WOKAS, A PRIMITIVE FOOD OF THE KLAMATH INDIANS.

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INTRODUCTION.

The Klamath Indians now live upon a reservation in the State of Oregon, which lies within a somewhat larger area occupied by them long before their discovery by the white race. The reservation is in the southwestern corner of the plateau of eastern Oregon, at the eastern foot of the Cascade Mountains and near the southern border of the State. The rainfall of the region averages only about 20 inches a year, the greater portion of the moisture that comes from the Pacific Ocean having been precipitated in passing over the Cascade Mountains. Most of the Klamath Plateau is covered by forests of yellow pine (*Pinus ponderosa*), but toward the east and toward the south are tongues of treeless sagebrush country (*Artemisia tridentata* and other species of the same genus) which extend along the valleys into the timber from the sage plains of eastern Oregon and northeastern California, while about the lakes and marshes mentioned below are several large areas, originally lake deposits, which are now raised above the surface of the water and are covered with grass, but which are still too wet to have acquired a covering of timber. That portion of the Cascade Mountains opposite the Klamath Reservation is made up largely of volcanic rock, covered by a layer of pumice gravel and dust. With such a porous soil the heavy precipitation in the mountains is not carried off by surface streams, but sinks into the ground and appears upon the plain at the base of the mountains in innumerable large springs of very cold and very clear water, which has filtered for many miles down the mountain slopes. As a consequence, the Klamath Plateau, although having a comparatively small rainfall, is nevertheless well watered and possesses some of the most beautiful streams on the continent. The drainage from these springs and streams produces two bodies of water, Klamath Marsh and Klamath Lake, which furnish a wealth of game. The richness of vegetable life, particularly in Klamath Marsh, is no less remarkable than that of the animal life, and the latter is in fact

dependent upon the former, for the birds feed upon the seeds and starchy roots of the larger plants or upon fish or other animals that ultimately depend for their supply of food upon the minute algæ with which the waters of the marsh and lake abound.

One of the plants growing abundantly in the marsh and less extensively in some of the bays of the lake, the great yellow water lily (*Nymphæa polysepala*), was a staple farinaceous food of the Klamaths in primitive times and now is regarded by them as a delicacy (Plates 1 and 2). An opportunity presented itself to spend a week at Klamath Marsh in August, 1902, and to see the Indians harvest their crop of wokas (wo'-kas),[a] or waterlily seed. The industry is well preserved in so nearly its primitive form that a detailed record of it has seemed desirable and is herewith presented. A wokas gatherer's camp is shown in Plate 3.

It is estimated that Klamath Marsh contains about 10,000 acres of a solid growth of wokas. The plant is so vigorous and has such a habit of growth as usually to occupy an area suited to it to the complete exclusion of other characteristic and conspicuous marsh plants, such as tule and cattail. Certain plants associate themselves habitually with the waterlily, but these plants are for the most part submerged in the water, are inconspicuous, and subsidiary in their relationship to the waterlily, and in no effective or important way contest its spread. The principal of these latter plants are bladderwort (*Utricularia vulgaris*), mare's tail (*Hippuris vulgaris*), and pondweed (*Potamogeton natans* and other species).

HARVESTING.

Wokas is harvested exclusively in boats of the kind known as a "dugout." The dugout (wuns) is hollowed from a single log, commonly of the yellow pine (*Pinus ponderosa*), and ordinarily is about 18 feet long, 2 feet wide, and 16 inches deep (Plate 4). Sometimes logs of Douglas fir (*Pseudotsuga mucronata*) are used. This tree makes a superior boat, but as the species normally grows at a higher elevation than the lake and marsh, it is less easily available to the boatmaker. The dugout is propelled usually by poling instead of paddling. The pole (la-gak'), made of a peeled sapling of the lodge-pole pine (*Pinus murrayana*), is about 9 feet long and 1½ inches thick. The lower end is split for a distance of about 6 inches, and the two split points are then spread abruptly to a distance of about 4 inches, where they are held by the insertion of a transverse brace. In all the poles seen the

[a] The alphabet and system of diacritic marks followed in this paper are those of the Bureau of American Ethnology, except that "sh" is here used instead of "c" for the sound of "sh" in shall, and "ch" instead of "te" for the sound of "ch" in church. Secondary accents are not marked when they occur at the normal distance of two syllables from a primary accent.

brace consisted of a large wire nail. The triangular base thus formed presents a larger surface to the mud and often permits the pole to rest firmly across one of the stout rootstocks of a wokas plant. Paddles (ka-chĭk′) are seldom used in wokas harvesting, as the water in the wokas fields is rarely open, and when open is seldom too deep for the propulsion of the boat by poling. Within a wokas field the use of a paddle would be very laborious if not wholly ineffective, while the resistance offered by the plants in the water is readily overcome when the dugout is shoved by a pole resting on the bottom. In localities affording considerable deep open water, paddles also are carried. The other necessary implements in the boat are a flat-bottomed coarse tule basket (tlâks) holding about half a bushel, and a large wicker spoon (näp, or se′-ot a-ko′-olks) made of tule or willow.

When a boat is poled by a single occupant, she takes a position not in the stern, like a paddler, nor at a point a little aft of the middle, like an oarsman, but at a point a few feet from the bow, and for the most effective work she stands instead of kneeling (Plate 5). As the boat is poled slowly along among the wokas plants the woman stoops forward, and, grasping a full-grown wokas pod (ka-kal″-ga′-li), pulls it off its stem and throws it into the boat. At this point occurs the first step of differentiation into grades or qualities of wokas. The pod when fully mature bursts open irregularly at the base; the white, moist, but mealy interior, as soon as it is brought into contact with the water begins at once a mucilaginous dissolution, and the seeds are soon scattered in the water. The seeds contained in these dissolving pods are more fully matured, larger, whiter, more palatable, and presumably more nutritious than those of the other pods, and consequently are much more prized and sought after by the Indians. They have a special designation, spokwas (spok′-was), which is applied also to the dissolving capsule itself and to the mucilaginous mass it forms when gathered. Spokwas constitutes only a small part of the whole gathering of wokas, and this fact, in view of the great demand for seeds of this quality, led to the question, Why do not the women gather only the fully matured pods of the spokwas grade? This is clearly answered by the result of a day's harvest of wokas pods. Ordinarily not more than 10 per cent is spokwas, a proportion due to the rapid dissolution of the fully ripened pods. If the women gathered only these, their day's harvest would be very small, while by gathering the full-grown but still hard pods they get a several times greater product.

The spokwas pods, in a state of mucilaginous dissolution, are lifted from the water not by the hand, but in the wicker spoon already mentioned, and are placed in the tlaks (tlâks), or spokwas basket.

The wokas gatherer's day is a long and laborious one. The women set out at about 8 o'clock in the morning and, taking a lunch, remain on the water until about 6 o'clock in the afternoon. They often go

2 or 3 miles from camp. An hour or so before their arrival the various boats from any one camp may be seen slowly approaching from different directions, the boat itself usually hidden among the wokas leaves, its occupant seeming at a distance to glide over the marsh with a spectral motion, unaccompanied by any evident means of support or propulsion.

A day's harvest, judging from actual measurements of several loads, is ordinarily 4 to 6 bushels of hard pods and a peck to half a bushel of spokwas. (Plate 6.)

SPOKWAS.

The basketful of spokwas as it is brought from the boat is emptied into a pit dug in the ground for the purpose, to which each successive day's harvest of spokwas is added. The disintegrating pods undergo some process of fermentation, which changes them into a mucilaginous liquid mass having the texture of a thin but very elastic dough. The pits are commonly 1½ to 2 feet in both diameter and depth. The top is covered with grass, tules, or an empty grain sack. These holes may be found anywhere about a wokas camp, and from the inconspicuous character of their covering, among the miscellaneous furniture of an Indian's summer camp, it is altogether too easy to step into one. If a motto were to be suggested for visitors, it might well be: Let the stranger in a wokas camp beware of the spokwas hole.

Other cases were observed in which an old dugout, a large spokwas basket, a grain sack, or even a wooden box was used as the fermenting receptacle for spokwas. Large holes plug themselves with pieces of the pods and small ones are sealed by the drying of the mucilaginous contents. In every case the receptacle was shaded, a fact which, taken with the limited diameter of the receptacle or pit, which never exceeded 2 feet, suggested that the contents were liable, under adverse conditions, to overfermentation and heating.

At the end of the period of harvesting by any individual, whether it is one week or five weeks, the contents of the spokwas pits are dipped out and placed in a dugout. Water is then poured in, the whole mass stirred, and the coarser portions squeezed with the hands, much as curdled milk is manipulated in a cheese vat. The seeds, no longer held in suspension in the mucilage, drop to the bottom, and the floating refuse, mucilage, and water are removed by skimming, by rocking the boat, and by baling. The wet seeds, with a small amount of mucilage and occasional small scraps of pod adhering, are scooped from the boat and spread on a tule mat (shtap's) in the sun to drain. They are then ready for manufacture into lolensh and subsequently into shnaps.

LOLENSH.

Fresh wokas seeds, in which the kernels are still moist, are in the condition necessary for manufacture into what is called lolensh (lo-lensh'). This condition exists in spokwas and in the two grades of seeds, nokapk and chiniakum, derived from cooked pods, or awal, described below. The dried seeds, lowak and stontablaks, can not be made into lolensh.

The fresh seeds are placed in a frying pan, one or two quarts at a time, and held over a fire for perhaps ten minutes, constantly stirred or shaken. This operation dries and partially cooks the seed, leaving the shell brittle and the kernel in a tough, elastic condition. In early times the cooking was done in a wicker tray with live coals, as described below under shiwulinz.

The removal of the shells is accomplished by grinding the seeds lightly on the ordinary mealing stone and then winnowing them. The lower mealing stone (lmach) is a piece of flat lava rock commonly about a foot and a half in length and about 10 inches in width. The upper stone (si-lak'-al-ĭsh), also of lava, is much smaller and has usually two nibs upon the back which fit into the hands of the user as she sits or kneels on the ground. The seeds to be ground are placed, a few handfuls at a time, on the end of the lower stone next to the grinder. The seeds on that side of the pile farthest from her are spread out in a thin layer reaching to or beyond the middle of the stone. She seizes the upper stone in both hands and rubs it lightly over the lower and over the thin layer of seeds upon it. The forward stroke does the grinding, while the deft backward stroke serves to catch between the stones a small amount of seeds from the thin edge of the pile on the lower stone. The product of the grinding accumulates on the end of the lower stone farthest from the grinder and is shoved off upon a circular mat or very shallow, tightly woven dish, commonly known as a wokas shaker, described below, upon which the end of the mealing stone has been placed. (Plate 7.)

The notable feature of the grinding of these seeds is that the shells are cracked so that they can be removed, while the kernels, from the tough, elastic texture they have acquired through their partial cooking and from the lightness of stroke exercised by the grinder, are not cracked as are thoroughly dried or roasted seeds when similarly manipulated upon the mealing stone.

The next process is that of winnowing, by which the loose pieces of broken seed shells are separated from the seed kernels. The implement employed is a winnowing tray, known to the white people of the Klamath Lake region as a wokas shaker (p'a'-hla). This is a broad, circular, very shallow dish closely woven of a cord twisted from narrow strips of tule stems, from the great tule marshes of the Klamath

Lake and Marsh country. The wokas shaker has commonly a diameter of 22 to 30 inches, and sometimes has some slight adornment in figures lighter or darker than the main body of the shaker. Ordinarily, Indian winnowing trays are of rigid construction, but the wokas shaker, which is the general winnowing implement used by the Klamaths and Modocs for the preparation of a wide variety of seed foods, is flexible, a characteristic which gives it a more varied usefulness than an ordinary stiff tray.

About a quart of the seeds, after cracking on a mealing stone, as already described, is placed on the shaker. This is seized by the operator in both hands, at opposite points of the margin, each hand, palm upward, grasping from beneath a radial fold in the margin, the end of the thumb usually extending up over the margin and occupying the inside of the fold. The woman sits with her back to the wind, and, grasping the shaker in the manner just described, proceeds by a series of skillful movements to separate the broken shells from the rest of the seed. One of these movements is the rotation of the shaker back and forth upon its own center as an axis. This accomplishes a general shaking up of the contents, through which the seed shells accumulate at the surface. A second movement is a circular motion of the whole shaker, which makes the seeds travel about in it like water in an eddy, the shells gathering in the center. The shells are then shifted to the farther margin by a jerk of the shaker, when they are tossed into the air and are carried away either by the wind or, when there is no wind, by blowing. The broken seed shells (tsi'-hlak) thus winnowed from the seeds are used in dyeing, in a manner to be hereafter described.

In the stage of preparation which they have now reached the seeds are known as lolensh (Plate 12, fig. 4). This may be made immediately into parched wokas or shnaps, or it may be spread out upon a mat in the sunlight to dry and then stored in sacks, to be parched later as used.

SHNAPS.

In the preparation of shnaps from shelled wokas kernels, or lolensh, the primitive method of roasting with live coals in a wokas shaker, as described under shiwulinz, seems to have been entirely discarded. The frying pan is now used instead by all the Indians. A handful or two of lolensh, either the fresh or the dried and stored product, about enough to barely cover the bottom, is thrown into a hot frying pan and roasted briskly over a fire until it is nicely parched and slightly browned, the pan being shaken meanwhile to prevent scorching. The kernels swell, crack their coats, and roll over like animate objects, but do not explode like popcorn. When the parching is completed the grains are roughly spherical, with a tuberculate surface (Plate 12, fig. 2), and the bulk of a mass of the kernels has increased two and one-third to three times. A thick-bottomed cast-iron frying pan is much better for parching wokas than a thin-bottomed one of pressed steel,

a much more even and not extremely high temperature being thus secured.

The parched wokas, or shnaps, has a delicious flavor, somewhat similar to that of popcorn or, more especially, parched corn. When freshly parched it is more crisp and appetizing, and doubtless more fully digestible, than after it has been allowed to stand in a humid atmosphere and absorb moisture.

Shnaps is often eaten dry, and in this state it is most palatable to white people, but ordinarily the Indian places it in a dish and pours over it barely enough cold water to cover it. It is then eaten with a spoon, with or without salt, a modern innovation. Sometimes the shnaps is finely ground before the addition of the water, and the preparation is then known as shlotish (shlo-tish′). In primitive times the Klamaths used for eating wokas a spoon cut from the breast bone of the swan, which is conveniently shaped for the purpose. Their name for such a spoon is sh'o-kobh′.

LOWAK.

The nearly mature but still hard wokas pods that make up the principal part of a day's harvest are ordinarily spread upon the ground to dry, in flat-topped piles about 8 inches thick (Plate 8). Each day the margin of the pile is added to as new pods are brought in from the marsh. The bright sunshine prevalent at the time of the wokas harvest hastens the drying, thick and mucilaginous as the pods are, and in from one to two weeks those on the surface and margins of the piles are thoroughly dry. The pods thus dried are placed on a mat or piece of gunny sack and pounded with a stone or short pestle (skâ). The seeds are thoroughly dry and drop out easily, and when the mass is sufficiently pounded portions of it are placed on a shaker and the light corky or pithy pieces of the pods are winnowed out. Some of the women, before winnowing the seed on a shaker, separate the coarser pieces of waste matter by running the whole mass through a coarse wicker sifter (ti-a′). Seeds thus prepared from dried pods and still covered by their shells are known as lo-wak′ (Plate 12, fig. 1). They are commonly stored in sacks for winter use. The screenings (kakt-chi′-as) from lowak, though made up mostly of the light corky pieces of the dry body of the pods, do contain a small percentage of seeds. They were sometimes stored, in the old days, for use in case of famine.

STONTABLAKS.

In the preparation of lowak, the pods in the interior of the drying piles do not dry, but turn into a soft, moist, rotten mass (Plate 9), the seeds themselves, however, retaining their freshness. When the piles are opened the dry pods are thrown in a pile by themselves to be made into lowak, but these moist, decomposing pods are differently

treated and produce a superior grade of seed having a different name, stontablaks (stont''-a'-blaks). The rotten pods, denuded of their covering of dry ones, are pounded to a pulpy mass with a ska. According to information from the Indians, the pounded pulp is further exposed until dry, and is then screened and winnowed, being thus left in the same form as lowak, suitable for cooking as shiwulinz, but not as lolensh and shnaps.

SHIWULINZ.

When required for cooking, the dried seeds, either lowak or stontablaks, are first roasted, shell and all, then cracked, and the shells winnowed out from the broken seeds on a shaker. The seeds, called in this condition shi'-wu-linz (Plate 12, fig. 3), are then boiled, forming a sort of mush to which the Indians apply the same name.

The word is derived from shi'-wi, meaning to shake or winnow, and refers to the winnowing of the shells from the cracked seeds. Among the younger women the cracking is often done in a hand coffee mill, but the usual instrument is the primitive mealing stone.

The roasting of lowak, preparatory to the making of shiwulinz, is now usually done in a frying pan, but the primitive method of roasting with live coals in a wokas shaker is still occasionally used by some of the old people. This operation, as witnessed at one of the wokas camps on Klamath Marsh, is conducted as follows: About 3 quarts of lowak were placed in a shaker and several pieces of live coal from a lodge pole pine fire were laid on top of the seeds. Most of the coals were 1 inch or less in diameter; a few were 3 or 4 inches long and 2 or 3 inches thick. The seeds and coals were then tossed so as to roll over and over each other in the shaker, the contents going into the air from the farther margin of the shaker and falling in the middle. After a few minutes the coals began to cool. They were then brought to the top of the mass of seeds by a rotary motion, the shaker was set on the ground, and a little vigorous fanning with another empty shaker soon brought the coals to a lively heat. Then the tossing went on again as before until the roasting was completed. The whole process requires dexterity, both to keep the coals in motion so that the shaker will not burn and to roast the seeds evenly without scorching them.

Another form of food prepared from lowak is named stilinsh (stĭl'-insh). This differs from shiwulinz in that the shells are not winnowed out on a shaker, but are skimmed from the boiling pot while the seeds are cooking. The name is derived from stĭ-lin', to skim, a word now applied to various operations, from the removal of cream from milk to the washing of gold in a miner's pan. In earlier times a food named talwas (tal'-was) was prepared from lowak. This was essentially the same as shiwulinz and stilinsh, but the boiling was done in a water-tight basket into which hot stones were dropped, a method of cooking not practiced among the Klamaths at the present day.

AWAL.

When seeds are required to be extracted from freshly gathered pods, either to furnish an immediate food supply, or to secure material for the preparation of shnaps, or because the wokas gatherer is nearing the end of his harvest and can not wait for the pods to dry, a process of cooking or steaming the pods is employed which facilitates the extraction of the seeds. These cooked pods are known as awal (a′-wal). The process of making awal, as observed at one of the camps on the east side of the Klamath Marsh, was a follows: Two pine sticks about 5 feet long and 4 to 5 inches in diameter were laid parallel, 4 feet apart, upon the ground. Upon these and at right angles to them are laid close together a row of cross sticks 2 to 4 inches in diameter, making a low platform about 4 feet square. Upon this platform was placed about 3 bushels of freshly gathered wokas pods, forming a low pyramidal pile about a foot deep in the middle (Plate 10). The space between the cross sticks and the ground was stuffed loosely with dry needles of the yellow pine (*Pinus ponderosa*), which were then lighted. A dense column of smoke rose high in the air, for awal is made only on calm days. The cross sticks soon ignited, and the blaze reached through the cracks to the wokas pods. In ten minutes the lowermost and outermost pods, sizzing and singing from the steam generated in them, were considered sufficiently cooked. The cross sticks were spread open a little and the cooked pods fell through to the ground, making room for the spreading out of the raw ones from the upper part of the pile. After five minutes more some of the burning cross sticks were pried upward through the steaming pods and left still burning on the top. Pods with their surface blackened by the fire were left upon the ground, but any green ones that fell off were thrown back again. In ten minutes more all the cross sticks had been brought to the top of the pile of pods and were roasting them from above. The Indian woman who was conducting the operation poked continuously around the margin with a pole to get the cooked pods out, occasionally removing one of the charred hot sticks, until at the end of an hour from the time of lighting all the sticks had been removed and the cooking was completed.

The awal is separated after cooking into two grades, based on the degree of maturity of the seeds. The better one (no′-kapk) makes up ordinarily much the larger part of the awal, while the poorer grade (chĭn-i′-a-kûm) consists of the smaller and more shriveled pods. In separating the two the woman tosses the large plump pods directly into the nokapk pile, but coming occasionally to a doubtful one she breaks it open, and from the appearance of the seeds themselves decides into which pile to put it.

DIACHAS.

In wokas pods properly roasted as awal the interior tissues are in the condition of a mucilaginous paste. The seeds do not separate from this paste as readily as they do from the mucilage in pods of the spokwas grade, and therefore the Indian has invented another method of extracting them. This method is known as diachas (di-ä″-chäs′). About a peck of awal, of either the nokapk or the chiniakum grade, is placed upon a sack or upon a hard smooth area of bare ground and pounded with a small stone (skâ) into a gluey mass. To this is added about half the quantity of dry rotten wood (mu-lo′) of a sort that is easily crumbled into dust. This is pounded and rubbed into the mass of pounded pods (Plate 11). Finely pulverized charcoal or ashes is often substituted for the rotten wood when the latter is not readily obtainable. After the manipulation is sufficient to take up the moisture and leave the surface of the seed dry and free about three quarts of the mixture is usually placed in a wicker screening basket (ti-a′) and the empty capsule skins screened out, the finer matter falling through into a wokas shaker. Sometimes a screen is not used. The material in such case is placed directly in a shaker, and the skins, after being brought to the top by rotating, are shoved off. The winnowing of the seeds, as in the preparation of lowak, follows, and the seeds are then made into lolensh by the process already described.

THE GRADES OF WOKAS.

Inquiry among the Indians as to the relative quality of the different kinds of wokas, irrespective of the method of cooking, but on the basis of what in the grain trade would be called grade, elicited replies showing the following order: (1) Spokwas, (2) stontablaks, (3) lowak, (4) nokapk, (5) chiniakum.

The significance of this arrangement of grades by the Indians lies in the fact that the sequence they gave represents exactly the relative degree of maturity of the seeds. In chiniakum and nokapk the seeds in the still green pods are roasted at once, usually on the day after they are gathered, and of these two grades the one called chiniakum is visibly the less fully developed. In lowak the seeds have several days longer to grow, since between the time when the pods are spread out in the drying piles and the time when they actually become dry the seeds are undoubtedly making considerable progress toward maturity. The stontablaks, lying in the center of the drying piles, and therefore remaining moist for a longer time than the pods on the surfaces of the piles, have a still further opportunity for the development of their seeds, and in spokwas the seeds are of course fully matured when they are gathered.

TSIHLAK.

In the preparation of lolensh and of shiwulinz the broken seed shells (tsi'-hlak) are winnowed, as already described, from the seed kernels. These seed shells or hulls are not always thrown away, but they are often saved for a later curious use. In the manufacture of their finer baskets and trays the Klamaths use for both warp and weft cords twisted from the split outer surface of the tule (*Scirpus lacustris*). Upon the main body of the basket as woven from these cords are overlaid various designs in white, black, yellow, and maroon. The patterns in black are made from the same material as the body of the baskets, split tule stems, which have been colored by a certain dyeing process. Ordinarily this is accomplished by immersing the tule stems in the black mud of sluggish springs containing iron. A superior color, however, is obtained by the addition of a quantity of wokas hulls, which contain a large amount of tannin. The same result is now frequently secured among these Indians by prolonged soaking of the tule stems in an iron kettle, in water containing a liberal amount of the hulls. The color is evidently due to the development of tannate of iron. Samples of the wokas hulls analyzed through the courtesy of Dr. H. W. Wiley, Chief Chemist of the Department of Agriculture, were found to contain 20 per cent of tannin.

WOKAS AS AN ARTICLE OF COMMERCE.

Wokas, when freshly parched so as to be nicely browned, is a delicious food, particularly if slightly salted and eaten with cream. There is every reason to believe that wokas could be brought into successful use as a breakfast food. Small quantities of it can be purchased from the Indians, but only at a price of from 10 to 20 cents a pound. It is evident that in order to enter into successful competition with other breakfast foods economical machine methods must be devised for extracting the seeds from the pods and putting them through the processes necessary to bring them to the lolensh stage, which is the best form for shipment. The primitive methods at present employed by the Indians are altogether too expensive. Some of the various means now used by seedsmen, coffee dealers, and millers for macerating, roasting, milling, and cleaning seeds are undoubtedly applicable, with some modifications, to the production of wokas.

The writer does not consider the cultivation of the wokas plant on a commercial scale to be feasible. The available supply of the seeds must be limited to the natural product, which in the Klamath country is estimated at about 10,000 acres. Other, but, so far as known, smaller areas of the plant exist on the Northwest Coast. There seems to be no probability that the pods can be harvested by any other

method than that now practiced by the Indians—hand picking from boats. It should be possible to secure the pods in this way at 10 cents a bushel, a bushel of the pods producing about one-fourth its bulk of seed, and the seeds about one-third their bulk of lolensh. The weight of lolensh to the measured bushel is about 59 pounds. When parched the lolensh expands to nearly three times its original bulk, a sample of the best shnaps weighing about 21 pounds per bushel. The season of harvesting in the Klamath country is about six weeks—from the middle of August to the end of September. For an illustration of a wokas camp at the close of the season see Plate 13.

KLAMATH NAMES CONNECTED WITH THE WOKAS INDUSTRY.

1. The Wokas Plant, its Parts, and its Products.

A′-wal, roasted pods.
Bal′-bal-wam, leaf.
Chĭn-i′-a-kûm, immature seeds, constituting the fifth grade.
Di-ä″-chäs′, a process of extracting seeds from roasted pods.
Ga′-i-dan′, rootstock.
Gam′-bol-wos, flower bud.
Ka-kal″-ga′-li, pod.
Kakt-chi′-as, screenings from the diachas process.
Kai′-a-kams, said to be an old name for chiniakum.
Lo-lensh′, shelled seeds, not roasted.
Lo-wak′, seeds from dried pods, constituting the third grade.
No′-kapk, the better seeds from roasted pods, constituting the fourth grade.
Shi′-wu-linz, dry seeds cracked and winnowed, cooked by boiling.
Shloks, pods strung on strings to dry.
Shlol′-bals, seeds, dried.
Shlo-tish′, finely ground parched seeds.
Shnaps, shelled seeds, parched.
Spok′-was, fully matured seeds, constituting the first grade.
Stĭl′-insh, dry cracked seeds cooked without winnowing.
Stont″-a′-blaks, seeds from pods fermented in the drying piles, constituting the second grade.
Swe-o-gûl′-tĭs, bunches of pods on short stems.
Tal′-was, soup of shiwulinz boiled in a basket with hot stones.
Tsi′-hlak, broken seed shells.
Wo′-kas, general name for the whole plant or for the food derived from it.

2. Implements of the Wokas Industry.

Cha′-ka-la, openwork willow pack basket.
Cha′-was, pack basket of tule strengthened with vertical sticks.
Ka-chĭk′, paddle.
La-gak′, pole for dugout.
Lkom, coals.
Lmach, lower mealing stone.
Mu-lo′, dry rotten wood.
Näp, wicker spoon for gathering spokwas.
P'a′-hla, wokas shaker or winnowing tray.
Se′-ot a-ko′-olks, wicker spoon for gathering wokas.
Sh'o-kobh′, swan's breast spoon.

Shtap'sˊ, tule mat.
Si-lakˊ-al-ĭsh, upper mealing stone.
Skâ, stone for pounding wokas pods.
T'aˊ-yas, sack.
Ti-aˊ, screening basket.
Tlâks, coarse tule basket flat- or round-bottomed.
Wĭlˊ-ĭ-sĭk, sack.
Wuns, dugout.
Yaˊ-kĭ, openwork willow pack basket.

EXPLANATION OF PLATES.

Plate 1. The wokas plant, *Nymphaea polysepala*. The plant is shown natural size, but the leaves are not fully developed. The drawing was made at Kadiak, Alaska.

Plate 2. Wokas pods. The pods, which were collected near Fort Klamath, Oregon, are shown in their natural size.

Plate 3. A wokas gatherer's camp on the shore of Klamath Marsh, Oregon.

Plate 4. The wokas gatherer's boat and pole.

Plate 5. Ten thousand acres of wokas, Klamath Marsh, Oregon. An Indian woman is poling a dugout.

Plate 6. One day's wokas harvest of two women.

Plate 7. Wokas in process of grinding on a mealing stone. Beneath the end of the lower stone (lmach) is a shaker (p'ahla), into which the meal is shoved when ground. The broken shells are afterwards winnowed out.

Plate 8. Wokas drying pile and implements. The close-woven basket on the extreme left, in the rear, as well as the one on the right, is a tlaks; the inverted conical basket is a chawas; the nearly flat close-woven one in front at the left is a p'ahla; each of the two screens is a tia; and the wicker spoon is a nap or seot akoolks.

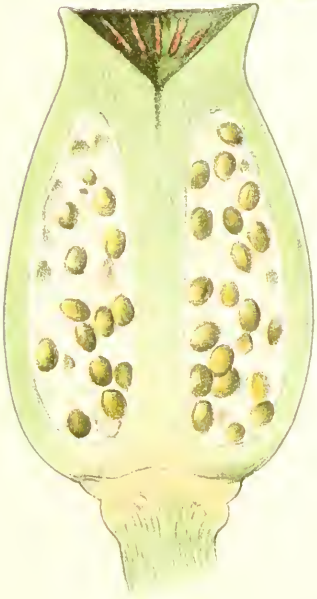
Plate 9. An opened drying pile of wokas. The outer ring of dried pods is lowak; the inner mass of fermented pods, pounded and now lying exposed for further drying, is stontablaks. In the left corners are tule mats, on which wokas seeds are drying in the sun.

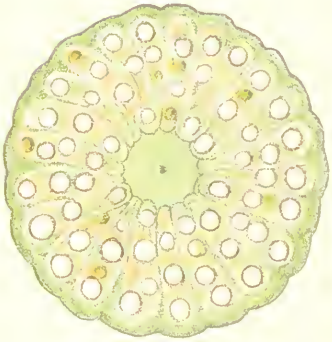
Plate 10. Wokas pods ready for firing. The roasting of the pods transforms them into awal, from which the seeds are extracted by the diachas process.

Plate 11. Extracting wokas seeds by the diachas process. The old woman is pounding rotten wood into the roasted pods. At the right in a shaker is a quantity of seeds already cleaned. In front of the shaker is a pounder (ska), of pumice stone, larger than the one in the woman's hand.

Plate 12. Seeds of wokas. Fig. 1, dry seeds in the shell (lowak); fig. 2, parched seed (shnaps); fig. 3, cracked seeds (shiwulinz), the shells winnowed out; fig. 4, seed kernels (lolensh), the shells removed. The unusually dark appearance of the lowak in the specimen photographed was due to roasting.

Plate 13. The end of a wokas camp. At the right is an awal pile still smoldering. On the mats is wokas in various stages of extraction, and in front of the dugout are two sacks of dry seeds.





A WOKAS GATHERER'S CAMP.

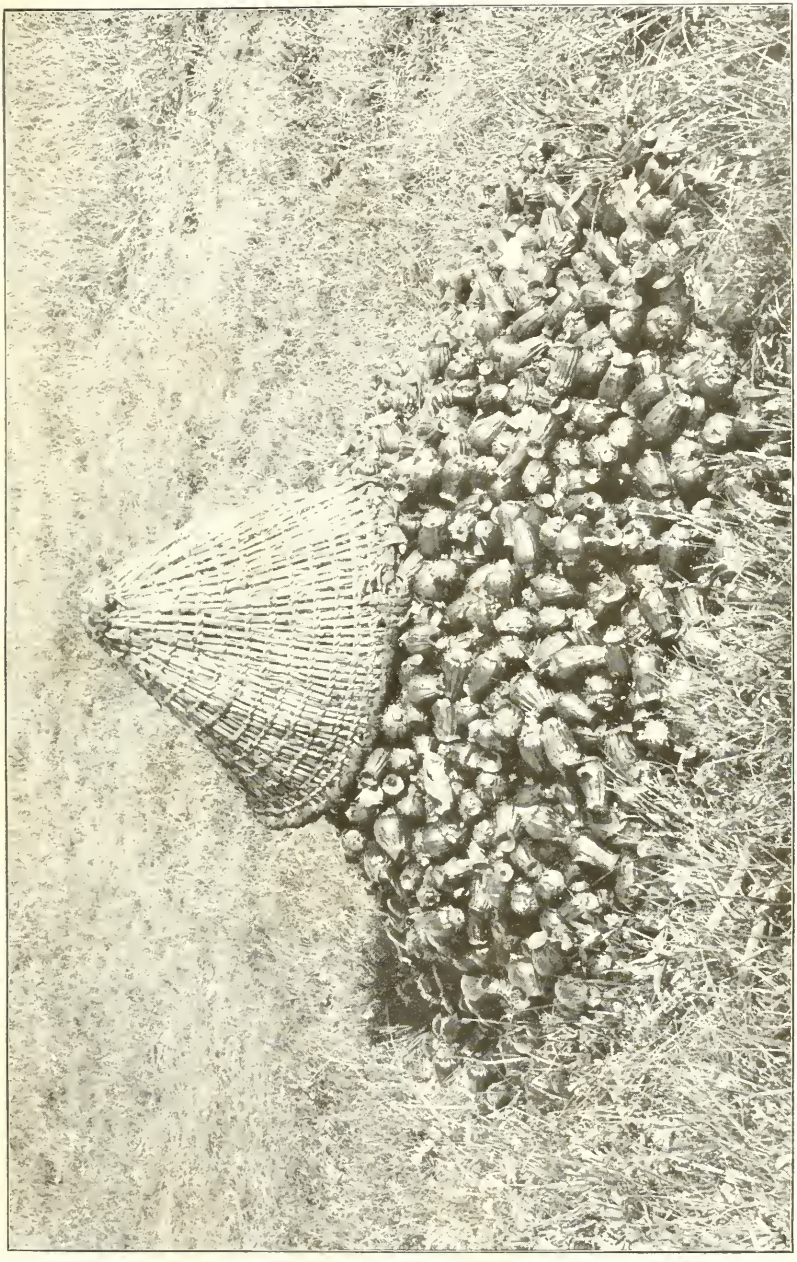
FOR EXPLANATION OF PLATE SEE PAGE 739.

THE WOKAS GATHERER'S BOAT AND POLE.

FOR EXPLANATION OF PLATE SEE PAGE 725.

TEN THOUSAND ACRES OF WOKAS.

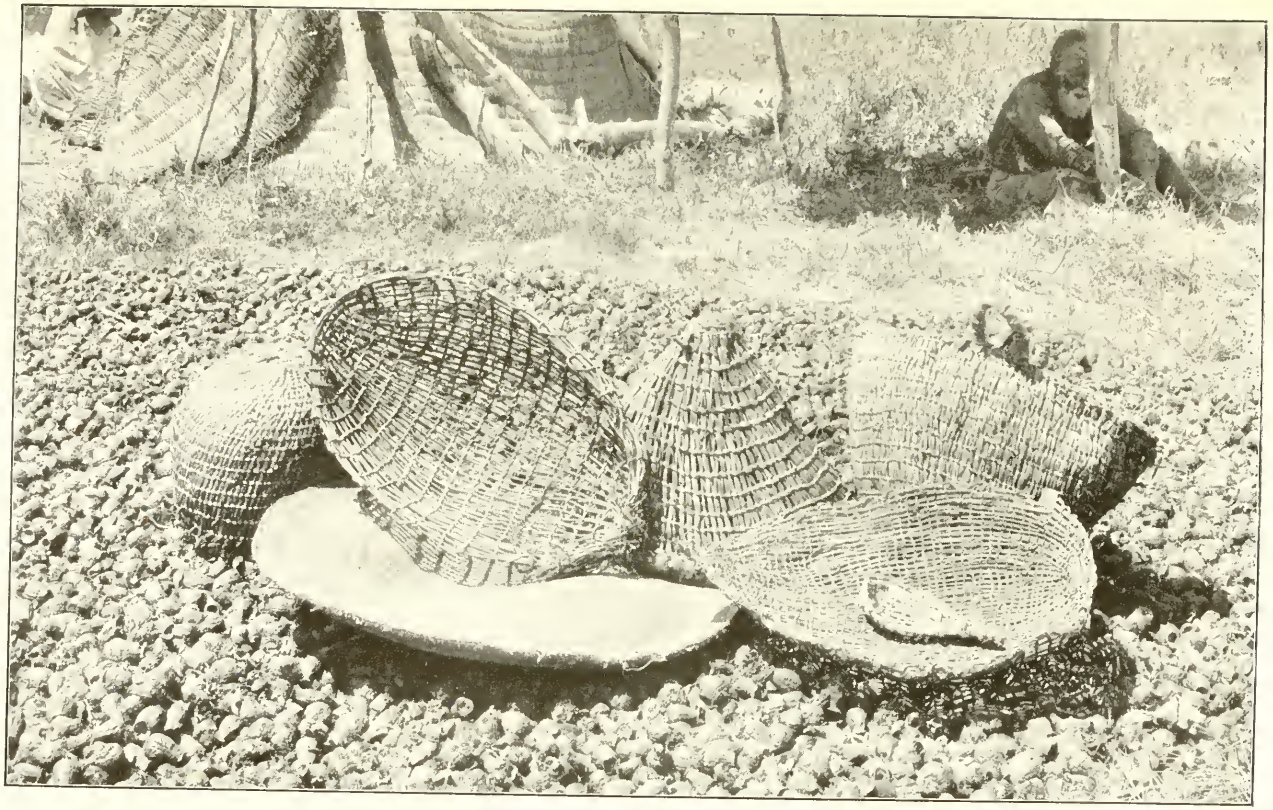
FOR EXPLANATION OF PLATE SEE PAGE 739.



ONE DAY'S WOKAS HARVEST OF TWO WOMEN.

FOR EXPLANATION OF PLATE SEE PAGE 730.

WOMAN ON A MEALING STONE



WOKAS DRYING PILE AND IMPLEMENTS.

FOR EXPLANATION OF PLATE SEE PAGE 739.

AN OPENED DRYING PILE OF WOKAS.

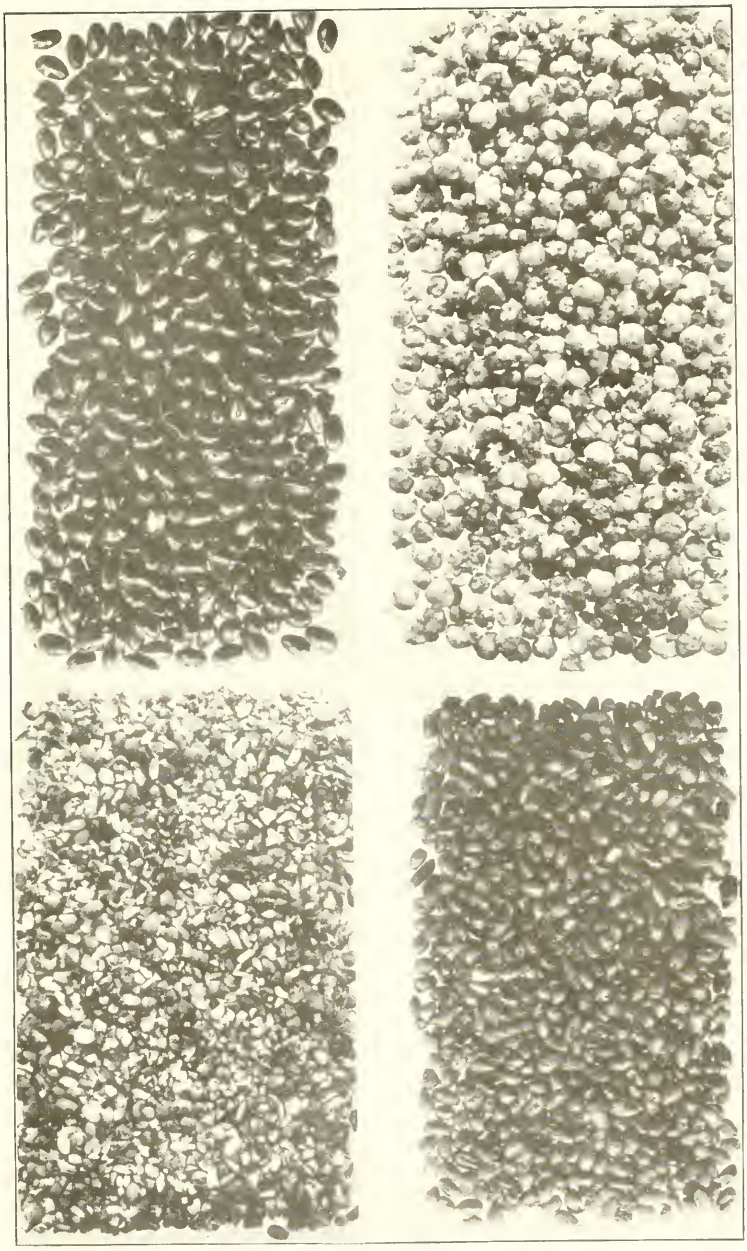
FOR EXPLANATION OF PLATE SEE PAGE 739.

WOKAS PODS READY FOR FIRING.

FOR EXPLANATION OF PLATE SEE PAGE 739.

EXTRACTING WOKAS SEEDS.

FOR EXPLANATION OF PLATE SEE PAGE 739



SEEDS OF WOKAS.

FOR EXPLANATION OF PLATE SEE PAGE 739.

THE END OF A WOKAS CAMP.

FOR EXPLANATION OF PLATE SEE PAGE 739.