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BAITED CAMERA OBSERVATIONS OF DEMERSAL FISH

SOUTHERN CALIFORNIA COASTAL WATER RESEARCH PROJECT
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INTRODUCTION

The kind and number of demersal fishes that live in and about the areas where wastewater is discharged, relative to other areas, is a subject of intense interest to the Coastal Water Project. In the past, we have relied mainly on data from daytime trawls, but questions have been raised as to whether or not these data tell a complete story. Perhaps the larger and more active fish swim out of the trawls or major population changes occur from day to night.

Thus, we decided to try other techniques to identify the fishes that live in the areas, the species that change locations at night, and the predators that prefer Dover sole, our prime study fish.

PROCEDURES

The observations described here involved the use of an automatic cine camera to photograph the activity around a bait at fixed intervals. The camera equipment was developed at the Scripps Institution of Oceanography by Prof. John D. Isaacs and Richard Shutts for use in deep water and generously loaned to the Project at cost. Mr. Shutts personally brought and operated the cameras, assisted by Jack Mardesich of our staff, who planned the exercise. The Sea-S-Dee (Capt. Rusty Shields), owned by the Los Angeles County Sanitation Districts and operated under the direction of oceanographer Douglas Hotchkiss, served as the camera launch and recovery platform. Other Project personnel who participated were biologists James Allen, Jack Word, and Charles Greene and engineers Harold Stubbs and Willard Bascom.

Generally, the system operates as follows: (1) the self-contained camera, light, and bait package is lowered to the bottom; (2) at regular intervals, such as 7.5 minutes, the lights go on, and the camera photographs the water around the bait for, say, 15 seconds; (3) after 24 hours, the entire system is retrieved. The stations at which we used the system are shown on Figure 1. One drop was made at each station; Drop 10 was unsuccessful.

The camera arrangement is shown in Figure 2. This configuration was developed for deep water as a free instrument (it returns to the surface on its own after a clock timer or a magnesium link releases the buoyed camera from its anchor) but we secured it to a surface buoy so we could retrieve it conveniently.

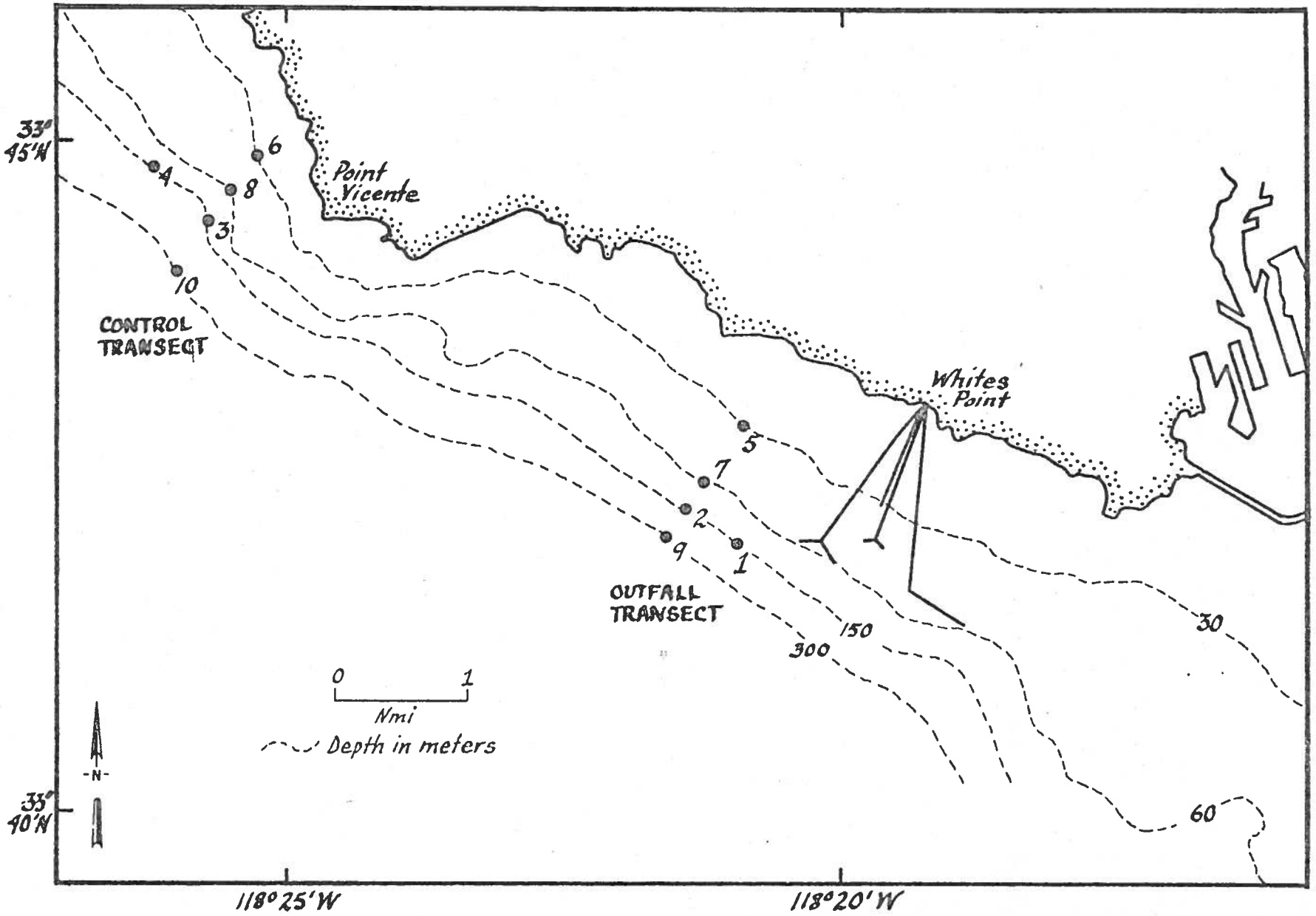

Figure 1. Locations of automatic cine stations, Palos Verdes shelf, 26 Nov-7 Dec 73.

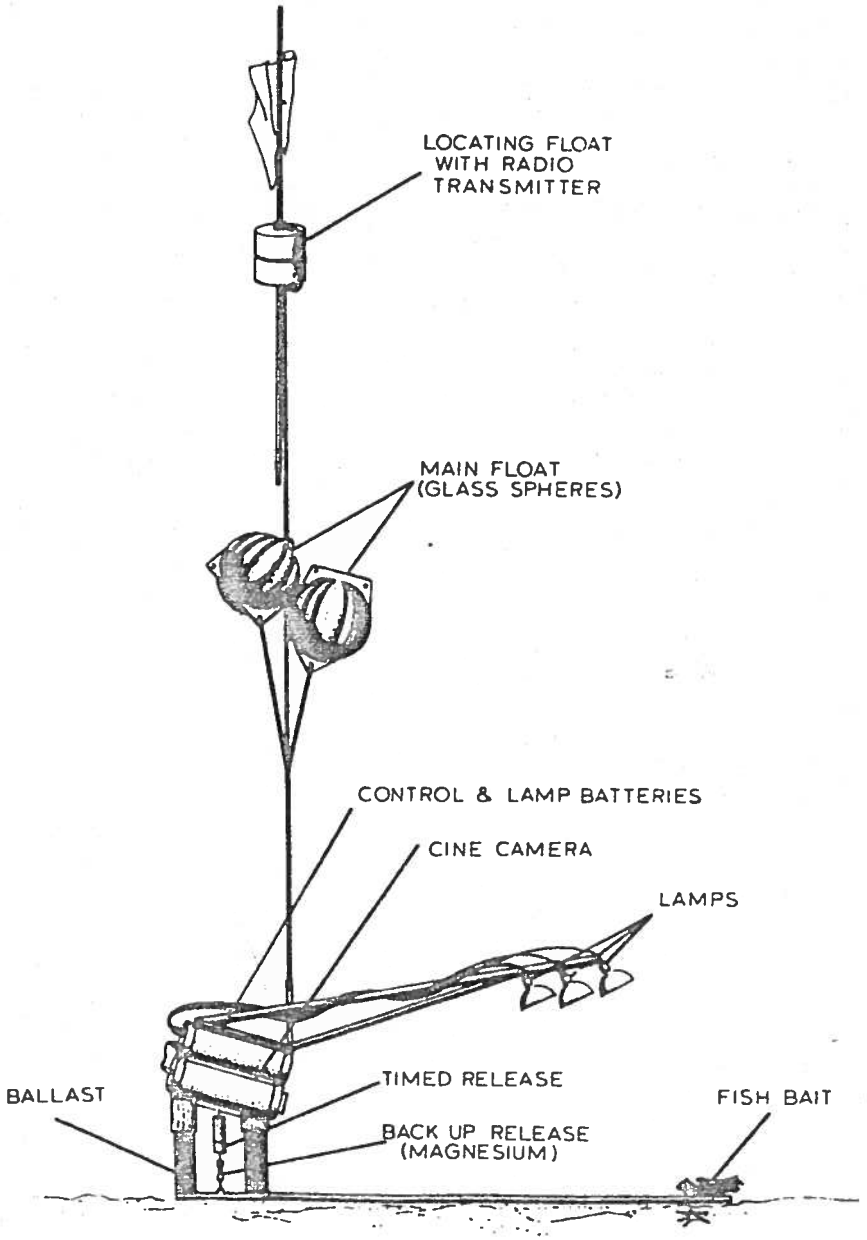

Figure 2. Isaacs/Shutts cine camera system (shown on ocean bottom). From Shutts 1973.

The camera used was a Bell & Howell transport system with 400-foot film spools. The film was Ektachrome 7242, processed at Consolidated Film Industries with normal development. Lens aperture was f/2.8; critical focal distance was set at 8 feet. The three 250-watt lamps and the camera were powered by 20 Yardley nickel-cadmium batteries, which performed satisfactorily.

The processed film prints were projected for the benefit of our biology staff, and the species present at each time and depth were identified by Jim Allen, Jack Word, and Danuta Charwat. Alan Mearns has summarized their findings on the following pages.

Generally, the system worked well except for Drop 10, where the camera and lights switched on and remained on rather than switching on and off at intervals. The Project is pleased with the results and plans to use the method again soon in other areas.

RESULTS

The films from each of the nine successful drops (described in Table 1) were examined for species identification, abundance, behavior patterns, sediment type, presence of water column particulates, and water movement. Each "scene" (10 or 15 second exposure of film) was examined in detail by stopping or reversing the film as needed. During the camera drops, we also conducted trammel-net, trawl, and hydrographic surveys in cooperation with the Sanitation Districts' staff. These surveys will provide valuable data for a complete description of the Palos Verdes environment.

Each successful camera drop included both day and night observations, but the proportion of each varied depending on the time of the drop. The number of scenes in the films from the eight best drops ranged from 29 to 53; each scene was considered a "sample" in our analysis.

Except for the rocky shallow stations (23 meters), all areas were characterized as having muddy or silty bottoms. Suspended particulate material was sparse inshore, but particle size and density increased offshore along both the outfall and control transects. Currents and water movement caused by waves was quite visible as deep as 137 meters. At 305 meters, water velocity was low and constant.

Forty species of fish and 19 species of invertebrates were tentatively identified in the scenes (Table 2), and all film from the successful drops included scenes of fish, crabs, shrimp, snails, urchins, and other organisms.

Both of the inshore rocky-shelf stations (Drops 5 and 6) were occupied by the most diverse fauna. Blue rockfish, crabs, señoritas, and blackeye gobies were common at both stations, but the control station, Drop 6, was occupied by a number of additional species. In contrast, the deeper stations (61 and 137 to

Table 1. Description of drops of Isaacs/Shutts cine camera system, Palos Verdes Peninsula, 26 November-7 December 1973

Drop No.	Date, Time Lowered	Date, Time Raised	L.A. County Designation of Location	Depth in meters (feet)	Time Lapse (min.) Duration (sec)	Lens Length*
1	26 Nov 1500	27 Nov 1500	T-4, E B7B	164 (540)	7.5 min. 10 sec	10
2	26 Nov 1530	27 Nov 1530	T-4, W B6B	146 (480)	7.5 min. 10 sec	10
3	27 Nov 1150	28 Nov 1150	T-1, E B2B	137 (450)	30 min. 15 sec	10
4	27 Nov 1200	28 Nov 1800	T-1, W between B1B and B2B	146-156 (480-510)	30 min. 15 sec	10
5	29 Nov 1045	30 Nov 1045	$T\text{-}1_{75}$ B6D	23-24 (75-80)	30 min. 15 sec	25
6	29 Nov 1120	30 Nov 1120	$T\text{-}4_{75}$ B2B	23-24 (75-80)	30 min. 15 sec	10
7	4 Dec 1100	5 Dec 1100	T-4 B6C	63 (208)	7.5 min. 10 sec	25
8	5 Dec 1055	6 Dec 1100	T-1 B2C	61 (200)	7.5 min 10 sec	10
9	6 Dec 0915	7 Dec 0915	T-4 B6A	305 (1,000)	7.5 min. 10 sec	25
10	6 Dec 1025	7 Dec 1000	T-1 B2A	305 (1,000)	7.5 min. 10 sec	10

*All film used was Ektachrome 7242; stop opening 2.8 focused on 8 ft (in water).

Table 2. Fishes and invertebrates observed at nine camera stations off Palos Verdes and location and depth of occurrence

Species	Common Name	Depth (m) and Location*								
		23		61			137-152			305
		C (6)	O (5)	C (8)	O (7)	C (3)	C (4)	O (1)	O (2)	O (9)
FISH										
Myxinidae										
Eptatretus stouti	Pacific hagfish									X
Scylliorhinidae										
Cephaloscyllium ventriosum	Swell shark	X								
Squalidae										
Squalus acanthias	Spiny dogfish	X			X	X	X	X	X	
Ophidiidae										
Chilara taylori	Spotted Cusk-eel						X			
Scorpaenidae										
Scorpaena guttata	California scorpionfish		X							
Sebastes sp. (unidentified)	Rockfish sp.					X	X			
Sebastes jordani	Shortbelly rockfish				X	X				
Sebastes mystinus	Blue rockfish	X	X							
Sebastes paucispinis	Bocaccio				X					
Sebastes rosaceus?	Rosy rockfish	X								
Sebastes saxicola	Stripetail rockfish						X			
Sebastes serranoides	Olive rockfish	X	X							
Sebastes serriceps	Treefish	X								
Sebastes vexillaris	Whitebelly rockfish	X								
Hexagrammidae										
Oxylebius pictus	Painted greenling	X								
Anoplopomatidae										
Anoplopoma fimbria	Sablefish			X	X	X	X	X	X	X
Agonidae										
Xeneretmus latifrons?	Blacktip poacher					X				
Serranidae										
Paralabrax clathratus	Kelp bass	X								

*O = outfall, C = control; numbers in parentheses are drop numbers.

Table 2 (Continued)

Species	Common Name	Depth (m) and Location*								
		23		61		137-152				305
		C (6)	O (5)	C (8)	O (7)	C (3)	C (4)	O (1)	O (2)	O (9)
Branchiostegidae										
Caulolatilus princeps	Ocean whitefish	X	X							
Embiotocidae										
sp. (unidentified)	Perch sp.	X			X	X				
Embiotoca jacksoni	Black perch		X							
Hyperprosopon argenteum	Walleye surfperch	X	X							
Phanerodon furcatus?	White seaperch	X								
Zalembius rosaceus	Pink seaperch		X							
Labridae										
Oxyjulis californica	Señorita	X	X							
Gobiidae										
Coryphopterus nicholsi	Blackeye goby	X	X							
Pleuronectidae										
Microstomus pacificus	Dover sole							X	X	X
Pleuronichthys decurrens?	Curlfin sole							X		
sp. (unidentified)	Eel-like fish						X			
sp. (unidentified)	Fish sp.	X						X		
INVERTEBRATES										
Echinodermata										
Asteroidea										
Patiria miniata	Bat star	X	X							
Echinoidea										
Allocentrotus fraguis	Sea urchin					X				
Coelenterata										
Anthozoa										
Lophogorgia	Gorgonian	X	X							
Muricea	Sea fan	X	X							
Medusa, unidentified	Jelly fish							X		

*O = outfall, C = control; numbers in parentheses are drop numbers.

Table 2 (Continued)

Species	Common Name	Depth (m) and Location*								
		23		61		137-152				305
		C (6)	O (5)	C (8)	O (7)	C (3)	C (4)	O (1)	O (2)	O (9)
Arthropoda										
Mysidacea										
Mysids, unidentified?						X	X		X?	
Amphipoda										
Amphipods, unidentified									X?	X
Decapoda										
Cancer anthonyi	Yellow crab	X			X					
Cancer antennarius	Rock crab	X	X							
Mursia gaudichaudii	Pointer crab			X	X	X	X	X		
Pandalus platyceros?	Coon-striped shrimp								X	
Crangon spp.	Snapping shrimp						X			
Spirontocaris spp.	Broken-back shrimp							X	X	
Eusicyonia sp.	Blue-tailed shrimp							X	X	
small shrimps, unidentified									X	
crab, unidentified				X						
Mollusca										
Gastropoda										
Nassarius spp.	Basket shell			X				X		X
Kelletia kelleti	Kellett's whelk	X	X							
Polinices sp.	Moon snail								X	
Unidentifed ribbon								X		

*O = outfall, C = control; numbers in parentheses are drop numbers.

152 meters) were occupied by only a few species at a time (crabs, snails, sablefish, bocaccio, and shortbelly rockfish). Most dramatic was the large abundance of sablefish at 61 meters. Sablefish are common but not abundant except at night in trawl surveys, and these films suggest that this is a dominant species. Hundreds of small, light-colored snails (probably Nassarius sp.) littered the soft bottom at all depths and appeared to be attracted to bits of the bait. The bait also attracted starfish (Patiria miniata), which moved in and then out again, to be replaced by urchins. As the urchins moved out, they were replaced by crabs (Cancer and Mursia). Fish and invertebrates were rare at the 305-meter stations.

In general, there appeared to be no great differences in the species present at the outfall and control stations except inshore, as indicated above.

Long-desired behavioral observations are abundant in these films. Figure 3, for example, demonstrates the dramatic day-night changes in some of the fish fauna off Point Vicente and provides us with explanations for the appearances or absences of certain species.

PRELIMINARY CONCLUSIONS

These films indicate to us that sablefish and spiny dogfish are more abundant than indicated by our trawl catches. Conversely, many species common in our trawl catches were not observed in the films; most notably absent were small fish, such as sculpins and combfish, small flatfishes, and several species of rockfish and croakers very common in trawl catches. A major value of these films is that they are confirming for us (1) the importance of community structure, (2) the balance and interaction that occurs between fish species, and (3) the differences between day and night assemblages.

A detailed analysis of the data from this survey will be presented in a future publication.

REFERENCE

Shutts, R. 1973. Cinematography on the ocean floor. Amer. Cinematog. 54:462.

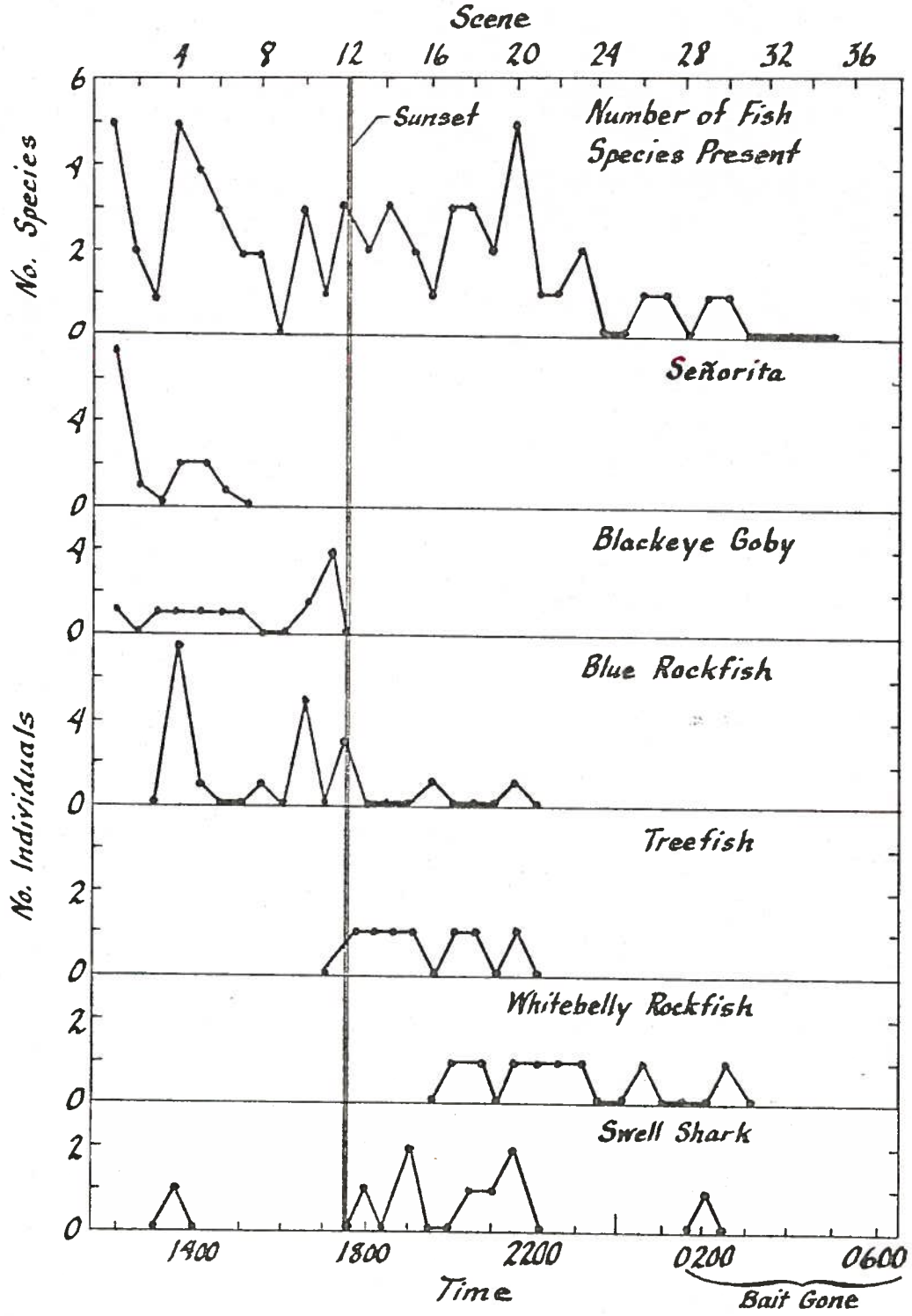

Figure 3. Number of species per scene and activity patterns of six rocky subtidal fishes observed off Pt. Vicente (Drop 6), 29-30 November 1973.