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An outstanding event in the history of New Zealand archaeological discovery is the recent recovery (in September, 1958) from a North Island swamp—the bed of a former extensive lagoon—of a large and expertly fashioned outrigger float. Evidence of the presence and the former use of the outrigger as a navigational aid within the New Zealand area is extremely rare, but one previous example is known and a second inferred, the latter by the recovery of an example of a canoe type obviously dependent on this stabilizing device. Buck (1927, p. 273) has stated that the early employment of the single outrigger canoe in the New Zealand region speedily went into disuse: that it was seen by Captain Cook and his company in only two localities, Te Mahia and Queen Charlotte Sound (Best, 1925, p. 15); and that early missionaries and settlers have made no reference to it. However, there is the archaeological evidence from the two other places not known at the time of Cook, and both are in the South Island, the more relevant being Monck's Cave, on the margin of Banks Peninsula, near Sumner.

In 1889, following the excavation of Moa-bone Point Cave on the Christchurch-Sumner road under the direction of Julius Haast in 1872, John Meeson (1890) and H. O. Forbes (1891) undertook the examination of the then newly opened Monck's Cave. Monck's Cave is located in an embayment of that name on the north-west border of the Bank's Peninsula hill-system a mile north-east of Moa-bone Point Cave and the same distance south-west of Sumner. The Moa-bone Point Cave had remained open to all comers since the time of its earliest human occupation, but Monck's Cave "had been sealed by a landslide in pre-European times" (Skinner, 1924, p. 151), and very probably in times ante-dating the Ngai-Tahu invasion (Meeson, 1890, p. 65). Hutton indeed emphasizes the latter probability (1892, p. 164), and suggests good reasons for setting a Ngati-Mamoe date for its final occupation prior to the cliff-fall that masked all knowledge of its existence until 1889.

The data supplied by Monck's Cave is of importance in presenting the theme of the present paper. The clues it supplies for an assessment of the cultural origins of its contents are relevant and need a brief resumé here. The removal for road maintenance of the slipped debris that sealed the cave—a mass 40 yards through

PLATE 1, FIG. 1.—The Te Horo outrigger float; upper side showing peg and lashing holes (5 sets); FIG. 2—Rear end of float, with holes of Set A; FIG. 3—Middle of float, with holes of Set B (left) and Set C (right); FIG. 4—Forward end of float, with holes of Set D (left) and Set E (right).

is recorded by Meeson—revealed the former habitation cavity and within a week or two investigations were carried out by accredited representatives of the Philosophical Institute of Canterbury and of the Canterbury Museum, respectively, named above. Unfortunately, as deplored by Skinner (1924, p. 152), the precise methods of modern archaeology were not then in vogue, but the contents of this cave were recognized as falling into two separate groups—one, comprising objects lying on the surface or placed by their former owners in recesses in the walls of the cave, and the other, articles buried in its floor. Skinner (1924, p. 152) assigns to these two groups of cultural material separate culture origins—the excavated portion, a "Moa-hunter age", but the surface finds, including the outrigger float, as of later date, though "standing closer in time to the Moa-hunters" than to the present native inhabitants (the Ngai-Tahu).

The second piece of South Island evidence for the New Zealand incidence of the outrigger canoe is the locally unique form known as the Henley Canoe. This has been fully recorded and described by Best (1925, pp. 19-22 and Figs 7, 8, 9), who concludes his account by appending notes by the former owner of this fragmentary hull, Sir Frederick Chapman (1925, pp. 21-22). This canoe was recovered during drain-digging operations on the Henley Estate, about 1895. The locality is reclaimed swamp or former lagoon, near Waipori Lake at the southern end of the Taieri Plain, Eastern Otago, the terrain resembling in all essential respects the locality of the subject of the present paper.

Best emphasizes the dissimilar fundamental character of the Henley hull to the typical open basal hull portion of the Maori canoe, the former having the closed form and narrow longitudinal opening of the Melanesian outrigger type of dugout craft (Best, 1925, Fig. 9), and of certain smaller Polynesian canoes (Buck, 1929, p. 205). In his notes supplementary to Best's account, Chapman gives additional observations on the conditions of burial and on the technique of workmanship displayed by the remains of the Henley Canoe and says: "These indications seem to me to point to the conclusion that the canoe belonged to the Waitaha or some other very early inhabitants of the district." His cited evidence for a Waitaha origin seems lacking in cogency, but the alternative "some other early inhabitants" could refer to no other than the Ngati-Mamoe, an inference that falls into line with the tentative conclusions of Meeson, Hutton, and Skinner (loci cit.). The important point here, however, is that the only conclusion that can be drawn from a contemplation of the very constricted form of the Henley Canoe is that its operation would have been impracticable without the aid of an outrigger. Both Elsdon Best and Sir Peter Buck, therefore, concur in citing the Henley remains as a second instance of the archaeological occurrence of the outrigger device in the New Zealand area, and there the matter has remained for the past 65 years.

The recent discovery, here recorded, of another outrigger float greatly exceeding in size the Monck's Cave specimen, and obtained in excellent preservation from a North Island swamp, provides very welcome precise data on a subject "concerning which", as Best remarks, "it is [or has been] difficult to obtain any reliable information" (Best, 1925, p. 2). The float in question may be alluded to for purposes of easy reference as the Te Horo outrigger float. The location of its recovery is the dune-belt of Western Wellington at a place about 2 miles north-west of the small village of Te Horo on the Wellington-Palmerston North section of the North Island Main Trunk Railway, and some 33 chains inland from the present sea beach. The principal watercourse hereabouts is the Mangaone Stream, which crosses the

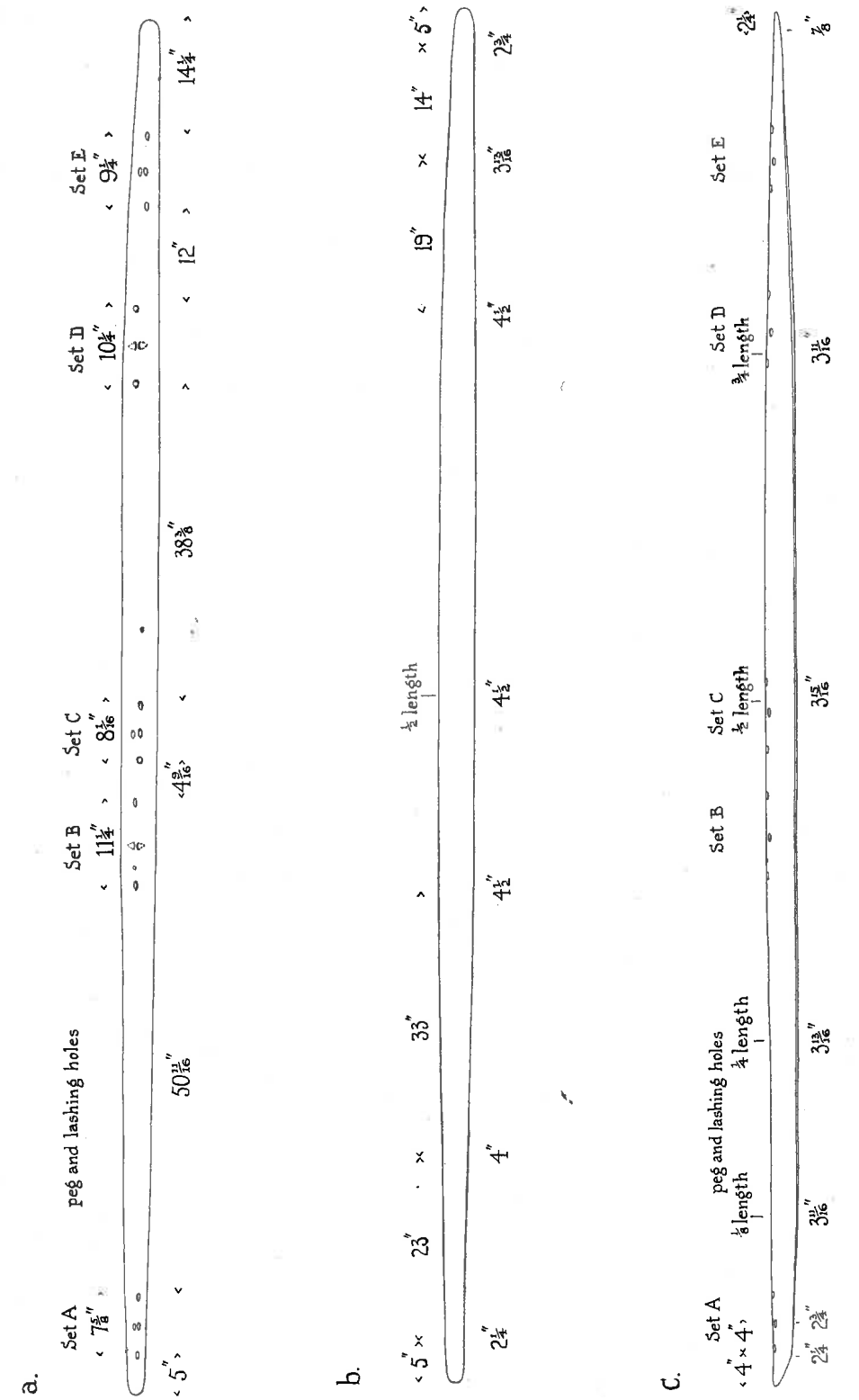

FIG. 1.—Longitudinal profiles of Te Horo outrigger float, 14 ft 3 in. in length. a—upper side, showing sets of peg and lashing holes, spacing, etc.; b—basal side, showing breadths; c—lateral aspect, showing thicknesses.

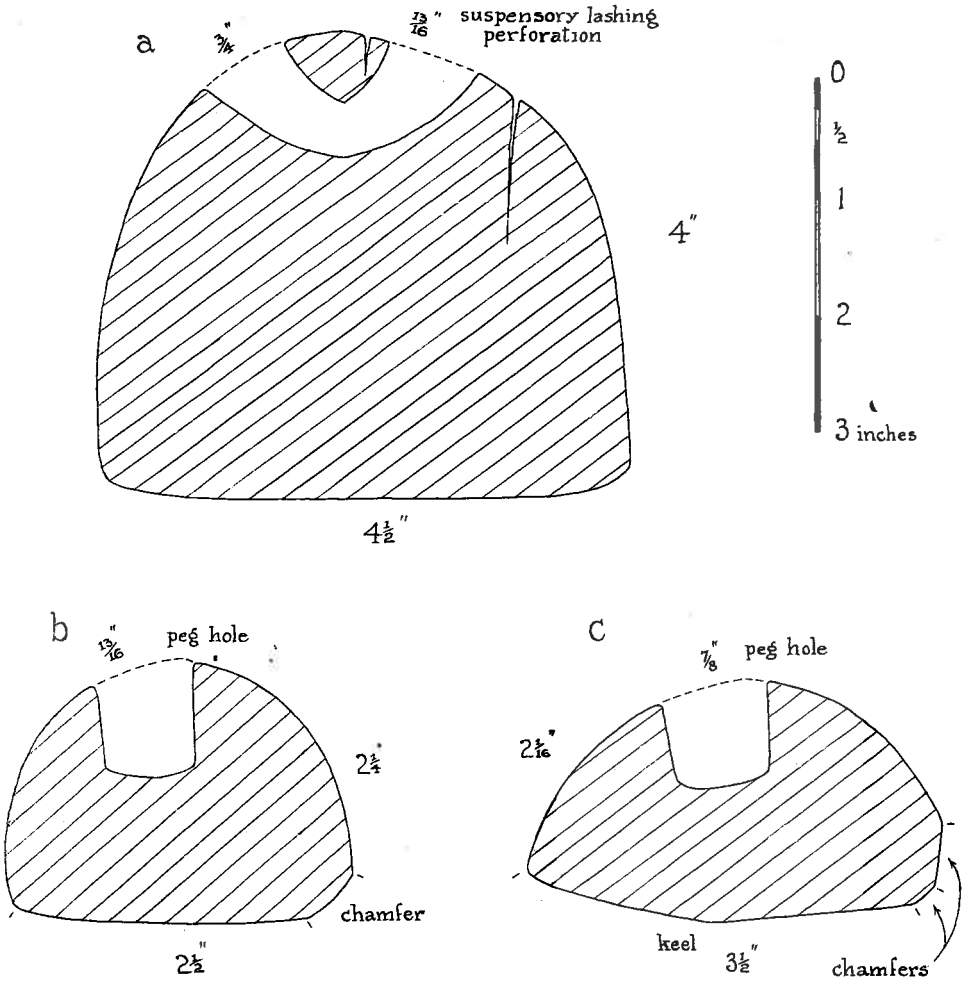

FIG. 2.—Cross-sections of Te Horo outrigger float. a—at half-length; b—at 5 inches from rear end; c—at 14½ inches from forward end.

coastal lowland, of which the dune-belt forms the outer part, from its source in the Tararua western foothills. Even in pre-European times the Mangaone had difficulty in maintaining a free outlet to the sea by reason of the vigorous development of dunes of blown sand. Ponding to form lagoons therefore tended to take place on its lower course, but the process seems to have been variable and intermittent, and changes in the position of broad shallow sheets of ponded water seems to have been a normal mutation of the landscape. The dune-formations in this locality have a tendency to assume a longitudinal trend, that is, parallel to the coast, with longitudinal depressions, usually waterlogged and the site of elongated swamps and lagoons, separating successive dune accumulations. There are two major developments of multiple dune ridges—an inner, older complex and a subsequent outer series—conspicuously separated by a large longitudinal depression or hollow, while other similar lesser hollows or vales intersect, quite irregularly, the respective dune belts. In pre-European times the main longitudinal furrow (incidentally specifically

referred to, farther to the south, by the old-time Maori as *kawaka,* a furrow) was flooded, where the Mangaone crossed it, to form an extensive lagoon, and it can be assumed that it was on this stretch of water that the outrigger canoe of which we now have the float, was navigated. It may be mentioned also, if only as an explanation of the present landscape regime, that in early European times another large lagoon was formed higher up the course of the Mangaone Stream, the channel of which had become at this stage again seriously blocked by sand drift. An artificial cut was made—the existing Gear's Drain or Mangaone Drain—to discharge the later lagoon to the sea by the more stable outlet of the neighbouring Paraha Stream, and a large lateral drain was also opened. The latter was effective in reducing the older lagoon mentioned above to the present longitudinal swamp, the northern end of which thereby became converted into good agricultural land. It was during ploughing operations on this fully drained former swamp area that the splendid specimen of an ancient outrigger float was brought to light. The owner of the property, Mr T. R. Pinfold, was not at first aware of the nature of what his plough had laid bare, but with great foresight and discrimination distinguished the beam of dressed timber from the numerous tree trunks embedded in the swamp, and extracted and preserved it with commendable care.

The Te Horo outrigger float has a length of 14 ft. 3 in. as against 5 ft. 11½ in. of the Monck's Cave specimen. The most remarkable circumstance, however, is that the Te Horo float has a pattern of attachment holes (which are commonly of variable character in outrigger design) exactly matching their counterparts in the Monck's Cave example. In 1927 Buck (1927, pp. 265-268, 274) compiled useful details of outrigger design and float-attachment methods of examples found in the Pacific region but did not, at that time, include a description of the latter technique of the kind required for the fastening of the Monck's Cave and the Te Horo floats of New Zealand. The pattern of the indicated attachment contrivance of these is identical. In general shape, also, these two floats are very similar indeed, especially as viewed from directly above, although when laterally viewed the Te Horo float is seen to be straighter than the other, the profile of which is shown by Skinner (1924, Plate 25; 1927, Plate 1) to have distinct upcurved termini.

In broad terms the Pacific outrigger floats (*ama*) fall into two classes—(1) those that are attached to the cross booms (*kiato,* Polynesian, *hokai, toro,* Maori) directly, i.e., tightly and rigidly lashed with boom and float in juxtaposition; and (2) those attached indirectly, i.e., by means of perpendicular pegs and pliant lashing, with the principal members of the contrivance spaced to a height equal (or approximately so) to that of the canoe bulwark. Buck calls attention to the "considerable variation" (Buck, 1927, p. 266) that prevails in Central Polynesia in the details of boom-to-float attachment technique. Skinner (1924, p. 155), also, mentions that the method of attachment that must have been used for the Monck's Cave float is not described by Haddon (*J.A.I., L.,* p. 69), or by Hornell (*Madras Fisheries Bulletin,* XII, pp. 43-114), "but a similar method was noted in a canoe model from the Admiralty Islands in the Australian Museum, and in a model from Samoa in the Otago University Museum". For this reason, but also for its uniqueness, Skinner concludes his description of the Monck's Cave specimen by saying "this float is of special importance as the only New Zealand example which has been preserved" [at that date, 1924].

In a subsequent paper (Skinner, 1927), Skinner returned to the problem of outrigger attachment necessary to conform with the perpendicular pits and the

V-shaped holes of the Monck's Cave float. In consultation with George Graham and Charles Nordhoff, he put on record the method of boom-to-float attachment demanded by the Monck's Cave float. For each boom two vertical sticks or pegs, at an average distance apart of about 4 inches*, were sunk into vertical holes, were then bent laterally to contact the sides of the boom, and thus securely lashed. A cord was then attached to the outer end of the boom, its free end passed through the V-shaped perforation provided via the inside opening, and taken back and bound to the boom inboard from the sticks. The sticks (or pegs) thereby kept the boom and float the required distance apart and the cord acted as a two-way stay.

In a further survey of canoe outrigger attachment in general, published in 1929, Buck reviewed the type of combined pegs and V-form suspensory lashing described by Skinner and outlined above. A number of objections to this method were presented and some alternative arrangements were offered. This Tahitian* procedure accepted by Skinner as the method (on the evidence of the Monck's Cave float) used in remote times in New Zealand, is diagrammatically reconstructed by Buck in his Figure 18, and he appears to accept it as suitable for use but with canoes of small size only. He suggests, however, that the third boom indicated as attached to the Monck's Cave float may have been added to offset an alleged inherent weakness in this type of attachment. The much larger Te Horo outrigger canoe with a length (as indicated by its float) of nearly $2\frac{1}{2}$ times that of the Monck's Cave craft, had a still greater number of additional booms, the presence of which appear to give support to Buck's contention.

Reverting to the details and dimensions of the Te Horo float. This is of relatively slenderer proportions than the Monck's Cave specimen but like it it tapers gradually, though unequally, each way to its ends. Reference to Figure 1, a, b, c, will assist in following a description of the form of the Te Horo float. At half-length the vertical thickness of it is 4 inches, and the width of the flattened but convex base in $4\frac{1}{2}$ inches; the maximum thickness, measured obliquely, is just on 5 inches. Assuming a normal position for the float on the left-hand side of the hull (Buck, 1929, p. 183), the respective ends of the Te Horo float are determinable: the rear end is blunter than the other and resembles in vertical profile the stern of a European schooner; the forward end is thin and acutely tapering; in horizontal profile the ends are of identical shape and size, both being practically semi-circular and 2 inches across at an inch and a quarter in. The flattened base of the float, for the most part slightly convex, sharpens and protrudes to form a blunt keel for a distance of 5 ft. 6 in. at the forward end. The upper, strongly rounded surface of the float (pl. 1, Fig. 1) persists throughout as a blunt semi-elliptical cross-section with a faint apical median spine. Along the crest of this rounded upper surface of the float are five sets of holes of identical pattern but spaced at irregular intervals (Sets A-E, Fig. 1). The grouping of each set of holes, four in number, takes the

*Text and diagram measurements are at variance but the average boom diameter is given as $3\frac{3}{4}$ inches.

*Though attributed to the Tahitian area (Central Polynesia) by reason of its use there, this particular method of boom-to-float attachment has been shown by Skinner, on the evidence of the two canoe models he has referred to (Skinner, 1924, p. 155), that a similar method was in practice in Samoa (Western Polynesia) and in the Admiralty Islands (Melanesia). This, if correct, is a vast geographical range and may be attributed to sporadic independent invention (which could have occurred, also, in additional areas), or to a former widespread diffusion of this particular mode of devising an effective fastening, with no precise spot indicated as the source of the New Zealand occurrence.

form of a narrow elongated cross: the two outside holes, sunk vertically to take the connecting pegs (*patiatia*) have between them a closely adjacent pair of holes set at right angles to the others and sunk obliquely to converge and meet to form a flattened V-shaped perforation, to be used to anchor each of the suspensory lashings attached, in two places, to the individual booms. The number of booms linking the float to the hull of all canoes seen by Buck in the Cook Islands were two only, but in other places (vide published illustrations) canoes may not uncommonly have three. The Monck's Cave float had provision for three booms and this Te Horo specimen was furnished with five.

In the Te Horo float the spacing of the booms and the individual breadths of their respective attachment hole-patterns are extremely irregular. The aft boom was approximately 9 inches from the rear end of the float and its peg-holes extended $7\frac{5}{8}$ inches (pl. 1, Fig. 2); the next boom forward was about 5 feet from the first and its peg-holes extended $11\frac{1}{4}$ inches (pl. 1, Fig. 3, left); the third boom (close to half-length of the float) was only about 14 inches away from the second and its peg-holes extended $8\frac{1}{16}$ inches (pl. 1, Fig. 3, right); the fourth boom was about 4 feet forward of the third and its peg-holes extended $10\frac{1}{4}$ inches (pl. 1, Fig. 4, left); the fifth or forward boom was 22 inches in front of the fourth and 18 inches from the acute front end of the float, and its peg-holes extended $9\frac{1}{4}$ inches (Pl. 1, Fig. 4, right).

The dimensions of the peg-holes and of the suspensory-lashing anchor holes are also variable within certain limits, and their shape and their quality of execution far from uniform; their alignment, also, deviates to right or to left of the longitudinal median line of the float, but probably none of these discrepancies had appreciable effect on the practical functioning of outrigger or canoe. The peg-holes vary from near circular and cylindrical to elliptical with some tapering, and some of them incline inward towards the side facing the canoe, a feature possibly tending to give greater fixity to the pegs. Maximum diameters are $\frac{15}{16}$ in., $\frac{7}{8}$ in., and $\frac{3}{4}$ in., with depths of $1\frac{1}{16}$ in., to only $\frac{7}{8}$ in. The V-shaped perforations for the suspensory lashings vary from a state of good preservation of the initial form to a noticeable broken-down condition. The "bridge" between each pair of these holes varies from $\frac{7}{8}$ in., to $\frac{5}{8}$ in., or less. The original outside diameters of these paired holes were probably of the same diameters as the peg-holes but in two cases subsequent modification, possibly by contemporary wear and tear, has reduced the flattened V-shaped perforation to a nearly straight horizontal one. The normal 4 units of the sets of attachment holes is varied by one set (Set B) having five; the extra hole seems to have been merely an error in spacing, discarded and corrected at the time by replacement by the adjacent outer hole at a more suitable distance.

The three cross-sections shown in Figure 1 give more precisely than a written description the actual form of the Te Horo float. The first (on left) is at a point 5 inches from the blunter or rear end of the float and shows the peg-holes at that place; the second is at half-length and includes the pair of adjacent suspensory-lashing anchor holes; the third is $14\frac{1}{4}$ inches from the acute or forward end of the float, and shows a peg-hole and the blunt keel of the forward part of the basal surface.

The entire surface of the Te Horo float is plainly the result of careful and practised craftsmanship with no part of the original tree surface left unshaped. Several knots occur but all are skilfully reduced to conform with the finished surface. The original 15 ft. balk of timber from which this float was fashioned

appears to have been obtained from the trunk of a moderate-sized forest tree, but owing to its long immersion in the moist peaty mud of the bed of the lagoon and later in the consolidated mud of the subsequent swamp stage, a thin skin-like layer had formed (and on drying out, has peeled off in places) leaving an exterior not readily identifiable as to the species of tree that furnished the timber. The depth below the consolidated drained-swamp surface of the paddock where it was found was about 7 inches, the plough-share just skimming and exposing the upper surface of the float as it lay buried in a horizontal position.

The most comprehensive work on the many and varied forms of outrigger canoes and types of float attachment is the three volumes entitled *Canoes of Oceania* by A. C. Haddon and James Hornell (1936-38). Volume 1 by James Hornell describes the canoes of Polynesia, Fiji, and Micronesia; volume 2 by A. C. Haddon describes the canoes of Melanesia, Queensland, and New Guinea, while the concluding volume 3 by both authors gives a definition of terms, a general survey of the subject, and conclusions. The data provided by Haddon and Hornell show that the New Zealand method of attachment (as shown by the two known floats) employs one of the simplest types of connectives in Oceania. The distribution map (loc. cit., vol. 3, p. 84) showing the range and limits of the types of outrigger attachments within the Pacific region, discloses that the New Zealand method is found only within the area that contains New Zealand, Fiji, Tonga, Samoa, the Tokelau Islands, and eastward, to and including the Marquesas. This distribution should supply satisfactory clues for determining the source of this particular style of outrigger attachment, but discussion of this aspect of the subject lies beyond the scope of the present paper.

Following the acceptance of the Te Horo outrigger float by Dr R. A. Falla, Director, and its lodgement, on 25 January, 1961, in the Dominion Museum, Wellington, some further relevant points were raised and queries posed.

Firstly, to what species of tree and place of origin could the timber of which it had been fashioned be referred? Most timbers, especially dressed timber, after burial for a long period in the mud of swamps or lake beds, tend to alter in appearance to a marked degree. The normal colour of any particular species usually changes and generally darkens, and the texture may become distended and modified to be unrecognizable under ordinary macroscopic inspection. The harder timbers and those of a less porous nature or because of a greater resinous content, are generally less affected than others of softer and water-absorbent quality, but most kinds deteriorate, hence the usual need for specialized testing for determination.

An increment core was taken from the Te Horo float and submitted to the New Zealand Forest Research Institute at Whakarewarewa, Rotorua. A report was received from Mr H. R. Orman, Senior Forest Products Officer of the New Zealand Forest Service. As a result of microscopic examination and attention to cellular pattern the increment boring sample was definitely identified as New Zealand *totara* (*Podocarpus totara*). Thanks are due to Mr Orman for this useful information.

With regard to certain critical features of the Te Horo float. The rather neat and even appearance of some of the vertical components of the sets of boom attachment holes in the float tend to excite attention. Not one of these holes, however, is precisely circular, and their rounded concave bottoms, without central pit as would be made by the pilot screw of a steel auger, together with irregular

grooving on their cylindrical sides, completely establish their native workmanship executed with primitive boring points of stone.

Another feature attracting notice is the peculiar excessive (?) wear seen at the converging V-form perforations that held the suspensory lashing (or stay cords) at the second and fourth booms (at B and D, Fig. 1). This condition was ascribed by the writer in an earlier paragraph as due to unexpected and rather inexplicable local attrition, and peculiar in that it did not apply to all five sets of boom attachment holes. A valuable alternative suggestion regarding the cause of the supposed wear in two places only and absent in the other three, was made by Dr T. Barrow, Dominion Museum Ethnologist. He took the view that the float originally had only three carrying booms (and thus primarily had a structure pattern identical with that of the ancient Monck's Cave outrigger float), and that the two additional booms of the Te Horo float had been added to it later by native workmanship of a skill inferior to that of the original builders. This view, by ascribing the peculiarities of the holes not to wear and tear but to other and less efficient artisans, has much to commend it and could provide an acceptable solution to a somewhat puzzling feature, though there still remains the problem of the purpose for the attachment of the unusual number of booms.

An attempt has been made in the foregoing to record all salient facts of the discovery and character of an exceedingly rare product of local prehistoric life and activity, and any perhaps tedious presentation of details and measurements herein may be excused on the grounds of their scientific interest and their value for purposes of constructive comparison. The writer wishes to express his thanks to Mr T. R. Pinfold for his courtesy and co-operation, and to Mr Ian Keyes for his ready assistance in making the numerous measurements and other work on the subject of this paper, also for supplying the photographs used for reproduction as illustrations.

The Dominion Museum authorities have intimated that they are indebted to Mr Pinfold for preserving the Te Horo float from destruction and for presenting it to the Museum; also to the writer for bringing this locally rare object to their knowledge and for assisting to secure it for the Dominion Museum collection.

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