

**BIG BIRDS, FROGS, SEA OTTERS, AND LOTS OF WRASSES:
VERTEBRATE REMAINS SPANNING 8,900 YEARS OF OCCUPATION
AT THE SPINDRIFT VILLAGE SITE IN LA JOLLA, CALIFORNIA**

SUSAN ARTER AND MARK ROEDER
SAN DIEGO ZOOARCHAEOLOGY LAB
DEPARTMENT OF BIRDS AND MAMMALS
SAN DIEGO NATURAL HISTORY MUSEUM

Recent excavations at the Spindrift site have yielded a tremendous diversity of amphibians, reptiles, birds, mammals, and fish--90 species identified so far. Of these, two birds, two marine mammals, and one amphibian have either been extirpated locally, or rarely occur in the region. At least 50 percent of identifiable fish are of the family Labridae (wrasses): sheephead, señorita, and rock wrass. This diversity reflects prehistoric peoples' varied subsistence strategies and adaptations to environmental changes along the San Diego coastline throughout the Holocene. Faunal identifications also provide baseline data on coastal biodiversity and perspective on the effects of human pressures on it.

The Spindrift Site (CA-SDI-39) is one of the first prehistoric native Indian village sites recorded within San Diego County. Initial excavations were conducted by Malcolm Rogers in the 1920s (Rogers 1930s). Ongoing residential development in the vicinity of La Jolla Shores has prompted additional salvage work over the years. Data presented here are the result of excavations by Laguna Mountain Environmental in 2005 and 2006 to mitigate site damage associated with utility undergrounding.

Backdirt from a series of 11 mainline trench segments and 26 1-by-1-m units was wet-screened through 3 mm (1/8 in.) hardware mesh and hand-sorted in the laboratory. Preliminary analysis of the zooarchaeological remains reflects the remarkable diversity of species procured by native people during nearly 9,000 years of occupation. Carbon-14 dates from Unit 3 between 60 and 70 cm came back at 6600 B.P. \pm 70 years, and at 8900 B.P. \pm 100 years from 110 to 120 cm. The data yield a rich, baseline record of Holocene amphibians, reptiles, birds, mammals, fish, and shellfish taken from a range of habitats, including rocky shoreline, estuary, beaches, and terrestrial habitats.

Early human occupation and foraging in the southern California region must be understood in the context of changes in temperature, rainfall, and sea level throughout the Holocene epoch. Around 12,000 years ago, cool, moist conditions alternated with warm periods. Coniferous forest, now limited to the nearby Torrey Pines State Reserve, was more widespread along the coast. A warming trend that began about 8,000 years ago led to today's drier climate and drought-tolerant plant communities (Gallegos 1992).

Approximately 10,000 years ago, the shoreline lay 20 m west of its current position. As sea level rose, around 5,400 years ago, an estuary evolved as seawater converged with fresh water from the adjacent San Clemente Canyon, culminating approximately 4,400 years ago in a deep pool. The large pond currently surrounded by the La Jolla Beach and Tennis Club golf course is a remnant of this deep pool.

As the sea continued to rise, the shoreline reached its present location about 3,500 years ago. Sediment began to fill the estuary, forming the beaches at La Jolla Shores (Figure 1). These environmental changes are reflected in shell remains generated throughout the site's occupation, and recovered at depths of up to 120 cm. The shifting dominance of various marine invertebrates attests to the changes from rocky shoreline to estuary to sandy beach.



Figure 1. La Jolla Shores beach and marine canyon.

Currently, over 52,000 highly fragmented amphibian, reptile, bird, and mammal remains from three-quarters of the excavated units and one-quarter of the trench matrices have been analyzed. To date, the units have produced 20,007 non-fish bones weighing 812 g, and the trenches have produced 31,933 non-fish bones at 1,974 g (Table 1). Fish remains have been sorted from two units and one-tenth of the trench matrices. Fish specimens from Unit 6 have undergone detailed analysis down to 110 cm. At this early stage of analysis, the faunal diversity has already proved astonishing: so far, 3 species of amphibians, 11 of reptiles, 32 of birds, 21 of mammals, and 23 of fish (Table 2). The range of species represented reflects both the variety of habitats exploited and the skill and resourcefulness of the native inhabitants who captured them.

Amphibians recovered from the site include the western toad, western spadefoot toad, and California red-legged frog (Table 3). All three species could have been taken from streambeds associated with the riparian habitat in nearby San Clemente Canyon. Eleven reptile species were also recovered from the Spindrift deposit. Among them the remains of sea turtles, Pacific pond turtles, and various snakes and lizards (Table 4). Of these, snake vertebrae were most prevalent, and were consistently found throughout most unit levels.

The greatest species diversity is represented among the bird remains (Table 5). While the largest number of elements per species is limited to seven, the diversity is quite remarkable at 32 and counting.

Table 1. Site-wide counts and weights by faunal class.

	COUNT	% COUNT	GRAMS	% WEIGHT
Amphibian	27	0.05	1.5	0.05
Reptile	709	1.36	35.6	1.28
Bird	153	0.29	37.7	1.35
Mammal	51000	98.06	2693.9	96.67
Indeterminant	121	0.23	17.9	0.64
Total	52010	100.00	2786.6	100.00

Table 2. Number of species represented by faunal class from units and trenches.

Amphibian	3
Reptile	11
Fish	23
Bird	32
Mammal	21

Table 3. Spindrift amphibians.

COMMON NAME	SCIENTIFIC NAME
Western Toad	<i>Bufo boreas</i>
Western Spadefoot Toad	<i>Spea hammondi</i>
California Red-legged Frog	<i>Rana daytonii</i>

Table 4. Spindrift reptile diversity.

COMMON NAME	SCIENTIFIC NAME
Sea Turtle	Cheloniidae
Pacific Pond Turtle	<i>Clemmys marmorata</i>
Gopher Snake	<i>Pituophis catenifer</i>
Western Rattlesnake	<i>Crotalus viridis</i>
Garter Snake	<i>Thamnophis</i> sp.
Red Coachwhip Snake	<i>Masticophis flagellum</i> ssp. <i>piceus</i>
California Whipsnake	<i>Masticophis lateralis</i>
Western Lyre Snake	<i>Trimorphodon biscutatus</i>
Coast Horned Lizard	<i>Phrynosoma coronatum</i>
Southern Alligator Lizard	<i>Elgaria multicarinata</i>
Western Fence Lizard	<i>Sceloporus occidentalis</i>

They range from large pelagic birds such as the short-tailed albatross, to passerines as small as the house finch. The majority of identifiable avifauna are seabirds.

The 21 mammal species identified to date range from elephant seal to pocket mouse, with seemingly everything in between (Table 6). The representation of identifiable small mammals, ranging in size from mice to jackrabbits, far outweighs those of identifiable medium- and large-size mammals. Medium mammals range in size from sea otter to coyote, and large mammal from deer to elephant seal. Among the fauna recovered from units, the clarity of this pattern is clear. Here, the relative number of identifiable small mammal remains clearly illustrates a predominance of small mammals (Figure 2). Looking more closely, the focus narrows to lagomorphs, where 63 percent of identifiable fauna are hares and rabbits. Pocket gophers account for 23 percent, and the other species fewer than 5 percent (Figure 3).

Table 5: Spindrift bird diversity.

COMMON NAME	SCIENTIFIC NAME	COMMON NAME	SCIENTIFIC NAME
Barn Owl	<i>Tyto alba</i>	Bufflehead Duck	<i>Bucephala albeola</i>
Western Screech Owl	<i>Megascops kennicottii</i>	American Coot	<i>Fulica americana</i>
Short-tailed Albatross	<i>Phoebastria albatrus</i>	Red-breasted Merganser	<i>Mergus serrator</i>
Osprey	<i>Pandion haliaetus</i>	Sooty Shearwater	<i>Puffinus griseus</i>
Double-crested Cormorant	<i>Phalacrocorax auritus</i>	Whimbrel	<i>Numenius phaeopus</i>
Brandt's Cormorant	<i>Phalacrocorax penicillatus</i>	Black-bellied Plover	<i>Pluvialis squatarola</i>
Common Loon	<i>Gavia immer</i>	Unidentified Sandpiper	<i>Calidris</i> sp.
Red-throated Loon	<i>Gavia stellata</i>	Ring-billed Gull	<i>Larus delawarensis</i>
Eared Grebe	<i>Podiceps nigricollis</i>	Greater Roadrunner	<i>Geococcyx californianus</i>
Cassin's Auklet	<i>Ptychoramphus aleuticus</i>	Northern Flicker	<i>Colaptes auratus</i>
Rhinoceros Auklet	<i>Cerorhinca monocerata</i>	California Quail	<i>Calipepla californica</i>
Ancient Murrelet	<i>Synthliboramphus antiquus</i>	Common Poorwill	<i>Phalaenoptilus nuttallii</i>
Surf Scoter	<i>Melanitta perspicillata</i>	Yellow-rumped Warbler	<i>Dendroica coronata</i>
Black Scoter	<i>Melanitta nigra</i>	California Thrasher	<i>Toxostoma redivivum</i>
Greater Scaup	<i>Aythya marila</i>	California Towhee	<i>Pipilo crissalis</i>
Lesser Scaup	<i>Aythya affinis</i>	House Finch	<i>Carpodacus mexicanus</i>

Table 6. Spindrift mammal diversity.

COMMON NAME	SCIENTIFIC NAME
Northern Elephant Seal	<i>Mirounga angustirostris</i>
Unidentified Dolphin	<i>Delphinidae</i>
California Sea Lion	<i>Zalophus californianus</i>
Sea Otter	<i>Enhydra lutris</i>
Mule Deer	<i>Odocoileus hemionus</i>
Coyote	<i>Canis latrans</i>
American Badger	<i>Taxidea taxus</i>
Long-tailed Weasel	<i>Mustela frenata</i>
Black-tailed Jackrabbit	<i>Lepus californicus</i>
Desert Cottontail	<i>Sylvilagus audubonii</i>
Brush Rabbit	<i>Sylvilagus bachmani</i>
California Ground Squirrel	<i>Spermophilus beecheyi</i>
Botta's Pocket Gopher	<i>Thomomys bottae</i>
Large-eared Woodrat	<i>Neotoma macrotis</i>
Bryant's (Desert) Woodrat	<i>Neotoma lepida</i>
Dulzura (Pacific) Kangaroo Rat	<i>Dipodomys simulans</i>
California Pocket Mouse	<i>Perognathus californicus</i>
San Diego Pocket Mouse	<i>Perognathus fallus</i>
California Mouse	<i>Peromyscus californicus</i>
Brush Mouse	<i>Peromyscus boylii</i>
California Meadow Vole	<i>Microtus californicus</i>

Among the 298 lagomorph remains from eight units analyzed to date, 75 were indeterminate desert cottontail or brush rabbit and 91 were either hare or rabbit. A breakout of 132 elements identifiable to species suggests that while cottontails, brush rabbits, and hares are equally represented at 36 percent, 31 percent, and 33 percent respectively. Overall, rabbits are more prevalent than hares.

All species found in the site are known from San Diego historically as well. But some reflect changes. Among the birds, for example, the ancient murrelet is more typical of the Pacific Northwest and today reaches as far south as San Diego only rarely (Philip Unitt, personal communication 2010). The ancient murrelet bone from Spindrift may reflect an ocean cooler in the past. Recovery of species that no

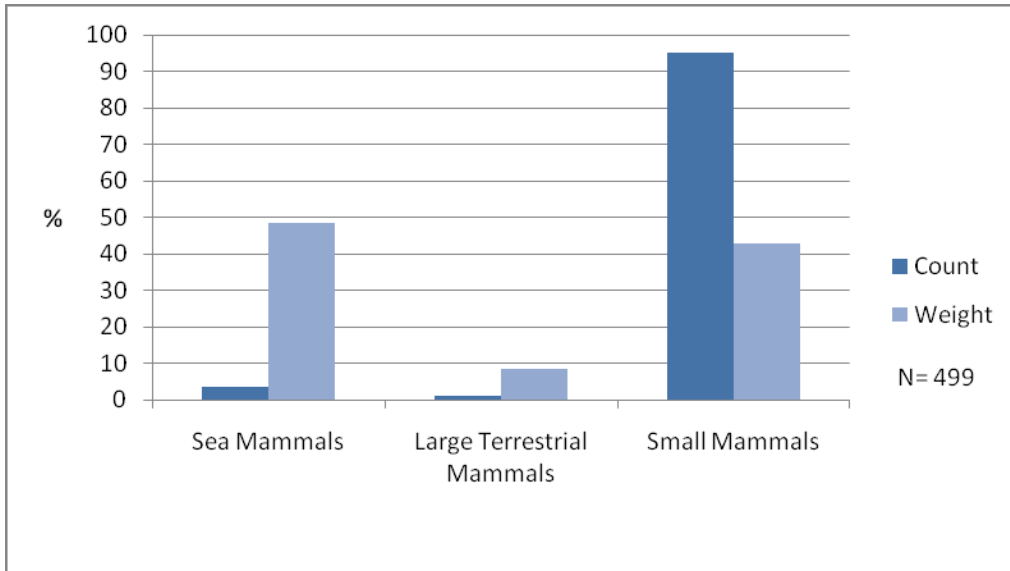


Figure 2. Relative frequency of mammals by count and weight.

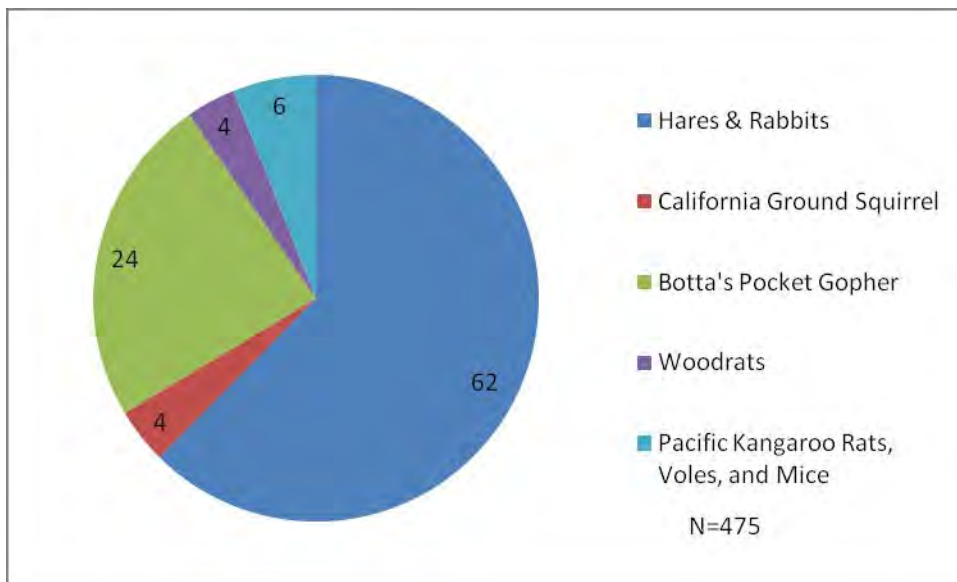


Figure 3. Percentages of identifiable small mammals by count.

longer occur in San Diego also points to pressures in the historic period such as overhunting and habitat destruction.

Short-tailed albatross remains from Spindrift confirm that species' presence along San Diego's coastline in prehistoric times. Now seriously endangered, the magnificent short-tailed albatross occurred with regularity off the coast of San Diego until the 1890s, when it was pushed to the verge of extinction by plume-hunters, then by a volcanic eruption on the single island near Japan where it still nested (Philip Unitt, personal communication 2010). Recovery of numerous short-tailed albatross remains, some with



Figure 4. Distal tibia of short-tailed albatross.

butchery scars, suggests that prehistorically it was common in southern California (Figure 4). It should be noted that a centimeter scale was used for all photographs included herein.

The California red-legged frog, now extirpated from San Diego County, is represented from the site by three bones, including the radio-ulna pictured in Figure 5. It and the Pacific pond turtle remains suggest that during the village's occupation, fresh water flowed nearby more consistently than it does today. The ancient, deep pool would also have provided suitable habitat for pond turtles.

Sea otters are known from the Spindrifft Site from 39 bones, three of which are shown in Figure 6, next to modern comparative specimens pictured on the left-hand side of the photograph. Sea otters were prized for their pelts by both native villagers and early European explorers. As a result, they were hunted nearly to extirpation from southern California in the early 1800s.

An elephant seal, identified by a partial petrous temporal skull bone, likewise has been recovered from the site but no longer occurs in our region. On the other hand, the most common fauna, the three local species of rabbits and hare, highly desirable for their meat and soft fur, were, along with gophers, clearly plentiful throughout the Holocene.



Figure 5. California red-legged frog radio-ulna.

The quantity and variety of fish remains are also remarkable, particularly at this early stage of analysis. Some of the species identified include a variety of sharks, rays, and numerous small wrasses. Among the wrasses, the larger sheephead are most abundant site-wide (Figure 7). Additional species include surfperch, Pacific mackerel, sardines, and moray eel, among others, largely identified by author Roeder, and by Richard Huddleston who identified the otoliths (Table 7).

Allen (1985) delineated numerous near-shore marine fish environments in the southern California region. At least nine of these occur in the vicinity of Spindrift. They range from sandy to rocky and from shallow to deep. Some environments like kelp beds and rocky reefs are rich in vegetation, invertebrates, and fish species, while others, like open-coast sandy beach, have only a few species of invertebrates and fish, and are devoid of vegetation (Figure 8). Some marine fish species are present in all of the environments, while others are specific to one or more environments.

Allen also organized common marine fish species off southern California into 16 groups associated with the various near-shore marine fish environments. Table 8 lists the fish species recovered from Spindrift and the environments in which they are found. The data reflect a predominance of rocky shore and kelp species, with some offshore species. Among these are the wrasses, again the most predominant of which is the sheephead.



Figure 6. Sea otter calcanei and humerus.

The thornback is the only species from the site that inhabits open-coast sandy beach, while the angel shark and shovelnose guitarfish are the only ones yet to be identified from offshore soft bottom environments. Additional species typically found in these environments, such as croakers and flat fish, are not well represented at the site. This may have to do with the preliminary sample size, or perhaps these environments were not exploited as heavily as others. Of particular interest are the presence of offshore species such as yellowtail, jack mackerel, and skipjack. Procurement of these fish would have required the use of seagoing craft.

As noted, at least 23 species of fish have been identified. With further analysis, we expect to identify another 40 species. As additional fish remains are analyzed, we anticipate a more complete picture of species procured, the full range of marine environments exploited, and capture methods used by the people of this unique coastal village site.

Although there were once many villages along our coast, few sites have been identified, much less excavated. The Spindrift site is particularly important because it is among San Diego's earliest human habitation sites. Year-round use of the site is reflected by the presence of a number of winter visitors such as the lesser scaup, surf scoter, and bufflehead ducks. California sea lions, on the other hand, were most accessible for scavaging or capture at a rookery in May and June.

Ongoing identification and analysis of fauna from this important coastal village site will further elucidate the incredible diversity of food resources available to and procured by native Indian people who once lived there. The data also provide an important baseline for San Diego's diverse prehistoric fauna, and for evidence of environmental changes during the Holocene.



Figure 7. Sheephead fish skull remains.

Table 7. Spindrift fish diversity.

COMMON NAME	SCIENTIFIC NAME
Horn Shark	<i>Heterodontus francisci</i>
Leopard Shark	<i>Triakis</i> sp.
Southern Shark	<i>Galeorhinus galeus</i>
Shovelnose Guitarfish	<i>Rhinobatos productus</i>
Thornback Shark	<i>Platyrrhinoides triserata</i>
Bat Ray	<i>Myliobatis californica</i>
Pacific Sardine	<i>Sardinops sagax</i>
Moray Eel	<i>Gymnothorax mordax</i>
Sheephead	<i>Semicossyphus pulcher</i>
Wrasses (two small species)	Perciformes: Labridae
Pacific Mackerel	<i>Scomber japonicus</i>
Barracuda	<i>Sphyraena argentea</i>
Blacksmith	<i>Chromis punctipinnus</i>
Bronzespotted Rockfish	<i>Sebastes</i> cf. <i>S. gilli</i>
Bocaccio	<i>Sebastes paucipinus</i>
Canary Rockfish	<i>Sebastes pinniger</i>
Vermilion Rockfish	<i>Sebastes miniatus</i>
Greenstriped Rockfish	<i>Sebastes elongatus</i>
Barred Sand Bass	<i>Paralabrax nebulifer</i>
White Croaker	<i>Genyonemus lineatus</i>
Diamond Turbot	<i>Hypsopsetta guttulata</i>
Surfperch family	Perciformes: Embiotocidae

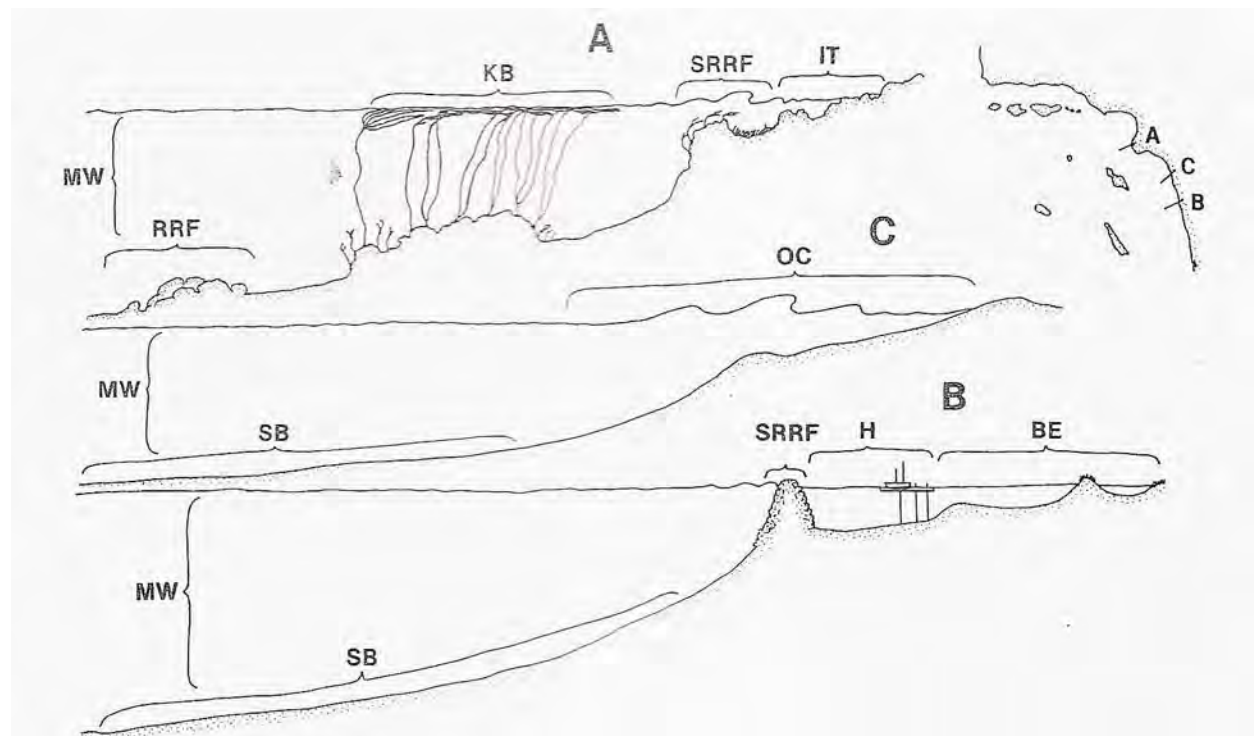


Figure 8. Marine habitats in the vicinity of Spindrift. (MW = Near-shore Mid-water; RRF = Deeper rocky reef; KB = Kelp beds; SRRF= Shallow rocky reef; IT = Rocky intertidal; SB = Offshore soft bottom; OC = Open-coast sandy beach; H = Harbor; BE = Bay estuary.)

Table 8. Spindrift fish and marine environments represented.

SPINDRIFT FISH SPECIES	ENVIRONMENT
Rock Wrass	Near-Shore Mid-Water, Shallow Rocky Reef, Kelp Beds
Sardine	Near-Shore Mid-Water
Blacksmith	Deeper Rocky Reef, Shallow Rocky Reef, Kelp Beds
Sheephead	Deeper Rocky Reef, Shallow Rocky Reef, Kelp Beds
Señorita	Deeper Rocky Reef, Shallow Rocky Reef, Kelp Beds
Moray Eel	Deeper Rocky Reef, Shallow Rocky Reef, Kelp Beds
Pile Surfperch	All Environments except Rocky Intertidal Zone
Thornback	Open-Coast Sandy Beach
Thornback	Shallow Rocky Reef, Deeper Rocky Reef
Soufín Shark	Near-Shore Mid-Water, Offshore Mid-Water
Bat Ray	Bay-Estuary, Shallow Rocky Reef
Angel Shark	Offshore Soft Bottom, Near-Shore Soft Bottom
Shovelnose Guitarfish	Offshore Soft Bottom, Near-Shore Soft Bottom, Bay-Estuary
Pacific Mackerel	Near-Shore Mid-Water
Barracuda	Near-Shore Mid-Water, Shallow Rocky Reef, Rocky Intertidal, Deeper Rocky Reef, Shallow Rocky Reef, Kelp Beds, Open-Coast Sandy Beach
Yellowtail	Offshore Mid-Water
Jack Mackerel	Offshore Mid-Water
Skipjack	Offshore Mid-Water
Rockfishes	All Environments except Rocky Intertidal Zone

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