracy in setting lines. Because the eggs are not visible while buried, we tend to err on the conservative side. We have found that even with the sometimes great difference in the heights of highest tides at the new and full moons, the grunion seem to place their eggs in a band on shore at about the same tidal height from one run to the next. After the maintenance line is set, we groom above that mark, all equipment stays on the dry side of the mark and any material that needs to be removed is loaded from the upper side. Although each subsequent daily high tide is lower and the apparent tide line moves lower down the shoreline, we continue to use the lunar tide line as the mark for maintenance. We have found that even with crowded beaches the difference between the groomed sections and the lower ungroomed section is clearly visible throughout the two-week period between semilunar high tides.

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