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1942 - Aboriginal Navigation off the Coasts of Upper and Baja California, Anthropological Papers, No. 39, Robert F. Heizer and William C. Massey

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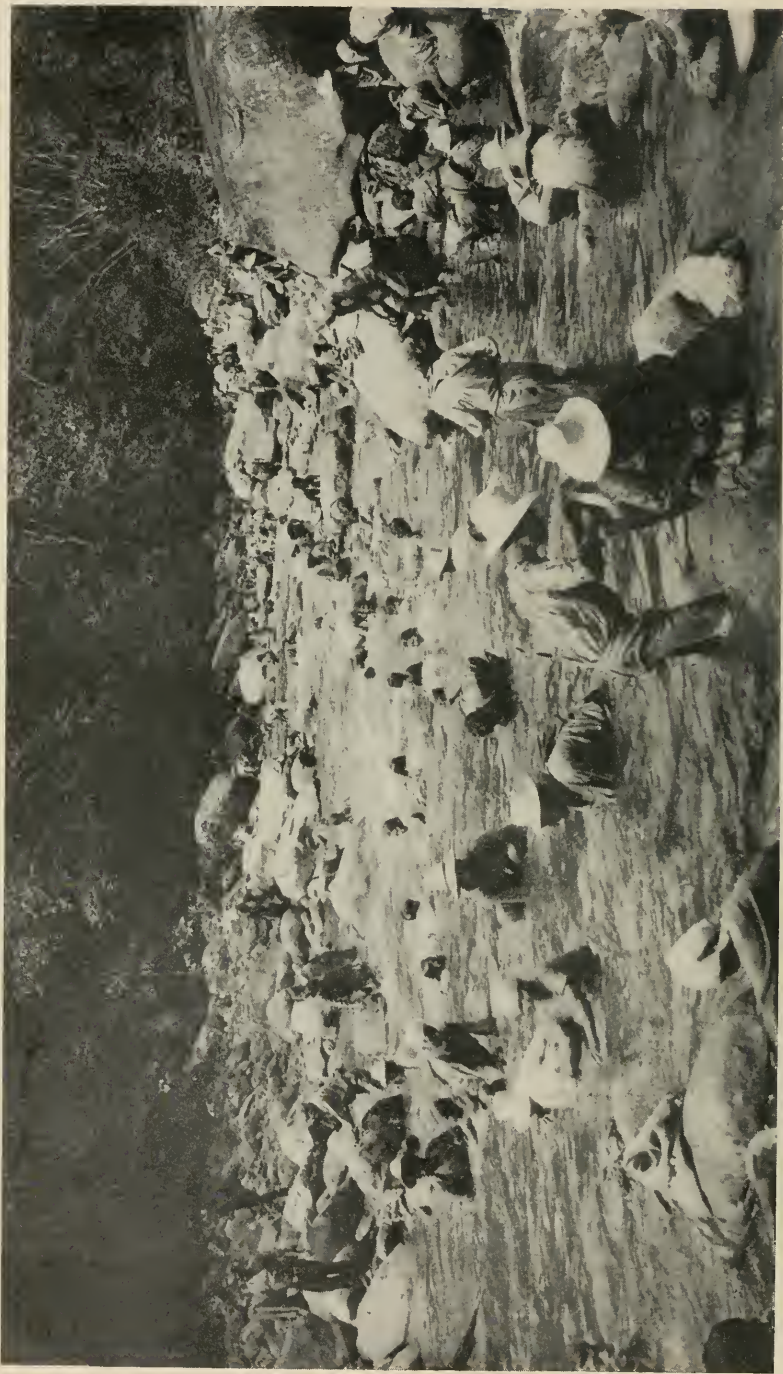
Aboriginal Navigation off the Coasts of Upper and
Baja California

By ROBERT F. HEIZER and WILLIAM C. MASSEY



JÍVARO INDIANS POISONING FISH.

(Photograph by E. P. Killip.)



JÍVARO INDIANS COLLECTING STUPEFIED FISH.
(Photograph by E. P. Killip.)



SOUTH AMERICAN INDIANS POISONING FISH, FORTALEZA, NEAR YURIMONGAS.



PLANTATION OF FISH-POISON PLANTS, FORTALEZA, NEAR YURIMONGAS.

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ABORIGINAL NAVIGATION OFF THE COASTS OF UPPER AND BAJA CALIFORNIA

By ROBERT F. HEIZER and WILLIAM C. MASSEY

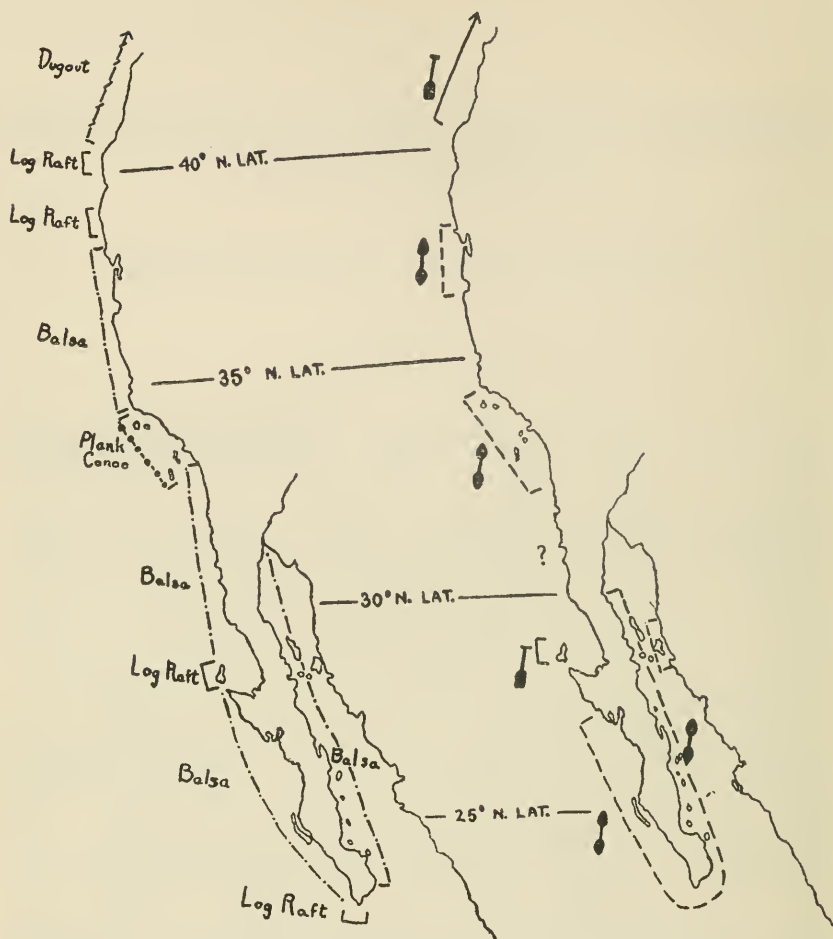
INTRODUCTION

There is no adequate summary of aboriginal navigation off the west-central coast of North America. Friederici's (1907) general treatment of native navigation in the New World is still the best we have, but for the California region this work does not satisfy the requirements of intensive treatment. Kroeber's summary of aboriginal navigation in Upper California (lat. 33° N. to 42° N.) is good, but is based mainly upon ethnographic information, and for certain critical areas can be amended or added to in detail by the early historical accounts (Kroeber, 1925, pp. 243-244, 812-814, *passim*).

The Pacific coast, from the Oregon-California boundary¹ to the southern tip of Lower California is a stretch of about 1,600 miles, and embraces some nineteen degrees of latitude. Environmentally this long coastal area may be divided into separate provinces. In the north from the Oregon-California boundary to the mouth of the Russian River is a rainy coast where conifer forests come down to the water's edge, and with turbulent rivers which meet the rocky coast. Here is an ideal habitat for the heavy log dugouts, or for log rafts. From Bodega Bay southward to Point Concepcion is a relatively treeless coast, somewhat rocky, but with several large and numerous small sandy bays. Wood is scarce, and the tule balsa is the sole means of navigation for inshore water travel. The coast dwellers occasionally used balsas to fish in the quiet waters of some bay; never to make long expeditions where walking would be quicker, safer, shorter, and on the whole easier.

Between Point Concepcion and Santa Monica Bay is the sheltered Santa Barbara Channel which harbored the maritime Chumash peoples. Driftwood logs, a well-developed woodworking complex, and sheltered waters seem to have favored the development here of the multiplank boat.

¹ For the coastal area north of the Oregon-California boundary, see the excellent paper on northwestern canoes by Olson (1927).



MAP 5.—Distribution of boat and paddle types along the coasts of Upper and Baja California.

From San Diego south along the entire west coast of Baja California is a low-latitude desert littoral where available softwood is absent (with two exceptions to be noted below). Wooden boats would be an impossibility, and the balsa made of easily gathered tules (*Scirpus* sp.) is generally employed. Great stands of cedars at Cedros Island and pines at Cape San Lucas offered variety in materials for boats, and here we find log rafts, but not dugouts.

Inside the Gulf of California along the east shore of the peninsula is again a treeless coast, somewhat broken by small bays, and offshore islands. Here, as on the ocean side, the balsa was used for navigation.

With the partial exceptions of the Chumash of the Santa Barbara

Channel, who were accustomed to fish in deep waters in their sea-going plank canoes, and the Pericue of Cape San Lucas, who went out of sight of land on fishing expeditions, the coastal tribes of Upper and Baja California could hardly be called maritime. Boats, whether dugouts, balsas, or rafts, seem incidental and generally nonessential cultural features of the whole area.

The differences in coastal topography are not very profound, yet sufficiently so that local environments favored the use of particular types of boats. These boat types are few and may be enumerated as follows:

- (1) Tule balsas.
- (2) Log dugouts.
- (3) Log rafts.
- (4) Plank canoes.

TULE BALSAS

In the whole coastal area under discussion, the tule balsa has the most extensive distribution of any single type of boat. Interruptions in the distribution are due to either unfavorable environmental conditions or the use of other types of boats. Nonoccurrence cannot be explained by the absence of materials (*Scirpus* sp.).

The northernmost coastal occurrence of the tule balsa is Bodega Bay (lat. 38°30'), where its presence is attested by a number of early explorers (Wagner, 1931, p. 331; Maurelle, 1781, p. 515; Corney, 1896, p. 81; Colnett, 1940, p. 175; Bolton, 1926, IV, p. 48; Khlebnikov, 1940, p. 333). It was propelled by means of a double-bladed paddle. (The balsa and paddle are illustrated here, after Colnett (1940, pl. opp. p. 176) in fig. 11). Bodega Bay also marks the northernmost occurrence of this paddle type (Colnett, 1940, p. 175). Colnett said of the Bodega (Coast Miwok) Indians in 1791:

Their rush floats are form'd in the following manner, three Bundles making the Bottom, and one on each side, Bow and Stern. Their Paddle is pointed at each end, held by the middle and used alternately, side and side, and End and End.

The tule balsa and double-bladed paddle were noted at Drake's Bay by Cermeño in 1595 (Wagner, 1924, p. 13). The balsa is known much farther north in the interior. The Thompson Indians of British Columbia used this boat as did the Klamath and some north-central California tribes.

The Costanoan Indians living on the shores of San Francisco Bay used only the balsa for navigating. The double-bladed paddle was also in use on the Bay (Menzies, 1924, p. 271; Khlebnikov, 1940, p. 333; Kotzebue, 1830, vol. 2, p. 90; Chamisso in Kotzebue, 1821, vol. 3, p. 48; Choris, 1822, pt. 3, p. 6; Bolton, 1927, p. 293; Von

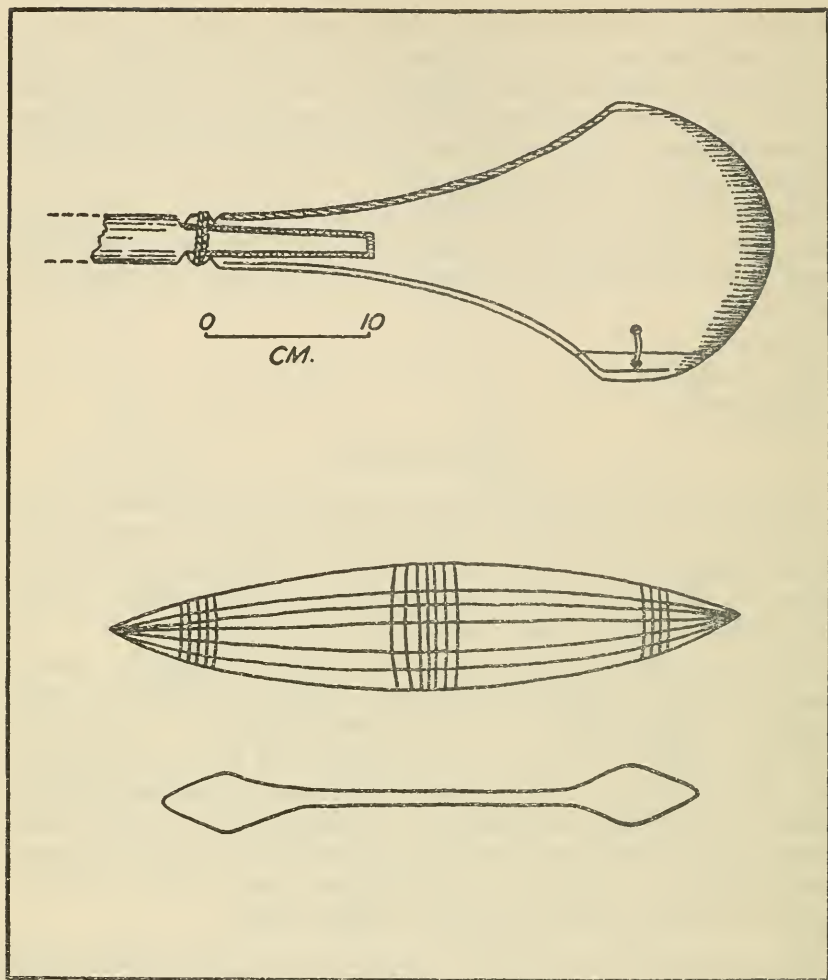


FIGURE 11.—Upper: Chumash paddle collected by Vancouver Expedition, 1793.

Lower: Colnett's sketch of a Coast Miwok balsa and paddle seen at Bodega Bay, 1791.

Langsdorff, 1814, pp. 187-188). Menzies describes the balsa as follows:

As we were going on shore in the forenoon two of the natives came along side in their *Canoe* if a few bundles of bulrushes fastend together could be called by that name, for it was about fourteen feet long and consisted of three or four bunches of bulrushes fastend together with thongs and tapering at both extremities; on this the two Men sat, each having a long paddle with a blade at each end which was held by the middle and used on both sides alternately . . . [Menzies, 1924, p. 271.]

Vancouver notes the balsa at San Francisco as follows:

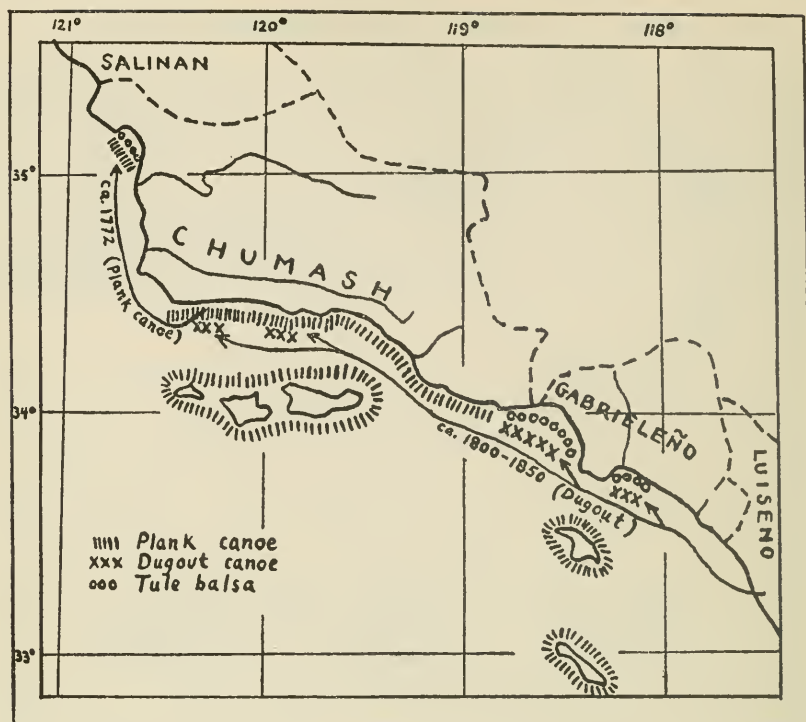
A message . . . was brought by three of the native Indians who spoke Spanish, and who came on board in a canoe of the country; which with another (though perhaps the same) seen crossing the harbour the evening we entered it, were the only Indian vessels we had met with, and were without exception the most rude and sorry contrivances for embarkation I had ever beheld. The length of them was about ten feet, the breadth about three or four; they were constructed of rushes and dried grass of a long, broad leaf, made up into rolls the length of the canoe, the thickest in the middle, and regularly tapering to a point at each end . . . They crossed the inlet for the purpose of catching fish . . . They conducted their canoe or vessel by long double-bladed paddles, like those used by the Esquimaux. [Vancouver, 1798, vol. 2, p. 90.]

Southward of San Francisco the balsa made of three or more bundles of tule lashed together was employed sporadically by Costanoans (Fages, 1937, p. 69; de Laperouse, 1798, vol. 2, p. 228; Vancouver, 1798, vol. 2, p. 5). This boat was used by the Indians of Monterey Bay for fishing. Here, as farther north, the double-bladed paddle was used for propulsion (Kroeber, 1925, p. 468; Costanso, 1910, p. 155; Vancouver, 1798, vol. 2, p. 5; von Langsdorff, 1814, vol. 2, pp. 187-188). South of Monterey to Point Concepcion the balsa was used in bays and protected coastal waters. In 1595 Cermeño mentioned use of balsas in San Luis Obispo (Wagner, 1924, p. 16). Shortly after the founding of Mission San Luis Obispo in 1772, the Santa Barbara Channel plank boat was imported for use by the Mission Indians at San Luis Obispo (Heizer, 1941; Wagner, 1924, pp. 6-7). Vizcaino in 1602 mentioned seeing balsas on the coast occupied by the Salinan Indians (Wagner, 1929, pp. 240, 242).

Although the balsa was probably known and perhaps occasionally used by the Chumash of the Santa Barbara region, it can hardly be considered the typical boat of this area. The balsa was not seen or noted by the Spanish explorers on the Santa Barbara Channel in the eighteenth century. Harrington (1942, section on "Navigation") implies that the balsa is an aboriginal Barbareño Chumash feature, but on what grounds is not stated by him or known to us. A detailed account of a well-made, bitumen-covered balsa from the Santa Barbara Chumash was printed in 1894, and though the author is unknown it was probably Lorenzo Yates (Anonymous, 1894). The account reads as follows:

Tules were firmly and closely tied with fiber taken from different plants and tarred with asphaltum into bundles about four inches in diameter in the center and tapering to a point at both ends, and of the length of the intended boat.

Pliant sticks, which were intended to act as the ribs of the boat, were shoved through the bundles at intervals in the manner indicated in Figs. 1 and 2 [pl. 21 of this publication.] After a sufficient number of bundles of tules and pliant sticks were placed together, they were bent and secured in the form of the main body of the boat. The bow and stern of the boat were then made in the form and



MAP 6.—Distribution of boat types in the Santa Barbara Channel and adjoining regions.

manner shown in Figs. 1 and 3. The tules were then quilted with tarred fiber until they were firm and watertight, BBB in Figs. 1 and 3. The bent position of the ribs was maintained by seats. Further rigidity was given to the boat, if necessary, by fastening poles lengthways of the boat to the ribs. The outside of the boat was then smeared with liquid asphalt of the consistency of heavy tar, AA, Fig. 3.

This account can hardly be purely imaginative, yet there is nothing similar known concerning tarred balsas. The general method of manufacture is Californian, however, and it may be that this particular form of boat is a late historic development which combined certain features of the old plank-boat complex grafted on the balsa boat.

The Gabrieleno to the south also knew the balsa (Fages, 1937, p. 23), but they shared the plank boat with the Chumash. The Luiseno next to the south, used both the balsa and the dugout canoe (Kroeber, 1925, p. 654). The paddle type is not known, although the double-bladed form, in view of its occurrence to the north and

south, was almost certainly used. The coastal Diegueño knew only the tule balsa and double-bladed paddle (Menzies, 1924, p. 340; Costanso, 1910, p. 123).

Cabrillo's reference to "small canoes" near Punta Banda in latitude $31^{\circ}50'$ (Cabrillo in Bolton, 1916, p. 21; Cabrillo in Wagner, 1929, p. 84) probably indicates the presence there of tule balsas, which may be ascribable to the coastal Diegueño of the peninsula (Vizcaino in Bolton, 1916, p. 73). Taylor (1860) reports that in 1856 a native at San Miguel Mission described balsas of reed formerly used for fishing in northwestern Baja California. At San Quentin Bay, Vizcaino saw tule balsas, and immediately to the north, at San Martin Island, Cermeño encountered Indians in boats, probably tule balsas (Cermeño in Wagner, 1929, p. 16). Vancouver, when off Rosario Bay just south of San Quentin saw "a native in a straw canoe like those seen at San Francisco" (Vancouver, 1798, vol. 2, p. 482).

Sales' account contains a careful description of the balsa referring to the Dominican mission region north of Rosario:

The Indians make some very small canoes; among some tribes they are of wood, in others they are of that reed (*bova*) which grows in the swamps. Only Indians who fear nothing are able to put to sea in boats of such slight resistance. They collect the stalks and stems of this reed, they tie and bind them with long twigs, and continue giving it the shape of a small boat that is only able to carry one man, and when he has to enter the sea he puts it over his head and lets it fall, quickly putting himself aboard on his knees. [Sales, 1794, vol. 1, p. 29.]

On Cedros Island log rafts were in use (Ulloa in Wagner, 1929, p. 40) but there is no mention of their occurrence on the opposite mainland. Martínez, states that from Cape San Lucas to San Ignacio (lat. 23° to 27°) the Indians "got around in a sort of raft in the shape of a small boat, made of canes or rushes. With this rudimentary craft they will put out to sea until they are lost to sight for many hours, one man in each, with a double-paddle, which they manipulate on both sides, half kneeling, or squatting" (Martínez, 1938, p. 15). Taraval (1931, p. 51) notes balsas at Todos Santos. Inside Magdalena Bay (lat. $24^{\circ}18'$) Ulloa (specifically at Almejas Bay: Ulloa in Wagner, 1929, p. 31) saw "very large rafts of cane," probably to be understood as large tule balsas. As shown elsewhere, the log raft was used at Cape San Lucas. From Cape San Lucas northward to La Paz Bay inside the Gulf of California bark-log rafts were in use. Just south of La Paz at a bay, which in 1633 Francisco de Ortega called San Ignacio de Loyola, were seen Indians with small balsas (*balsillos*), and Taraval notes balsas in 1735 at Cerralvo Island in the same region (Ortega, 1633, p. 161; Taraval, 1931, pp. 74-75, 276).

North of La Paz among the Cochimi the balsa and double-bladed paddle continued in use on the coast. Ulloa has left a careful description of the Cochimi balsa at lat. $29^{\circ}48'$:

They had a little raft which they must have used in fishing. It was made of canes tied in three bundles, each part tied separately, and then all tied together, the middle section being larger than the laterals. They rowed it with a slender oar, little more than half a fathom long, and two small paddles, badly made, one at each end. [Ulloa in Wagner, 1929, p. 22—at Bahia de San Luis Gonzaga.]

On the coast near Loreto, Vizcaino noted in 1596, "five canoes like *balsas* very well made with canes and strong, came out from the shore. In each were three or four Indians" (Vizcaino in Wagner, 1930, p. 211).

At Espiritu Santo Island, outside La Paz, Ortega in 1631 said that "many Indians came out to the ship in their (tule) *balsas*" (Ortega, 1631, p. 75).

North of the Cochimi people and inside the Gulf live the Peninsular Kiliwa and Akwa'ala whose culture is oriented toward the interior rather than seaward. It is probable that here the tule balsa was used when occasion demanded, but no definite evidence can be produced to support this possibility. The Cocopa were accustomed to use the tule balsa (Derby, 1932, p. 58), as were other tribes of the lower Colorado River.

On the west coast of Mexico south of the Colorado River delta the balsa is sporadically present. The Seri of the Sonora coast and Tiburon Island use both the tule balsa and double-bladed paddle (McGee, 1898; Kroeber, 1931, pp. 20-41; Davis and Dawson, 1945, pp. 196-197, fig. 5). The single occurrence of this paddle type on the Mexican mainland leads to the conclusion that the Seri learned of navigation, at least in part, from the peninsular tribes across the waters of the Gulf of California.

DUGOUT CANOES

On the northwestern California coast the dugout is the only means of navigation. It is a country of rivers, and the boats are used for both ocean and river travel. The "Yurok type" canoe used by the littoral Tolowa, Yurok, and Wiyot, is essentially suited to river travel because of its blunt, rounded prow and round, gently curved belly, and not to the sea and surf where a high-ended, keeled, and sharp-prowed type would be more practicable. It is clear that the dugout here has developed on the interior rivers, and later came out to the ocean.

The canoe is made of soft, straight-grained redwood. The excavation is done by controlled firing and shaping with a shell-bladed *adz* attached to a stone handle. The bow and stern rise only a foot

above the level of the gunwales, which are wide and overhanging inward rather than flaring outside to prevent wash. The wide gunwales serve as longitudinal strengtheners. Inside the boat is a stern seat and in front of the seat are two foot braces.

The Yurok dugout has, according to Kroeber (1925, pp. 82-83) a standard length of 3 fathoms and a hand (18 feet), but varies considerably in breadth (3 to 4 feet) and depth (1 to 2 feet), which has the effect of increasing capacity, but not at the expense of maneuverability on the rocky river where the length of the boat is an important feature. The draft is shallow and the canoe rarely draws more than 6 inches in the middle when loaded. A shallow-draft canoe is suited to the rocky river rather than to the ocean, and is a further indication of the interior riverine development of this type.

The Yurok of Trinidad Bay on the northern California coast were early discovered by the Spanish, and from Fr. Benito de la Sierra's account of the Hezeta expedition of 1775 we have a description of the canoes which are said to have been at most 4 yards in length, well built, double-ended, and made of a single log. The stem and stern are stated to have been "half-decked," but the phrase is puzzling since the later boats here do not show any feature of this sort (de la Sierra, 1930, p. 222). Peter Corney (1896) described the Trinidad Bay canoes in 1817 as from 16 to 20 feet long, square at both ends, and flat-bottomed. Inside the boat were ridges, spaced about a foot apart, which looked exactly like frames or ribs of a boat and which served to strengthen the canoe. This last feature is not reported by other observers, and may possibly represent an effort in historic times to copy the frame feature of European boats.

South of the Wiyot, who use the same canoe as the Yurok and Tolowa to the north, the dugout is not employed. Kroeber (1925, p. 147) places Cape Mendocino as the southern limit of the dugout, which is a local and peripheral manifestation of the British Columbian and Alaskan coastal dugout-canoe area. (See Olson, 1927, and Barnett, 1937, p. 170.) The Mattole and Coast Yuki used no boats whatever on the coast. The Pomo used tule balsas on Clear Lake in the interior, but this form did not reach the coast in their territory. Occasionally the Pomo might use a makeshift log raft to visit mussel and sea lion rocks offshore (Kroeber, 1925, p. 243; Gifford and Kroeber, 1937, El. No. 258; Loeb, 1926, p. 182) but this temporary raft was hardly a standard feature of coastal Pomo culture.

Just south of the Pomo are the Coast Miwok of Bodega and Tomales Bay who, as we have already seen, used the tule balsa in their salt-water fishing. It is not until we reach the Luiseño of southern California that the aboriginal dugout canoe again is found (Sparkman, 1908, p. 200; Kroeber, 1925, p. 653). Here it exists side by side with

the tule balsa, but the plank canoe did not diffuse from their northern neighbors, the Gabrieleño. Incidentally the Luiseño called the dugout pauhit, "yellow pine" (Kroeber, 1925, p. 654), and the Chumash call their plank canoe tomolo, "pine" (Heizer, 1941, pp. 60-61). This peculiar canoe-pine linguistic parallel can hardly be fortuitous, and leads one to suspect some specific connection between the Luiseño dugout and the Chumash plank canoe. This possibility is enhanced by the fact that for a long distance north of the Chumash and south of the Luiseño wooden canoes of any kind are unknown. How the development of these types occurred is impossible to say, nor is it easy to imagine what relationships the two boat forms have, since their occurrences are geographically exclusive and they are technologically distinct.

J. P. Harrington (1942, section on "Navigation") gives the late ethnographic (i.e., historic) occurrence of boat types in the Santa Barbara region as follows:

	N. Cost-anoans	S. Cost-anoans	Barbareño	Ventureño	Gabrieleño
Dugout canoe.....			×	×	×
Plank canoe.....			×	×	×
Tule balsa.....	×	×	×	×	×
Double-bladed paddle.....			×	×	×

We may be certain that the dugout was not used in early historic times (sixteenth to eighteenth centuries) in the Channel region, and it is not until the midnineteenth century that we find the first mention of the dugout in the Santa Barbara region in a newspaper account reproduced in Alexander Taylor's *Indianology*, where it is stated,

They made canoes by digging out a solid trunk to contain four or five men, which were of remarkably neat model and handsomely bevelled, rounded off inside and out with hatchets made of stone, and scrapers and knives formed of shells. They were about thirty feet long and three or four deep and wide. The stern and bow were shaped alike, with a deep channel or groove for the anchor-rope to run through . . . these ropes were made from the fiber of the California wild maguey. [Woodward, 1934, pp. 120-121; Taylor, 1860.]

Thus, the Channel Barbareño and Ventureño seem to have used the dugout only in the past century. It was introduced either through the Spanish,² or from the Luiseño to the south. The Gabrieleño shared the plank boat with their Chumash neighbors to the north, but placed some reliance at least upon the tule balsa. There is no evidence, other than Harrington's check list, that the Gabrieleño used the dugout and we may suspect its late introduction here as among the Chumash.

² For which there is no direct evidence, but must be considered a possibility. Note the historic introduction, by U. S. Army soldiers, of the dugout to the Pomo of Clear Lake (Gifford and Kroeber, 1937, p. 135).

LOG RAFTS

Log rafts, although rarely used, are hardly to be considered as a typical or characteristic means of navigation on the coast of Upper California. Gifford and Kroeber (1937, p. 145) list a raft of logs lashed together with withes for the northwestern and southwestern Pomo (Loeb, 1926, p. 182; Kroeber, 1925, p. 243). It was used by the people to visit offshore mussel-bearing rocks. Farther north the Sinkyone and Tolowa, whose territories front the ocean, claim to use the log raft, but whether this was for interior river or coastal lagoon service is unknown (Driver, 1939, section on "Navigation"). As with the dugout canoe in northwestern California, the log raft is more widely used in the interior, and its presence on the coast must be looked upon as due to spread from the hinterland.

Logs were used in Baja California on Cedros Island (lat. 28°15') where cedar trees are common in the mountainous interior, near Cape San Lucas to the north of which pines grow on the slopes of the Sierra de la Victoria, and in the Bay of La Paz inside the Gulf of California north of Cape San Lucas. Boats constructed of logs were rafts and nowhere was the dugout used.

Ulloa, who visited Cedros Island in 1539, has left the following description of the raft seen at Morro Redondo (lat. 28°2'):

They had five or six rafts which they had used in fishing, made of pine or cedar timbers, as long as 12 or 15 feet and so big that a man could hardly reach around them. The part under water is rounded, and where the people stand on them is flat. They are not hollow in any part. On each side, to maintain the balance, there are bundles of many cedar poles, closely tied together, as long as the canoes themselves. They rowed them with paddles two or three palms long and about three fingers across, at the end of each a three-cornered triangular piece of wood of this shape [arrowhead] five or six fingers from point to point. [Ulloa *in* Wagner, 1925, p. 52.]

This log raft appears to have been made of a single split cedar log stabilized by bundles of cedar poles lashed on each side. This is certainly a unique boat type for the Californias. Although the use of stabilizers is known in Oceania and Colombia (Hornell, 1928), we would draw no connection between these and the Baja Californian occurrence.

At La Paz Bay and probably referring to the Guaicurá (though possibly to the Pericu islanders of Espiritu Santo), Cardona in 1617 said—

Their vessels are of three bundles of thin canes, two at the sides and one in the middle, very well tied in such a way that two persons travel on each of them. They also have another class of vessel which is of three logs fastened together. On each an Indian goes out to fish. They row with both hands, with an oar with two blades. [Cardona, 1868, p. 35.]

In the south near Cape San Lucas rafts described as "bark-logs" were used. These were apparently made of *Ceiba* (cork) logs, although the local pine may have also served for this purpose. Pines grow in the interior at high elevations, and it is not known whether the Indians could carry them down to the sea (Rogers, 1928, p. 231; Baegert, 1772, pt. 2, sect. 4). They were propelled with the double-bladed paddle and served the natives in fishing (Rogers, 1928, p. 231; Shelvocke, 1928, p. 226; Clavigero, 1937, p. 100). Shelvocke (1928, p. 226) describes the log raft as follows:

... they go out to sea on their bark-logs, which are only composed of five logs of a light wood, made fast to one another by wooden pegs; on these they venture out rowing with a double paddle.

An earlier description by Clavigero reads—

In order to fish on the high sea in this second way they use a simple raft composed of three, five, or seven logs fastened together with sticks and well tied; the log in the middle, which extends farther because of being longer, serves as a prow. The wood from which these rafts are made is cork (a tree already described by us), because it is lightest. On each of them, according to their size, 2 or 3 men take their places and depart 4 or 5 miles from the coast, without fear of the very high waves of the Pacific Sea, which at times, seem to lift them as far as the clouds and at times to bury them in the bottom of the sea. [Clavigero, 1937, p. 100.]

Clavigero refers again (op. cit., p. 50) to the "Corcho" from which the Indians make rafts. This is to be identified with the *Ceiba acuminata*.

The combination of a raft and the double-bladed paddle presents such a degree of discordance as to lead to the conclusion that the raft in this region was possibly a recent introduction to a people who already knew the balsa and double paddle, or that the paddle was borrowed from natives in the Gulf where it is the common means of propulsion.

PLANK CANOES

In the whole coastal area from the California-Oregon boundary to the southern tip of Baja California is a single small littoral strip where multiplank canoes were used. This restricted area is the Santa Barbara Channel, which was occupied in ethnographic times by the Chumash Indians. The plank boat was in use on the mainland between Point Concepcion (lat. 34°50' N., long. 121°50' W.) and Point Dume (lat. 34° N., long. 119°15' W.) and on the offshore islands of Santa Barbara, Santa Rosa, and San Miguel at the time of the early Spanish explorations (1542-1770). The plank boat was not used by the Luiseño, Juaneño, or Diegueño so far as known. The relatively sheltered waters of the channel seem to have permitted the safe employment of this boat, and to this extent environmental

determinism may be assumed to have operated. North of Point Concepcion the rocky unsheltered coast was hardly suitable for employment of the fragile plank boat, and there is no evidence of its presence in early historic times. Cermeño in 1595 noted the tule balsa at San Luis Obispo Bay (lat. 35°20') some forty-five miles north of Point Concepcion (Wagner, 1929, p. 161; 1924, p. 16). But in 1775 Pedro Fages mentioned plank canoes in this same bay (Fages, 1937, pp. 51-52; see also Wagner, 1929, p. 371), as did Vancouver in 1793 (Vancouver, 1798, vol. 2, p. 445). This conflict in evidence would lead one to suspect a local replacement of the original tule



FIGURE 12.—The Chumash plank canoe.

balsa by the plank boat in post-Hispanic times. Documentary evidence for such introduction and substitution is to be found in the statement of Fr. Pedro Font in 1776 that their expeditionary force escorted six Christian Indians from Mission San Luis Obispo to the Santa Barbara Channel where they bought, with glass beads, two plank canoes. The Spanish party continued on south, the Obispeño returned to their home with the boats (Bolton, 1930, p. 453). The exact date of the first transfer to San Luis Obispo Bay of the southern plank boats cannot be determined, though it could hardly have been much before 1772, since Mission San Luis Obispo was founded at that time. The boat Vancouver saw was undoubtedly one of the imported Channel Chumash canoes.

The construction and form of the Chumash plank canoe has been treated fully in other papers (Woodward, 1934; Heizer, 1938, 1940 b, 1941; Robinson, 1942; Kroeber, 1925, pp. 558-559), and these points need only be summarized here. The average canoe measured about 25 feet in length (range 12 to 30 feet), 3 to 4 feet in breadth, and about 3 feet in depth. The foundation of the boat was a heavy flat-bottom plank with two end posts bound on with cords through drilled holes. Taking off from each side of the base plank at an angle of 50 to 60 degrees, were longitudinally laid planks, each about 3 feet in length, 6 inches wide, and a half inch thick. Each short plank was tied on all four edges to the adjoining planks by sewing through drilled holes. Each course of planking was calked with quantities of asphaltum applied when hot and viscous. The canoe had no internal ribs or frames, and was strengthened solely by means of a center gunwale thwart which also served as a seat. From the descriptions of the

boat which have come down to us in historical accounts, one gets the impression that the canoe was a rather weak and unstable craft. This, however, was not the case—the canoe was of light weight and flexible construction, and the weight of the paddlers who kneeled in the bottom tended to draw the gunwales together and tighten the seams (Heizer, 1940 a). The liberal quantities of asphaltum used undoubtedly were helpful in making the boat seaworthy, and it is difficult to imagine the Chumash canoe without this asphaltum which was so abundant in their territory. The plank canoe had an unusual profile. The planking at the bow and stern was elevated, leaving the center gunwales low. The reason for this feature was probably to prevent a following wave from coming into the boat when landing in the surf. Three or four people at most were all that were observed to ride in one of these boats, although early explorers repeatedly estimate that the canoes had a potential capacity of 8 or 10, or even 20. Thus size was a misleading factor to the Spanish observers, while the Indians undoubtedly knew from long experience how many could safely ride in the plank canoes. The double-bladed paddle was used to propel these ocean-going canoes, and they were well made with the blades mortised to the handle. The paddle was from 6 to 10 feet in over-all length.

Some of the more detailed descriptions by early observers are given below—others may be consulted in the special papers on the Chumash plank canoe (Heizer, 1938, pp. 194–207; Robinson, 1942, pp. 203–209). Miguel Costanso, engineer of the Portola expedition of 1769–70, says:

The expertness and skill of these Indians is unsurpassed in the construction of their canoes of pine boards. They are from eight to ten yards in length from stem to stern post, and one yard and a half in breadth. No iron whatever enters into their construction and they know little of its use. But they fasten the boards firmly together, making holes at equal distances apart, one inch from the edge, matching each other in the upper and lower boards, and through these holes they pass stout thongs of deer sinews. They pitch and calk the seams, and paint the whole in bright colors. They handle them with equal skill, and three or four men go out to sea to fish in them, as they will hold eight or ten men. They use long double-bladed oars, and row with indescribable agility and swiftness. . . They hold intercourse and commerce with the natives of the islands. [Costanso, 1910, pp. 136–139.]

Fr. Pedro Font wrote in 1776 of the Chumash plank boat, and his description has come down to us as the best single detailed account:

The Indians are great fishermen and very ingenious. . . Above all, they build launches with which they navigate. They are very carefully made of several planks which they work with no other tools than their shells and flints. They join them at the seams by sewing them with strong thread which they have, and fit the joints with pitch, by which they are made very strong and secure. Some of the launches are decorated with little shells and all are painted red with

hematite. In shape they are like a little boat without ribs, ending in two points somewhat elevated and arched above, the two arcs not closing but remaining open at the points like a V. In the middle there is a somewhat elevated plank laid across from side to side to serve as a seat and to preserve the convexity of the frame. Each launch is composed of some twenty long and narrow pieces. I measured one and found it to be thirty-six palms long (24 to 26 feet) and somewhat more than three palms high (2 to 3 feet). In each launch, when they navigate or go to fish, according to what I saw, ordinarily not more than two Indians ride in each end. They carry some poles about two varas long which end in blades, these being the oars with which they row alternately, putting the ends of the poles into the water, now on one side and now on the other side of the launch. In this way they guide the launch wherever they wish, sailing through rough seas with much boldness. [Bolton, 1930, pp. 252-253.]

Archibald Menzies, naturalist of the Vancouver expedition, described the Santa Barbara canoes in 1795 as:

... from 14 to 18 foot long and in the middle about four feet wide and tapering to both extremities. They were made of different pieces of wood curiously sewd together, their Paddle was about half the length of the Canoe and bladed at each end so as to be held by the middle and used alternately on each side. ... [Menzies, 1924, p. 315.]

In another place Menzies gives further data on the canoe:

The make and formation of their Canoe shewd no small degree of ingenuity as it is regularly built of different pieces of boards of various sizes and figures and neatly fastened together with Thongs and Sinews & glewed so close as to be quite water tight and preserves its shape as well as if it had been made of one piece, without any other timber to strengthen it but one small thort in the middle, from thense it rises gradually & tapers to both extremities, where it is double pointed by a small notch at each end— These Canoes are from 12 to 18 feet in length & in the middle about 4 feet wide, they are large enough to carry about half a dozen of the Natives in smooth water and are extremely serviceable to them for the purpose of fishing in the channel as we had the pleasure to experience during our stay by the plentiful supply of Fish they daily brought us— Canoes made in this manner are to be met with no where else in California, & the inducement to form these of such scanty materials might probably originate in a desire of visiting & keeping up an intercourse with the adjacent Islands which as the sea is smooth and the climate is serene is frequently affected without danger.— Their paddle we have already seen is about half the length of the Canoe, bladed at both ends & used alternately on each side. [Menzies, 1924, pp. 325-326.]

THE DOUBLE-BLADED PADDLE IN THE NEW WORLD

At an earlier time it was felt that the isolated occurrence of the double-bladed paddle at San Francisco Bay and the Santa Barbara Channel (for long the only recognized California instances) presented a problem referable in some manner to the classic Eskimo use of this instrument (Kroeber, 1925, p. 559). In the present paper we have established the fact that the double-bladed paddle is found along the east and west coasts of Baja California, at San Diego, Santa Barbara, Monterey Bay, San Francisco Bay, Drake's Bay,

and Bodega Bay. Here is clearly a continuous and unitary distribution of this instrument. The presence of this type of paddle among the Seri of the north Mexican mainland is most easily explained as having been adopted from the Peninsular tribes (Cochimi?) who, at least with reference to the Seri, form a local center of gravity.

Birket-Smith (1929, p. 262, table A51) lists the double paddle among the following New World Eskimo groups: Northeast Greenlanders, East Greenlanders, West Greenlanders, Polar Eskimo, Labrador, Baffin Island, Iglulik Eskimo, Southampton Island, Caribou Eskimo, Netsilik Eskimo, Copper Eskimo, Mackenzie Eskimo, Point Barrow, Bering Strait region, Pacific Eskimo (Koniag), and Aleut. The Chukchi and Koryak on the adjoining coast of north-eastern Asia also know this instrument.³

In South America the double-bladed paddle is known by the Agaces Indians of the Rio Paraguay, the Tamoyos on the Rio de Janeiro, from northern Chile, and archeologically from Arica (Nordenskiöld, 1931, pp. 88-89, map 22). As Birket-Smith (1929, p. 174) points out, there is some evidence that European sportsmen and African slaves may have introduced the double-bladed paddle into certain parts of South America and the southern United States. Lothrop (1932, pl. 21, fig. *b*; pl. 20, figs. *a*, *b*; p. 242) shows that the double-bladed paddle was used to propel the seven-plank *dalca* and the sealhide float of Chile.⁴

From these data it would appear that the double-bladed paddle has had a complicated, and in several instances, a local and independent history of development. The Eskimo block may or may not be connected with the Asiatic occurrences, and for a discussion of this problem we refer the reader to Birket-Smith (1929, pp. 79, 174-175). The great gap between the southernmost Eskimo (Koniag) and northernmost Californian occurrence (Bodega Bay) of the double-bladed paddle seems to be an area which has never known this implement. The gap between the southernmost Californian (Cape San Lucas) and the nearest South American occurrence (Peru) is again so large that we are left with the only possible explanation of the California distribution block as historically independent and unrelated

³ Also in Asia it is recorded for the Yukaghir, Chuvantsi, Kolyma Russians, Kuril, Goldi, Managir, Orochi, Daurians, Olcha, Lamut, Tungu, Manchu, Yakut, Yeneseians, Samoyed, and (?) Zyryans (Birket-Smith, 1929, pp. 340-341, table B37.) This paddle form has also been noted from the Danish peat bogs (Late Paleolithic?) and from Yemen. In Africa it is known in Cameroon (Birket-Smith, 1929, p. 174). Pitt-Rivers (1906, p. 206) mentions its occurrence on the Egyptian Upper Nile and in the Sulu Archipelago.

⁴ In addition to the illustrations in Lothrop's paper, we call attention to the double-log raft with lattice decking from the Chilean coast shown by Poeppig (1835, vol. 1, pp. 304-305, atlas). The Peruvian coast sealhide float and double paddle at Iquique Island (latitude 19°50' S.) are noted by Shelvocke. This account also contains an excellent description of the Chilotan three-plank *dalca*. As a further addition to Lothrop's data, see the sixteenth-century drawing of the Peruvian sailing catamaran in Taylor (1932, pl. opp. p. 366).



MAP 7.—Distribution of the double-bladed paddle in the New World.

1., E. Greenland Eskimo. 2, W. Greenland Eskimo. 3, Labrador Eskimo. 4, Southampton Island Eskimo. 5, Iglulik Eskimo. 6, Baffin Island Eskimo. 7, Netsilik Eskimo. 8, Caribou Eskimo. 9, Copper Eskimo. 10, Chipewyan. 11, Mackenzie Eskimo. 12, Kutchin. 13, Point Barrow Eskimo. 14, Bering Strait Eskimo. 15, Nunivak Island Eskimo. 16, Pacific Eskimo (Koniag). 16-A, Tanaina. 17, Aleut. 18, Coast Miwok (Bodega Bay). 19, Coast Miwok (Drake's Bay). 20, Costanoan (San Francisco Bay). 21, Costanoan (Monterey Bay). 22, Chumash (Sta. Barbara Channel and Islands). 23, Gabrieleño (Sta. Catalina Island). 24, Diegueño (San Diego Bay). 25, Baja California tribes (Kiliwa, Cochimi, Pericue, etc.). 26, Seri (Tiburon Island). 27, Peruvian Coast. 28, Arica (archeological occurrence). 29, Agaces (Rio Paraguay). 30, Tamoyos (Rio de Janiero). 31, Chilean coast.

Sources for map occurrences: 1-14, 16-17, Birket-Smith, 1929; 15, Margaret Lantis, information; 16-A, Osgood, 1937; 18-26, from data enclosed in this paper; 28-30, Nordenskiöld, 1931; 31, Lothrop, 1932.

to other New World areas of use of this paddle form. How and where, then, did the California double-bladed paddle originate?

The distribution maps of this paper indicate that the double-bladed paddle has a wider distribution than either the log raft, dugout, or plank canoe, and approximates most closely the distribution of the balsa. Apparently the double paddle is old—perhaps as old as the balsa on the coast, and almost certainly older than the log raft (of Baja California), the dugout (Luiseño), or plank canoe (Santa Barbara Channel). For all practical purposes, we can only decide that the balsa and double paddle are the oldest boat and paddle forms on the coast south of Bodega Bay, and that the other types of boats (dugout, log raft, plank canoe) are later developments which have simply adopted the preexistent paddle type. To some extent the double paddle must have had an effect upon the form of these later boats, for it is of necessity that only a narrow boat can be propelled with such a paddle. The problem of the age of the northern California dugout is referable to that of the antiquity and spread of dugout boats on the Northwest Coast proper.

Kroeber seems to have hit upon the probable manner of origin of the double-bladed paddle, and it is to be noted that he was, at the time he wrote, unacquainted with its fuller Californian distribution which has been established here. Kroeber says, in discussing the double-bladed paddle of the Seri:

This type of paddle is established for the Seri, Santa Barbara islanders, the San Francisco Bay Indians, then apparently is lacking until the Eskimo-Aleutian area. Among the Chumash it is native and associated with the plank-built canoe. On San Francisco Bay it was used with the rush balsa, and may or may not be due to Aleutian sea-otter hunters introduced by the Russians.⁵ It seems possible that the Seri and Chumash occurrences would prove connected by occasional use in Baja California if we had fuller data, since some of the natives there went several leagues out into the open sea. We are so accustomed to think of the two-bladed paddle as an adjunct of the specialized kayak, that it too impresses as a complicated device, inappropriate with a simple raft. As a matter of fact, wherever scarcity of wood, or lack of skill and usage in working it resulted in a paddle blade being cut separately from the shaft, the inventive step from attaching one blade to attaching two blades would have been insignificant—in fact, would be an improvement or variation rather than an invention.⁶ The determining factor as to its adoption would probably be the type of navigation as set by water conditions. This is borne out by the distribution of the double paddle, which clings to areas of open salt-water navigation or large bays approxi-

⁵ The double paddle is attested for the San Francisco Bay Costanoans long before the Russians began their penetration into California.

⁶ This is no doubt true, but as we have shown in this paper, many of the California double paddles were made by simply flattening each end of a pole. (See pl. 20.) The single-piece paddle with narrow blades is presumably a rude imitation of the better-finished composite form of, for example, the Chumash (pl. 21). Not all Chumash paddles were so well made. (See the illustration of a paddle blade in Robinson, 1942, fig. 21.) The Pomo, according to Gifford and Kroeber, (1937, p. 185, fn. 526), made single-bladed paddles with a detachable blade.

mating open water conditions. On rivers and lakes the double paddle would rarely help and often be in the way. In this way the varying association with skin boat, wooden boat, and raft boat seems accounted for. Another factor must be the size of the vessel navigated. A broad or high canoe would scarcely allow of alternate paddling on both sides. This may be the cause of the absence of the implement on the Northwest Coast. Whether the Arctic and the California-Seri occurrences are to be historically connected, must probably be left an open question for the present. An answer in favor of connection will evidently depend on the establishment of sufficient other connections to set up a favorable presumption. Until then, the considerations just mentioned make the possibility of independent origin equally plausible. [Kroeber, 1931, pp. 20-21.]

The question of where the Californian double-bladed paddle originated is more difficult to answer. As Kroeber indicates, it is not used in the interior on rivers or lakes, and seems to have spread solely along the coast via the open coastal salt-water line of contacts. The balsa extends in the interior as far as the peripheral Thompson and Klamath (Wilkes, 1844, vol. 5, p. 253), but south of here is found in ever increasing use. On the coast it terminates in the north at Bodega Bay. There is, from these facts, presumptive evidence that the balsa has spread northward with its means of propulsion, the double paddle. Where in the south should we look for the place of origin of this paddle? Hardly to Baja California among the culturally and manually backward groups. This leaves us with the Santa Barbara Channel region among the Chumash, accomplished and dexterous woodworkers and authors of a technologically advanced civilization. Although acceptance of this theory of a Channel origin of the double-bladed paddle necessitates adherence to the additional hypothesis of a subsequent northward and southward coastal diffusion, this latter seems not improbable, since intergroup contacts along the coast have probably always existed. This suggestion begs the question of how the double paddle became associated with the balsa, and the history of both types subsequent to their adhesion.

For the history of the double-bladed paddle in the New World we offer the following suggestions. The Californian coastal occurrences may be considered an historical unit, with a possible locus of origin among the Chumash of the Santa Barbara Channel at a time before the development of the plank canoe. The presence in California of this paddle form is historically independent of that of the Eskimo unit far to the north, and of the South American occurrences far to the south. Thus, on the basis of the New World data alone, there is presumptive evidence that the double paddle has had at least three separate and independent developments. Offhand, the several widely separated South American occurrences may indicate plural origins there, and the Old World examples, some isolated and remote, may be considered other evidence, if such be needed, that Kroeber's suggestions of the technological ease of the invention of this paddle

form may be accepted. Theoretically within the Californian coast area there may have been plural origins, although the continuous geographical distribution of the form among relatively simple and uninventive groups could hardly be considered strong support for such an hypothesis.

R. F. H.

May 1952

NOTE

Since this paper was written 10 years ago, some new information on boats of the Pacific coast has become available. In particular there should be mentioned the excellent summary of Mayan and Mexican canoes and navigation by J. E. S. Thompson (1951) which effectively closes the last major gap in a series of syntheses of aboriginal navigation from Tierra del Fuego to Bering Strait. It should now be easy to discuss Pacific coast navigation as a unit from the historical point of view.

The monumental handbook of South American Indians unfortunately lacks a summary of boats, though the several regional survey volumes contain the essential data. A recent work by Castillejo (1951) on Arawak and Carib boats is useful.

The Baegert account of Baja California has recently been translated by M. Brandenburg and C. Baumann and published by the University of California Press (1952).

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BIBLIOGRAPHY

ANONYMOUS.

1894. Some of the ancient uses of asphaltum by the aborigines of California. *Sci. Amer. Suppl.* No. 994, p. 15085.

BAEGERT, J.

1772. *Nachrichten von der Kalifornischen Halbinsel.* Mannheim.

BARNETT, H. G.

1937. Culture element distribution: VII, Oregon Coast. *Univ. Calif. Anthropol. Records*, vol. 1, No. 3. Berkeley.

BIRKET-SMITH, K.

1929. The Caribou Eskimos. Report of the Fifth Thule Expedition, 1921-1924, vol. 5, pt. 2. Copenhagen.

BOLTON, H. E.

1916. *Spanish exploration in the Southwest.* New York.
 1926. *Historical memoirs of New California* by Fr. Francisco Palóu. Berkeley.
 1927. Fray Juan Crespi, missionary-explorer on the Pacific Coast, 1769-1774. Berkeley.
 1930. Fr. Pedro Font's complete diary (vol. 4 of Anza's California Expeditions). Berkeley.

CARDONA, NICHOLÁS DE.

1868. *Relacion del descubrimiento del reino de la California por el capitan y cabo Nicolás de Cardona.* In *Torres de Mendoza, Coleccion de Documentos Ineditos, relativos al descubrimientos . . .*, vol. 9. Madrid.

CASTILLEJO, R.

1951. Medios de transporte. *Divulgaciones del Instituto de Etnología*, vol. 2, pp. 57-125. Univ. del Atlantico, Baranquilla, Colombia.

CLAVIGERO, F. J.

1937. A history of (Lower) California. Trans. by S. E. Lake and A. A. Gray. Stanford Univ. Press. Palo Alto.

CHORIS, L.

1822. Voyage pittoresque autour du monde. Paris.

COLNETT, J.

1940. The journal of Captain James Colnett aboard the *Argonaut* from April 26, 1769, to November 3, 1791. Publ. Champlain Soc., No. 26. Toronto.

CORNEY, P.

1896. Voyages in the North Pacific Ocean (in 1817). Honolulu.

COSTANSO, M.

1910. The narrative of the Portola Expedition of 1769-1770 by Miguel Costanso. Edited by A. van Hemert-Engert and F. J. Teggart. Publ. Acad. Pacific Coast Hist., vol. 1, pp. 90-159. Berkeley.

DAVIS, E. H., and DAWSON, E. N.

1945. The savage Series of Sonora. Sci. Monthly, vol. 40, pp. 193-202, 261-268.

DERBY, G. H.

1932. The topographical reports of Lieutenant George H. Derby. Quart. Calif. Hist. Soc., vol. 2, Nos. 2, 3, 4.

DRIVER, H. E.

1939. Culture element distributions: X, Northwest California. Univ. Calif. Anthropol. Records, vol. 1, No. 6. Berkeley.

FAGES, P.

1937. A historical, political and natural description of California by Pedro Fages. Trans. by H. I. Priestly. Berkeley.

FRIEDERICI, G.

1907. Die Schiffart der Indianer. Stuttgart.

GIFFORD, E. W., and KROEBER, A. L.

1937. Culture element distributions: IV, Pomo. Univ. Calif. Publ. Amer. Arch. Ethnol., vol. 37, No. 4. Berkeley.

HARRINGTON, JOHN P.

1942. Culture element distributions: XIX, Central California Coast. Univ. Calif. Anthropol. Records, vol. 7, No. 1. Berkeley.

HEIZER, R. F.

1938. The plank canoe of the Santa Barbara region, California. Ethnol. Studies, vol. 7, pp. 193-227. Gothenburg, Sweden.
1940 a. Aboriginal use of asphaltum by the California Indians. California State Div. of Mines, Bull. 118, pp. 73-75. Sacramento.
1940 b. The frameless plank canoe of the California Coast. Primitive Man, vol. 13, pp. 80-89. Catholic Univ. Amer. Washington, D. C.
1941. The distribution and name of the Chumash plank canoe. The Masterkey, vol. 15, pp. 59-61. Southwest Mus. Los Angeles.

HORNELL, J.

1928. South American balanced canoes. Man, August, No. 102.

KHLEBNIKOV, K. T.

1940. Memoirs of California by K. T. Khlebnikov. Trans. by A. G. Mazour. Pacific Hist. Rev., vol. 9, pp. 307-336.

KOTZEBUE, O. VON.

1821. A voyage of discovery into the South Sea and Beerings Straits . . . 1815-1818. 3 vols. London.

KROEBER, A. L.

1925. Handbook of the Indians of California. Bur. Amer. Ethnol. Bull. 78.

1931. The Seri. Southwest Mus. Pap. No. 6. Los Angeles.

LANGSDORFF, G. H. VON.

1814. Voyages and travels in various parts of the world, during the years 1803-07. 2 vols. London.

LAPEROUSE, J. F. G. DE.

1798. A voyage around the world, in the years 1785-1788. 2 vols. London.

LOEB, E. M.

1926. Pomo folkways. Univ. Calif. Publ. Amer. Arch. Ethnol., vol. 19, No. 2.

LOTHROP, SAMUEL K.

1932. Aboriginal navigation off the west coast of South America. Journ. Roy. Anthrop. Inst., vol. 62, pp. 229-256. London.

MARTÍNEZ, JOSÉ LONGINOS.

1938. California in 1792. Trans. by Leslie Simpson. San Marino.

MAURELLE, F.

1781. Journal of a voyage in 1775 to explore the coast of America, northward of California . . . by Don Francisco Maurelle. In Daines Barrington's Miscellanies, pp. 471-534. London.

McGEE, W. J.

1898. The Seri Indians. 17th Ann. Rep. Bur. Amer. Ethnol., 1895-96, pt. 1, pp. 1-128, 129*-344*.

MENZIES, A.

1924. Archibald Menzies' journal of the Vancouver Expedition. Introduction and notes by Alice Eastwood. Quart. Calif. Hist. Soc., vol. 2, pp. 265-340.

NORDENSKIÖLD, E.

1931. Origin of the Indian civilizations in South America. Comp. Ethnogr. Studies, vol. 9, pp. 1-94.

OLSON, R. L.

1927. Adze, canoe, and house types of the Northwest Coast. Univ. Washington Publ. in Anthrop., vol. 2, No. 1. Seattle.

ORTEGA, FRANCISCO DE.

1631. Primer demarcación de las islas Californias, etc. Ms. in Bancroft Library, Univ. Calif., Berkeley.

1633. Descripción y demarcación de las yslas Californias, etc. Ms. in Bancroft Library, Univ. Calif., Berkeley.

OSGOOD, C.

1937. The ethnography of the Tanaina. Yale Univ. Publ. Anthrop., No. 16. New Haven.

PITT-RIVERS, A. F.-L.

1906. The evolution of culture. Oxford.

POEPPIG, E. F.

1835-1836. Reise in Chile, Peru und auf dem Amazonstrome während der Jahre 1827-32. 2 vols., atlas. Leipzig.

ROBINSON, E.

1942-43. Plank canoes of the Chumash. The Masterkey, pt. 1, vol. 15, pp. 202-209 (1942); pt. 2, vol. 17, pp. 13-19 (1943). Southwest Mus. Los Angeles.

ROGERS, WOODES.

1928. A cruising voyage around the world, 1708-11. New York.

SALES, L.

1794. *Noticia de la Provincia de Californias en Tres Cartas*. Vol. 1. Valencia.

SHELVOCKE, GEORGE.

1928. *A voyage around the world*. London.

SIERRA, B. DE LA.

1930. Fray Benito de la Sierra's account of the Hezeta Expedition to the Northwest Coast in 1775. *Quart. Calif. Hist. Soc.*, vol. 9, pp. 201-242. Trans. by A. J. Baker, notes by H. R. Wagner.

SPARKMAN, P. S.

1908. The culture of the Luiseño Indians. *Univ. Calif. Publ. Amer. Arch. Ethnol.*, vol. 8, No. 4. Berkeley.

TARAVAL, FR. SIGISMUNDO.

1931. The journal of the Indian uprising in Lower California. Trans. by M. E. Wilbur. The Quivira Soc. Los Angeles.

TAYLOR, A. S.

- 1860-1863. The Indianology of California. *In* The California Farmer and Journal of Useful Sciences, Feb. 22, 1860-Sept. 11, 1863. (Reference here is to installments No. 11, May 18, 1860, and No. 13, June 1, 1860.)

TAYLOR, E. G. R.

1932. Francis Drake and the Pacific: Two fragments. *Pacific Hist. Rev.*, vol. 1, pp. 360-369. Los Angeles.

THOMPSON, J. E. S.

1951. Canoes and navigation of the Maya and their neighbors. *Journ. Roy. Anthropol. Inst.*, vol. 79, pp. 69-78.

UNITED STATES HYDROGRAPHIC OFFICE.

1880. The West Coast of Mexico. *Bur. Navigation, Bull.* 56.

VANCOUVER, GEORGE.

1798. *A voyage of discovery to the North Pacific Ocean and round the world*. . . 2 vols. London.

WAGNER, H. R.

1924. The California voyage of Sebastián Rodriguez Cermeño in 1595. *Quart. Calif. Hist. Soc.*, vol. 3, No. 1.
1925. *California voyages, 1539-1541*. San Francisco.
1929. *Spanish voyages to the Northwest Coast of America*. San Francisco.
1930. Pearl fishing enterprises in the Gulf of California. *Hispanic Amer. Hist. Rev.*, vol. 10, No. 2. Durham, N. C.
1931. The last Spanish exploration of the Northwest Coast and the attempt to colonize Bodega Bay. *Calif. Hist. Soc. Quart.*, vol. 10, pp. 313-345. San Francisco.

WILKES, C.

1844. *Narrative of the U. S. Exploring Expedition during the years 1838-42*. 5 vols. Philadelphia.

WOODWARD, A.

1934. An early account of the Chumash. *The Masterkey*, vol. 8, pp. 118-123. Southwest Mus. Los Angeles.