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AN INTERESTING MARINE INSECT, *RHEUMATOBATES AESTUARIUS* (Heteroptera: Gerridae), FROM BAJA CALIFORNIA, MEXICO[1]

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Abstract: A marine littoral insect, *Rheumatobates aestuarius* Polhemus, is recorded from mangrove lagoons along the coast of Baja California, Mexico, with a detailed description of various instars. The ♂♂ are characterized by prominent "moustaches" on the 6th and 7th abdominal ventrites.

Rheumatobates is a genus of small water-striders belonging to the subfamily Rhagadotarsinae of the Gerridae. Most of the species in this genus are found in freshwater habitats, but a few have been described from marine or brackish water. They are exclusively New World in distribution, being found in both N. and S. America and in the W. Indies. Hungerford monographed the genus in 1954 and provided descriptions and a key to the 23 known species and 4 subspecies. Since then only two new species have been added to this genus (Drake 1958; Polhemus 1969).

The specimens described in this paper were collected from among mangroves on the coast of Baja California, Mexico, during a survey expedition to that area. They belong to a group of *Rheumatobates* species in which the ♂♂ are characterized by specially modified hind legs and antennae. Large numbers of them were observed on the surface of tidal marine lagoons in the region of La Paz. They generally stayed close to the shore, and were only rarely observed more than 10–20 meters from the aerial roots of the mangrove *Rhizophora mangle*. (Presumably by staying close to shore they reduced the danger of being swept out to sea at ebb tide.) No pairing was observed and no feeding behavior was noted.

Our collections consisted exclusively of the species described. No other insects were found.

Materials and Methods

Collections were made by sweeping the water surface with a 1-mm mesh net, 20 cm in diameter. The insects were preserved in 70% alcohol. Our collection consists of five samples collected between 17 and 21 May 1969. The localities (fig. 1) and the numbers of specimens in each sample are given below; location 5, Isla San José, is

1. When these specimens were collected they were considered to represent an undescribed species, for which this comprehensive description was originally prepared for publication. After it had been completed and submitted, however, our attention was drawn to a prior description of the species by Polhemus (1969). The name he assigned, *Rheumatobates aestuarius*, has priority, and has therefore been adopted in this paper, which otherwise contains only our own independent and original information on this species.
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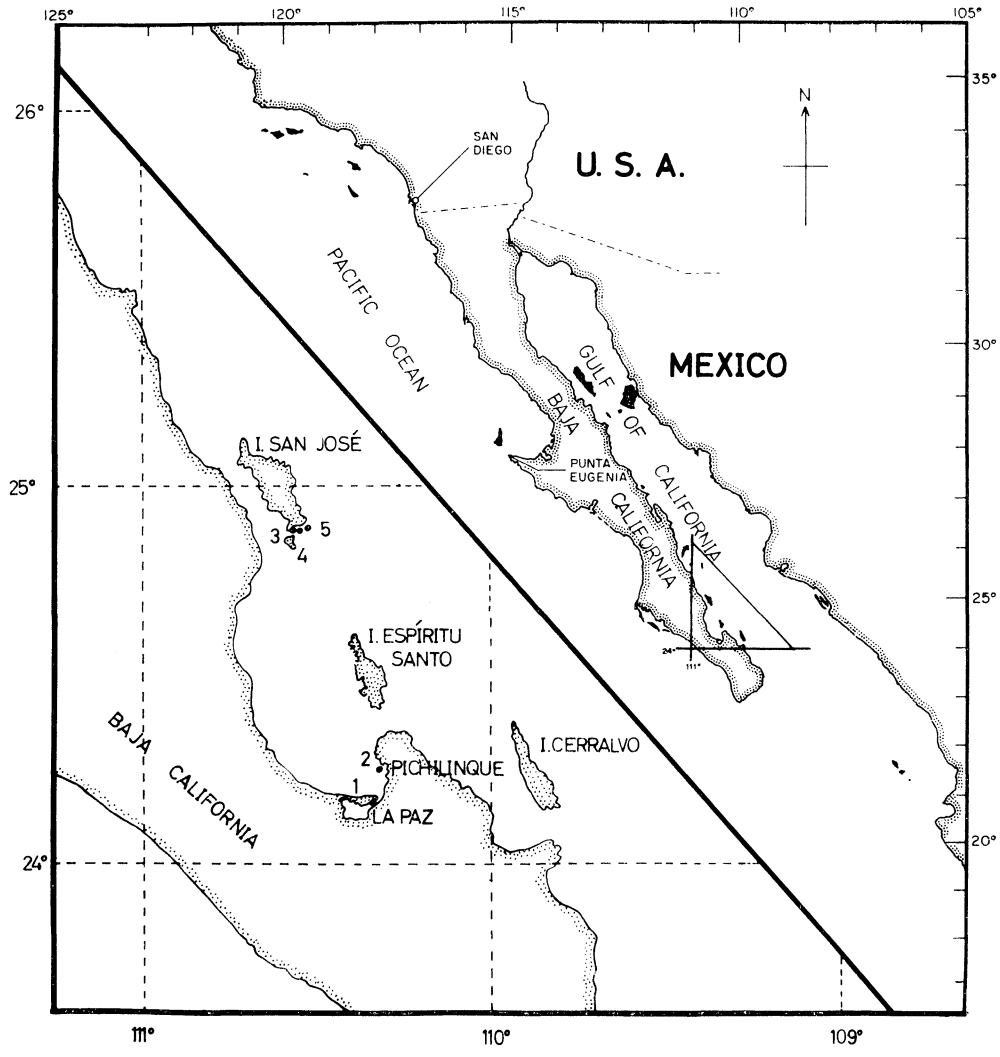


Fig. 1. *Rheumatobates aestuarius* localities.

designated as the type locality.

1) 05.30 hrs., 17.V.1969. Shallow water over mud in mangrove swamp at El Mogote, opposite La Paz, B. C. 37 ♂♂, 102 ♀♀, 160 5th instar, 12 4th instar.

2) 18.00 hrs., 17.V.1969. Pichilinque, near La Paz, B. C. 13 ♂♂, 7 ♀♀, 4 5th instar, 2 4th instar.

3) 16.00 hrs., 18.V.1969. Mangrove lagoon at south end of Isla S. José, B. C. 6 ♂♂, 22 ♀♀.

4) 17.00 hrs., 19.V.1969. Same, at high tide. 4 ♂♂, 14 ♀♀, 18 5th instar, 10 4th instar, 3 3rd instar.

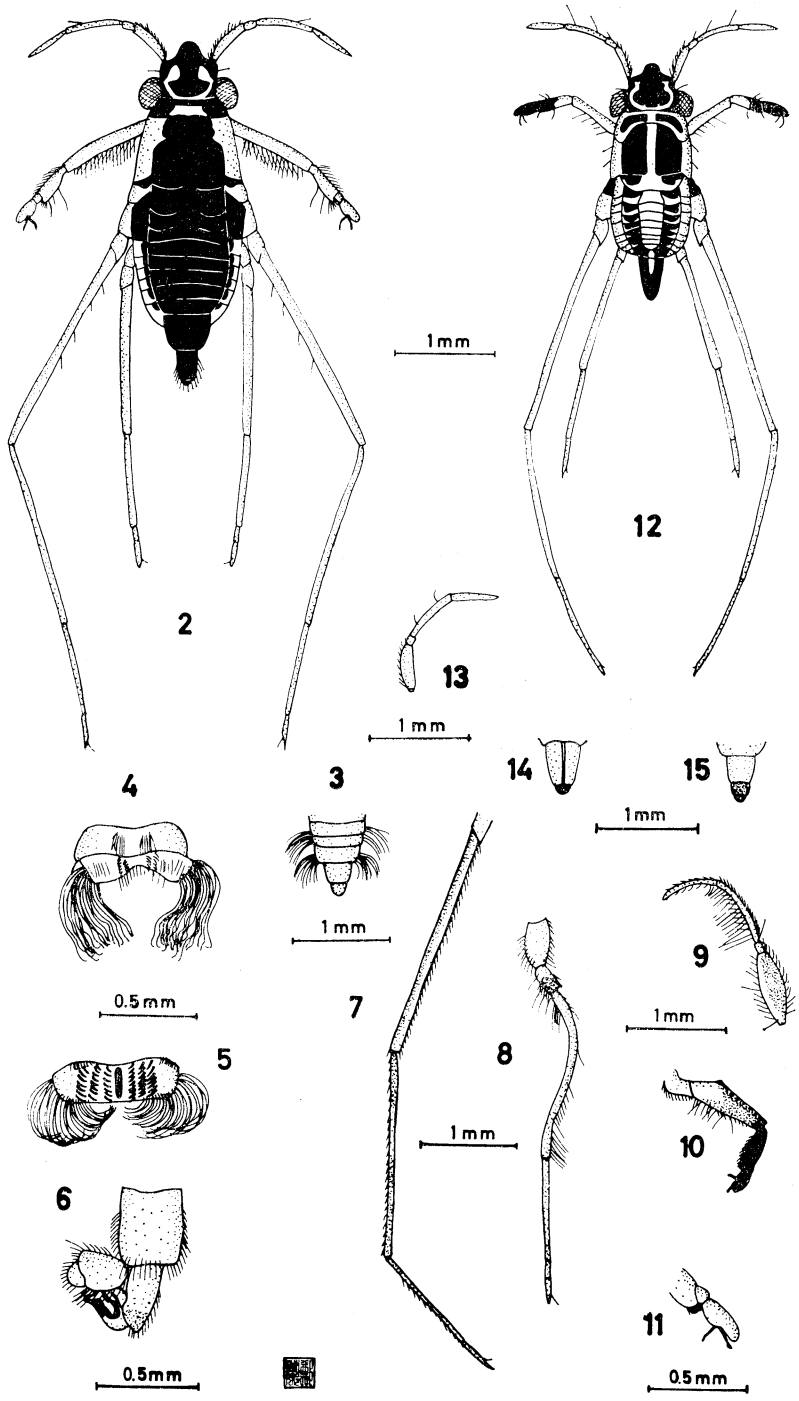
5) 06.00 hrs., 21.V.1969. Lagoon, Isla S. José, B. C. 38 ♂♂, 52 ♀♀, 18 5th instar, 8 4th instar, 2 cast skins of 5th instar.

Line drawings were made by using a Bausch & Lomb projection microscrope. The color patterns were drawn from entire specimens; various parts of the insects were drawn after they had been cleared in hot 10 % NaOH, dissected, and mounted. Measurements were made by using a micrometer eyepiece. Lengths of the insects were measured from the tip of the head to the tip of the abdomen; widths at the widest part of the thorax; leg and antennal segments from end to end. Small joints between segments of the antenna were not included in antennal measurements. Measurements of body dimensions and appendage segments of all stages are given in Table I.

Table I. Ranges of body dimensions (in mm) and average lengths of appendage segments (in μ) of *Rheumatobates aestuarius*.

Stage	Adult (apterous)		5th Instar		4th Instar	3rd Instar
Sex	♂	♀	♂	♀	Indet.	Indet.
Number measured	8	8	5	5	4	3
Body length (mm)	3.11-3.33	3.27-3.44	2.22-2.81	2.36-2.83	1.47-2.08	1.47-1.69
width (mm)	1.11-1.22	1.33-1.39	0.98-1.11	1.00-1.25	0.81-0.97	0.78-0.81
Antenna						
Seg. 1	722±27	444±27	486±13	347±13	250±27	180±13
Seg. 2	111± 0	111± 0	111± 0	111± 0	83± 0	83± 0
Seg. 3	722±27	555± 0	555± 0	430±13	347±13	236±13
Seg. 4	527±27	500±27	444± 0	402±13	333±13	236±13
Front leg						
Femur	861±27	833±27	736±13	736±27	555± 0	361±27
Tibia	416±27	402±13	416± 0	375±13	305± 0	208±13
Tarsus-1	83± 0	83± 0	361± 0	333± 0	263±13	180±13
Tarsus-2	263±13	263±13				
Middle leg						
Femur	2277±55	2277±83	1944± 0	1944± 0	1500±27	1069±13
Tibia	1972±83	1861±83	1583±27	1500±27	1138±55	805± 0
Tarsus-1	1027±27	972±55	1194±55	1166±27	888±27	652±13
Tarsus-2	388± 0	388± 0				
Hind leg						
Femur	1694±27	1611±55	1277±27	1194± 0	861±27	569±13
Tibia	972±27	888±55	777±27	777±55	569±13	388±27
Tarsus-1	138± 0	138± 0	416±27	416±27	333± 0	250± 0
Tarsus-2	263±13	263±13				

Scanning electron micrographs of insects, coated with gold-palladium film, were taken on a Cambridge Stereoscan S4 scanning electron microscope.


1mm
2
12
13
1 mm
4
3
14
15
1mm
0.5mm
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10
6
11
0.5mm
0.5mm

Rheumatobates aestuarius Polhemus

Apterous ♂. (97 collected; no winged adults found). Ground color dark brown to black with pale yellow markings.

Antenna with 1st segment greatly enlarged and fringed with hairs; 2nd segment extremely short; 3rd segment as long as 1st, thin, with several rows of long hairs; 4th segment slightly shorter than 3rd, curved and covered with short hairs (fig. 9). First antennal segment brown with pale brown base; segments 2-4 all dark brown.

Front leg (fig. 10): femur somewhat flattened laterally, with a tubercle at outer margin about 1/3 from the base; inner margin with long hairs; tibia about 1/2 the length of femur, with a fringe of hairs at distal end almost covering 1st tarsal segment, inner margin also fringed by hairs; 1st tarsal segment about 1/2 as long as 2nd; 2nd segment bears at its basal 1/2 claws somewhat flattened at tips (fig. 11), unlike those in ♀. Coxa, trochanter, and base of femur pale brown, rest of femur brown, tibia and tarsus dark brown.

Middle leg very long (about 2× length of hind leg), segments not modified. Coxa and trochanter pale brown, all other segments dark brown except for a pale section in middle of tibia (fig. 7). Lengths of femur and tibia vary slightly from specimen to specimen, length of tarsal segments rather constant.

Hind leg with coxa enlarged, about 2× as big as trochanter. Femur peculiarly curved, covered with hairs which are longer near each end. Tibia straight, about 1/2 length of femur; tarsal segments short, 1st about 1/2 length of 2nd, with claws a short distance from apex (fig. 8). Coxa and basal 1/2 of trochanter pale brown; distal 1/2 of trochanter and much of femur brown; rest of leg dark brown.

Abdomen slender, pale ventrally, with fine velvety texture. In addition to hairs and setae on all segments, lateral margins of 6th and 7th ventrites each bear a tuft of longer hairs, or "moustaches," about 1/2 mm in length (fig. 3, 4, 16, 17, 18). The closely set body velvet, shown clearly in the stereoscan picture in fig. 18, is presumably non-wettable and serves to trap a film of air which prevents the insects from getting water-logged. The setae scattered over the body surface (fig. 16, 17) are possibly sensory in function. The moustaches, which in this species are confined to the ♂, may serve a function, possibly the dispersal of pheromones, similar to that of the hair pencils in the ♂♂ of the noctuid moth *Trichoplusia ni* (Grant 1970) and analogous structures in other ♂ insects. In addition to the lateral moustaches, the 7th ventrite also bears 6 rows of median setae, 3 on each side of the central brown band, and 2 groups of finer setae on each proximal corner (fig. 5). The genital segments are much narrower than the preceding abdominal segments; external sexual appendages and parameres are absent (fig. 6).

Apterous ♀. (197 collected; no winged adults found). Color pattern similar to that of ♂ (fig. 2). Antenna not modified as in ♂, less hairy. Proportional lengths of antennal segments different from those of ♂; 3rd segment longest, 2nd shortest, 1st slightly shorter than 4th.

Front leg: femur thin, without tubercle, covered by hairs; tibia about 1/2 length of femur; 1st tarsal segment very short, 1/3 length of 2nd; latter bearing on basal 1/2 claws tapering to a point, unlike those in ♂.

Fig. 2-15. *R. aestuarius*: 2, apterous ♀, dorsal view; 3, ♂ abdomen, dorsal view; 4, ♂ 6th abdominal ventrite; 5, ♂ 7th abdominal ventrite; 6, ♂ genital segment, lateral view; 7, ♂ middle-leg; 8, ♂ hind-leg; 9, ♂ antenna; 10, ♂ front-leg; 11, ♂ front-tarsus; 12, 5th instar ♀, dorsal view; 13, 5th instar ♂, antenna; 14, 5th instar ♀ genital segment, ventral view; 15, 5th instar ♂ genital segment, ventral view.

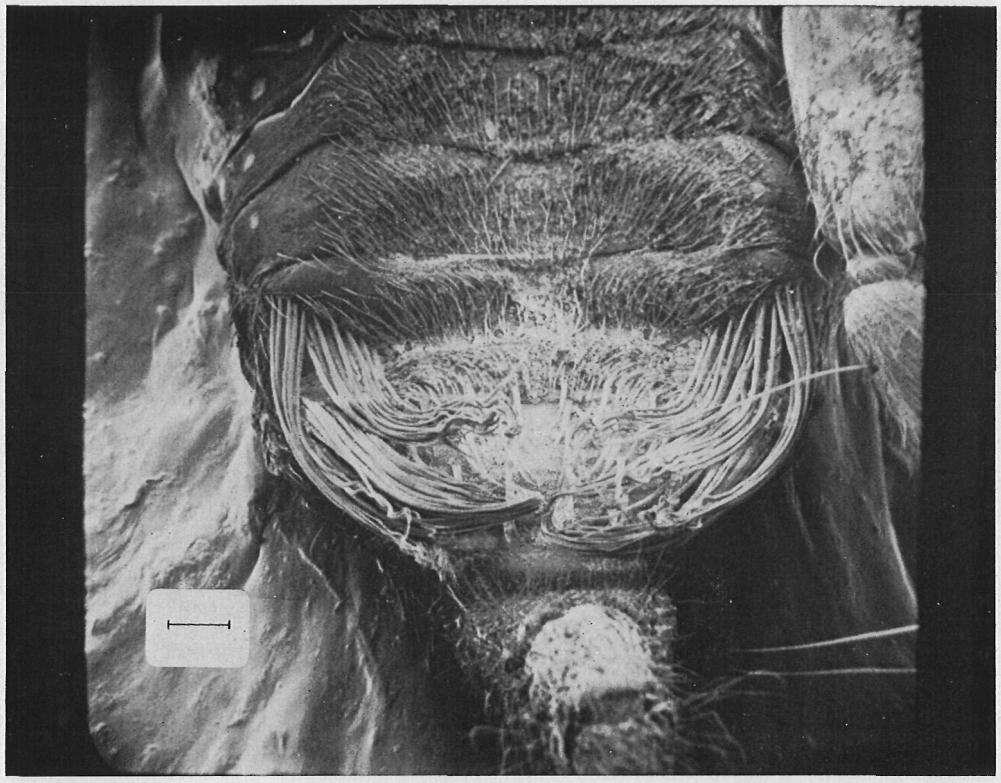

Fig. 16. *R. aestuarius*, adult ♂, abdomen, ventral view, showing "moustaches." (Scale bar=100 μ).

Middle leg, as in ♂, very long and thin. Proportional lengths of leg segments similar to those of ♂.

Hind leg not modified as in ♂.

Abdomen broader than in ♂, without tufts of hairs on ventrites. First genital segment broad with rounded posterior margin, 2nd segment long, more or less cylindrical, enclosing long ovipositor.

5th instar nymphs (200 collected; 107 ♂♂, 93 ♀♀). Different in color pattern from adults, pale areas more extensive (fig. 12), smaller. Body more rounded, sexes easily distinguishable by structure of antennae and genital segments. First antennal segment of ♂ (fig. 13) much thicker than that of ♀; 1st genital segment of ♂ entire ventrally (fig. 15), that of ♀ divided (fig. 14). ♂ secondary sexual characters, namely, moustaches and curved hind femur, are not visible at this stage.

Younger nymphs (32 4th instar, 3 3rd instar, no 2nd or 1st instars collected). Similar to 5th instar in color pattern and general body structure, but sexes indistinguishable. 3rd and 4th instars distinguishable only by measurements of antennal and leg segments; see Table I.

Comments: This species has so far been collected only from mangrove areas along

Fig. 17. *R. aestuarius*, bases of "moustache" and body setae. (Scale bar=20 μ).

the west coast of Mexico. Winged forms are not known; probably the adults are regularly wingless, as in all other known marine gerrids. In the series of insects we studied, the adult sex ratio differed significantly from a 1 : 1 ratio (98 ♂♂, 197 ♀♀), although among the 5th instar nymphs collected, the sexes were more or less equally represented (107 ♂♂, 93 ♀♀). It is possible that adult ♂♂ have a higher mortality or a shorter longevity than ♀♀. Unfortunately the biology of this species has not been studied, as we were unable to bring live specimens back to the laboratory. Since the ovipositor is long and serrate, it is likely that the eggs are inserted into plant tissues as suggested for *R. rileyi* by Hungerford (1920) and Herring (1950).

The ♂♂ of this species can be easily recognized by the moustache-like tufts on the ventral surface of the 6th and 7th abdominal segments. In Hungerford's key (1954), this species runs down to *R. carvalhoi*, described from a highland freshwater stream in Brazil by Drake & Harris (1944). Although the abdomen of *R. carvalhoi* also bears long hairs, they do not occur in discrete tufts as in *R. aestuarius*. This species is also distinguishable by the structure and proportional lengths of the antennal segments.

Specimens from our Baja California collections are distributed as follows: Bishop Museum, Hawaii (5 ♂♂, 5 ♀♀); British Museum of Natural History, London (5 ♂♂, 5 ♀♀); United States National Museum (5 ♂♂, 5 ♀♀); National Museum of Mexico

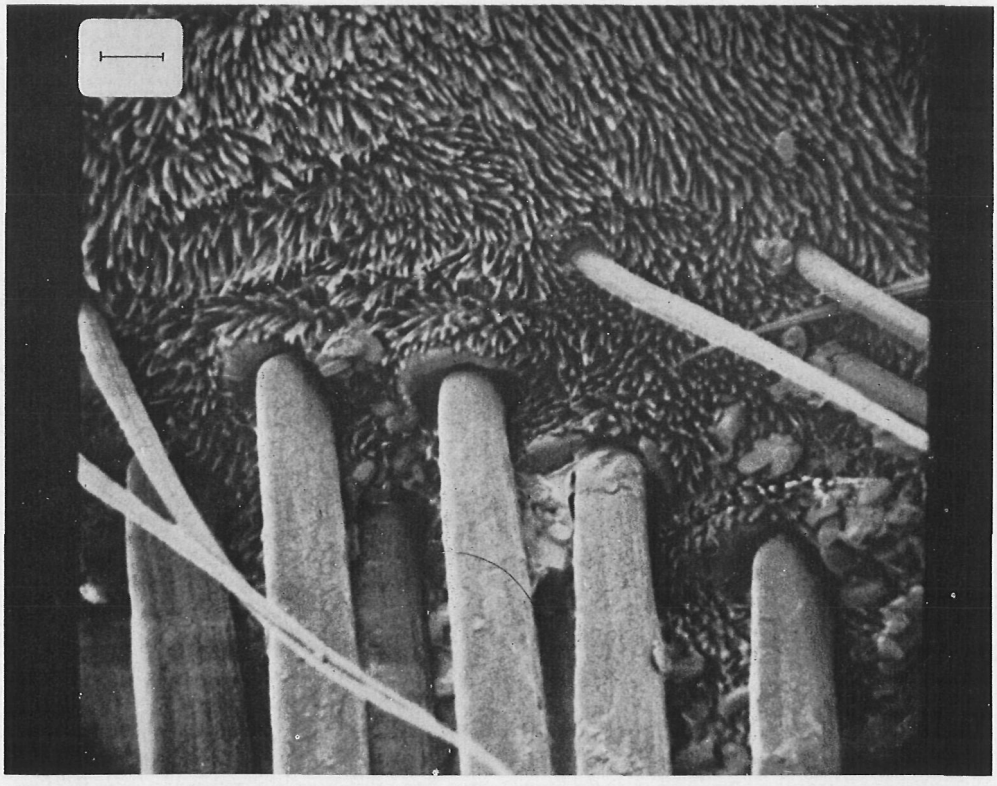

Fig. 18. *R. aestuarius*, bases of setae and portion of ventrite showing velvety texture. (Scale bar=5μ).

(5 ♂♂, 5♀♀) ; Francis Huntington Snow Museum, University of Kansas (5 ♂♂, 5 ♀♀). The rest of the specimens are in the authors' collection at the University of California.

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