JUNE, 1907. VOL. XII. PAGES 1-26

Proceedings

—OF THE—

Davenport Academy of Sciences

THE MONTEREY PINE SCALE

BY DUDLEY MOULTON

DAVENPORT, IOWA, U. S. A.
DAVENPORT ACADEMY OF SCIENCES
1907

Beginning with Volume XI the Davenport Academy of Sciences changed the manner of publication of its PROCEEDINGS. To avoid the delay incident to waiting for volumes to be completed, and to make less likely the burying of valuable papers in a general volume, hereafter the separate papers will be distributed in pamphlet form as soon as printed. The last section of each volume will contain reports of officers and a record of the Academy meetings, together with title page for the volume, table of contents, and index. This plan will make possible the binding of the volumes of the PROCEEDINGS by those libraries and societies that wish to keep their file intact. On the other hand there will be a more prompt and direct distribution of the separate papers to those who are most interested.

THE PUBLICATION COMMITTEE.

DAVENPORT, IOWA.
March, 1907.

THE MONTEREY PINE SCALE, PHYSOKERMES INSIGNICOLA (Craw).

BY DUDLEY MOULTON
STANFORD UNIVERSITY, CALIFORNIA

[INTRODUCTORY NOTE.—In the second Volume (pp. 293–347, plates XII–XIII, Dec. 1879) of the Proceedings of the Davenport Academy of Natural Sciences was published a paper entitled, "Biological and Other Notes on Coccidæ," by J. Duncan Putnam. This paper has been, ever since its appearance, a model for students of the Coccidæ. The thoroughgoing character of Mr. Putnam's observations, and his admirable combination of notes on the economic, developmental, morphologic and systematic phases of the study of a single Coccid species, make his study of the cottony maple scale (*Pulvinaria innumerabilis*) a classic in American entomology. For several years the work of students of Coccidæ in my laboratory has been modeled on the general lines of this early study, and these students (Kuwana, Coleman, Moulton, Patterson and others, now professional entomological workers) have published several papers on the biology of scale insect species following approximately the style of Mr. Putnam's paper.

Because of the importance of the Coccidæ, both economically and biologically, too much careful attention cannot be given them. It is, therefore, my intention to maintain in my laboratory for a number of years, at least, special work on the life history, morphology, and general biology of particular Coccid species. And it seems specially fit that the results of such work should be published in the Proceedings of this Academy of Sciences. By arrangement, therefore, with the publication committee of the Academy, we hope to print in these Proceedings during the next few years a series of papers on the Coccidæ, of which the present one, by Mr. Dudley Moulton (Stanford, '03, M. A., '06) on the Monterey Pine Physokermes (*Physokermes insignicola*), is the first. VERNON L. KELLOGG,

Professor of Entomology, Stanford University, California.]

October 1, 1906.

My attention was called to the Monterey pine scale, *Physokermes insignicola*, an account of whose life-history is contained in this paper, in the fall of 1900, and since then I have had it under more or less nearly constant observation. The results of this study are recorded in this paper.

My thanks are due to Mr. S. I. Kuwana and Mr. Geo. A. Coleman for helpful suggestions in connection with the work, and to Prof. V. L. Kellogg, under whose direction the study was made in the Entomological Laboratory of Stanford University.

Life-history and Habits

Physokermes insignicola, as we know it, is confined to the Monterey Pine, *Pinus radiata* (*insignis* Doug.), except that a single instance of its occurrence on another host has been noted by Mr. Alexander Craw, former State Horticultural quarantine officer, stationed at San Francisco, who mentions having found it on a cherry tree which was growing just under a row of infested pines. Mr. Craw reports it common on the Monterey Pine at San Mateo and in Golden Gate Park, San Francisco, and Mr. Geo. A. Coleman, forester and entomologist for the Pacific Improvement Company, reports it very abundant in the 7,000-acre forest of this pine at Monterey. I have studied the insect on trees on the Stanford campus and in their native home in the Monterey forest.

Physokermes insignicola lives on some trees side by side with *Lecanium hesperidum*, from which, in the younger stage, it is not readily distinguished at first sight. The adult female looks much like *Kermes sp?* found on the valley oak, *Quercus lobata*, and the two insects may easily be confused on superficial examination. In the natural pine forest at Monterey the insect is most common on young trees from three to five feet high and on the lower limbs of mature trees. Old trees infested by the scale are also usually weakened, and young trees weakened and dwarfed, by the fungus *Peridermium harknessi*. In the spring of 1903, trees were noted on which the insects on certain branches were mostly of one sex, either male or female. Often several large lower limbs were infested, while the adjoining limbs, and in fact the rest of the tree, showed no signs of the insect. In these

infested spots the small twigs were almost completely covered with females and the flat surface of the leaves was thickly spotted with male larvæ and cocoons (fig. 1 in text). The insect is thus sporadic in its distribution on the host-plant.

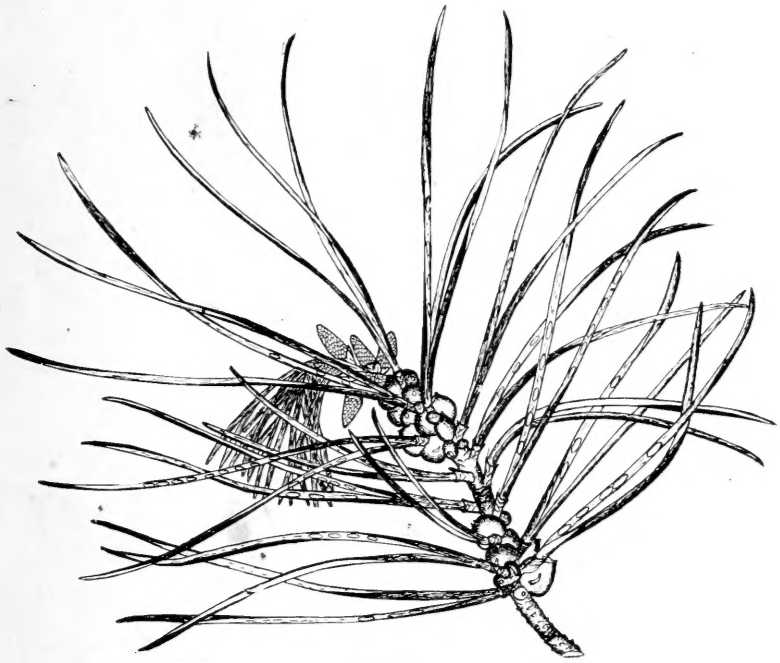


FIG. 1.

The *adult female*. Adult females appear about the first of April. The life is short, lasting only three or four weeks. A fully matured female, the commonly observed form of the insect, becomes a very conspicuous object on the tree. During this adult stage the development and changes are marked and rapid, body growth is greatly augmented, the color changes, honey dew is secreted, copulation takes place, the eggs are developed and placed within the chamber formed by the infolding of the venter, and within we find the young larvæ passing the first part of their lives.

During the first two weeks of adult life, the insect grows from 2mm. in length and 1mm. in width to be a great globular body 6mm. or more in diameter. The old larval skin splits in halves

along the median dorsal line and its parts remain attached to the sides of the adult scale and by comparison give us an idea of the great increase in size of the adult over the second larva. A female, while in the larval stage, takes up a position at the base of a leaf with her abdomen projecting outward and toward the tip of the branch. Because of this, the old scale shells remain fixed to the tree for two years or more and fall with the dead leaves or are washed or brushed off by the rain and wind.

The leaves of the Monterey pine are closely set and the scales, often with many crowded on a twig, are always closely pressed. The body wall of the insect is soft during its rapid growth, hence its shape is determined largely by its surroundings. An insect thus crowded is often forced to grow quite around a leaf and it is then held to the branch rather by its position than through any effort of its own.

The outer or exposed wall of the shell is the greatly expanded dorsum, the edges of which, in the later development, meet and become closely appressed and form a suture along the ventral median line. The venter, at first broadly expanded and contiguous with the surface of the limb, gradually becomes infolded and forms a chamber which opens out at the anterior and posterior ends of the body. The spiracles, the spiracular grooves, and their accompanying wax ducts are also taken in with the infolded venter. Thus in the fully matured insect the dorsum forms all of the outer exposed wall and the venter forms the inner wall of the cavity which eventually becomes the egg chamber.

After molting the second larval skin the female is light brown, which color later changes from a light to a dull brown, to a blue-black, and finally to a brown-black.

It is while the insect is in the blue-black stage and actively secreting honey-dew that copulation with the male takes place.

The secretion of honey-dew occurs while the insect is undergoing its greatest body-growth. Great numbers of ants visit the scales during these few weeks in March and April and gather the honey-dew so diligently that in the natural conditions on the tree this honey-dew is kept cleared away by them. When the insects are confined in the laboratory under glass jars and with ants excluded, the excretion gathers in great drops, often as large as the insects themselves. This substance is not sweet, as the

name might suggest, but has rather a resinous flavor similar to that of the pine tree sap.

Just why honey-dew is secreted is a question. Several experiments were made to find out if possible if it had any special value to the insect, and while no definite conclusions were reached, the observations may be of interest. The honey-dew is certainly attractive to ants. But it may be asked, are the scale insects benefited by the attraction, and if so, how? Do the ants protect the young of the scale? Do they keep off the enemies? or is the honey-dew, perhaps, a means of attraction of the male?

During the season while the honey-dew is present numerous ants often completely cover the body of the scale. In one case an ant was actually observed stroking, with its antennæ and first pair of legs, the abdominal tip of the scale. A few ants kept in confinement with a number of scales had more than an abundance of the honey-dew and these simply gorged themselves until their abdomens were greatly expanded and rendered almost transparent. Other than keeping the trees cleaned of the honey-dew and the accompanying smutty fungus, I cannot see that the ants are in any way beneficial. They do not protect the young of the scales, and they do not keep off its enemies. Finally, the honey-dew is not attractive to the males as will be seen later.

If an adult insect be dissected at the time of fertilization its body is found to be completely filled with eggs; in fact, the function of the adult female seems to be solely that of developing eggs and almost all other internal structures are sacrificed to the needs of the egg-producing organs, the ovaries. Shortly after fertilization the tiny pink, or flesh-colored, ovate eggs begin to be placed within the chamber of the invaginated venter. The ovaries become smaller and the mass of eggs in the outer cavity increases as oviposition proceeds. With the enlarging egg mass the venter is pushed upwards and the egg chamber with its contents displaces the internal body cavity. Eventually all of the internal body structures are reduced to a thin dorsal ridge which extends down into and separates the egg chamber, now the entire space within the shell, into two parts. The venter is at last pressed quite closely to the dorsum and the old body organs dry up between these two walls. The spiracles, with their accompanying wax secreting glands, open into the egg chamber

and the minute waxen plates serve to keep the egg mass mealy and the walls of the venter soft and pliable. The outer body-wall is strongly chitinous, hence rigid. The old dead scale is thus a double-walled chitinous chamber, left secure on the tree protecting the eggs and young.

The young break from their egg covering and live for a time within the egg chamber. Their bodies contain numerous oil globules, presumably stored-up food, as they have been observed to live for some time within the chamber before beginning to take food for themselves.

An adult female may often be found still containing all the young within the old shell, but with the young no longer alive. These dead young are not mutilated as if killed by a parasite or a predaceous enemy. But one probable explanation is offered for this. The parent is often so crowded on the branch that the outer openings of the egg chamber become closed and the hardening chitin walls form a death trap from which the feeble young, with their sucking mouth parts, have no means of boring or biting or forcing their way out. Thus the malformed body of the parent is often the means of the death of its own young.

First larval stage. The young larvæ, after emerging from the parent shell, are extremely small, light brown in color, quite transparent and usually inconspicuous. Those which remain on the stem are especially hard to see, for numerous small bark scalings closely resemble the insects themselves. It has not been determined whether the habit, so characteristic of the second larval stage, of the males moving out on the leaf and the females remaining on the stem, holds good for this stage. Those individuals on the stem always locate near or at the base of a leaf, while those on the leaf are always quite near the base and on the flat surface between the two or more leaves of each whorl, in each case a position similar to that taken by the later larval stages when sexual differences may be determined. There are no apparent structural sexual differences in the first larvæ.

In the second larval stage the differences of sex may be determined by the body structure and by the insect's position on the branch. The structural differences are considered at length in the later technical description and are here merely mentioned. They are as follows: the male has seven jointed antennæ (Fig.

15, Pl. III), the female six (Fig. 32, Pl. III); the male has numerous wax ducts arranged in a row a short distance from the body margin (Fig. 11, Pl. II), and the body is rather elongated, while the wax ducts are absent in the female and the body is more hemispherical. The difference in body-shape in the two sexes is of a general character and more apparent during the latter part of this life stage. As regards their position on the tree, females apparently never go out on the leaves and males never remain on the stems. This appears to be a positive characteristic. In a great many closely examined cases no males were taken from the stems and no females from the leaves. A female instinctively moves to a protected place at the base of the leaf, inserts her setæ and becomes quiescent. Males wander more at leisure, not remaining at any particular place for any length of time. Their characteristic position is on the flat surface and quite near the base of a leaf where an opposite one affords protection. This tendency to wander was noticed alike on branches confined in the laboratory and on trees in the open. Numerous vari-colored strings were tied to the leaves and the insects near each were specially noted. The larvæ, it was found, moved away from the strings and even to different leaves. Male larvæ become quiescent only a short time before entering the pupal stage. A peculiar habit of the larvæ of both female and male is to walk out on the stem or leaf and turn around so that the anterior end is toward the base of the branch. This habit is common with many Coccids but no general explanation of it has been given. This action on the part of the female *Physokermes* might be explained by necessity of the position which the body must take in its rapid growth; the body must project from the branch in the same direction with the leaves, an angle of about 45 degrees. But why the male should do the same thing remains inexplicable.

The female in changing from the second larval to the adult stage simply casts the cuticle and retains the general form of the larva. The male, however, has a complete metamorphosis, and passes from the larval to a pupal and lastly to the imaginal stage.

The *male pupa*. The first signs of newly forming cocoons of male insects were found on April first, on which day, also, were found the first mature females. A short time before changing to the pupa the larva becomes quiescent and a thin waxen pellicle

forms over the upper surface of the body. This is presumably secreted by the wax ducts arranged near the body margin. The pupa rests directly on the leaf. The outer edges of the cocoon are attached by a sticky, waxy substance and if gently lifted, and if the waxen threads are not broken, these latter contract and bring the cocoon back again into place. The insect underneath appears at first as a dark brown object, and later, just before the adult is ready to issue, the color changes in part to a shade of pink. The pupal skin splits open crosswise at the anterior end, also part way along the dorsal median line; it is sloughed off and pushed out posteriorly from under the cocoon. The long waxen filaments next appear (fig. 33, pl. II). There is a cross suture about one-fourth the length of the cocoon from the posterior end, which serves, hinge-like, for the posterior part, and by lifting this up the insect is enabled to rid itself of the old pupal skin and also to emerge when it is fully developed. Insects kept under observation in the laboratory remain in the pupal stage from twelve to fourteen days. Just before it leaves the cocoon the insect appears restless. The tip of the cocoon is lifted by the action of the abdomen and style and the insect backs out. The old cocoon remains attached to the leaf indefinitely.

The newly issued *adult male* walks about with antennæ vibrating and style working vigorously up and down. It has apparently but the one mission in life, to fertilize the female, and Nature has well fitted the insect for this purpose by giving it a well-developed nervous system, wings and powerful thoracic muscles to operate them, many eyes and reproductive glands developed at the expense of most other internal abdominal organs. The male, having no mouth parts, no alimentary canal, and apparently no stored-up energy, must perform its function at once, hence it is important that both male and female mature at the same time, and this they do. The first adult males appeared on April twelfth and by the twentieth almost all males had issued. Adult females were found on April first and were ready for copulation by the fifteenth.

Males in flight travel only a few feet at a time and their wings, although relatively large, are frail and not easily manipulated. A few individuals taken from cocoons had their wings spread and were ready for flight within two minutes, although usually it is

some minutes before the wings can be arranged for flight. The wings are first raised rather more by the action of the style and filaments than by the wing muscles themselves, and when once lifted they are constantly kept poised above the body and supported by the long waxen filaments. Perhaps the most characteristic attitude of an active male is with its wings raised and with the waxen filaments closely appressed to their under sides. The male becomes absolutely helpless if its wings are entangled, so that the filaments play an important part in their support, especially before and during copulation. The female secretes a great amount of honey-dew and if this is not carried away by ants or otherwise, the males are easily entrapped in it. The filaments are easily bent, but unless broken or injured soon again return to their normal position.

Another characteristic attitude of the male is with wings raised and supported by the filaments but with the style pointed directly downward (Fig. 44, Pl. IV) with its tip touching the leaf, the attitude taken during copulation.

Copulation has been observed many times. In each case the female has been kept in confinement for some time and being free from ants, the honey dew had accumulated in large drops. This, however, did not inconvenience the male in the least unless its wings became entangled. In each case, as soon as males were introduced, they would be found copulating within a minute or two. In three cases copulation occupied ten, fifteen and twenty minutes respectively, and immediately afterward in each case the male moved to an elevated place and attempted to fly away. One case was noted in which two males were found copulating with one female at the same time.

The male adult life is short and lasts from a few minutes to at most not more than two or three days. Numerous males taken immediately on issuing from the pupa and kept in confinement were all dead within twenty-four hours. In a certain experiment in which they were kept in complete darkness, death occurred much sooner. In another trial seven out of ten males lived for twenty-four hours; three, thirty-six, and one lived forty-eight hours. These were kept in as natural a state as possible but were not mated. Males always die immediately after copulation.

An adult male is often found lying on its back, and it is by the aid of style and filaments that the insect raises itself again to the normal position. The wings are pushed out and down by means of the filaments to a very decided angle under the back and the insect turns a somersault by pushing itself far enough over to enable the feet to grasp the object on which it rests.

The great restlessness and apparent energy of the males soon flag and after several attempts to fly they become exhausted and may be seen lying on their sides or backs in an apparently lifeless condition. This is especially true if they are kept in darkness. When exposed to light, a reaction immediately takes place.

The effects produced on males by either light or darkness are very marked. They are attracted and stimulated by light and are overcome at once if placed in complete darkness. Numerous specimens reared in the laboratory before the bright light of a window moved toward the light immediately after issuing. Stopped by the windowpane, however, they soon weakened and, overcome, fell to the sill below.

Numerous experiments were made to ascertain whether or not the honey-dew of the female had any attractive power for the male. Males were confined in an inverted glass dish and some honey-dew was placed on a glass slide close beside them. The insects thus confined jumped about from place to place in no apparent direction but finally came to rest on the side nearest the window. The same experiment was tried within a darkened chamber. The insects, observed every twenty minutes, remained in about the same position all during the afternoon. Insects placed in darkened chambers were all dead the following morning. These and other experiments proved that males were in no way influenced by the presence of honey-dew. Honey-dew placed on a glass, and distant only an inch or two, seemed entirely unknown to them. When several males were placed on branches regardless of whether or not there was any honey-dew they were attracted to the females and almost immediately were found in the act of copulation.

Parasitic and Predaceous Enemies.

In the spring of 1902 the insects could be readily found on the lower branches of several trees near the University quadrangle,

but in 1903 they were much more difficult to obtain. Apparently their parasitic and predaceous enemies were more abundant and more thorough in their work of destruction, or there may have been some other factor which we were unable to determine. Infested trees stand in no serious danger so active are these parasites and predaceous enemies.

The most important enemy of the male is a small Coccinellid larva. Several of these were found under cocoons where they had completely devoured the pupæ. After molting, having passed the first larval stage underneath the cocoon of its host, the beetle larva comes out and wanders about attacking both larvæ and pupæ of the scale insects. It attacks the larvæ of the female as well as those of the male, but I have not observed it preying on the adult female. This Coccinellid, determined from larvæ carried through to maturity, proved to be *Rhizobious ventralis*, a small, black lady-bird, which was imported from New South Wales into California by the California State Board of Horticulture as a remedy for the black scale (*Saissetia oleæ*).

The most important enemy of the female scale is a small Chalcid fly which Dr. L. O. Howard identifies as *Microterys sylvus* (Dalmann). Dr. Howard notes that the parasite sent him and determined by him should be considered a geographical variety since it differs from the type specimens in the color of the scape. Another parasite of the female scale identified by Mr. Howard is *Blastrothrix longipennis* (Howard). A Chalcid parasite of the male is *Aphycus lecanii*.

From a comparison of the great number of young found within the body of an adult female and of the much smaller number of scales which reach maturity, it is evident that their enemies are numerous. A single female will produce between four and five hundred young, yet but two or three, or even one, will be fortunate enough to reach maturity and produce young. Mr. Coleman, after making an examination of the scales on many young pine trees at Monterey, estimates that about nine-tenths of the adult females are parasitized, and here on the Stanford University campus I find about the same condition. In every case in which a female reaches maturity, the leaf, at the base of which she is situated, is stunted in its growth.

Other scale insects injuring the Monterey Pine are: *Chionas-*

pis pinifoliæ, *Coccus hesperidum*, *Pseudococcus* n. sp. (Coleman), and *Aspidiotus hederæ*.

Other species of Physokermes are:

1—*Physokermes taxifoliæ* Coleman, found on *Pseudotsuga taxifolia*, very closely related to *Physokermes insignicola*. (Coccidæ of the Coniferæ, Jour. N. Y. Ent. Soc., V. XL, p. 72, 1903.)

2—*Physokermes concolor* Coleman, found on *Abies concolor*. (Coccidæ of the Coniferæ, Jour. N. Y. Ent. Soc., V. XI, p. 73, 1903.)

3—*Physokermes piceæ* Schr. Faun. Boica, II, pt. 1, p. 146.

4—*Physokermes coloradensis* Ckll. The Entomologist, XXVIII, p. 101.

The Egg (Fig. 1, Pl. I).

The eggs are smooth, ovate and of a light pink or flesh color when first deposited within the egg chamber. Later the egg fades in color and becomes almost transparent but with an opaqueness near one end. During the last part of the embryonic development the forming setæ are coiled on either side of the mouth-framework and remain thus until after birth when they slip down into their respective grooves. The legs, placed side by side, are directed backward, and the claws of the posterior pair on either side come very near to the anal plates. The long spines of the anal plates are crossed near their proximal ends and are bent forward. The egg is .5mm. long and .3mm. broad.

First Larval Stage (Fig. 2, Pl. I).

As it emerges from the egg the larva is broadly ovate, flat, about .7mm. long and .35mm. wide. It grows to be 1.2mm. in length and about half as broad, before the first skin is molted. During both the latter embryonic and the first larval stages the body is almost transparent with only the more heavily chitinized parts, such as the legs, antennæ, mouthparts, etc., distinguished by a light brown color. The whole upper surface of the body is formed by the dorsum. The pleura are closely connected with the venter and with it form the actual ventral surface of the body. The body shows several emarginations, notably those of the eyes, the spiracular grooves and the anal fissure. There is no conspicuous suture between head and thorax. There are nine

abdominal segments, the last being modified into the anal plates.

Numerous small regularly arranged spines are found over the body surface. Generally speaking, each segment has two pairs of lateral spines, one, the largest, on the outer margin, and a second on the dorsal surface, quite near the base of the first. There are seven spines on each side of the head, three anterior and four posterior to the eye. This fact may have no particular significance but it may possibly suggest the original number of segments which have been used to form the head. The spines of the thorax and abdomen are similar to those of the head. In addition there are four special pairs of spiracular thoracic spines as described later. A ventral pair on the eighth abdominal segment is greatly enlarged.

The *head* forms almost one-third of the insect's body and bears antennæ and mouthparts as appendages, and the eyes.

The *antennæ* (Fig. 3, Pl. III) are attached to the head about one-third the width of the body from the side, and rather nearer the chitin framework supporting the setæ than the anterior margin, and a little behind the emargination of the eyes. They are six-segmented, are irregular in outline, and taper slightly from proximal to distal ends, and have well defined sutures. The formula is 3, 6, 2, 4, 5, 1.

The chitinous *mouth framework*, and the setæ of the first larval stage, do not differ essentially from those of the second (described later). The labial sac, however, which contains and protects the setæ, is very long and extends backwards within the abdomen to a point just anterior to the anal plates.

The *eye* (Fig. 10, Pl. I) is simple, and is simply the modified tip of the optic nerve which has become enlarged and surrounded by a mass of black pigment. It is situated in a small emargination on the margin of the head and can be readily seen from either above or below.

The *thorax* occupies rather more than the central third of the body and is divided by definite sutures into pro-, meso-, and metathoracic segments. The prothoracic, largest of the three, bears besides the first pair of legs, the anterior pair of spiracles, the grooves leading from the spiracles to the emarginations at the sides, the wax ducts along the sides and in the bottom of the grooves, and the first pair of thoracic spines. The legs are equi-

distant, and are attached about one-fourth the width of the body from the margin; the first pair articulates with the body wall on either side of the labium, the second occupies a position about midway between the anterior and posterior ends of the body, and the third articulates with the posterior edge of the metathorax. The legs are alike in shape and in the number and position of the hairs.

The *spiracles* (Fig. 7, Pl. I) are placed at the inner ends of the spiracular grooves and just back and outward from the articulation of the coxa with the prothorax. Each has a chitinous circular plate, slightly funnel-shaped, with a crescent-shaped, chitinous thickening which supports the central opening. Four *wax ducts* are found along the sides and bottom of each thoracic groove. They are circular, slightly lobed, and have a central opening with others arranged in a circular manner; these latter vary in number from seven to twelve. Small waxen pellicles which fill the groove and act as a screen to keep foreign particles from entering the tracheal tubes, are secreted by these ducts. The thoracic spines are stronger than the ordinary marginal spines and are placed one on either side of the spiracular emarginations. Often the outer wax duct is between or very close to them.

The *prothorax* is larger than the mesothorax, which in turn is larger than the metathorax. All are longer along their outer margins than in the median region. The second pair of spiracular grooves, with their accompanying spiracles, wax duct and spines, are between the meso- and metathorax. The insect has two freely flexible sutures in its body corresponding respectively to the two spiracular grooves and emarginations. There is also possibly a slight movement of the abdominal segments.

The *abdomen*, constituting the posterior third of the body, tapers gradually and bears no appendages. Its segments are not clearly marked, though the dividing sutures of the sternites are well defined. The pleura have no distinct dividing sutures. The first six sternites are regular in shape but broader at the sides than in the center, causing the posterior segments to become much crowded. These latter, the seventh, eighth and ninth, are variously modified. The seventh tergite almost completely surrounds the eighth, which is deeply cleft in the center to form the

anal fissure. The eighth sternite is modified into two *anal plates* (Fig. 6, Pl. I). Each is sub-triangular, strongly chitinized, and bears at the tip one long and three short spines. These plates serve as support and protection to the delicate ninth segment, modified to be the anus, a striated, membranous structure which, when withdrawn, is completely surrounded by the conical plates. The *vulva* is strengthened by two chitinous, crescent-shaped plates which, meeting at their tips, form an elliptical opening. Each plate bears three large spines.

Second Larval Stage.

There are in the second larval stage two clearly evident and several minor differences which distinguish the sex of the individuals. The seven-segmented antennæ (Fig. 15, Pl. III) and the row of wax ducts around the margin of the body with two central abdominal groups, also the presence of wing and leg histoblasts are distinct characteristics of the male (Fig. 11, Pl. II). In the female the antennæ are six-segmented (Fig. 32, Pl. III). The wax ducts are not present in the second larval female stage, although they appear in the adult. The wing and leg histoblasts are wanting. The female is broader and more convex than the male. The four pairs of thoracic spines are stouter and more blunt in the female than in the male. The emarginations of the body of both sexes are clearly marked. Measurements of the female just before the second molt are: length 2.3mm., width 1.3mm., antennæ .27mm. The formula for the antennæ is 3, 6, 4, 5, 2, 1.

After molting the first skin the *male* larva retains the same general shape and about the same proportions of body as it has before, but for a time it grows very rapidly and before pupating has more than double its length and breadth. Its measurements just before pupating are: length 2mm., width .8mm. The numerous marginal spines characteristic of the male are of a uniform size and arrangement and, with their delicate waxen filaments, form a fringe around the body (Fig. 12, Pl. II). The spines were counted in a typical specimen of this stage and sex and numbered as follows: 51 in front from eye to eye, 24 and 26 from the eye to the first thoracic emargination on either side respectively, 22 and 26 between first and second emarginations, and 74 and 80 from

second emarginations to the posterior tip, 363 in all. The thoracic spines are similar to the others but have very blunt tips (Fig. 20, Pl. 1). Each special thoracic pair has one and often two of the regular spines between them. Other spines or hairs of definite position may also be found, notably four pairs anterior to the base of the antennæ, of which a large and a small pair are very near and between the first antennal segments. There is a single spine in front of the coxa of the meso- and metathoracic legs. There are five pairs along and quite near the median line of the venter, one pair to each of the abdominal segments, the last pair being the longest. A few inconspicuous dorsal spines are found around the body margin from the second to eighth abdominal segments.

The marginal spines are hollow, elongate, and cone-shaped, and each fits into a perforated chitinous ring in the margin of the body; each has an opening at the tip and a wax-secreting gland at the base. Wax from the gland flows up through the ring, through the spine and out through the tip. A spine may be covered with a conical cap of wax, which hardens and is forced up by newly forming wax, when it helps to form the waxen filament. Several of these growths may be seen in a single filament. The filaments are easily broken off, but are soon again replaced by the newly forming wax (Fig. 14, Pl. I).

The antennæ are seven-segmented and taper gradually from the broadened basal joint to the tip. The length is about .27mm., the formula, 3, 7, 1, (4, 5, 6,) 2. The fifth, sixth and seventh segments, respectively, bear three stout spines, probably sense cones.

The relative size and proportions of the various segments of the leg may be seen by reference to Fig. 16, Pl. III. Fig. 17, Pl. III, represents a leg straightened out and seen from the ventral side. It shows the chitinized pivot on which the coxa moves, also the chitinous rings which protect the internal structures, the trachea, muscles and nerves as they pass down into the legs.

The modification of the eighth and ninth abdominal segments of the second larval stage are similar to those of the first; namely, the sternites of the eighth are modified to be anal plates and the ninth segment to be the anus (Fig. 24, Pl. I). Instead of one long and three short spines at the distal end of each anal plate as found in the first larva (Fig. 6, Pl. 1), there are four short ones. The

spines on the crescent-shaped anal thickenings are long and tapering rather than stout and blunt as in the earlier stage.

The *mouthparts* of the Coccids, because of their extreme modification and development, present several problems and only with much difficulty, if at all accurately, can we homologize them with the mouthparts of other Hemipterous insects. Several good descriptions of Coccid mouthparts are already available, and since the parts are quite similar in all scale insects, differing only in minor details, especially in the shape of the framework, I shall here enumerate only those points about them which render this Coccid species different from others. The chitinous box which supports the mouthparts of the larval stages is alike in both sexes. In describing the buccal organs several distinct parts, such as the framework, the setæ, the labium and the pharynx are recognized and may be described and considered separately.

The framework (Fig. 19, Pl. 3) is a box-like structure which contains and supports the more delicate organs. It is mostly internal, having only the posterior ventral side exposed where the broad labium articulates with and moves hinge-like upon it. The upper interior side is purely skeleton. The "arcus superior" and "costæ superiores" are hollow rods which flatten out somewhat at the ends where they articulate one with the other. The lower posterior part of the framework is formed by two similar but curved rods forming a horseshoe-shaped structure on either side, each tip of which supports a single seta. The rods, which in the first larva form the "arcus inferior," in the second larvæ are flattened into a broad ventral plate with thickened edges (Fig. 9, Pl. 3). This tendency for the parts of the mouth framework to broaden out as the insect matures can be seen most readily in the adult female where nearly all of the rods are represented by plates.

The setæ, four chitin rods, which probably correspond to the mandibles and maxillæ of other Hemiptera, fit together to form a sucking tube. Each enlarged basal end is secured in a chitinous, funnel-shaped groove supported by the framework. The grooves appear to be attached to the horseshoe-shaped rods. The smaller lower ends of the grooves, with their enclosed setæ, are surrounded and held closely together by a chitinous enlargement of the pharynx, by which means a continuous tube is formed be-

tween the cavity of the setæ and the small œsophageal opening (Fig. 19, Pl. III).

The setæ, often longer than the insect's body, are sheathed when not in use within an invaginated sac, a part of the labium. Though similar in structure in all of the larval stages and in the adult female, the setæ vary greatly in length in proportion to the size of the insect's body. In the first larva, when not in use, the setæ form a loop which reaches almost to the anal plates (Fig. 2, Pl. I) and when protruded they are considerably longer than the insect's body. In the second larva they are much shorter in proportion and in the adult female are very short, there being almost no loop at all. In the embryo, just before the egg membrane is cast off (Fig. 1, Pl. I), and in the newly-hatched larva, also before each larval molt, the setæ appear in coils, two on either side of the chitinized framework, with their distal ends resting just above the funnel-shaped grooves (Fig. 8, Pl. III). When in this position they are still within the retort-shaped receptacles in which they are produced (Fig. 19, Pl. III). The proximal ends of the setæ are enlarged and when slipped down into place fit into the receptacles. Two setæ just before and after moving into the funnel-shaped receptacles are represented in Figs. 8, Pl. III, and 9, Pl. III. The labium and the setæ are the external and movable organs of the mouthparts, and the setæ are sheathed and manipulated by the labium. The labium is limited to a slight up and down movement, working hinge-like at its articulation with the ventral chitin plate of the internal skeleton. It is flattened and folded downwards and inwards and its lower edges come together ventrally and are partly fused together. A part of the upper inner surface of the labium is modified into a sac which extends into the abdominal body cavity and receives and protects the setæ.

The question often arises as to how a scale insect can operate its setæ. They are delicate, long, chitin rods and in themselves have no power of movement, and it is altogether impossible for the muscles which connect their broadened bases to work so as to thrust the distant tips into a branch or leaf. This might be possible were the setæ straight and rigid. The external opening of the labium through which the setæ pass is strongly chitinized and its inner edges are roughened and have a rasp-like surface (Fig. 9, Pl. III). The two sides can come together and take a vice-

like grip with their rough surface on the protruding setæ and, by alternately freeing and grasping them in unison with the up and down movement of the labium, they can thrust the setæ into the plant tissue or, by reversing the action, withdraw them into the labial sac.

Digestive System. Continuous with the cavity of the setæ is the pharynx, small in front but much swollen farther back, where it enlarges into the œsophagus (Fig. 19, Pl. III). The *œsophagus* extends forward, diminishes suddenly and passes between the œsophageal commissures and over the "arcus superior," where it takes a sharp turn back. The insect, in drawing sap from the host plant, uses the enlarged œsophagus as a little pump, the valves of which permit liquids to pass up but not down. I have observed this action, by the aid of a microscope, within a living insect as it was feeding on a pine leaf. The little valve worked back and forth and the enlarged œsophagus was seen to be alternately contracting and swelling.

The *salivary glands* are closely connected with the internal mouthparts. They are groups of six spherical bodies joined closely, or by small tubes, and each group has a common duct which leads to the œsophagus; the actual connection with it I have been unable to see. The œsophagus, after passing between the œsophageal nerve commissures, and while still retaining its small size, passes backward and lies immediately above the fused thoracic ganglia. Near the center of the ganglion it takes a sharp turn upward and forward and enters the enlarged ventriculus or stomach.

The *intestine* makes two or three long coils lengthwise of the body, one of which is a spiral-shaped recoil pushed into a pouch-like sac in the anterior part of the large rectum. The *rectum* extends straight back to the anal opening. This spiral coiling of the intestine is characteristic of most Coccids.

Respiratory System. The *spiracles*, situated one at each end of the grooves, on the ventral side of the thorax, have funnel-like, slightly kidney-shaped, chitinous openings, and on the upper inner margin of each may be seen a crescent-shaped thickened rod (Fig. 21, Pl. II). Numerous small waxen plates cover completely the tracheal openings, and almost fill the grooves; these keep foreign particles from entering and stopping the tracheal tubes,

These waxen particles extend out over the edges of the grooves and form quite a mass of wax, so that when an insect is lifted four broad white lines are left, showing where the thoracic grooves had rested against the leaf (Fig. 20, Pl. I). Doubtless this wax serves also to hold the insect to the leaf.

The tracheæ arise from four initial trunks, one from each spiracle (Fig. 12, Pl. II). There are three large connecting trunks between the tracheæ of each side; the first is ventral, and arises directly from the initial trunks of the anterior spiracles, the second, also ventral, arises from the initial trunks of the posterior spiracles, and the third is found in the fourth abdominal segment. This last trunk is dorsal and unites large trunks from both anterior and posterior spiracles. Each initial trunk divides into several, which in turn branch variously to all parts of the body.

Circulatory System. I have not given special study to the circulatory system. In sections no definite dorsal vessel could be found. Circulation must be similar to that found in other Coccidæ, that is, the blood flows in open channels through the body, bathing the tissues. There is a definite tendency for the blood to flow toward the head in the dorsal region where in more highly developed insects a definite vessel is found.

Wax-secreting Glands. There are three kinds of *wax-secreting glands* in the second larval stage of the male, viz., those which connect with the marginal spines and secrete the waxen filaments, those of the thoracic grooves which produce the waxen plates, and lastly those arranged around the body margin and which probably secrete wax to form the cocoon. One finds glands in the second larval stage of the female similar to the first two mentioned. The third kind is characteristic of the male in the second larval stage, where they form a quite regular row around the outer body margin from and including the head to about the middle of the abdomen, where they suddenly broaden out into two groups of nine or ten each. The ducts leading from the glands open out on the dorsal surface of the body. They have a characteristic cup-shaped structure. Only the duct walls can be seen in a transparent insect. A similar cup-shaped gland appears on the dorsum of the adult female.

The *nervous system* consists of three large fused ganglia, two cephalic and the compound thoracic, with their several nerves

leading to the eyes and various parts of the body (Fig. 26, Pl. II). A cleft on the lower side of the large thoracic ganglion becomes very deep in some parts and extends almost to the upper surface; the invaginated sac of the labium, with the contained setæ, lies within this groove. The labial sac is often so closely pressed that it is almost completely surrounded by the sides of the ganglion. The cephalic ganglion lies close to the ventral body wall. At its posterior constriction the commissures pass up through the framework below the arcus superior and gradually enlarge again into the thoracic ganglion. By a bend in the commissures the thoracic ganglion is also brought to lie near the ventral body wall.

The *eye* in the larval stages is simple. It consists of a simple corneal, cuticular lens, with an optic nerve enlarged and covered with masses of very dark-brown or black pigments (Fig. 29, Pl. II).

Pupa.

The male cocoon is found on the flat surface of the leaves in a position similar to that of the larvæ and always with its anterior end toward the branch. The cocoon is a waxen pellicle covering the pupa but not completely surrounding it, for on the ventral side the pupa rests directly on the leaf. The cocoon is marked with numerous irregular wavy lines and has several thickened areas somewhat rectangular in shape and quite regularly arranged, five on each side and four in a median line. A cross suture near the posterior end and the anal fissure, as found in the larvæ, are common characters. The outer edge often retains many of the waxen filaments so characteristic of the larva (Fig. 33, Pl. II).

The *larval eyes*, conspicuous by their black pigment, persist during the pupal and adult stages only as pigment spots. The large dorsal and ventral eyes, also the smaller lateral ventral ones, are new to the pupal stage. The large ventral eyes begin as buds growing out from the lobes of the brain. They join with the outer thickened cuticle, which later becomes the corneal lens. In his description of *Pulvinaria innumerabilis* Putnam suggests that the ventral pair of eyes has a spiral structure and may be the missing mouthparts changed to eyes. This is not the case in *Physokermes*. The mouthparts, also the receptacles in which the setæ are produced, disappear entirely while all of the eyes develop, as do the dorsal ones, from lobes of the brain.

Imaginal discs or *histoblasts* are found in the second larval stages of the male, though not in the female. They become quite conspicuous in the pupæ and as in other insects become evaginated externally as wing-pads, each enclosed in its pupal sac (Fig. 34, Pl. II). The *halteres* arise from a similar, though much smaller, pair of imaginal discs. The reproductive organs, small at first, soon take on large proportions and fill quite the whole of the abdomen. The testes, ducts, receptacle and penis are readily determined.

Figure 34, Pl. II, represents the insect soon after the cocoon is completely formed, showing the newly developing antennæ, legs and wing-buds, each within its pupal membrane. The anterior legs project forward and slightly outward, the other legs and wings having a backward and outward direction. Great bands of thoracic muscles appear and the reproductive glands take on large proportions. Figure 35, Plate II, represents the pupa at a later period. The anterior pair of legs has made a characteristic forward loop. The changing body does not increase in length from tip of head to tip of style, so that the style never projects from under the pupal covering. If the cocoon is removed just before the adult is ready to issue, the body is seen to have become contracted and withdrawn in an anterior direction until the tip of the abdomen lies just beneath the cross suture in the cocoon. The style projects backward to quite near the end. The space otherwise unoccupied is filled by the newly expanding wings, which lie spread one above the other over the dorsal surface of the body.

The *waxen filaments* are much longer than the adult's body and are extremely delicate and easily broken off. They are the only parts which, during the pupal stage, can be seen protruding from under the cocoon (Fig. 33, Pl. II, and 36, Pl. IV).

Adult Male, (Fig. 36, Pl. IV).

The measurements of the adult male are: head .27mm., body 1.25mm., style .78mm., wing 2.25mm., antennæ 1.13mm. The total length from head to tip of style is 2.2mm. The head bears but one pair of appendages, the antennæ; there are no mouthparts nor anything which might be presumed to correspond to them. Viewed from either above or below the head appears spherical (Figs. 39, 40, Pl. IV), but from the sides it is sub-triangular. It articulates with the thorax by a very short, slender, flexible neck.

The *antennæ* are long and slender; they taper gradually from proximal to distal ends and are covered with numerous short, delicate hairs. The proximal segment of each is strongly and almost immovably set in a large cavity on the anterior ventral side of the head. It is regular in outline and bears no hairs. The second segment tapers rapidly to receive the small ends of the club-shaped third. The following seven segments are all quite regular in outline and diminish gradually in size. Each of the two distal segments bear two strong spines and the last segment has three knobbed hairs on the tips (Fig. 38, Pl. IV). The formula is 3, 4, 5, 6, 2, 7, 8, 9, 1.

The *thorax*, conspicuous by its thick chitin walls, forms a strong box or shell to support the great mass of muscles within. It carries the legs, wings and halteres. The distal end of the tibia bears a single short, stout spine which is set deeply in a large tubercle or cushion, this cushion overlapping on the tarsus. The tarsus bears several small hairs and four digitules, two larger upper and two smaller lower ones. The leg terminates in a claw. The *wings* are about as long as the insect's body, including the style, and in width are about one-third their length; they are strengthened by no definite veins. A vein-like thickening parallels the costal margin and extends almost to the distal end, while a second branches from near the base of the first and is directed toward the anal distal margin. The wing is strengthened by various other thickenings and numerous minute hairs (Fig. 36, Pl. IV). The wing thickenings and the costal margin are also rendered quite conspicuous by red pigment. The club-shaped *halteres* arise as appendages of the metathorax and function in the movement of the wings. At its distal end each bears two, sometimes three, tiny hooks which catch in a small pocket on the basal anal wing margin. In some specimens quite a decided thickening may be noted between this pocket and the base of the wing.

The *abdomen* has well-defined segments and terminates in a long, slender style. It is capable of considerable motion. The filaments arise from spines on either side of the base of the style.

Some Notes on the Internal Structure of the Male.

In the male there are three systems of organs especially developed and worthy of particular mention. They are the nervous

system, including the eyes, the muscular, and the reproductive systems.

Five pairs of eyes are present in the adult insect, but only four are serviceable. The larval eyes are present throughout the life of the insect, but in the adult stage they are merely dark, dorsal, pigment blotches surrounded by a horseshoe-shaped thickening of the outer chitinous wall and do not function at all. They have no lens and apparently no nerve connections. Of the other four pairs two are dorsal (one large and one small pair) and two are ventral (also a large and a small pair). These are outgrowths or lobes of the cephalic ganglia and are closely united to them. One can hardly speak of an optic nerve. There really is no nerve; the eye is simply a modified lobe of the ganglion and the cornea, the modified chitinized cuticle (Figs. 41, 42, Pl. IV).

The *muscles* of the thorax have displaced, with the exception of the fused thoracic ganglia, all other thoracic organs and completely fill the strong chitin box. They serve to operate the legs and wings. The abdominal muscles are especially adapted to operate the style and waxen filaments. Other than the usual circular and longitudinal bands, there are two great groups, a dorsal and a ventral, which connect anteriorly with the posterior edge of the thoracic wall and posteriorly with the base of the style. The dorsal group is regular, consisting of three bands on either side, which taper gradually from thorax to style. The ventral bands begin in groups of three, but widen in the fifth segment to five or six and these, as distinct bands, diminish rapidly in size to the abdominal tip. Numerous other small cross and longitudinal muscles may be seen connecting the larger longitudinal groups with the outer circular layers.

Though the *reproductive organs* appear in the larval stage, they first become conspicuous during pupal development. It is then that the separate parts, the testes, ducts, receptacles and style can be determined. In a newly issued adult the two great testes extend the full length of the abdomen. They are constricted posteriorly, where each makes a loop forward and over, and the two ducts unite to form the seminal receptacle (Fig. 43a, Pl. IV). Before copulation the sperm descends into the greatly expanded receptacle and the testes become much reduced (Fig. 43b, Pl. IV).

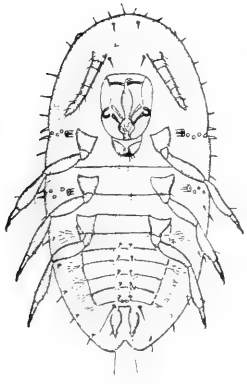
Adult Female.

Spending, as the adult female does, her whole life in one place, eyes, antennæ and legs become useless. The eyes have disappeared altogether and legs and antennæ are much reduced.

The *mouthparts*, with that part of the venter anterior to them, are pushed forward and out and form a conical-shaped mass; this enables them to retain their external position and prevents them from being caught in the infolding venter during the very rapid growth. The setæ project from the tip of this cone. Structurally the mouthparts are similar to those of the second larval stage, but here the rods which form the framework are opened out into large plates. The *ovaries* are developed beyond all the other organs and fill up the entire body cavity. The *spiracles* are conspicuous and the branching tracheal trunks extend out from them in several directions (Fig. 47, Pl. II). *Wax glands*, similar to those of the second larval male, are found scattered over the anterior part of the body. These glands probably secrete the wax, so conspicuous on the outside of the body.

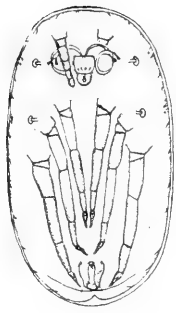
EXPLANATION OF PLATE I.

Fig. 1. Egg, embryo ready to issue.
Fig. 2. Larva in first stage.
Fig. 5. Spiracle, wax ducts, and thoracic spines.
Fig. 6. Anal plates, first larval stage.
Fig. 7. Spiracles, first larval stage.
Fig. 10. Eye, first larval stage.
Fig. 13. Marginal spines.
Fig. 14. Waxen filaments, second larval stage.
Fig. 20. Spiracle, spiracular groove and thoracic spines, second larval stage.
Fig. 23. Anal plates in resting position, anus withdrawn.
Fig. 24. Anal plates opened out, anus protruded, second larval stage.
Fig. 25. Wax ducts in spiracular groove, second larval stage.
Fig. 46. Wax-secreting glands.

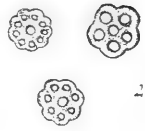


2

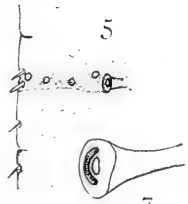
10



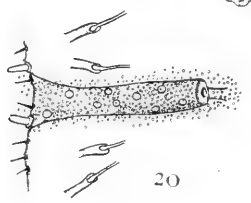
1



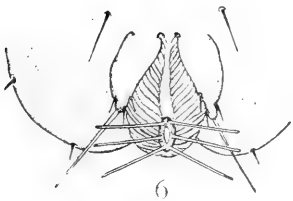
25



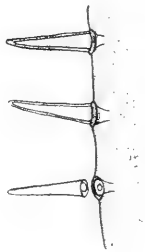
5 7



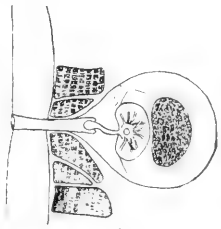
20



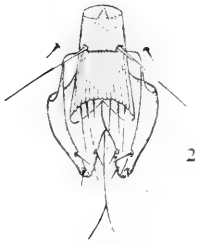
6



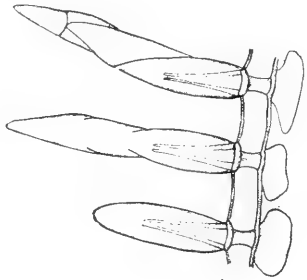
13



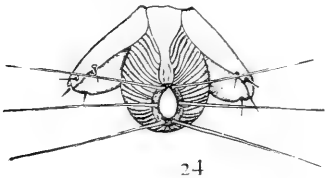
46



23



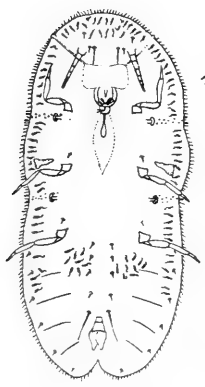
14



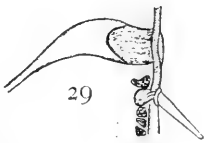
24

EXPLANATION OF PLATE II.

Fig. 11. Male, second larval stage, showing wax ducts (ventral side).
Fig. 12. Male, second larval stage, showing tracheæ (ventral side).
Fig. 21. Spiracle and tracheal trunk.
Fig. 22. Spiracle.
Fig. 26. Ganglia of male.
Fig. 27. Thoracic ganglion, cross section.
Fig. 28. Cephalic ganglion, cross section.
Fig. 29. Eye, second larval stage.
Fig. 30. Wing bud (histoblast).
Fig. 31. Wing bud (histoblast) in cross section.
Fig. 33. Male cocoon and pupa on leaf.
Fig. 34. Pupa, young.
Fig. 35. Pupa, older.
Fig. 47. Spiracle and tracheal trunks of adult female.



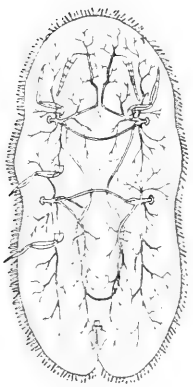
11



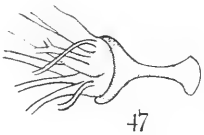
29

21

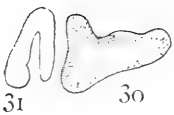
22



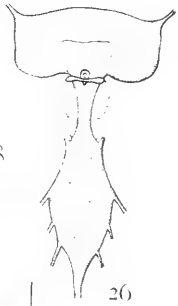
12



47



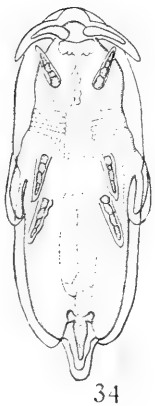
31 30



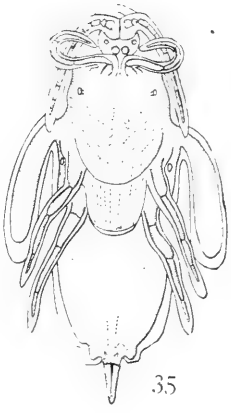
28

27

26



34

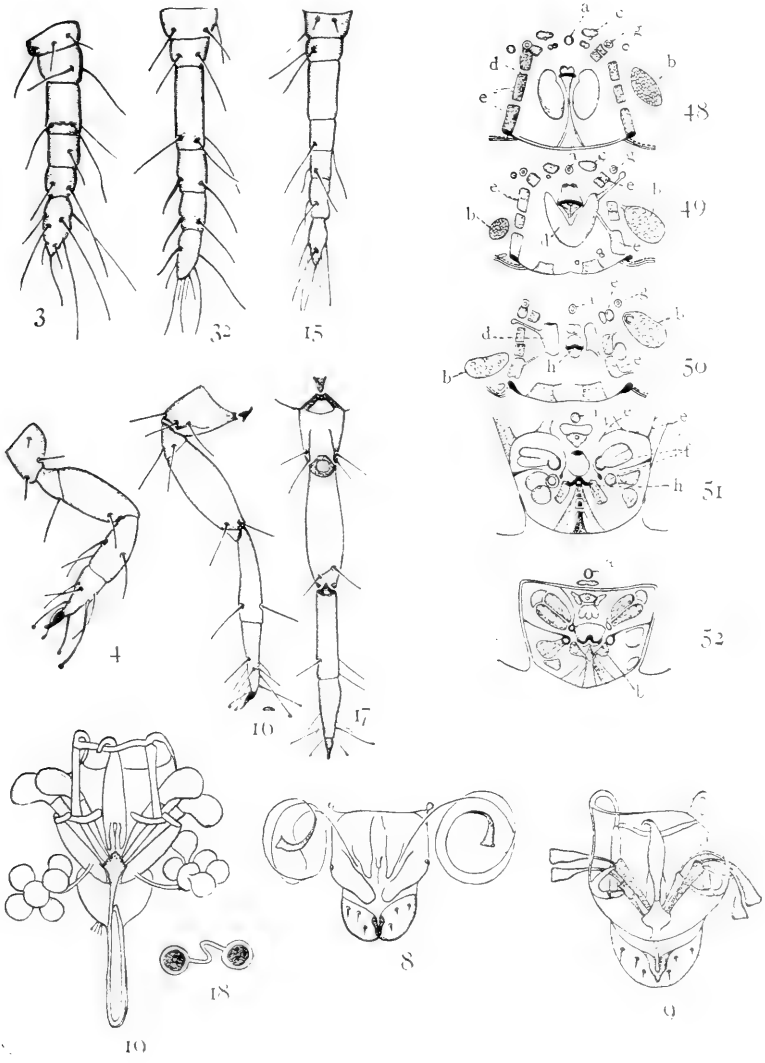


35

33

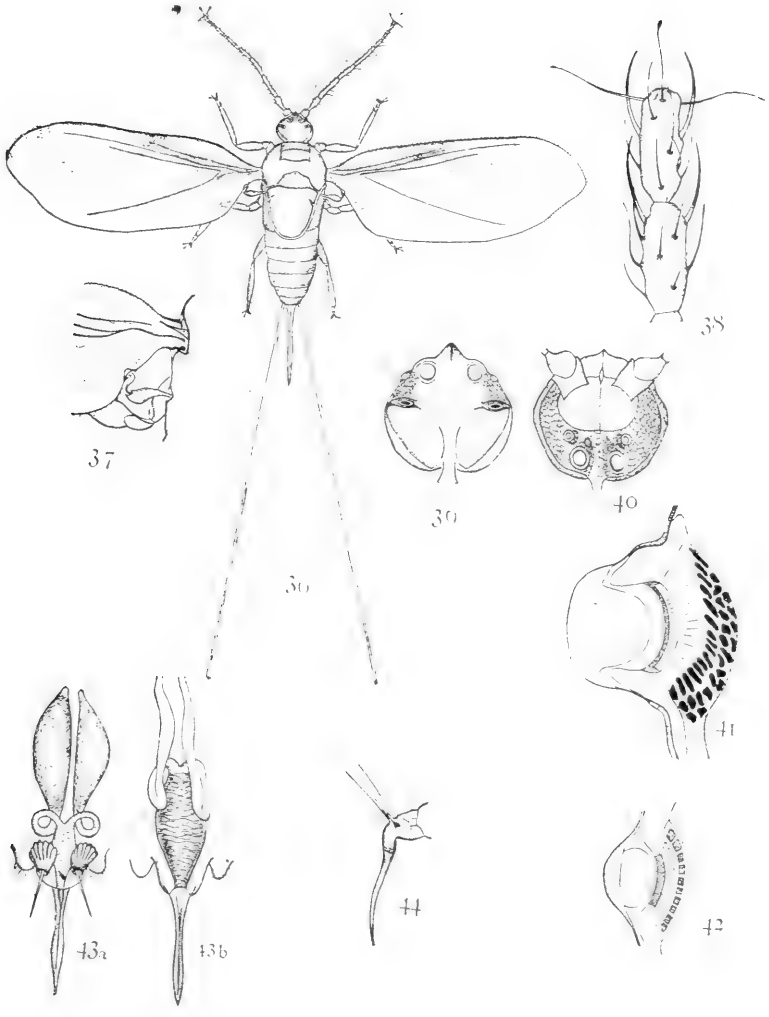
EXPLANATION OF PLATE III.

Fig. 3. Antenna, first larval stage.
Fig. 4. Leg, first larval stage.
Fig. 8. Mouthparts, with setæ in spiral coil (ventral aspect).
Fig. 9. Mouthparts before setæ are slipped into place (ventral aspect).
Fig. 15. Antenna of male, second larval stage.
Fig. 16. Leg of female, second larval stage.
Fig. 17. Leg of male, second larval stage.
Fig. 18. Cross section through invaginated sac of labium.
Fig. 19. Mouthparts and salivary glands, second larval stage (dorsal aspect).
Fig. 32. Antenna of female, second larval stage.
Fig. 48.
Fig. 49.
Fig. 50.
Fig. 51.
Fig. 52. Successive cross sections through the mouthparts, showing hollow rods, ventral plate, ganglion, œsophageal commissures and valve. *a*, œsophagus; *b*, retort-shaped glands; *c*, other chitin-secreting glands; *d*, ganglion; *e*, muscles; *f*, enlarged receptacle for setæ; *g*, costæ superiores; *h*, valve.


3
32
15
48
49
50
51
52
4
10
17
18
10
8
9

EXPLANATION OF PLATE IV.

Fig. 36. Adult male.
Fig. 37. Base of wing and wing-hooks.
Fig. 38. Distal end of antenna.
Fig. 39. Head, dorsal view.
Fig. 40. Head, ventral view.
Fig. 41. Large ventral ocellus, in section.
Fig. 42. Small ocellus, in section.
Fig. 43a. Reproductive glands and style.
Fig. 43b. Reproductive glands and style.
Fig. 44. Style, side view.


37
38
39
40
41
42
43a
43b
44

JULY, 1907. VOL. XII. PAGES 27–94

Proceedings

——OF THE——

Davenport Academy of Sciences

THE GENUS EUTETTIX

BY ELMER DARWIN BALL

Published from the Income of the
Putnam Memorial Fund

DAVENPORT, IOWA, U. S. A.
DAVENPORT ACADEMY OF SCIENCES
1907

PROCEEDINGS OF THE DAVENPORT ACADEMY OF SCIENCES
Davenport, Iowa, July, 1907 Vol. XII, Pages 27-94

THE GENUS EUTETTIX

WITH ESPECIAL REFERENCE TO E. TENELLA, THE BEET LEAF HOPPER: A TAXONOMIC, BIOLOGIC AND ECONOMIC STUDY OF THE NORTH AMERICAN FORMS

BY E. D. BALL

INTRODUCTION

During the season of 1905 a small leaf hopper (*Eutettix tenella*) appeared in immense numbers in the beet fields of Utah and the surrounding region. Investigations were at once started to discover its life history and the best means of combating it. As the season progressed a large number of the beets were found to be affected with a peculiar condition, called "curly-leaf," which resulted in an immense damage to the crop.

In order to assist in determining whether this condition was the direct result of the attack of the leaf-hopper, a study was made of the effect of the other members of the group on their respective food plants. During this study it was found that certain species of leaf-hoppers that had been placed in different sub-families agreed with the members of this group in many structural characters and also, in some cases, in producing a similar injury to their food plant. The tracing of these relationships laid the foundation for a systematic revision of the group which is here presented with the results of the economic and biological studies.

SPECIFIC CHARACTERS.

The characters available for specific separation vary widely in the different groups of leaf-hoppers. In the group under consideration the shape of the vertex and its angle with the front varies with the different species and can be depended upon within certain limits. The relative length and width of either vertex or face is, however, of little value, as it varies between the sexes and still more so between large and small individuals.

The shape of the elytra and pattern of venation furnish good characters in many of the species. The genitalia, which in many Jassid groups furnish the court of last resort in the determination of the species, is of little value here. Occasionally good characters appear in a species, but in many cases the individual variation is greater than the difference between the species. Under *seminuda*, *scitula* and *strobi*, the ordinary form and different variations in these structures are figured. These variations are not due to changes in the shape of the segment itself as much as in differences in position and curvature, as will readily be seen in the series shown under *seminuda*.

With the exception of the *lurida* group the color, and especially the color pattern, has proven to be one of the best characters for the separation of species, and in the *strobi* group it is practically the only character available for the separation of some of the best known species, such as *strobi* and *seminuda*.

SPECIES AND VARIETIES.

For the purpose of the present study, forms have been considered as specifically distinct, where all the known specimens agree in possessing certain specific characters, the limits of whose variation do not reach the extreme variation of some other known form. On the other hand, even where the great majority of the individuals of two forms fall around certain definite and quite widely separated modes, but where in the remainder complete intergradation of characters can be shown, they have been considered as varieties.

In reality there is more difference between species and varieties than would be inferred from the above. Species usually differ by a number of different characters, such as size, form, color pattern and different structural modifications, any one of which might vary in the direction of another species while the rest remain constant, and would easily distinguish it. Varieties are, however, often separated on single characters or closely correlated groups of characters, and variation in these characters leaves nothing stable on which to found the species.

In practice, the question of distribution, food habits, larval characters and life-history, and the known stability or variability

of the other members of its group have all been considered in deciding as to the standing of a given form. Some varieties appear to be quite stable when taken only from the extreme limit of their specific range, as in the case of *subaenea* and *querci* in Colorado, and two or three forms recognized as species in this paper may prove to be only similarly isolated varieties when more thorough collecting is done nearer their centres of dispersal.

The *lurida* group presents a case of wide variability along a few very definite lines. In color they range from a shining black with a few white marks through brown, reddish brown and indefinitely spotted or washed forms to golden or greenish white, with almost every conceivable gradation between. In the something over one hundred specimens examined, while no two are exactly alike, the great majority of them seemed to arrange themselves around about eight forms, all but one of which has been described as species, but which must be treated as color varieties.

There is also a very wide variation in size in this group, which is, however, in no way correlated with the color variation, the largest and smallest forms occurring in the same color variety. Although intergradations occur, two forms of wing lengths are very common; one in which the elytra are long and rather flaring behind, giving the insect a narrow parallel-margined effect, and the other with the elytra closely folded behind, giving a very broad, compact appearance. These variations run through all varieties, but are most marked in some of the extreme forms.

MATERIAL USED AND ACKNOWLEDGMENTS.

In the course of this study practically all the material known to exist in American museums, including types of all described species excepting those of Say and Fitch, has been examined.

The United States National Museum material was especially rich in the varieties of the *lurida* group, in material from Texas and the southwest, and also contained a number of types. The collections of Dr. Uhler and Mr. Heidemann furnished most of the material from Maryland and the District of Columbia. The Cornell collection contained a fine series from Arizona and one type. The collection of the Iowa Agricultural College contains the Van Duzee collection and types, and the Iowa material and types of Osborn and Ball. The Colorado Agricultural College

collection contains part of the material and types of Gillette and Baker, and also of those species from Colorado described by the writer. Prof. Osborn's collection contains material from Iowa, Ohio, and smaller amounts from various places, as well as types of his species. Mr. Van Duzee's collection contains material from New York and a fine series of Colorado and Utah forms, including a number of types. Rev. Mr. Wirtner furnished material from Pennsylvania, and Prof. Snow from Kansas and the southwest. As the writer had worked and collected in this group for a number of years, his own collection was of the greatest help, containing material in ever species here listed, and types of over two-thirds of them.

The writer wishes to express his obligation to Dr. L. O. Howard for courtesies extended while working in the National Museum, and for material loaned; to Prof. Comstock for the loan of the Cornell material; to Prof. Summers for the loan of types from the Iowa collection, and to Prof. Gillette and Mr. Heidemann for assistance in verifying records, and other favors; to those named above who have furnished material; and especially to Prof. Osborn for material furnished and for his never-failing assistance and suggestions in the final preparation of this paper, the writer is deeply indebted. The life-history studies have extended through a number of years of field work, but the final summary has been prepared and most of the systematic work done in the Zoölogical Laboratory of the Ohio State University.

Genus Eutettix Van Duzee.

Resembling *Phlepsius*, but with the ramose pigmentation reduced to definite bands or wanting. Head short and slightly conical or moderately long and nearly flat, a transverse depression just back of vertex margin, more pronounced in the short-headed species. Elytra rather short, shorter and broader than in *Thamnotettix*. Face nearly flat; front broad, gradually narrowing to the clypeus, which is expanded at the apex.

As thus defined the genus *Eutettix* is made to include all the groups that have apparently sprung from a *Phlepsius* stock by reduction of the ramose pigmentation. Three of these groups have been considered worthy of subgeneric rank and it is possible that they may eventually be considered as distinct genera; however, until the present confusion in the placing of Jassid genera is cleared up, little of value can be accomplished along that line.

KEY TO THE SUBGENERA.

A Elytra with only one cross nervure between the sectors, costal margin destitute of supernumerary veinlets. Subgen. *Eutettix* Van D.

AA Elytra with two cross nervures between the sectors or supernumerary veinlets to costa or both (in orange fulvous species these are sometimes obscure).

B Anterior margin of vertex rounding to front, without a definite line except near the apex. Second cross nervure always present, no black line under vertex. Subgen. *Alligia* nov.

BB Anterior margin of the vertex acutely angled with the front often, slightly produced and with a black line beneath. Subgen. *Mesamia* nov.

Subgenus EUTETTIX Van Duzee.

Van Duzee, Psyche, VI, p. 307, 1892; Trans. Am. Ent. Soc., XIX, p. 300, 1892.

Rather stout, head of about the same width as pronotum. Vertex rather short, slightly sloping, distinctly transversely depressed, the apex often slightly conically upturned. Elytra moderately long, usually slightly flaring, venation simple, only one cross nervure between the sectors. Elytra without supernumerary veinlets or ramose lines, or with these reduced or aggregated into oblique bands (*pannosa* excepted).

This subgenus, as here restricted, contains all the species included in the genus by Van Duzee, in his catalogue, except one (*cincta*), and also one (*strobi*) which was there placed in *Phlepsius*. As now arranged it is made up of three closely-related groups of species.

ARTIFICIAL KEY TO THE SPECIES.

A Elytra without distinct transvese bands or ramose lines.

B Large, some shade of brown or black, or if light, then without a tinge of green, and more than 5mm. long (*lurida* group).

C Ground color of vertex and pronotum yellow, elytra brown or dark, with a white commisural spot.

D A black band on anterior margin of vertex and another on posterior disc of pronotum, the latter often reduced.

E Elytra more or less black, with the margin and commisural spot light. Var. *picta* Van D.

EE Elytra not black.

F Elytra uniform brown, markings same. Var. *tristis* nov.

FF Elytra creamy, mottled with brown around the light commisural spot. Var. *slossoni* Van D.

DD Vertex and pronotum yellow, without definite markings.

E Elytra tawny, nervures indistinct, scutellum unmarked. Var. *lurida* Van D.

EE Elytra subhyaline, nervures dark, scutellum with two black points on the margin. Var. *subaenea* Van D.

CC Ground color of pronotum same as that of elytra, vertex often paler.

D Elytra smoky, subhyaline or brown.

E Elytra subhyaline, whole insect mottled with brown. Var. *marmorata* Van D.

EE Uniform reddish or chestnut brown. Var. *southwicki* Van D.

DD Pale straw, shading to golden brown. Var. *quercı* G. & B.

BB Smaller, green, pale green or golden yellow, often with black spots (*clarivida* group).

C With two or four black spots on vertex margin. *clarivida* Van D.

CC Vertex without spots.

D Elytra with light flecks or black points, or both.

E Elytra bright green, infuscate at apex, with white flecks and sparse black points. *osborni* n. sp.

EE Elytra subhyaline white, peppered with black points.

F Black points, irregular, mainly along nervures, rarely almost wanting. *insana* Ball.

FF Black points mainly in transvere rows and reticulations. *paupercula* Ball.

DD Elytra greenish or golden without black markings. Species very small.

E Golden yellow, head broad. *stricta* Ball.

EE Greenish yellow, head narrow. *tenella* Bak.

AA Elytra with oblique bands, rarely obscure (*albida*), sometimes connected into a median stripe, and rarely absent along costa (*strobi* group).

B Elytra with a saddle or other pattern on the disc.

C Markings on anterior half of claval areas, irregular or wanting. A definite oblique band across posterior half of clavus.

D Pronotum and anterior half of elytra white or but faintly reticulate. *seminuda* Say.

DD Markings on pronotum and anterior part of clavus distinct, same color as saddle.

E Whole insect suffused with reddish. *strobi* Fitch.

EE Ground color light yellow or white.

F Posterior half of vertex and basal third of corium without markings. *scitula* Ball.

FF Posterior half of vertex and basal third of corium irregularly inscribed. *pullata* Ball.

C Markings on claval areas united into a definite median stripe narrowed in the middle, and usually dark bordered externally.

D Saddle definitely margined, extending to costal margin of elytra.

E Markings on pronotum and elytra pale olive, pronotum not definitely margined.

F Color pattern of elytra margined with black, black spots behind eyes.

G Vertex obtusely angulate; face, vertex and scutellum pale creamy or white, disc of the latter irrorate.
perelegantis Ball.

GG Vertex rounding, face, vertex and scutellum orange yellow.
mildredæ Ball.

FF Color pattern of elytra very pale, without black margins.
snowi n. sp.

EE Markings on pronotum and elytra rich chestnut or brown, margin of pronotum narrowly lined with white.

F Vertex pale, irregularly irrorate at base. *saucia* Ball.

FF Vertex chestnut, anterior margin narrowly light.
pulchella Bak.

DD Saddle not definitely margined or not extending to costa.

E Saddle obscure, whole elytra sparsely reticulate, face light.
albida Ball.

EE Saddle definite, not extending to costa, face dark.
pannosa Ball.

BB Elytra uniformly colored or reticulate before apex of clavus.

C Pronotum and elytra uniformly irrorate with very pale brown.
texana n. sp.

CC Elytra creamy, posterior third and pronotum heavily irrorate with black. *bicolorata* Ball.

EUTETTIX SUBAENEA (Van Duzee).

(For synonomy, see under varieties.)

A stout, broad-headed species, with an almost parallel margined vertex, and moderately long and simply veined elytra. Size and color very variable.

Vertex broad, over twice wider than its middle length, but very little longer on middle than against the eyes, disc sloping to the transverse depression, then flat or slightly elevated and transversely striated. As seen from the side the union of vertex and front is slightly produced, shading out toward the ocelli. Venation simple, only one cross nervure, central anteapical cell very slightly narrowed in the middle, veinlet between fourth and fifth apical cells sloping back, rather long in stout and short-winged forms; approaching a right angle with the costa, in narrow, long-winged forms.

Genitalia: Female segment with the outer angles slightly rounding, posterior margin slightly excavated to rounding, according to position, with the median fifth triangularly produced into a broad, slightly notched tooth about as long as its basal width. Male valve broadly rounding, the apex slightly angularly produced; plates together, long, spoon-shaped, the margins clothed with long hairs and slightly emarginate just before the black apex.

Habitat: Specimens of the different varieties are at hand from Massachusetts, Long Island, Maryland, District of Columbia, New Jersey, Georgia, Florida, Texas, Indiana and California (all

from U. S. N. M. coll.: The Maryland forms from the Uhler collection: Florida forms from the Ashmead collection), Ohio and New York (Osb. coll.), District of Columbia and Maryland (Heid., Sanders), Florida (Slosson), Tennessee (Summers), Iowa, Colorado and Utah (Ball), Indiana and Arkansas (Osb. coll.), Michigan and Pennsylvania (Wirtner), and Mexico (Vienna museum).

In size, this species varies from $7^{mm.}$ long in large females down to $4.5^{mm.}$ in the smallest males; in width it is equally variable, ranging from $2.5^{mm.}$ down to $1.5^{mm.}$. The variations in color are innumerable, but seem to arrange themselves around about eight forms, which are here described as color varieties.

EUTETTIX SUBAENEA *var.* PICTA Van Duzee.
(Pl. I, Fig. 1.)

Eutettix pictus V. D., Trans. Am. Ent. Soc., XIX, p. 301, 1892 (Desc. Pa.); Catalogue, p. 297, 1894.

Eutettix magnus Osb., Ent. News, XI, p. 395, 1900 (Illinois and Arkansas).

Resembling *Thamnotettix clitellarius* but much stouter. Definitely black and yellow marked.

Color: Vertex, pronotum and scutellum lemon yellow or slightly fulvous, anterior half of vertex and posterior half of pronotum, omitting the posterior margin, glossy black, the margins of these bands often irregular, and the anterior one frequently bisected on the median line. Elytra shining black, a common oval spot on the suture before the apex of clavus and the anterior two-thirds of costal margin pale yellow. Size of both spot and margin very variable, sometimes wanting. Face black, with a broad band across under eyes and short arcs above yellow, varying to all yellow below except a basal band on front. In some specimens the black on the elytra fades out to brownish except along the margins of the yellow, and in others it breaks into spots.

Specimens are at hand from Baltimore, Maryland, District of Columbia, Pennsylvania, New Jersey, Florida, Tennessee, Indiana, Arkansas and Mexico, those from the coast regions being mostly smaller than those inland. The form, described as *magnus* by Osborn, from Illinois and Arkansas, is the largest, and those from Florida the smallest.

EUTETTIX SUBAENEA *var.* TRISTIS nov.
(Pl. I, Fig. 2.)

With pronotum and head of *picta* and elytra of *southwicki* nearly.

Color: Vertex, face, pronotum and scutellum yellow, margin of vertex and base of front with a pair of black spots extending out to the ocelli and separated by a rather broad median line. Pronotum with the transverse band of *picta* reduced in size and fading to brown in color. Elytra of a uniform tawny brown becoming subhyaline toward costa, a very small sutural spot usually present.

Specimens of this form are at hand from Maryland, District of Columbia, New Jersey, Georgia, and Florida.

EUTETTIX SUBAENEA *var.* SLOSSONI Van Duzee.

Eutettix slossoni V. D., Bull. Buf. Soc. N. S., V, p. 210, 1894 (Desc. Fla.); Catalogue, p. 314, 1894.

Pale creamy yellow, maculate with brown, black marks on vertex and traces of pronotal band as in *picta*.

Color: Face, vertex, pronotum and scutellum pale creamy yellow, a broad band on base of front, extending a trifle over onto vertex, bisected in the middle, black. A brownish transverse band faintly indicated on posterior half of pronotum. Elytra creamy, mottled with brown, especially against the scutellum and along sutural margins.

Specimens of this form are at hand from District of Columbia, Florida, and Texas (all females).

EUTETTIX SUBAENEA *var.* MARMORATA Van Duzee.

Eutettix marmorata V. D., Trans. Am. Ent. Soc., XIX, p. 302, 1892 (Desc. N. C.); Catalogue, p. 297, 1894; Osborn in Smith Cat. Ins. N. J., p. 95, 1900 (N. J.).

Eutettix incerta Gill. and Bak., Hemip. Colo., p. 100, 1895.

Resembling *lurida* but with the fulvous on vertex and pronotum obscured by testaceous markings, and the elytra irregularly mottled with the same color.

Color: Vertex, pronotum and scutellum pale yellow, washed with dirty brown, and ornamented with testaceous lines and spots. Usually a line in the transverse depression of vertex and two spots at apex, four along the base, and the median impressed line testaceous. Scutellum with traces of about six stripes on the disc and a few submarginal spots testaceous. Usually a few dark spots behind the eyes. Elytra subhyaline blotched with testaceous brown, fading out toward the costa. Traces of a white spot on commissure as in *lurida*, except in the darkest males. Face with the arcs and a spot at base of front sometimes extending into vertex, testaceous.

Specimens are at hand from Massachusetts, New York, North Dakota, District of Columbia, Ohio, North Carolina, Florida, and Colorado.

EUTETTIX SUBAENEA *var* SOUTHWICKI Van Duzee.
(Pl. I, Fig. 3).

Eutettix southwicki V. D., Bull. Buf. Soc. N. S., V., p. 209, 1894 (N. Y. City); Catalogue, p. 296 and 324, 1894; Osborn and Ball, Iowa Acad. Sci., V., p. 232, 1897 (Iowa); Osborn in 20th Rep. St. Ent. N. Y., p. 531, 1905 (list).

Eutettix brunneus Osborn, in 20th Rep. St. Ent. N. Y., p. 530, fig. 33, 1905 (western N. Y.).

Resembling *marmorata* but with the testaceous markings coalescing to form an almost uniform testaceous brown color above.

Color: Vertex dirty yellow with testaceous markings of *marmorata* coalescing to form an irregular wash, often deepening at apex and uniting with a brown band on base of front. Pronotum testaceous brown, elytra of uniform testaceous cast, often becoming smoky toward the tip in the females and all over in the males, in which case they present a slight coppery irridescence. Nervures concolorous, those to costa on the smoky specimens slightly fuscous.

Specimens are at hand from New York, Maryland, District of Columbia, and Iowa.

This species was described from males only; the females are larger and lighter. Some of the smaller smoky males superficially resemble certain species of the genus *Athysanus*. In Osborn's figures, a nervure in the under wing showing through the elytron was taken for a second cross nervure and the genitalia were drawn from damaged specimens and are not typical of the species.

EUTETTIX SUBAENEA *var.* LURIDA (Van Duzee).
(Plate I, Fig. 4.)

Thamnotettix lurida V. D., Can. Ent., XXII, p. 250, 1890 (Desc. Iowa and Mich.).

Eutettix lurida V. D., Psyche, VI, p. 307, 1892 (Type of genus); Catalogue, p. 296, 1894 (Adds. Md.); Osborn and Ball, Iowa Acad. Sci., IV, p. 232, 1897 (Iowa list); Osborn, Ohio Acad. Sci., 8th Ann. Rept., p. 67, 1900 (Ohio); in 20th Rept. St. Ent. N. Y., p. 530, 1905 (N. Y.).

Resembling *tristis* with the dark markings on the vertex and pronotum lost, and the light spot on the commissure enlarged.

Color: Vertex, pronotum and scutellum fulvous, elytra testaceous brown, fading out to subhyaline towards costa, the common commissural spot and

sometimes the apex of scutellum creamy yellow. Face light testaceous brown, the sutures darker, the frontal arcs light.

Specimens are at hand from Maryland, Georgia, Florida, New York, and Iowa, and Van Duzee gives Michigan.

EUTETTIX SUBAENEA *var.* SUBAENEA (Van Duzee).

Thamnotettix subaenea V. D., Ent. Am., VI, p. 77, 1890 (Desc. Calif.); Psyche, VI, p. 307, 1892.

Eutettix subaena V. D., Trans. Am. Ent. Soc., XIX, p. 303, 1892; Catalogue, p. 296, 1894.

Resembling *lurida* closely in color pattern, but with faint testaceous markings on vertex and pronotum, and subhyaline elytra with the costal nervures embrowned. Narrower and with the vertex slightly more angled than in typical *lurida*.

Color: Vertex and pronotum pale fulvous, the transverse depression, median line and two irregular spots at base of the vertex and six stripes on pronotum obscurely testaceous. Scutellum pale yellow, with a black point on either side the apex. Elytra subhyaline shading to testaceous next the scutellum, and along the sutural margin, omitting a light spot, the apices of elytra and nervures to costa smoky.

Specimens are at hand from Fort Collins, Colorado, and Los Angeles, California.

EUTETTIX SUBAENEA *var.* QUERCI Gill. and Baker.
(Plate I, Fig. 5.)

Eutettix querci G. and B., Hemip. Colo., p. 101, 1895 (Southern Colo., on oak).

Resembling a pale *slossoni*. Similar to *southwicki*, but much paler. Greenish yellow or pale golden yellow.

Color: Vertex and scutellum creamy yellow, pronotum and elytra pale whitish or brownish straw, shading up in the males to pale golden yellow. Entire elytra subhyaline with dark bands on abdomen showing through, apical cells and costal nervures in the males often marked with smoky.

Specimens are at hand from District of Columbia, Colorado Springs, Palmer Lake and Grand Junction, Colorado, and Salt Lake, Utah.

Larvæ: Stout, vertex flat, half longer than in adult, roundingly right-angled with a sharp margin, color very variable, commonly a pale creamy, with four quadrate areas on the vertex, three series of triangular ones on the pronotum, scutellum and wing pads pale brown, the abdomen usually heavily irrorate omitting an oblique band or row of spots on each side the middle.

Some of the larvæ are more or less suffused with reddish and some have the color areas joined into a broad black median stripe, narrowest on the wing pads, and often wanting on the vertex.

Variety *querci* is strictly confined to the oak in both larval and adult stages, most of the specimens of *marmorata* have been taken from oak, *lurida* is apparently an oak feeder, and it is likely that all of the varieties will be found to feed on oak, when the life history is known.

EUTETTIX CLARIVIDA Van Duzee. (Pl. I, Fig. 6.)

Eutettix clarivida V. D., Can. Ent., XXVI, p. 138, 1894 (Colo.); Catalogue, p. 297, 1894; Gill. and Baker, Hemip. Colo., p. 100, 1895 (list).

Form and structure of *subaenea* nearly, smaller, stouter, with a fuller front. Pale green with two or four black spots on vertex. Length ♀ 5.2mm. ♂ 4.5mm.; width 1.4mm.

Vertex with the disc slightly convex, transverse depression shallow, slightly longer on middle than against eye. Front strongly inflated along the middle line, sometimes visible from above, less inflated below; clypeus stout, prominent, scarcely constricted. Elytra rather short, closely folded at the apex, venation simple as in *subaenea*, with occasionally a few weak supernumerary veins in the claval areas and in the fifth apical cell.

Color: Pale green, the vertex and elytra often a trifle yellowish green. A pair of large round black spots on vertex margin just inside the ocelli and a pair of minute points inside the apex, brown or black.

Genitalia: Female segment rather long, posterior angles rounding, posterior margin truncate or slightly rounding, median sixth produced into a short and usually bidentate tooth. Male valve obtusely angular, short, plates broad at base, triangular, their apices slightly attenuate, a trifle longer than their basal width.

Specimens are at hand from Fort Collins, Los Animas, Pueblo, Palisades, and Grand Junction, Colorado; Cisco, Thompson's, Moab, Layton, Manti, and Salina, Utah, all collected by the author, and Delta and Montrose, Colorado (Gill).

Larvæ: Resembling the adult, but with a longer and more angular head. Green, with two black spots on the vertex; these correspond to the outer pair of the adult, and are sometimes wanting in the younger larvæ.

The green color with the black spots on vertex will at once distinguish this species. It lives on *Atriplex canescens*, to which its green color adapts it. From this plant it spreads to other species of salt bush and related plants. It will, no doubt, be found widely distributed on its food plant in the arid region.

EUTETTIX OSBORNI n. sp. (Pl. I, Fig. 7.)

Form and structure of *clarivida* nearly, the head a trifle shorter. Deep green, the elytra with milky flecks and smoky apices. Length ♀4.6mm., ♂4mm.; width 1.3mm.

Vertex with the margins evenly rounding or slightly tumid at apex, disc convex, the transverse depression very faint, front broad, slightly convex, but little narrowed until suddenly rounding in to the clypeus, clypeus broad with the margins nearly parallel, elytra moderately long, closely folded, giving a wedge-shaped appearance to the insect. Venation simple, obscure, the anteapicals slightly longer than in *clarivida*, and the central one with the apex slightly more enlarged.

Color: Vertex and face pale green, pronotum deep green, irregularly mottled on disc, paler anteriorly. Elytra deep green to just beyond the apex of clavus, then smoky, subhyaline. Several irregular white flecks on the green portion, an irregular band between the green and smoky, a round spot in the apex of the central anteapical cell, and the costa back of the middle, white. The nervures towards the apex are light, with a smoky shade intensified against them, especially against the fifth apical veinlet, where it appears margined with fuscous, interrupting the light costal area. Traces of minute black dots appear on the green portions of pronotum and elytra in two specimens.

Genitalia: Female segment rather short, outer angles bluntly rounding, posterior margin rounding and slightly produced in the middle; male valve equilaterally triangular, acutely pointed, clothed with light hairs along the margin.

Described from one female and two males from Galveston, Texas, taken in May by Prof. Snow.

EUTETTIX INSANA Ball. (Pl. I, Fig. 8.)

Eutettix insana Ball, Can. Ent., XXXII, p. 203, 1900 (Desc. Colo.).

Form of *clarivida* nearly, smaller, with a longer vertex and more flaring elytra. Greenish white peppered with black points. Length ♀4mm., ♂3.3mm.; width 1.1mm.

Vertex slightly angled, apex rounding three-fourths of the length of the pronotum, disc almost flat, margin thick, front not inflated, resembling *lurida*. Pronotum short, deeply inserted into apex. Elytra rather short and broad, venation regular except that claval veins often approach each other in the middle.

Color: Vertex and face pale creamy, a few black dots on vertex. Pronotum pale greenish white or dirty white, sparingly peppered with black dots. Elytra greenish white or subhyaline, thickly sprinkled with minute black points, the greater number of them on or close to the nervures.

Genitalia: Female segment rather long, posterior margin triangularly

excavated half its depth, from the bottom of which arises a strap-shaped tooth about as long as its basal breadth. Male valve very broad, short, plates together very broad at base, equilaterally triangular, with the apices produced and upturned. Margins with fine hairs.

Specimens are at hand from Las Animas, Pueblo, Salida, Delta, Rifle, Palisades, Grand Junction, and Loma, Colorado; Cisco, Thompson's, and Moab, Utah, all collected by the author.

Larvæ: With a sloping conically pointed vertex, half longer than the adult, white with irregular brown markings, similar to those of *querci*, the margins of the brown areas set off by black points. Below pale, an olive band under the vertex, about three rows of brown dots on upper part of front and a few larger black spots on lorae and genae.

The fine black dots on the pale ground color harmonize well with the dirty greenish white leaves of the shad scale (*Atriplex confertifolia*), on which the insect lives. There are, apparently, two broods in a season.

Eutettix paupercula (Ball). (Plate I, Fig. 9.)

Phlepsius paupercula Ball, Can. Ent., XXXV, p. 228, 1903 (Desc. Colo.).

Resembling *insana*, shorter, stouter, with a flatter and more angled vertex, creamy white with black points on elytra arranged in ramose lines. Length ♀ 3.3$^{mm.}$, ♂ 3$^{mm.}$; width 1.1$^{mm.}$.

Vertex nearly as long as pronotum, roundingly rightangled, disc flat, anterior margin thick, slightly acutely angled with the front. Front inclined to be tumid. Pronotum transversely wrinkled, depressed just back of the anterior margin. Elytra short, broad, venation obscure.

Color: Pale creamy or greenish white, elytra milky white with minute black points along the nervures and in transverse ramose lines.

Genitalia: Female segment with the posterior margin nearly truncate, slightly notched in the middle and slightly sinuate either side. Male valve short, obtusely rounding, plates equilaterally triangular, their margins with a few coarse bristles.

Habitat: Specimens are at hand from Grand Junction, Colorado (Van Duzee and Ball), Thompson's, and Monroe, Utah (Ball).

This species is found on a very small species of salt bush growing in the desert region and from its host plant often spreads to several other species of the same genus. The shape of the vertex will at once separate this species from any of the other small species in this group.

EUTETTIX STRICTA Ball. (Pl. I, Fig. 10.)

Eutettix stricta Ball, Can. Ent., XXXII, p. 204, 1900 (Colo.).

Form of *insana* nearly, smaller, the elytra less flaring. Resembling *tenella*, but with a broader head and golden yellow in color. Length ♀ $4^{mm.}$, ♂ $3.5^{mm.}$; width $1^{mm.}$.

Vertex as in *insana*, rather large, obtusely angular, flat, the margin rounding to front, scarcely a transverse depression, two-thirds the length of the pronotum, elytra rather closely folded, the venation obscure similar to *tenella*.

Color: Vertex pale yellow, sometimes washed with orange, and with a pair of round fuscous dots one-third of the way back from the apex. Scutellum pale yellow, sometimes a pair of spots on the disc. Pronotum and elytra golden yellow. Below lemon yellow, sometimes about seven short brown arcs on front.

Genitalia: Female segment rather long, posterior margin concave with the median third roundingly produced. Male valve short, obtusely rounding, plates broad, triangular, their apices produced and upturned.

Specimens are at hand from Phoenix, Arizona (Kunze), Victoria, Texas (U. S. N. M.), and San José de Guaymas, Mexico (L. O. Howard, U. S. N. M.).

This species is closely related to *tenella*, but can at once be distinguished by the color and the genitalia of either sex.

EUTETTIX TENELLA (Baker). (Pl. I, Fig. 11; IV, Figs. 4–5).
(The Beet-leaf Hopper.)

Thamnotettix (*Jassus*) *tenella* (Uhl. MSS.) Gill and Baker, Hemip. Colo., p. 100, 1895 (Colo., on sugar beets).

Thamnotettix tenella Baker, Psyche, VII, Supp., p. 24, 1896 (Desc. N. M. and note); Ent. News, VIII, p. 54, 1897.

Eutettix tenella Forbes and Hart, Bull. 60, Ill. Exp. Sta., p. 423 and 523, 1900 (after G. and B.); Ball, 16th Ann. Rept. Utah Exp. Sta., p. 16, 1907 (injury to beets).

Eutettix stricta Howard, Rept. U. S. Ent. for 1905, p. ——, 1906 (injury to beets).

Form of *stricta* nearly, smaller, paler, pale yellowish green. Length ♀ $3.5^{mm.}$, ♂ $3.1^{mm.}$; width $.9^{mm.}$.

Vertex rather short, rounding, about one-fourth longer on middle than against eye, disc nearly flat, transverse depression obscure, the margins rounding over to front. Elytra rather long, closely folded, venation regular, simple, except the base of the outer and anteapical cell is sometimes pedunculate and the apical veinlets are long and narrow.

Color: Vertex and face creamy or pale orange yellow, scutellum lemon

or greenish yellow, pronotum pale green, the margins often pale yellow, elytra greenish or milky subhyaline, the dark tergum showing through. Occasionally specimens are entirely pale yellow and still more rarely they are suffused with red.

Genitalia: Female segment with the posterior margin produced on the median half and then narrowly, semicircularly emarginate more than half way to the base of the segment. Male valve large, simi-circular, inflated, plates short, together wider than long, widest at apex, where they are roundingly truncate. A row of about ten short stout spines set a little distance back of the margin.

Habitat: Specimens are at hand from Fort Collins, Lamar, Trinidad, Buena Vista, and Grand Junction, Colorado; Moab, Thompson's, Monroe, Lehi, Salt Lake, Ogden, Logan, and Garland, Utah, all collected by the author; Phoenix (Kunze, Ball), Hot Springs (Barber and Schwarz, N. M.), and Flagstaff, Arizona (Barber, N. M.), and it was described from Las Cruces, New Mexico.

Larvæ: Vertex slightly conical, half longer than in the adult. Color variable; a few are pure white, a few others are white with an irregular broad, black, median stripe; the majority are white with a brown saddle on the abdomen and irregular faint brown markings on the thorax; a few others have these markings irrorate with red.

The strikingly distinct genitalia of either sex will at once serve to distinguish this species from any other in the group. Its small size and greenish color render it liable to be mistaken for insects of several other groups, but even here its genitalia will at once separate it.

It is single-brooded; the adults hibernate and lay eggs in the summer to produce adults from late July on until fall. The original food plant was probably *Sarcobatus*, from which it has spread to the sugar beet.

Eutettix seminuda (Say). (Pl. II, Fig. 1.)

Jassus seminudus Say, Jour. Acad. Nat. Sci. Phil., VI, p. 307, 1831 (Ind.), (Complete writings II, p. 138, 1869); Harris in Hitchc. Geol. Mass., 2d Ed., p. 580, 1835.

Bythoscopus seminudus Fitch, Homop. N. Y., St. Cab., p. 58, 1851 (See Lintner's 9th Rept., p. 398, 1893). (N. Y. and note). Walker, Homop. B. M., IV, p. 1161, 1852 (mention); Dimmock, Psyche, IV, p. 241, 1885 (after Fitch). Packard, 5th Rept. U.S. Ent. Comm., p. 543, 1890 (after Fitch); Ashmead in Smith Cat.

Ins. N. J., p. 445, 1890 (N. J.); Southwick, Science, XIX, p. 318, 1892 (after Smith).

Thamnotettix seminudus Uhl., Stand. N. Hist., II, p. 246, 1884; Osborn, Iowa Acad. Sci., I, Part II, p. 120, 1892 (Iowa).

Athysanus seminudus Van Duzee, Psyche, V, p. 389, 1890.

Eutettix seminudus Van Duzee, Psyche, VI, p. 307, 1892; id: in Lintner's 9th Rept., p. 410, 1893; Bull. Buff. Soc. N. Sc., V, p. 199, 1894 (N. Y. and note); Catalogue, p. 297, 1894 (eastern U. S. and Can.); Ashmead, Ins. Life, VII, p. 323, 1895 (on cotton, Miss.); Forbes and Hart, Bull. 60, Ill. Exp. Sta., p. 414 and 423, 1900 (Econ. Summary and on Beets Ill.); Osborn, Ohio Acad. Sci., 8th Ann. Rept., p. 68, 1900 (Ohio); Ohio Nat., I, p. 11, 1900 (S. E. Ohio); in 20th Rept. St. Ento. N. Y., p. 529, 1905; Wirtner, Ann. Carn. Mus., III, p. 223, 1904 (Pa. and Notes).

Milky white, with a broad testaceous brown saddle, and a few reticulations on apex of elytra. Length ♀ 5$^{mm.}$, ♂ 4.5$^{mm.}$; width 1.5$^{mm.}$.

Vertex slightly longer on middle than against eye, transversely convex, sloping, with a weak depression before margin; margin blunt, rounding, indistinct even at apex. Elytra moderately long, venation regular and indistinct.

Color: Vertex, face and below pale creamy, pronotum creamy white, rarely faintly irrorate with brown. Scutellum often irregularly marked with pale tawny or brown. Elytra milky white with a broad testaceous brown saddle occupying the posterior half of claval area and narrowing to half that width on the costa, margins irregularly darker, the anterior one oblique. A testaceous cloud centering in the fourth apical cell, often surrounded by few reticulations and sometimes a few pale reticulations appear on base of clavus. The spines on posterior tibia and pygofers arise from black spots.

Genitalia: Ultimate female segment with the posterior margin truncate or slightly rounding with a wedge-shaped median tooth, slightly notched in the middle. Male valve roundingly rightangled, plates long, triangular, their apices narrowly truncate, margins clothed with filamentous hairs.

Habitat: Specimens have been examined from Connecticut (Britton), Maryland and District of Columbia (Heid.), North Carolina (Fiske, Sherman), Tennessee (Summers), Pennsylvania (Wirtner), Niagara, Canada (Osborn), Ohio (Osborn and Cornell coll.), Illinois (Titus and Osborn coll.), Iowa (Osborn and Ball), Missouri (Snow), Kansas (Effingham, Van Duzee; Manhattan, Cornell coll.), Texas (Victoria, U. S. N. M.); it has been reported from Massachusetts, New York, Indiana, and Mississippi, above.

Larvæ: Resembling the adults, vertex slightly longer, white with slight irregular cloudings on the posterior portion of the vertex and pronotum, a transverse band across the wing pads and a definite saddle on the abdomen brownish irrorate. Beneath pale, with black points on hind tibiæ.

There are two broods in a season, the adults appearing in late May, and June, and again in August and September. The type of this species has been lost, but there can be no question about the determination, as it is the only species in that range that could answer the description. It is widely distributed in the Eastern and Middle States, extending westward into Kansas and Texas, beyond which it is replaced by *scitula*.

Eutettix strobi (Fitch).

(Pl. II, Fig. 2; IV, Fig. 3.)

Bythoscopus strobi Fitch, Homop. N. Y. St. Cab., p. 58, 1851 (on pine N. Y.) (Lintner's 9th Rept., p. 398, 1893); Trans. N. Y. St. Ag. Soc., XVII, p. 739, 1857; Walker, Homop. B. M, III, p. 876, 1851 (mention); Rathvon, Monib. Hist. Lanc. Co., Pa., p. 551, 1869 (list); Packard, Bull. 7, U. S. Ent. Comm., p. 216, 1881 (after Fitch); 5th Rept. U. S. Comm., p. 802, 1891 (after Fitch).

Phlepsius strobi Van Duzee, Psyche, V, p. 390, 1890, id. in Lintner's 9th Rept., p. 410, 1893; Trans. Am. Ent. Soc., XIX, p. 67, Pl. I, fig. 3, 1892 (Desc. N. Y., Ohio, Tex.); Southwick, Sci., XIX, p. 287, 1892 (after Van Duzee); Van Duzee, Catalogue, p. 299, 1894; Osborn, Iowa Acad. Sci., I, pt. III, p. 103, 1893 (Iowa and notes on food plants.)

Eutettix strobi Baker, Psyche, VII, Supp., p. 24, 1896; Osborn, Iowa Acad. Sci., VII, p. 39, 1899; Ohio Acad. Sci., 8th Ann. Rept., p. 68, 1900 (Food plants, Ohio); Wirtner, Ann. Carn. Mus., III, p. 223, 1904 (Pa.); Osborn in 20th Rept. N. Y. St. Ent., p. 531, 1905 (N. Y. and note on type).

Thamnotettix seminudus Osborn, Sci., X, p. 166, 1887 (Coloring leaves of *Chenopodium*).

? *Allygus sp.* Bruner, U. S. Div. Ent., Bull. XXIII, O. S., p. 17, 1891 (on *Chenopodium* and beet).

Form of *seminuda*, fulvo-testaceous, elytra milky white with the saddle and an irregularly reticulated band at either extremity, testaceous. Length ♀ 5.25mm., ♂ 4.5mm.; width 1.6mm.

Vertex slightly more produced than in *seminuda*, almost angled with the front at apex, face evenly convex in both diameters. Elytra moderately long, venation regular but obscured by the reticular lines.

Color: Vertex, pronotum and scutellum sordid fulvous or fulvo-testaceous, irrorate. Elytra milky white with the saddle, a basal and an apical band of minute testaceous brown irrorations. Irregular pigment lines along nervures tend to join saddle and basal band along the sutural margin and the saddle and apical band on the disc. Eyes rich testaceous, face fulvous, below pale yellow, pygofers brown.

Genitalia: Female segment with the margin variable, as in *seminuda*. In fresh specimens often rounding with only faint indications of median lobes. Male valve distinctly obtusely angled, plates together triangular, broad at base, then rapidly rounding in to the elongate filamentous tips, margins clothed with long hairs.

Habitat: Specimens have been examined from Massachusetts, Connecticut (Britton), New York (Van Duzee), Niagara, Canada (Osborn), Pennsylvania (Wirtner), Ohio (Osborn), Iowa (Osborn, Ball), Missouri (Heid. coll., Osborn coll.), Nebraska (Bruner), Kansas (Snow, Crev.), Colorado (Gill., Ball), Utah (Ball), Texas (College Station, Sanderson; Victoria, U. S. N. M.).

Larvæ: Resembling *seminuda* in form, the head much longer and flatter than the adult. Ground color white, so heavily irrorate with red as to be obscure. Usually a pair of dark red spots on the apex of vertex, a few pale ones on the disc, and others on the abdomen.

The larvæ live on lamb's quarter, where their punctures cause purple spots on the leaves. There are two broods in a season, adults appearing in June and again in August. This is another species in which there can be no question about the determination, as no other one approaches it in coloration. It is widely distributed and will, no doubt, be found clear across the continent in the northern United States at least.

Eutettix scitula Ball. (Pl. II, Fig. 3.)

Eutettix seminuda Gill. and Baker, Hemip. Colo., p. 102, 1895 (Colo.); Baker, Psyche, VII, Supp., p. 24, 1896 (Western var.).
Eutettix scitula Ball, Can. Ent., XXXIII, p. 47, 1901 (Desc. Colo.).

Form and color pattern of *strobi* nearly, ground color of *seminuda* with the markings darker testaceous. Length ♀ 5.5$^{mm.}$, ♂ 4.75$^{mm.}$.

Vertex distinctly longer on middle than at eye, anterior submargin flat, margin thick, forming an angle with the front, front very weakly convex, elytra rather long, venation as in *strobi*.

Color: Vertex pale creamy yellow, six pale fulvous spots along anterior margin and a large pair on basal half near eyes on well-marked specimens. Pronotum milky white, heavily irrorate and reticulate with dark brown, omitting the anterior margin between the eyes and traces of three narrow stripes. Elytra milky white with a saddle slightly narrower than in *seminuda*, an irregular spot against the scutellum, and a cloud against the apex, of dark brown irrorations. Usually the apical cloud is connected with the saddle near the middle and there may be a few black dashes against the costa. Usually three pairs of black dots along the common suture and a lobate light spot in the middle of the saddle. The apical cloud is interrupted by one or more circular light spots. Face and below pale, a few faint olive fuscous arcs on front, pygofers washed with brown.

Genitalia: Female segment with posterior margin truncate or gently rounding, with two blunt median teeth, separated by a notch equalling them in width. Male valve short, rounding, plates rather narrow, long-triangular, their margins continuing almost straight to the filamentous tips.

Habitat: Specimens have been examined from Julesburg, Fort Collins, Pueblo, Salida, Buena Vista, and Grand Junction, Colorado (Ball), Berkeley (Osborn coll.), and Montrose, Colorado (Gill.), Mesilla, New Mexico (on *Populus*, Cockerell), Wellsville, Utah (Ball), Galiuro Mt., Arizona (Hubbard, U. S. N. M.).

Larvæ: Resembling *seminuda* but lacking the saddle on abdomen. Vertex long, slightly sloping, the margin distinct, roundingly angled in front. Pale pink, with a powdery "bloom" slightly hiding it on anterior portion of body. Abdominal segments margined with reddish bands and often with black dots along the base.

This species closely resembles *seminuda* but may be distinguished by the longer head and color pattern on pronotum and base of elytra. It is only known from the Rocky Mountain region. The larvæ feed on lamb's quarter, the adults flying up to cottonwood trees. There are two broods, as in *strobi*.

Eutettix pullata Ball. (Pl. II, Fig. 4.)

Eutettix pullata Ball, Can. Ent., XXXIII, p. 48, 1901.

General appearance of *scitula* but narrower and darker. Elytral pattern of *strobi*, but not as dense. Dirty hyaline white, irrorate with brownish fuscous on pattern. Length ♀ 5.5$^{mm.}$, ♂ 5$^{mm.}$; width 1.4$^{mm.}$.

Vertex narrower and slightly more angled than in *scitula* or *strobi*, sloping from behind down to the transverse depression. Margin flat on the middle third, slightly rounding near the eyes. Elytra appressed posteriorly, giving a wedge-shaped appearance. Venation distinct, definitely lined with brownish fuscous.

Color: Vertex creamy yellow or white and irregularly lined in the transverse depression, four small dots in front of this and three subquadrate reticulated areas behind, the latter sometimes coalescing. Pronotum milky white, irregularly irrorate, often partly omitting the anterior disc; scutellum with the angles brownish fuscous, the disc creamy yellow, elytra dirty subhyaline white with brownish fuscous markings in the pattern of *strobi*, but with less irrorations and more reticulations. Basal third of corium with the pigment lines reduced to black points, sutural margins with the six black points and light areas of *scitula*. Face and below, pale yellow.

Genitalia: Female segment with the margin broadly rounded, median fourth triangularly excavated, the apex of excavation broad and slightly roundingly produced. Male valve obtuse, plates narrow long-triangular, the outer margins straight and tips attenuate.

Habitat: Manitou and Salida, Colorado (Van Duzee, Ball), Las Vegas, New Mexico, Bright Angel, Arizona (Barber and Schwarz, U. S. N. M.), Arizona (Cornell coll.), and Richfield, Utah (Ball).

The adults have been taken late in July and August from pine trees in southern Colorado and Utah. They were taken only in sheltered situations and this is probably the northern limit of its range.

EUTETTIX PERELEGANTIS Ball.

(Pl. II, Fig. 5.)

Eutettix perelegantis Ball, Can. Ent., XXXIII, p. 46, 1901.

Form of *mildredæ*, nearly. Vertex more angled, pattern and marking resembling *scitula* and *pullata*, but of a solid olive fuscous shade, with few reticulations. Length ♀ 5$^{mm.}$, ♂ 4.75$^{mm.}$; width 1.7$^{mm.}$.

Vertex obtusely angulate or slightly rounding, half longer on middle than against eye, disc sloping, the transverse depression shallow, margin distinct, often slightly produced. Elytra moderately long, only slightly depressed, venation rather weak and obscured against the apex.

Color: Vertex and face creamy white, four equidistant pale fulvous spots on anterior margin of vertex and some irregular irrorations at base. Pronotum pale olive, four irregular black marks behind each eye, joined at their bases. Disc with faint brown irrorations usually emphasized as two broad stripes near the light median line. Scutellum with a minute ivory white point in each angle set off by a larger brown one, apical brown spot quadrangular and separated from the basal one by an angular ivory white spot, disc sparsely irrorate with brown; sometimes the disc and white markings washed with yellow. Elytra ivory white, with the saddle and entire claval areas before disc, omitting a triangle at base, and an angular strip along the suture, brownish olive edged with black. Apical portion reticulated and

clouded with brown, omitting three large irregular light spots on margin and often a few small circular ones on disc. Sutural margins with a pair of black spots. Below, pale.

Genitalia: Female segment with the posterior margin slightly rounding or almost truncate, median fourth angularly emarginate with a stout blunt tooth filling the notch. Male valve angularly rounding, apex trilobate, plates together triangular, apices acute filamentous.

Habitat: Specimens are at hand from Fort Collins, Salida, Ridgway, and Durango, Colorado, Cisco and Richfield, Utah, all collected from red cedar by the author. The solid color pattern will at once separate this species from *pullata*, which it otherwise closely resembles.

Eutettix mildredæ Ball.

(Pl. II, Fig. 6.)

Eutettix mildredæ Ball, Can. Ent., XXXIII, p. 45, 1901.

Form and general appearance of *perelegantis* nearly, vertex rounding, yellow, scutellum with the disc yellow, unmarked. Length ♀ 5.5$^{mm.}$, ♂ 5$^{mm.}$; width nearly 2$^{mm.}$.

Vertex broad, shorter than in *perelegantis*, resembling *strobi* but slightly angled, strongly sloping to a thick margin, transverse depression shallow. Elytra as in *perelegantis*.

Color: Vertex and face fulvous or orange yellow. Vertex unmarked or with but traces of the markings of *perelegantis*. Pronotum with the markings of *perelegantis* but paler, the black markings reduced to an irregular line behind the eyes. Scutellum fulvous or orange with an irregular reticulate area against each basal angle and a dash on either side of the apex brown. Elytra with the pattern and color of *perelegantis* except that the white area on outside of clavus is smaller and nearly semicircular instead of wedge-shaped, and the clouding at apex is usually denser.

Genitalia: Female segment broadly rounding, or almost truncate, with the median third produced into black, marked, evenly-rounding lobes. Male valve obtusely rounding, plates slightly longer than their basal width, their apices filamentous.

Habitat: Specimens are at hand from Manitou, Colorado (Van Duzee, Ball), Las Vegas, New Mexico (Barber and Schwarz, U. S. N. M.), and Arizona (Cornell coll.).

This pretty species, *perelegantis*, and *pullata*, form a group of closely related tree-inhabiting forms. This species is found with *perelegantis* on the red cedar, but only in sheltered situations. From the latter species it may be readily separated by the yellow scutellum and distinct genitalia.

EUTETTIX SNOWI n. sp.
(Pl. II, Fig. 7.)

Form and general appearance of *saucia*, nearly, much paler, pattern and color of *mildredæ*, nearly, but lacking the black markings. White, with a very pale brownish olive color pattern. Length ♀ 4.75mm.; width 1.5mm.

Vertex rather long, very slightly angled, disc almost flat, the margins thick, elevated, slightly acutely angled with front. Elytra rather short, venation regular, the apical cells short.

Color: Vertex pale creamy white, sometimes with six faint brown spots on anterior margin and traces of irrorations on the disc. Pronotum finely irrorate with pale olive, with a brownish cast. Elytra hyaline, with the pattern of *mildredæ*, or *saucia*, nearly, very pale brown olive, the saddle fading out towards the costa, pattern covering the entire claval area except for a narrow ivory white margin along suture on anterior half. Saddle with the anterior margin sloping rapidly backwards and fading out before reaching costa, rather broadly connecting with the apical cloud inside the middle of the disc. Three or four points on outer margin of claval pattern, one on anterior edge of saddle, another at apex of clavus and a few against the third and fourth apical veinlets, brownish or fuscous.

Genitalia: Female segment with a posterior margin gently rounding, a pair of minute acute median teeth set off by a slight notch on either side.

Habitat: Described from three specimens from Douglass, Arizona, altitude 3,750 feet (F. H. Snow), one from Catal Springs, Arizona (Barber and Schwarz, U. S. N. M.), and one from Cornell U. coll. labelled "Ariz. Lot 34," all females.

EUTETTIX SAUCIA Ball. (Pl. II, Fig. 8.)

Eutettix saucia Ball, Can. Ent., XXXIII, p. 46, 1901.

Form and color pattern of *pullata*, nearly, darker, and without the pattern on vertex. Much more definitely marked than in *snowi*. White, with a definite color pattern. Length ♀ 4.6mm., ♂ 4.2mm.

Vertex shorter than in *snowi*, about equalling *pulchella* in length, but more angulate, one-third longer on middle than against eye. Disc sloping, the transverse suture strongly marked on middle half, before which the margin is flat and nearly right-angled with the inflated and strongly curved front. Elytra as in *pulchella*, venation simple, distinct.

Color: Vertex pale yellow, six minute points on anterior margin and three irregularly irrorate patches on the posterior disc brown. Pronotum white, coarsely irrorate with dull brown, omitting three irregular lines on disc and the lateral margin. Scutellum finely irrorate with brown, three

ivory white points in an apical triangle and sometimes a yellow stripe on the disc. Elytra ivory white with a pattern as in *snowi* or *pulchella*, of dull brown slightly edged with fuscous, a few coarse brown or fuscous reticulations on base of corium and two or more light spots along the common suture.

Genitalia: Female segment with the posterior margin truncate or slightly rounding, median fourth excavated and bearing two slightly protruding median teeth. Male valve obtusely rounding, plates narrow, long-triangular, the apices acute, attenuate, clothed with fine hairs.

Habitat: Specimens are at hand from Greeley, Fort Collins, Denver and Buena Vista, Colorado, Cisco, Utah (Ball), and Los Angeles county, California (Coquillett).

Utah specimen was taken from a place where the bottle weed (*Eriogonum inflatum*) was abundant, while the Colorado specimens were swept from places where another species of *Eriogonum* grew.

Eutettix pulchella Baker. (Pl. II, Fig. 9.)

Eutettix pulchella Baker, Psyche, VII, Supp., p. 24, 1896 (Desc. N. M.).

Eutettix scaber Osborn and Ball, Dav. Acad. Sci., VII, 1898 (Desc. Iowa); Iowa Acad. Sci., V, p. 235, 1898 (list).

Superficially resembling *strobi*, but with much more definite pattern and with darker chestnut color. Length ♀ 4.7$^{mm.}$, ♂ 4.4^{mm}.

Vertex broad, short, scarcely longer on middle than against eyes, disc very slightly sloping, transversal depression faint or obsolete except back of apex. Front receding, gently rounding, slightly acutely angled with vertex, the margins thick. Elytra of median length. Venation obscure.

Color: Milky or ivory white, minutely heavily irrorate, with testaceous brown as follows: all of vertex except an ivory line in front of the transverse depression, into which extends four equidistant brown points, all of pronotum except an ivory line on each lateral margin, scutellum except three white dots, forming an apical triangle and often four more on disc; elytral pattern as in *saucia*, only denser and more definitely margined. The ivory line along claval suture narrow and definite, with a few acute brown projections, to just before the saddle, where it broadens into a semioval spot. Three equidistant white dots along sutural margin. Face and below, pale yellow.

Genitalia: Female segment with the posterior margin gently rounding, median fourth slightly emarginate, with two minute teeth extending a trifle beyond the margin. Male valve very short and obtuse, plates similar to *saucia*, long-triangular, their apices acute.

Habitat: Specimens are at hand from Ames, Iowa (Ball), San Augustine, New Mexico (Cockerell), Tucson (Hubbard, U. S. N. M.), Baboquivaria Mts., Arizona (Snow), and Arizona (Cornell coll.).

This is probably a southern species, as no specimens have been taken in Colorado or Utah. Baker's specimens from Fort Collins, Colorado, no doubt belonged to *saucia*, as he speaks of them as darker in color and different in other points. The types of *scaber* are very much larger and especially broader than the western specimens of *pulchella* and may possibly be distinct, but it is not possible to separate them on structure or pattern with the material at hand. This species is closely related to *saucia*, and from their color it is probable that both will be found to feed on species of *Eriogonum*.

EUTETTIX ALBIDA (Ball). (Pl. II, Fig. 10.)

Phlepsius albidus Ball, Can. Ent., XXXII, p. 203, 1900.

Resembling *scitula*, but smaller and much paler with very obscure saddle of ramose lines. Length ♀ 4.5mm., ♂ 3.8mm.; width 1.2mm.

Vertex flat, scarcely sloping, longer than in *scitula*, and slightly more evenly rounding. Transverse depression faint, anterior margin broadly rounding over to front. Elytra moderately long, appressed behind.

Color: Vertex pale creamy white, six faint dots on the anterior margin and about six dashes at base brown. Pronotum pale, sometimes faintly washed with olive and with a few brown irrorations. Elytra milky white, with scattered brown pigment lines heaviest in the male. These pigment lines usually aggregate so as to form a very obscure pattern like that of *saucia*, but often wanting along costa. The basal half of corium with a few coarser reticulations than those of pattern. A spot at apex of clavus and about three smaller ones along edge of claval pattern, on the basal half, black. Below, pale.

Genitalia: Female segment with the posterior margin slightly rounding and weakly notched in the middle. Male valve broad, triangularly rounding, plates equilaterally triangular, their apices slightly acute, not as long as the pygofers.

Habitat: Specimens are at hand from Pueblo, Palisades, and Grand Junction, Colorado; Thompson's, Helper, and Monroe, Utah, all collected by the author, and Douglass, Arizona (Snow).

This species, *insana* and *snowi* have reached a similar pale condition by quite different routes. In this species it has been by reduction in number and size of the ramose lines until it resembles the color of *Atriplex confertifolia*, on which it feeds.

EUTETTIX PANNOSA Ball. (Pl. II, Fig. 11.)

Eutettix pannosa Ball, Can. Ent., XXXIV, p. 12, 1902.

Superficially resembling *saucia*, but smaller, darker, and more

coarsely reticulate. Vertex long, face dark. Heavily and coarsely reticulate above with dark brown, except the costal third of elytra. Length ♀ 4.5mm., ♂ 4mm.; width 1.2mm.

Vertex long, right-angled, the apex a trifle rounding, half longer on middle than against eye. Disc almost flat, the anterior margin thin, angle with face acute. Elytra rather long, narrow, venation regular, distinct, dark lined; rarely a second cross nervure present.

Color: White, the entire dorsal surface heavily, coarsely reticulate with brownish fuscous, except the narrow lateral margin of pronotum and outer half of elytra. Usually six irregular black spots on anterior margin of vertex. The reticulations on elytra are heaviest near the outer edge of pattern, shading out to irregular pale areas along the suture. Outer half of elytra with a few irregular reticulations and ramose lines along veins and costa. Face heavily irrorate with brownish fuscous. Below, washed with brown.

Genitalia: Female segment with the posterior margin rounding, the median fourth produced in two bluntly rounding lobes as in *mildredæ*. Male valve narrow, slightly obtusely angular, plates rather broad, equilaterally triangular, their margins convex and apices slightly produced.

Habitat: Known only from the types from Los Angeles county, California (Coquillett, U. S. N. M.). The long flat vertex and white stripe along costa will at once distinguish this species.

Eutettix texana n. sp.

Form of *strobi* or *seminuda*, nearly, but entirely lacking their color pattern, resembling *albida* but pale creamy yellow, entirely covered by coarse reticulations of very pale rusty brown. Length ♀ 4.6mm., ♂ 4.2mm.; width 1.6mm.

Vertex nearly as in *strobi*, a trifle angled before, disc slightly sloping, in the same plane as pronotum, transverse depression shallow, margin thick and indefinite except at apex, where it is slightly acutely-angled with the front. Elytra as in *strobi*, venation regular but very much obscured by the reticulations.

Color: Pale creamy yellow, coarsely and rather evenly reticulate with pale rusty brown, often wanting on the vertex. Pronotum and elytra often with a few scattered ivory white dots, face and below pale. Sometimes the reticulation becomes so pale as to be scarcely visible.

Genitalia: Female segment with the posterior margin truncate or slightly rounding, median fourth excavated either side of two rounding approximate lobes that equal or slightly exceed the margins. Male valve very short, obtuse, plates long-triangular, acutely pointed.

Habitat: Described from five females and two males from Brownsville, Texas (Snow), and Victoria, Texas (U. S. N. M.); easily distinguished from the other pale forms by the saffron color and absence of definite pattern.

EUTETTIX BICOLORATA Ball. (Pl. II, Fig. 12.)

Eutettix bicolorata Ball, Can. Ent., XXXVII, p. 212, 1905 (Ark. and Utah).

Form of *strobi*, nearly, but entirely different in color and pattern. Pale greenish white with heavy black reticulations, omitting the elytra from the apex of clavus forward. Length ♀ 6.2mm., ♂ 5.7mm.; width 1.7mm.

Vertex narrow, moderately long, very slightly produced in the middle, disc strong, convexly sloping to the deep transverse depression, beyond which the margin is very slightly sloping. Front very strongly inflated, almost angled as seen from side, meeting vertex in a slightly obtuse angle. Elytra long and narrow, venation weak, obscure on basal part, slightly broken by the heavy reticulations on apical third.

Color: Vertex ivory white, four points on anterior margin, and a subquadrate reticulate area occupying the middle of either side of the disc, black; often a black dot against eye in the transverse depression, connected by a line with the quadrate area. Pronotum ivory white, heavily reticulate with black, usually omitting a few large spots on anterior submargin, a narrow median stripe and a line along posterior margin. Scutellum brown, irregularly maculate with black and white, a definite spot on each lateral margin and apex ivory white. Elytra dirty cream color with a greenish cast to just beyond the edge of clavus, then milk white with heavy black veins and coarse reticulations. Usually a black cloud at apex containing a small round light spot. Upper half of face greenish white, a small black point under either eye, lower half heavily irrorate with dark brownish fuscous. Below, brown or black, genitalia light.

Genitalia: Female segment with the posterior margin slightly rounding, slightly angularly produced in the middle fourth with a weak median notch. Male valve small, obtusely rounding, plates long-triangular, acutely pointed.

Habitat: Specimens are at hand from Richfield, Utah (Ball), and Hot Springs, Arkansas (Barber, U. S. N. M.).

Larvæ stout, the vertex almost conical. Pale greenish white with dark brown mottlings on back of vertex and pronotum. Upper half of face white, lower half dark brown or black; below, dark brown.

This species is found only on *Ephedra*. When resting on a stem it resembles a frayed sheath, such as encircles the joints, so well that it will often escape detection.

Subgenus ALIGIA nov.

Allygus Van Duzee, Ent. Am., VI, p. 93, 1890; Trans. Am. Ent. Soc., XIX, p. 299, 1892; Catalogue, p. 294, 1894.

(Not *Allygus* Fieb., Cat. Europ. Cicad., p. 13, 1871, or of other European authors).

Vertex short, sloping, rounding to front without a definitely angled margin except near apex, transverse depression faint or curved posteriorly in the middle and ending at the ocelli; front long, wedge-shaped, margins not constricted between antennal sockets. Elytra subhyaline, the nervures distinct, dark, two cross nervures present between the sectors and usually a number of supernumerary veinlets along costa and claval sutures.

Type of subgenus *jucunda* Uhl.

This subgenus includes the forms in which the ramose pigment lines have broken up into veinlets and many of them have disappeared. There is in some forms a fairly definite saddle and the head is still short, but is not conical as in the typical *Eutettix* and the transverse depression has been pushed back.

This group agrees with *Allygus* in possessing a second cross nervure, but in other characters is widely separated and has, no doubt, had a very different origin.

ARTIFICIAL KEY TO THE SPECIES.

A Vertex nearly right-angled, the apex slightly produced. *inscripta* V. D.
AA Vertex rounding, the margins nearly parallel.
B Nervures and markings on elytra brown or fuscous, nervures distinct.
C Vertex fulvous, eyes bright red, female under 5mm. *oculea* Ball.
CC Vertex pale, washed with brown, eyes dark brown or black. Female 5mm. or over.
D Form narrow, vertex white with definite dark markings. General color brownish fuscous. *jucunda* Uhl.
DD Form broader, vertex washed with brown obscurely marked. General color brown. *munda* Ball.
BB Nervures and marking on elytra tawny, nervures often indistinct on basal part.
C A number of supernumerary veinlets along costa and claval suture. Males darker than females. *modesta* Osb. & B.
CC At the most only one or two supernumerary veinlets along costa or claval suture. Males golden. *manitou* Ball.

Eutettix (Aligia) inscripta Van Duzee.

(Pl. III, Fig. 1.)

Allygus inscriptus Van Duzee, Ent. Am., VI, p. 92, 1890 (Desc. Calif.); Catalogue, p. 294, 1894.

Resembling *jucunda*, but paler and with a definitely angled vertex. Length ♀ 5.5mm., ♂ 4.5mm.; width 1.5mm.

Vertex almost right-angled, apex acute, nearly twice as long as against eye, two-thirds the length of pronotum, transverse depression on a line with the ocelli. Elytra long, rather narrow, venation similar to that of *jucunda*, the reticulations not as definite.

Color: Vertex pale creamy, two dots at apex, a short transverse line in the depression and two dots at base brownish fuscous. Pronotum pale, washed and faintly irrorate with brown. Elytra pale, the nervures and transverse veinlets brown, often a brown cloud omitting the base and a narrow transverse band across the second cross nervure.

Genitalia: Female segment with the posterior margin truncate, median fourth slightly produced. Male valve short, broadly triangular, plates long-triangular, their apices upturned.

Habitat: Specimens are at hand from Los Angeles, California (Coquillett), and Mountain View, California (Ehrhorn).

The pointed vertex will at once separate this species from any other member of the group.

Eutettix (Aligia) oculea Ball.

Eutettix oculea Ball, Can. Ent., XXXIII, p. 50, 1901.

Form of *jucunda*, nearly, smaller, with a narrower, longer vertex. Lighter than *munda*, with a fulvous vertex and red eyes. Length ♀ 4.75mm., ♂ 4.25mm.; width 1.3mm.

Vertex narrow, slightly longer on the middle than against eye, with the apex slightly rounding, not quite twice wider than long. Elytra parallel-margined, slightly flaring, venation and reticulations as in *jucunda*.

Color: Eyes bright testaceous red, vertex and face bright fulvous with a crescentic line on the depression and spot on the disc against either eye testaceous. Pronotum milky white, sparsely irrorate with fuscous on anterior disc omitting the median line. Scutellum with the markings of *jucunda*, the fuscous replaced by fulvous. Elytra milky white, the nervures and reticulations fuscous in sharp contrast. Traces of three fuscous bands as in *jucunda*, but with pigment spots reduced in size, leaving the general effect of a milky white wing with dark nervures.

Genitalia: Female segment resembling that of *munda* but with the projection less sharply bi-lobed. Male genitalia similar to that of *jucunda*, the valve shorter but similarly pointed at apex.

Habitat: Specimens are at hand from Rifle, Ridgway, Dolores and Durango, Colorado (Ball).

This species is apparently strictly confined to the sarvice berry (*Peraphyllum ramosissimum*). Adults were taken commonly in late July and early August. The red eyes and reddish cast of the dorsum harmonizes well with the red twigs of its food plant.

Eutettix (Aligia) jucunda (Uhl.). (Pl. III, Fig. 2.)

Jassus jucundus Uhler, Bull. U. S. Geol. and Geog. Surv., III, p. 469, 1877.

Paramesus jucundus Osborn and Ball, Dav. Acad. Sci., VII, p. 97, 1897 (foot-note); Gill. and Baker, Hemip. Colo., p. 84, 1895 (in part) (after Uhler).

(See under *cincta* and *modesta* for eastern references.)

Superficially resembling *nigridorsum*, but paler and with a rounding head. Longer and more nearly parallel-margined than any *Eutettix* proper. Length ♀ 5.5 mm., ♂ 5 mm.; width 1.7 mm.

Vertex evenly rounding, scarcely longer on middle than against eyes, two and one-half times wider than long, transverse depression deep. Elytra long, narrow and flaring, about fifteen veinlets between inner sector and the claval suture, half that number along costa, a few between the sectors of clavus and in the posterior end of the central anteapical cell, and often other irregularities in venation.

Color: Vertex white or pale yellow, the transverse depression, two spots at apex, a dash on margin against ocellus, an elongate spot against either eye, a line inside and sometimes the median line brownish fuscous. Pronotum pale, mottled with brownish fuscous, omitting the posterior border and the narrow median line. Scutellum with five narrow longitudinal stripes and the transverse suture black, dividing it into compartments. Outer angular compartments, apex and a spot on margin between them, ivory white. Second compartments orange or dark brown, median compartments pale creamy, a round black spot in each in front of suture, median stripe terminating in an enlargement just back of suture. Elytra milky white, the nervures and veinlets dark rusty brown, traces of three transverse bands, one midway between the cross nervures, another at apex of clavus and a third at apex of elytra. The first two bands of brown cloudings and fuscous brown areas in the center of the cells, apical one dark smoky, containing an oval light spot. The common suture with four pairs of black spots and three pairs of larger ivory white ones. Front brown, with light arcs, sutures of face brown.

Genitalia: Female segment with a posterior margin slightly rounding, median fourth obtusely roundingly produced, pygofers long, narrow, ovipositor exceeding the pygofers by three times its width. Male valve short, obtusely angulate, apex produced, plates long, slightly convexly narrowing at base, then regularly narrowing to the subacute black-tipped apices, disc convex.

Habitat: Specimens are at hand from Fort Collins, Palmer Lake, Colorado Springs, Salida (Ball) and Manitou, Colorado (Van Duzee), Las Vegas, New Mexico, and Williams, Arizona (Barber and Schwarz) (U. S. N. M.), Soldier's Summit and Salt Lake, Utah (Ball).

This species is strictly confined to the scrub oak growing on the mountain sides at from five to eight thousand feet elevation.

Adults have been taken most abundantly in July and August.

The type of this species in the Uhler collection is from Manitou and is no doubt the one from which the description was mainly drawn, as it fits it exactly. No specimens of this species have been found in the East, and it is very probable that the specimens referred here by Dr. Uhler belong to *modesta*. Later workers, doubtless mislead by the Maryland reference of Uhler, placed this name on what is now known as *cincta*, while the latter part of the Gillette and Baker reference probably refers to *nigridorsum*.

Eutettix (Aligia) munda Ball.

(Pl. III, Fig. 3.)

Eutettix munda Ball, Can. Ent., XXXIII, p. 48, 1901.

Closely resembling *jucunda* in structure and general appearance, much broader, with more flaring elytra. Vertex pale fulvous with few markings. Length ♀ 6mm., ♂ 5.2mm.; width 2mm.

Vertex broader and slightly more angled than in *jucunda*, transverse depression shallow. Face much broader, elytra broader, more flaring, and with more numerous transverse veinlets than in *jucunda*.

Color: Vertex dirty orange, with the markings of *jucunda* reduced to pale round spots or absent. Pronotum pale, with a few irregular mottlings on disc. Scutellum dirty orange or pale, an oval brown spot inside basal angle and a black dot either side the apex. Elytra subhyaline white with bands as in *jucunda* but broader and more diffuse in color, reticulations finer and lighter color, apical bands reduced to a few rusty brown margins to the nervures. Black and white spots along the common sutures, as in *jucunda*.

Genitalia: Female segment broad, short, posterior margin truncate with the median third slightly produced, and broadly bi-lobed. Pygofers shorter than in *jucunda*, only slightly exceeded by the ovipositor. Male valve triangular, plates broad at base, long, spoon-shaped, with bluntly rounding apices.

Habitat: Specimens are at hand from Palmer Lake, Salida, Ridgway, Dolores and Durango, Colorado (Ball), White Mountains, New Mexico (Cockerell), and Williams, Arizona (Barber and Schwarz, U. S. N. M.).

This is a duller colored and less plainly marked species than *jucunda*, some specimens even approaching *modesta* in shade; they however lack the tawny ground color to the elytra and the bands are differently placed. This species also occurs on the scrub oaks, but is much rarer than *jucunda* in the regions under observation.

Eutettix (Aligia) modesta Osborn and Ball.
(Pl. III, Fig. 4.)

Eutettix modesta Osborn and Ball, Dav. Acad. Sci., VII, p. 98, 1898 (Desc. Iowa).

Resembling *munda*, but stouter and more tawny, superficially resembling *subaenea*. Stout, fulvous or tawny, with a light band across second cross nervure. Length ♀ 5.5mm., ♂ 4.5mm.; width 1.5mm.

Vertex shorter and more sloping than in *manitou*, rounding to the front, the apex a trifle produced before the transverse depression. Elytra shorter than in *munda*, venation similar, the anteapical cells much shorter, supernumerary veinlets along clavus and costa inclined to be irregular and branching.

Color: Pale fulvous, inclined to be paler on the vertex and anterior part of pronotum. Vertex with a pair of tawny spots near apex and a pair of oblique marks inside the basal angles. Pronotum faintly irrorate with tawny. Elytra subhyaline white clouded with reddish fulvous, omitting an indefinite basal band and a narrow definite one across the second cross nervure.

Genitalia: Female segment almost truncate, with a broad slightly rounding median projection. Male valve triangular with the apex produced, plates long, spoon-shaped, the margins clothed with long hairs, except for the black-marked upturned tips.

Habitat: Specimens are at hand from Ames, Iowa (Ball), Maryland (Uhler coll., U. S. N. M.), District of Columbia (Heidemann) and Tryon, North Carolina (Fiske, Osborn coll.).

This species apparently feeds on oak and as it is the only eastern representative of the subgenus it cannot be confused with any other species. The specimens from North Carolina are more highly colored than those from the other localities.

Eutettix (Aligia) manitou Ball. (Pl. III, Fig. 5.)

Eutettix manitou Ball, Can. Ent., XXXIII, p. 49, 1901.

Form and general appearance of *modesta*, but smaller; smaller than *oculea*. Golden yellow with a lemon yellow vertex, female elytra subhyaline, both with transverse light bands. Length ♀ 4.5mm., ♂ 3.75mm.; width 1.3mm.

Vertex narrow, distinctly longer on middle than against eye, forming an obtuse angle, depression obscure, entire margin rounding to front. Elytra moderately long, very much flaring in female, appressed in the male. Venation as in *oculea*, but lacking the numerous cross nervures. Usually two or three cross nervures in the central anteapical cell, the posterior one often

forming an enlarged hexagonal compartment, an extra cross nervure to costa close to the fifth apical cell and usually a cross nervure on clavus. The fourth apical cell very large and almost circular. Male much smaller and narrower than female.

Color: Female, vertex and face lemon yellow, sometimes with two fuscous spots at apex of vertex. Pronotum pale cinereous, washed with golden omitting three faint stripes. Elytra pale milky subhyaline washed with testaceous brown on the disc, a definite light band across the second cross nervure and an irregular one before the apical cells. The nervures on anterior half concolorous, on posterior half brownish fuscous in sharp contrast, apex of clavus and the costal nervures fuscous. Male same as female except that the pronotum and anterior two-thirds of elytra are of a rich golden brown, the light band across the second cross nervure reduced to a few milky spots.

Genitalia: Female segment with the posterior margin slightly rounding, the median fifth slightly produced and bi-lobed, pygofers of medium length, scarcely exceeded by the ovipositor. Male valve rounding, the apex produced, plates as in *jucunda*, the apices curved up but not darkened.

Habitat: Specimens are at hand from Manitou (Van Duzee and Ball), Palmer Lake, Dolores (Ball), and Grand Junction, Colorado (Van Duzee), and Las Vegas, New Mexico (Barber and Schwarz, U. S. N. M.).

This is strictly an oak feeder and occurs on scrub oaks with *jucunda*. The adults are most common in August. The very small golden yellow male will at once distinguish this species from any other in the group.

Subgenus Mesamia nov.

Paramesus Van Duzee, Trans. Am. Ent. Soc., XIX, p. 299, 1892; Catalogue, p. 290, 1894; and other American authors.

(Not *Paramesus* Fieb., Ver. d'Zoo. Bot. Ges. Wien, XVI, p. 506, 1866, and European authors).

Vertex with the disc depressed, anterior margin usually elevated and acutely angled with the front, margin often slightly produced, front narrow, slightly constricted at antennal socket, then angularly widened to the ocelli, surface smooth polished, nearly flat above. Elytra subhyaline, the second cross nurvure present (sometimes obscure) and the central anteapical cell slightly constricted. Usually with a number of supernumerary veinlets along the clavus and costa.

Type of the subgenus *nigridorsum* Ball.

This subgenus includes forms in which the ramose lines have been aggregated into definite nervures as in *Aligia*, but the head has been elongated and the vertex and face flattened. Even here the transverse bands or "saddle" type of marking predominates.

Some of the members of this subgenus have been placed in *Paramesus* by different American authors and in the flat and highly polished front they do closely resemble that genus; but in the shape of the front and the vertex, and still more in the structure of the elytra, they are apparently quite distinct and have, no doubt, arisen through very different lines of development.

ARTIFICIAL KEY TO THE SPECIES.

A Species with fuscous markings or at least fuscous nervures.
B A number of fuscous reticulations between second sector and clavus.
C A dark saddle on elytra between the cross nervures. *nigridorsum* n. sp.
CC Without a definite dark band.
D Size of *nigridorsum*, vertex depressed, with four spots on anterior margin, connected by a line posteriorly, a broad band below vertex. *straminea* Osb.
DD Smaller than *nigridorsum*, vertex flat with a narrow line above and below margin, sometimes wanting. *coloradensis* G. & B.
BB No reticulations between first sector and clavus. A definite light band across the first cross nervure between the sectors.
C Vertex conical, without spots, species stout. *cincta* O. & B.
CC Vertex flat, with a marginal row of black spots. Species elongate. *fenestrata* Ball.
AA Species fulvous yellow with light spots, or creamy with a median stripe, nervures concolorous.
B Vertex short, obtusely rounding, six black spots on anterior margin, two veinlets to costa. *johnsoni* Van Duzee.
BB Vertex much produced, roundingly rightangled, unicolorous above. Four or more costal veinlets.
C Elytra fulvous, with light spots. *vitellina* Fitch.
CC Elytra creamy, with a common brown stripe along suture. *palliolata* Ball.

EUTETTIX (MESAMIA) NIGRIDORSUM n. sp.

(Pl. III, Fig. 6; IV, Fig. 6.)

Paramesus twiningi Osborn, Iowa Acad. Sci., I, pt. II, p. 120, 1892 (Iowa as *P. sp.*); pt. III, p. 104, 1893 (as *twiningi* and note); Van Duzee, Catalogue, p. 290, 1894; Osborn, Iowa Acad. Sci., VI, p. 39, 1899 (NW. Iowa); Wirtner, Ann. Carn. Mus., III, p. 221, 1904, (Pa. and notes).

Paramesus jucundus Gill. and Baker, Hemip. Colo., p. 84, 1895 (in part).

Milky white, posterior half of vertex, pronotum, scutellum and

a median saddle on elytra black or dark fuscous brown. Length ♀ 5mm., ♂ 4mm.; width 1.7mm.

Vertex but little longer than half its basal width, obtusely rounding, one-third longer on middle than against eye. Disc depressed, anterior margin elevated and acutely angled with front. Elytra moderately long, flaring, parallel-margined venation regular, two cross nervures, a few cross veins on clavus, a series along the claval suture, and about seven strong and slightly reflexed ones along costa.

Color: Vertex with a black line between the ocelli, which sends forward a quadrangular spot on either side of the median line. Before this line the margin is ivory white, disc brown, face highly polished, shining, shading to black below, traces of about five pale arcs. Pronotum brown behind the eyes, behind this a narrow light band containing a pair of irregular dark spots on either side. Behind this the disc is brownish or fuscous irrorate. Scutellum irrorate with brown except for three ivory white points in a triangle. Elytra milky white, the nervures brown, a black or dark brown saddle across the posterior two-thirds of clavus and usually a narrow band at base and apex and the costal veinlets black. The saddle contains four white spots along the suture and some irregular ones on the corium.

Genitalia: Female segment rather long, posterior margin slightly angularly excavated, the median fifth produced into a broad strap-shaped tooth as long as its basal width, slightly narrowing and a trifle bi-lobed at the extremity, pygofers short and stout, very convex as seen from below, the ultimate segment curving around them. Male valve very obtusely angulate, almost concealed, plates small, a trifle longer than their basal width, slightly concavely narrowing to their acute apices, margins clothed with a few coarse spines.

Habitat: Specimens have been examined from Penn Station, Pennsylvania (Wirt), Black Mountains, North Carolina (Beutenmueller), Ames and Little Rock, Iowa (Ball), Sioux Falls, South Dakota (Osborn), Onaga, Kansas (Crevec), Lamar, Pike's Peak, Pueblo and Trinidad (Ball), and Colorado Springs, Colorado (Tucker), Provo, Lehi, Salt Lake and Logan, Utah (Ball), and Guerrero, Mexico (Biologia coll.). It is apparently a southern species and reaches its northern limit in Pennsylvania, Iowa, and Colorado.

The larvæ resemble those of *straminea* in shape and color pattern, but are somewhat darker, with the white spot smaller or partially wanting.

This species is two-brooded, the adults appearing in June and again in August. Both larvæ and adults feed on two species of *Helianthus*, causing black spots on the leaves.

This species has long been known in collections and has been

commonly determined as *twiningi* Uhler. The species described under that name by Uhler proved, however, on examination, to be the *vitellina* of Fitch, thus leaving this form without a name. Its milk-white elytra with the black nervures and black saddle in sharp contrast render it a strikingly distinct and easily recognized species.

Eutettix (Mesamia) straminea (Osborn).

(Pl. III, Fig. 7; IV, Fig. 7.)

Paramesus stramineus Osborn, Iowa Acad. Sci., V, p. 231 and 241, 1898 (Desc. Iowa, S. D., and Neb.).

Size and form of *nigridorsum*, nearly, but of a uniform greenish straw-color, with dark veins. Length ♀ $5.5^{mm.}$, ♂ $4.5^{mm.}$; width $1.7^{mm.}$.

Vertex slightly longer and more angled than in *nigridorsum*. Elytra distinctly longer and more flaring than in that species, the apical and anteapical cells longer, the central anteapical cells enlarged at the apex and sometimes divided.

Color: Disc of the vertex straw yellow, anterior and posterior margins ivory white, behind the anterior margin there is an irregular black line, interrupted in the middle, which is sometimes reduced to four black spots, a pair against the ocelli and a larger pair behind the apex. Anterior half of pronotum pale dirty yellow, posterior half olive and brown irrorate, and separated from the yellow portion by a darker line which arches forward in the middle. Scutellum with a pair of orange spots just inside the margin and seven light dots around the edge. Elytra subhyaline washed with brownish olive on the disc, except for three pairs of oval milky spots along the suture, nervures brown, a crescent at apex and the costal veinlets fuscous. Face pale, front brown, darkening above with a narrow black band under vertex, arcs of the front light.

Genitalia: As in *nigridorsum*.

Habitat: Specimens have been examined from Ames and Little Rock, Iowa (Ball), Sioux City, Iowa, and Sioux Falls, S. D. (Osborn), West Point, Neb. (Bruner), Onaga, Kansas (Crevec), Riley county, Kansas (Osborn coll.), Fort Collins and Palmer Lake, Colorado (Ball), American Fork, Lehi, Salt Lake, Layton and Logan, Utah (Ball). It is probably confined to the Mississippi Valley and western states, where its food plants abound, but will, no doubt, be found much farther south than at present recorded.

The larvæ are elongate, the abdomen quite tapering, vertex distinctly longer than pronotum, longer and more angled than in the adult, but with the same depressed disc. Color light smoky or chocolate brown, with two

black dashes at apex of vertex, separated by a median stripe and a narrow crescent of white. A narrow median light stripe with an enlarged spot at each transverse suture extends back to the abdomen. An irregular row of white spots on each side near the margin, one on each abdominal segment, and two on each thoracic division. Pairs of intermediate spots on the pronotum, the wing pads, and the first three abdominal segments and four spots in a diamond on the fifth and sixth segments, white. Face white, a band below the vertex brown, the antennal sockets, lower half of front, and clypeus black, below and legs white. Femora annulate with black at apices, tibiæ annulate at both extremities, spines on hind tibia arising from black points.

This species is closely related to *nigridorsum*, but can be readily separated by the absence of the saddle and by the greenish color. It has about the same life history as that species and also feeds on *Helianthus*, but is found only on the rough-leaved species.

Eutettix (Mesamia) coloradensis (G. & B.).

Allygus coloradensis G. & B., Hemip. Colo., p. 91, 1895 (Desc. Colorado).

Paramesus immaculatus Ball, Can. Ent., XXXVII, p. 211, 1905.

Form of *nigridorsum*, nearly, but slightly smaller, resembling a pale *straminea*, but much smaller and with a flatter vertex. Length ♀ 4.5mm., ♂ 3.7mm.; width 1.6mm.

Vertex flat, form of *straminea*, nearly, the apex a trifle more pointed, acutely angled with the front, but not produced. Elytra short and with the venation of *nigridorsum* except that usually there are more reticulations.

Color: Pale greenish white, often with a sparse wash of yellow and dirty brown. Vertex usually with a hair line of black along the margin, interrupted in the middle, and sometimes with two black spots at base. Pronotum pale straw anteriorly, immaculate, or with a few black spots around the eyes, disc irregularly irrorate with brown. Elytra pale or greenish brown, subhyaline, the nervure and reticulations brown, darkest along the costa. Sometimes a faint brownish cloud on the disc omitting a few milky spots. Pale specimens may be uniformly greenish white.

Genitalia: As in *straminea;* female segment pale, the margins of tooth embrowned.

Habitat: Specimens are at hand from Fort Collins, Home, Palmer Lake and Rico, Colorado; Soldiers' Summit and Logan, Utah, all collected by the author, and Orizaba, Mexico (Biologia coll.). A damaged specimen from Keatchie, Louisiana (Hine) probably belongs here.

The larvæ were not preserved. They were pale, with faint brown markings. Both larvæ and adults feed on a single species

of sage brush (*A. dracunculoides*). There are two broods in a season, the adults appearing in middle June and again in early August.

It was rather difficult to decide as to which name to apply to this species. *A. coloradensis* G. & B. was described from a single example, and what purports to be that example is now in the Colorado collection. The head is lost, but it is unquestionably a male of the previous species (*straminea* Osborn). Recognizing this the writer, while in Colorado, described this species as *immaculatus*. The description of *coloradensis*, however, applies much better to the present species, and later examinations have shown that the material sent out as *coloradensis*, as well as most of that remaining in the Baker collection, belongs to this species. If the species were placed according to the Colorado type, then *straminea* should be known as *coloradensis*, and this species as *immaculata*. If, on the other hand, the description is to be given greatest weight in fixing the species, and on account of the questionable character of all the Gillette and Baker types, this plan has been adopted in the present case, then the present arrangement is the correct one.

Eutettix (Mesamia) cincta Osborn and Ball.

(Pl. IV, Fig. 1.)

Eutettix jucunda Van Duzee, Psyche, VI, p. 307, 1890; Osborn, Iowa Acad. Sci., I, pt. II, p. 120, 1892 (Iowa); Van Duzee, Catalogue, p. 297, 1894 (Md., Texas, Miss.).

Eutettix cincta Osborn and Ball, Dav. Acad. Sci., VII, p. 97, 1898 (Desc. Iowa, Texas and D. C.); Osborn, Iowa Acad. Sci., V, p. 235, 1898 (Iowa list); Ohio Acad. Sci., 8th Ann. Rept., p. 67, 1900 (Ohio); Wirtner, Ann. Carn. Mus., III, p. 223, 1904 (Pa. and note); Osborn, in 20th Rept. St. Ent. N. Y., p. 530, 1905 (Long Island).

Resembling *munda* in shape, the dark and light bands reversed. Larger than *nigridorsum*, with a sloping vertex. Length ♀ 6$^{mm.}$, ♂ 5.3$^{mm.}$; width 1.8$^{mm.}$.

Vertex sloping, with a weak depression, margin subacute, nearly half longer on middle than against eye, the apex bluntly conical. Elytra compressed at apex, venation of the pattern of *nigridorsum* with the cross nervure carried forward or wanting, the claval nervures united and joined to

suture. Outer anteapical cell often divided, about four reflexed veinlets to the costa, broadened along the margin.

Color: Vertex and upper part of face pale, dirty greenish yellow washed with saffron, lower part of face rusty. Pronotum soiled greenish or yellowish brown, irrorate. Scutellum pale, a pair of spots on each lateral margin and a smaller pair on the disc. Elytra milky or greenish washed with saffron, the nervures reddish. A broad brownish or fuscous band crossing the posterior half of clavus and then sloping obliquely back to the costa. The nervures have a narrow saffron margin through this band and there are a few pale spots in the cells. The cross nervures on clavus broadly black, forming an oblique mark, an irregular area in the third apical cell, and the expanded costal nervures black.

Genitalia: Female segment with the posterior margin slightly rounded, a trifle produced in the middle. Male valve short, rounding, plates long, broad at base, concavely narrowing to the strap-like upturned apices, margins thickly clothed with fine hairs.

Habitat: Specimens are at hand from Plummer's Island, Maryland, District of Columbia (Heidemann), Greensburg, Pennsylvania (Wirtner), Castalia and Columbus, Ohio (Osborn), Michigan (Heid. coll.), Ames, Iowa (Osborn and Ball), Onaga, Kansas (Crevec), Texas (Osborn coll.), and it has been recorded from Long Island, New York, and Mississippi above. Specimens are also at hand from Mexico, Central America, and Brazil (Ball coll.).

The life history records are incomplete but indicate a single brood of adults appearing the last of July and through August. The food-plant and larvæ are unknown. The adults have been taken from weeds in damp woods.

This species is quite distinct in our northern fauna. The heavy costal nervures and oblique spots on clavus will separate it at once from any Jassid known. Its known distribution from New York to Kansas and down through Brazil indicates that it is able to adapt itself to widely varying conditions and it will, no doubt, be found throughout its entire range east of the plain regions, when more collecting is done. It was thought for a time that this was *Jassus jucundus* of Uhler, and was so listed. Later the real *jucunda* was found and this species described as *cincta*.

Eutettix (Mesamia) fenestrata Ball.

Eutettix fenestrata Ball, Can. Ent., XXXIV, p. 12, 1902.

Structure of *johnsoni*, nearly, resembling *jucunda*, larger and more definitely marked. Pale, with brown markings and numerous milk white spots on elytra. Length ♀ 6$^{mm.}$, width 1.5$^{mm.}$.

Vertex short and flat, margins almost parallel, front narrow, a little expanded above, meeting vertex in an acute but rather thick margin. Elytra long and narrow, folded at the apex, venation similar to *jucunda* but lacking cross nervures along claval suture and with the second cross nervure faint or wanting. Claval nervures tied together and outer one to suture. Central anteapical cell very long, constricted, and with about three cross nervures, anterior end very much enlarged.

Color: Vertex pale yellow, a pair of crescentiform spots at the apex, a pair of dots on the margin against the ocelli, a dash against either eye in front, and a pair of spots on either side the disc, posteriorly brown or black. Pronotum pale, irrorate with brown posteriorly, irregularly spotted with black anteriorly. Scutellum as in *straminea*. Elytra milky white with a narrow dark brown band at base, a broader one between the cross nervures and a narrow smoky one at apex. Nervures dark in sharp contrast with the white bands.

Genitalia: Female segment with the posterior margin truncate next the lateral angles, the middle half obtusely angularly produced, the apex of which is again produced into a triangular tooth.

Habitat: Sierra Madre Mts., Chihuahua, Mexico (Townsend).

Eutettix (Mesamia) johnsoni Van Duzee.

(Pl. III, Fig. 8.)

Eutettix johnsoni Van Duzee, Can. Ent., XXVI, p. 137, 1894 (Desc. Pa.); Catalogue, p. 296, 1894 (N. Y.); Osborn and Ball, Iowa Acad. Sci., IV, p. 232, 1897 (Iowa); Osborn, in Smith Cat. Ins. N. J., p. 95, 1900 (N. J.); Wirtner, Ann. Carn. Mus., III, p. 223, 1904 (Pa.); Osborn, in 20th Rept. St. Ent. N. Y., p. 531, 1905 (N. Y.).

General appearance of *vittelina*, nearly, much smaller, with a shorter vertex. Orange fulvous, maculate with white, six black points on the vertex margin. Length ♀ 5.2$^{mm.}$, ♂ 4.8$^{mm.}$; width 1.3$^{mm.}$.

Vertex slightly sloping, with a definite depression, rather short, one-third longer on middle than against eye, meeting the face in a slightly acute angle. Elytra moderately long, slightly flaring, the claval nervures often tied together and the outer to suture. No supernumerary veinlets on corium, and the second cross nervure often obscure or wanting, anteapical cells short, the middle one constricted, apical cells large, the fourth one unusually so.

Color: Orange fulvous; vertex margin with an interrupted line beneath and six dashes above, black; posterior margin of vertex, three stripes on the pronotum and numerous oval spots on the elytra, milky white.

Genitalia: Female segment suddenly narrowing at about half its length, then rounding slightly to the posterior margin, posterior margin roundingly emarginate, slightly notched in the middle, the margins of the notch bear-

ing long, acutely pointed teeth. Male valve large, triangular, plates convexly narrowing, with the points acutely produced.

Habitat: Specimens have been examined from New Hampshire (Weed); Staten Island (Osborn); Pennsylvania (Wirtner); Maryland (Heidemann); New Jersey (Osborn coll.); North Carolina (Fiske); Tennessee (Summers); Ohio (Osborn); Iowa (Osborn, Ball).

Larvæ: Stout, vertex angular, pale creamy yellow sprinkled and washed with bright red, a pair of red points at the apex of vertex, and another pair against the eyes, irregular red dots on pronotum and wing pads, and a reddish brown saddle on the posterior part of the abdomen, below reddish yellow and brown.

The life history is incompletely known. There are apparently two broods. The adults appear in late June and August. No food plant is known. This is a remarkably distinct species in both color and genitalia and should be easily recognized. It apparently reaches its western limit in Iowa but will, no doubt, be found in all states east of the Mississippi when more collecting is done. The Iowa specimens were taken sweeping along the edge of timber land.

Eutettix (Mesamia) vitellina (Fitch).

(Pl. IV, Fig. 2.)

Acocephalus vitellinus Fitch, Homop. N. Y. St. Cab., p. 57, 1851 (See Lintner's 9th Rept., p. 397); Walker, Homop. B. M., IV, p. 1160, 1852 (mention); Van Duzee, Can. Ent., XXI, p. 9, 1889 (Ontario, Can.).

Selenocephalus vitellinus Ashmead, in Smith's Cat. Ins. N. J., p. 445, 1890; Van Duzee, Psyche, V, p. 390, 1890.

Parabolocratus vitellinus Southwick, Science, XIX, p. 318, 1892 (After Ashmead).

Paramesus vitellinus Van Duzee, in Lintner's 9th Rept., p. 410, 1893 (genus); Bull. Buff. Soc. N. S., V, No. 4, p. 198, 1894 (N. Y. and notes); Catalogue, p. 290, 1894 (Adds Mich.); Gillette and Baker, Hemip. Col., p. 84, 1895 (Colo. and note); Osborn and Ball, Iowa Acad. Sci., IV, p. 232, 1897 (Iowa); Osborn, Iowa Acad. Sci., VI, p. 39, 1899 (Iowa and S. D.); in Smith's Cat. Ins. N. J., p. 94, 1900 (N. J.); in 20th Rept. St. Ento. N. Y., p. 516, 1905; Van Duzee, do., p. 554 (Adirondacks); Wirtner, Ann. Carn. Mus., III, p. 221, 1904 (Pa. and notes).

Jassus twiningi Uhler, Bull. U. S. Geol. and Geog. Surv., IV, p. 511, 1878 (Desc. N. D.). (Not *twiningi* of later authors.)

Paramesus furcatus Osborn, Can. Ent., XXXII, p. 285, 1900 (Desc. Maine).

Rich fulvous, with an oblique testaceous stripe on the elytra. Vertex long and acutely angled in front. Length ♀ 6.5mm., ♂ 5.5mm.; width 2mm.

Vertex almost as long as pronotum, roundingly angled at apex, the disc slightly depressed, almost flat, margin acute, a trifle produced. Elytra long, but little flaring, venation obscure, second cross nervure present, outer apical cell often divided, a number of veinlets to the costa.

Color: Vertex, face and all below, lemon yellow, a narrow black line under vertex in dark specimens. Pronotum testaceous, the anterior margin pale yellow, scutellum pale yellow, the basal angles clouded with testaceous, elytra pale golden, subhyaline, an oblique band at base and another parallel with it from the middle of costa to apex of clavus, testaceous; tips of costal veinlets black. Whole surface of elytra sprinkled with white spots, especially conspicuous on clavus and in the bases of apical cells.

Genitalia: Female segment rather long, posterior margin shallowly emarginate, with a narrow strap-like tooth arising from the middle. This tooth is half longer than its basal width and often expanded, bi-lobed at the apex. Male valve triangular and nearly as long as the ultimate segment, plates roundingly narrowing to just before the acutely pointed and slightly produced apices, margins clothed with weak hairs.

Habitat: Specimens have been examined from Maine (Osborn coll.); New Hampshire (Slosson); Massachussetts (Uhler coll.); Sault Ste. Marie, Canada (Osborn coll.); Agassiz, B. C. (Osborn coll.); Wellington, B. C. (Taylor); District of Columbia (Heidemann); Iowa, Nebraska and Colorado (Ball); Utah (Van Duzee); Washington (Osborn coll.), and it has been reported from New York, Pennsylvania, New Jersey, Michigan, South Dakota and North Dakota above. It is apparently a northern species extending clear across the continent in Canada and the northern United States, and reaching its southern limit in Pennsylvania, Iowa and Colorado. In Colorado it was only found on the plains in the northern part, while it extended to the southern border in the mountains.

Larvæ: (Not preserved). They were rich creamy yellow with rusty brown mottlings scattered on the dorsum, and were covered with a whitish bloom. The vertex was very similar to that in the adult.

There is apparently a single brood, the adults appearing in late

June and early July and continuing through two months. It feeds on wild rose, the larvæ curling the leaves.

The long vertex and fulvous yellow color alone will separate this from any other species in the group. Fitch also mentions the long elytra and dark spots on the costa near the apex. The northern forms are a trifle narrower and darker as a rule, and from these Dr. Uhler described *twiningi* and Prof. Osborn *furcatus*. Dr. Uhler evidently recognized this identity, as Prof. Heidemann informs me that there is a female in the Uhler collection in the National Museum, from Turtle Mountain, labeled "*Paramesus vitellinus* Fitch, *twiningi* Uhler." This is evidently a type of *twiningi*, as it was described from females from Turtle Mountain and Pembina. Gillette and Baker united the species and referred to the type of *twiningi* as a faded male. There is a male in the Uhler collection, from Turtle Mountain, labeled "*Jassus twiningi*," but this cannot be the type, as the description says "only females have been examined." This male was probably one of those species referred to by Uhler as "too much altered to admit of description." As stated under *nigridorsum*, later writers have considered that species as the *twiningi* of Uhler.

Eutettix (Mesamia) palliolata Ball.

(Pl. III, Fig. 9.)

Eutettix palliolata Ball, Can. Ent., XXXIV, p. 13, 1902 (Desc. Texas).

Form and structure of *vitellina*, a trifle smaller. Creamy yellow, with the pronotum, scutellum, and a narrow stripe along the sutural margins of elytra, rich brown. Length ♀ 6$^{mm.}$, ♂ 5$^{mm.}$; width 1.9$^{mm.}$.

Vertex and face as in *vitellina*, the former a trifle more depressed on the disc. Elytra scarcely inclined to be flaring, venation very obscure, similar to *vitellina*, the second cross nervure usually wanting, about four supernumerary veinlets to costa.

Color: Vertex pale lemon yellow, pronotum pale greenish white, with four obscurely defined brown stripes, the outer one with a definite outer border next to a narrow, creamy, lateral margin. Scutellum washed with brown, the apical triangle inclined to be yellow. Elytra with the scutellar and sutural margins narrowly bordered with brown. This stripe enclosing five or six small white spots on its outer margin, the rest of clavus creamy white, continuing the stripes on the margin of pronotum. Corium subhyaline white, nervures indistinct. Below, pale lemon yellow.

Genitalia: Female segment twice the length of the preceding, truncate posteriorly, with the median fourth produced into a blunt tooth, slightly notched at the apex. Male valve obtusely angulate, the apex rounding, plates long and narrow, margins rounding at base, concave towards the blunt upturned apices.

Habitat: The original material from the United States National Museum was simply labeled "Tex." Several specimens, probably from the same original lot, have been examined since, and one male received from College Station, Texas (Sanderson).

In structure this species is closely allied to *vitellina*, while in color pattern it is quite distinct. This is evidently an extreme southern form, while *vitellina* is the most northern one in the genus.

SPECIES NOT INCLUDED.

Eutettix exitiosa Gillette and Baker, Hemip. Colo., p. 100, 1895.

This species belongs to the genus *Athysanus*.

Eutettix terebrans Gillette and Baker, Hemip. Colo., p. 102, 1895.

Baker has since referred this to the genus *Athysanella*.

Eutettix vanduzei Gillette and Baker, Hemip. Colo., p. 102, 1895.

This = *Jassus laetus* Uhler and belongs to *Cicadula*.

Athysanus irrorellus Stal., Freg. Eug. Resa. Ins., p. 295, 1859.

It has been impossible to recognize this species from the brief description. It is doubtless a *Phlepsius* or a *Eutettix*.

PHYLOGENY.

The genus *Eutettix* is apparently an offshoot from the same line of development that produced the genus *Phlepsius*. The close structural resemblance to the latter genus of the *strobi* group, together with the presence of the pigment lines, would indicate a common origin and if it were not for the presence of some rather generalized species, indicating other relationships, it might be considered as a recent outgrowth from that parent stock.

In the breaking up of the ramose pigment character two lines of development seem to have been followed. To one group in which the pigment lines were lost in certain areas and remained unchanged (at first) in others, the subgenus *Eutettix* has been restricted. In the second line of differentiation the ramose pigment lines were reduced in number and increased in size, and these pigment lines were apparently often followed by tracheæ,

forming true nervures from which the second cross nervure and other cross veinlets have arisen. This line apparently soon split on head characters and formed the subgenera *Aligia* and *Mesamia*.

The subgenus *Eutettix* seems to be made up of three quite distinct branches. The *strobi* group, in which the ramose lines were first confined to restricted areas, then gradually changed to definitely margined color patterns and finally in the highest forms became nearly solid colors. The *lurida* group, in which the pigment lines were apparently first replaced by diffuse color areas and then these varied in different ways. This group is still very plastic and apparently quite recent. Its relationship to the *strobi* group is evident but quite puzzling. In the case of the pigment lines it agrees with the *clarivida* group and it may have been an early offshoot from that source. The *clarivida* group, in which the pigment lines have been transformed into round black punctures or entirely lost. It would also be possible to look upon this as a group set off before pigment lines were developed, but in that case it would be necessary to consider *Eutettix* as the older genus and *Phlepsius* as the offshoot. The close resemblance in larval characters to the *strobi* group, and the fact that this group is confined to the arid region where pigment reduction is general, make it very certain that the former has been the line of evolution.

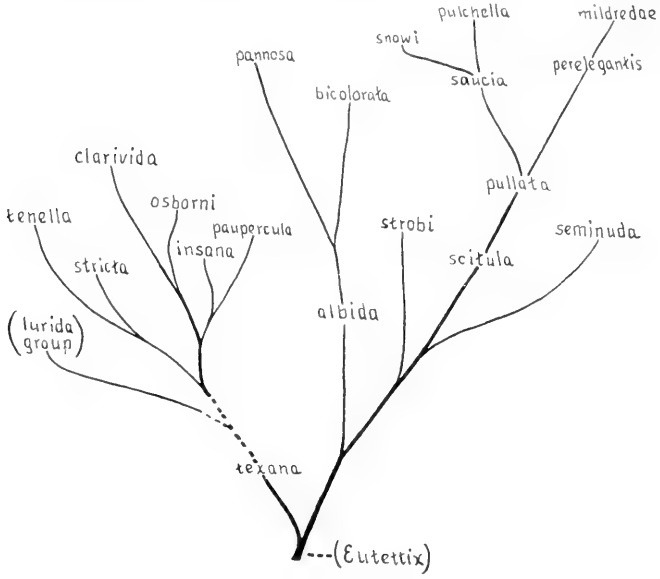
THE STROBI GROUP.

Starting from a hypothetical ancestry with pigmentation in the form of ramose lines, this group has developed along the line of reduction in the pigmented area and concentration into definite color patterns. In this *texana* represents the first known step in this direction, but probably not in the direct line of the group. The tendency in this form is toward total reduction, which points very strongly towards it as the ancestral line of the *clarivida* group.

From an indefinite reduction in elytral pigmentation probably slightly emphasized at the base, two divergent lines soon sprang up: one in which the reduction was on a very definite slightly oblique basal area and an irregular subapical one; the other, in which the reduction was emphasized along the costa. In this, *albida* presents an intermediate type, probably the beginning of the second line of development. In *pannosa* this line has become

fixed and quite highly specialized in both structure and color, while in *bicolorata* a wide departure is again made in that the pigment has disappeared from all but the apical third of the elytra. This might easily arise from an extreme reduction in either a *pannosa* or *pullata* pattern, but the marking on the remainder of the body strongly suggests the former species.

In the first group a definite pattern as represented by *strobi* and *scitula* was apparently soon established, *strobi*, however, diverging from the direct line through a change in ground color from brown to red. *Seminuda* apparently arose from this same stem at about



the same time, but diverged in the further reduction of the color areas and in an increase in the density of the pigment. *Strobi* and *seminuda* are apparently extreme forms in different lines, while the further development of the group came through the more generalized *scitula* branch. Of this branch *pullata* still retains the generalized pattern and some of the pigment lines. The ground color has, however, changed from lemon to orange and the pattern is darker and more definitely margined. A still farther darkening of the margins and an olive cast to the center of the pattern gave *berelegantis*, while still further reduction in pig-

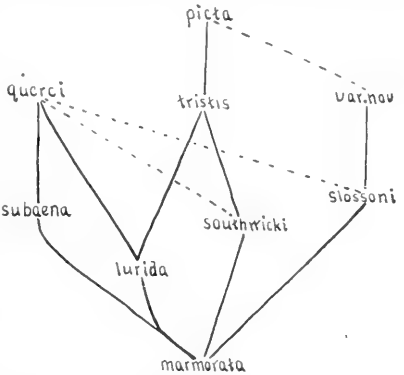
mentation on the body region gave *mildredæ*. In *saucia* the pigment lines of *pullata* have coalesced into a finely irrorate condition on a brown pattern. This has been further modified in two different ways: deepening into a rich brown and extending onto the vertex in *pulchella*, or fading into a brownish olive in *snowi*.

THE CLARIVIDA GROUP.

This group contains three quite distinct elements. In one line the pigment lines entirely disappeared, leaving a golden yellow ground color in *stricta*, and even that has been lost in *tenella*. In the other line round dots have in part replaced the ramose lines; these again diverged, *insana* and *paupercula* retaining the dots over nearly the entire surface, while *osborni* and *clarivida* have lost most of them, *osborni* retaining a few on the elytra and *clarivida* only four, which have become greatly emphasized on the vertex margin.

THE LURIDA GROUP.

This group of varieties apparently arose from a *marmorata*-like form in which pigment lines had broken down into brown mottling omitting a more or less definite spot on the elytral suture. An increase in the size of the mottlings until they coalesced into a uniform reddish brown shade gave *southwicki*, a slightly farther darkening of the elytra and a segregation of the pigment on vertex and pronotum into transverse bands gave *tristis*, while a farther increase in the darkening and segregation formed *picta*, a black and yellow extreme. Through another line of variation from *marmorata* we get *lurida*, in which the brown pigment has spread out and taken a reddish cast on the elytra and disappeared from the rest of the dorsum. From these forms, with a little reduction on both areas, a golden green *querci* form results. Through a change in the ground color to a bright yellow, together with a reduction of pigment on the elytra

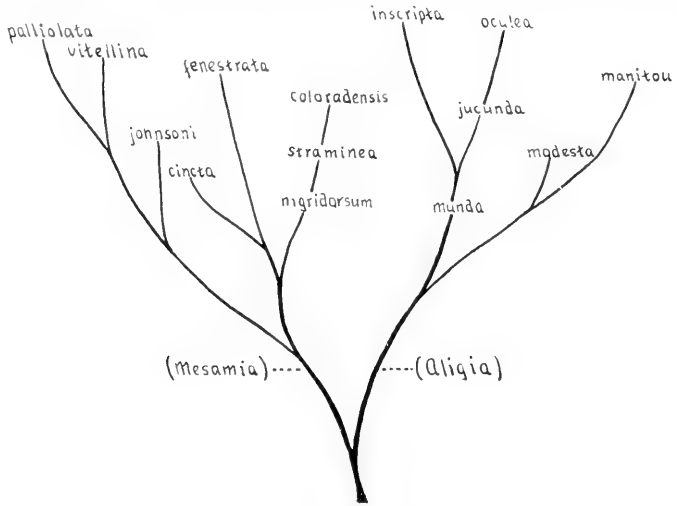


and a concentration of it into bands on the vertex and pronotum, *slossoni* is formed. If the elytral color is also segregated and deepened into black blotches in the cells, then an unnamed variety appears, and coalescence of these blotches is all that is required to form a *picta* again.

As *querci* is only the result of reduction of brown pigment to a minimum it would be possible for it to arise from either *southwicki*, *subaenea* or *slossoni*. In the same way the concentration of the pigment into bands on the vertex and pronotum of *lurida* would give a *tristis*. Thus it would be possible for forms apparently alike to have arisen through different lines of variation and in the material at hand this has apparently occurred.

SUBGENERA ALIGIA AND MESAMIA.

As mentioned above, these groups apparently sprang from a ramose pigmented form by reduction and concentration of the pigment lines. These lines apparently broke up and disappeared



first along transverse bands, the two principal ones falling into the regions of the two transverse nervures between the sectors, while between these bands the amount of pigment was considerably increased. While this was going on there was a separation into two groups on head characters; one group, which is here recognized as the subgenus *Aligia*, retained the short depressed head

and much of the original pigmentation, while the other branch developed a longer and flatter head with an acute margin to the vertex and carried the change from the pigment lines to definite nervures to the extreme. This latter group is here recognized as the subgenus *Mesamia*.

SUBGENUS ALIGIA.

The ancestral forms in this group have apparently been lost, as the known forms are already pretty clearly divided into two groups on the color and arrangement of the pigment. In one line the pigment is dark brown and still more or less ramose in character, while in the other it has changed to a tawny red and become diffuse in character on the bands. In the first group, which is apparently the older, *munda* represents the most generalized type; from this a reduction in the amount of pigment, especially on the median band, and a slight change in form gave *jucunda*, while still further reduction in pigment and size, together with a reddish cast, gave *oculea*. By another line of development from *munda* the pigment was again reduced and the head prolonged to form *inscripta*.

In the other line *modesta* has not materially changed in structure from the *munda* type, although the tendency to diffusion in the pigment areas is already well-marked, as is the tawny color. In *manitou* the ramose lines have almost all disappeared and in the male the tawny color has been concentrated into a uniform golden yellow.

SUBGENUS MESAMIA.

Like the preceding subgenus this group apparently first divided on color and arrangement of pigment, one group changing but little from the original brown at first and then darkening up, while the other changed to a diffuse fulvous red. In both groups the ground color has a tendency to appear in milky white spots in sharp contrast.

The group with the dark markings divided on the amount of reticulations on the elytra and on head characters, the first group starting with a definite saddle and only a few coarse reticulations in *nigridorsum*. From this pattern, by the loss of the saddle, *straminea* was formed, and by further reduction in pigment, *colora-*

densis, these three species forming a very closely related group. The other branch of this same stem contains quite similar forms, both, however, possessing considerable pigment in solid bands and therefore little in the form of transverse veins. This has resulted in a reduction in the second cross nervure, so that it is weak in *fenestrata* and often wanting in *cincta*. On account of not possessing the cross nervure the relationship of *cincta* to this group was not at first recognized. One of the first results, however, of the concentration of the ramose lines is the formation of a number of transverse veinlets to the costa, and in the more specialized forms these become oblique. In *cincta* these veinlets are highly developed and it therefore appears to be an offshoot from this group with the second cross nervure moved forward or replaced by a doubling or even trebling of the first one.

The group, with the fulvous coloration again separated on head characters *johnsoni*, still retaining the short head and marginal spots of the ancestral group, while the others have developed a longer and flatter vertex, without markings. In the development of the long vertex *vitellina* is quite specialized, while in the saddle on the elytra it still shows its origin. *Palliolata*, on the other hand, has not gone as far in head development, but in the reduction and concentration of elytral pigment to a narrow strip on the inner margin it has departed widely from the general trend.

GENERAL CONSIDERATIONS.

The generalized color pattern everywhere, both in adults and larvæ, is the oblique band or saddle. This is retained throughout the entire *strobi* group, appears at least in the lower forms of every other group except the *clarivida* branch, and even here it appears in some of the larvæ. The origin of every color pattern from the "saddle" precludes the idea of having a true stripe appear. In *pannosa* and *palliolata* the markings strikingly resemble stripes, but the ramose character and included light spots show that these patterns are very different in origin from true stripes.

As a group the head is very short, far shorter, no doubt, than it was in the primitive Jassid stem from which our genera have sprung. This would be shown in a comparison with some of the less specialized genera, as is easily seen in comparing the larvæ

with their adult forms. That the head is very variable is shown by the fact that forms with long verticles have arisen independently in each of the groups. *Pannosa* in the *strobi* group is possibly questionable, but *paupercula*, *vitellina*, *coloradensis* and *inscripta* show unquestionable relationship and derivation from shorter-headed forms in their respective groups and lend strong support to the placing of *pannosa*.

The change from the ancestral ramose brown pigment to a diffuse fulvous red is another variation that has appeared independently in all groups except the *clarivida* one, in which both have been lost. In the *jucunda*, *nigridorsum* and *lurida* groups it appeared early and marked one line of development. In the *strobi* group it appeared early in *seminuda* and later in a different line, in *pulchella*.

Such an apparently trifling character as a dark line under the vertex margin appears in all three branches of the subgenus *Mesamia*.

GEOGRAPHICAL DISTRIBUTION AND ADAPTATION.

Both *Eutettix* and *Phlepsius* are widely distributed, the former being nearly world-wide in distribution, while the latter is known from both North and South America and forms have recently been referred to this genus from the Philippines (Kirkalday), Ceylon, and East Africa (Melichar). Both genera have, however, reached their highest development in the Nearctic region, and species formation is apparently still in progress here.

In the present state of our knowledge of the distribution of our Jassid fauna, little more can be done than to point out general lines of dissemination. Distribution along the northern limits of this group is fairly well known, but from the southern part, to which we must look for the centers of dispersal, our material is as yet very meager and only from isolated localities. Some peculiar facts are, however, brought out in the study of even this imperfectly known distribution of our species. *Cincta*, with a distribution from New York to Kansas and south to Brazil, does not seem to have given rise to a single form in our fauna, while farther south its relatives are apparently the predominant group in the genus. The *lurida* group, with its varieties, is the next most widely distributed, ranging from Massachusetts and Michigan to

California and south to southern Mexico. Although prolific in varieties, none of the other species can be traced back to this group. In fact, with the possible exception of *nigridorsum* not one of these eastern species has given rise to any other form. Instead, the great development of the entire group has been in the southwest, and here the species have apparently become fixed and distinct and exhibit little variation. This is especially noticeable when the condition of the *lurida* group in the two regions is compared. In the East, and especially along the Atlantic coast, every known variety occurs with every gradation of the series. On passing westward, however, the number of varieties grows less until, in the Rocky Mountain region, from Colorado to California, only three forms have been found, *marmorata*, *subaenea* and *querci*, all representing one line of development, and for the latter two, at least, apparently fixed forms showing little tendency to vary. In fact, if *querci* and *subaenea* occurred in this region alone, they would be regarded as distinct specific types, but when considered in connection with their eastern extension it is impossible to do so. In the genus *Clastoptera* of the Cercopidæ the same conditions exist. In the northeastern United States the two species are widely and indefinitely variable while the same species in Colorado have only a few varieties and these very constant.

The reason for this variation can only be conjectured. It seems possible that the explanation may lie in the fact that under arid conditions the range of a particular food plant is often broken and isolated and that in this way the varieties have been separated until they became fixed. In the light of recent work on variation in insects, and especially Tower's exhaustive work on *Leptinotarsa*, it seems probable that much of this indefinite color variation in the eastern region is due to the varying humidity. In support of this is the fact that the black varieties of the *lurida* group have been found only in the humid regions, and in the greatest abundance along the Coast regions in Maryland and Florida, while the pale *querci* is the most abundant form on the dry mountain slopes in the Rockies. This same general distribution also holds in the *Clastoptera*. The black forms are most abundant from Maryland to New Hampshire and again around Lake Erie, while the pale and intermediate forms are the common ones in Colorado, and no black ones have been found there.

The geographical distribution of color in the entire group is in general harmony with Tower's conclusions, the darker and more solid colors being with one or two exceptions found in humid regions while the paler and more broken patterns are in the arid Southwest. Two apparent exceptions to this are easily explained. *Strobi* ranges from Massachusetts to Utah without changing color, but in the arid regions its distribution is limited to the moist conditions in which its food plant can grow, while *vitellina*, another eastern and northern species which has been taken in Colorado and Utah, occurs only in the mountains except in the northern part.

That changes in temperature and humidity have been important factors in modifying these color patterns is undoubtedly true, but that the subsequent fixation or further modification of these intricate patterns could have been brought about in this way is, in the light of our present knowledge, very doubtful.

Tower's experiments were made on a group already highly specialized along the line of "warning colors," and any tendency to vary along the line of adaptation to environment would have been eliminated in the fixing of the warning pattern. That any number of different patterns might be equally effective as far as warning is concerned is also probable, hence this was an ideal group on which to show the full effect of temperature and moisture. That the new patterns resulting failed to survive would not necessarily show a lack of value in the pattern, but rather a lack of education on the part of predatory animals.

In the present group, however, the development has been along entirely different lines. Every form of which we know the life-history shows in both larva and adult a remarkable adaptation to its food plant, and in many cases to some particular part of the plant or to some change in the plant brought about by the insect itself. Thus the larvæ of *strobi*, *scitula*, *nigridorsum* and *straminea* have become wonderfully adapted to the discolorations which their punctures make on their respective food plants, and as these discolorations are of the same color in both humid and arid climates the insects are constant in color throughout their range. On the other hand, *scitula* or some closely related form has, in the western region, given rise to a group of distinct but closely related species that have taken up other food plants, and in doing

so have been modified in both color and pattern to conform to some part of their host. In doing this the general change has been toward a decrease in pigment, apparently more for the reason that the general trend of the arid flora is toward decreased pigment and that was the line of selection necessary to adaptation, than because of any direct effect of the arid climate on the insects themselves. If the change was due to the climate it would affect all alike. Instead, we find *strobi* at the base of the series unchanged, and *pulchella* at the top of one line with a still deeper pigment than its ancestors in direct adaptation to its food plant. The remaining forms, although under the full effect of the arid climate, have either remained practically unchanged or else grown paler, but each one along the line that has adapted it to a particular environment, as in the case of the yellow and pale green of *mildredæ* to the Juniper.

The reduction in pigment in the *clarivida* group has been extreme, but not more than was necessary to adapt them to the white or greenish white plants of the desert region, and each form has been modified along the same line as that of its food plant.

An interesting and convincing case of adaptation is shown in *bicolorata*. Here the saddle of the *strobi* group has entirely disappeared, while the rest of the markings have been intensified. This insect feeds exclusively upon the *Ephedra*, a bushy plant whose stems superficially resemble the scouring rush. The insect's body is about the size of a stem, and the pale creamy elytra, with the apical reticulations, so closely resembles a frayed sheath such as encircles the nodes that the deception is often complete.

Another apparently clear case of adaptation is that of *oculea*. Its nearest relatives, *munda* and *jucunda*, are oak-feeding forms, widely distributed in the Southwest. In southwestern Colorado a sarvice berry occurs with the oaks, and here *oculea* is found, slightly smaller and paler than *jucunda*, with bright red eyes and other reddish shading enough to admirably adapt it to the red twigs of its new host.

If the *lurida* group is to be looked upon as in the process of species-forming, then the criteria used by either Tower or Adams would point to the Atlantic coast region as the point of origin, for in this region occurs the greatest variation, the largest number of individuals, and probably the least dependence on a re-

stricted habitat. The occurrence of varieties distributed clear across the continent in the northern range of the species would, however, point to a much older and more southern origin, or else to a wide distribution of the species before the southern migration.

The greatest number and most closely related species of the *strobi* group are found in the Southwest, and that would point to that region as the center of dispersal for this group; but these species are evidently derivatives of more generalized types found generally distributed in the humid region. In the same way *nigridorsum* ranges from the Atlantic coast west to Utah at least and south to southern Mexico, while *straminea* and *coloradensis*, its nearest relatives, are restricted to the Southwest.

From the above facts it would seem that this group arose under humid conditions and that all of the main divisions were set off while still under those conditions; that representatives of each of these groups migrated into the arid regions of the Southwest and there gave origin to the dominant Jassid types of that region, twenty-nine out of the thirty-four forms here listed being found there.

As to the location of the original center of distribution of these humid forms our present knowledge gives no clue. It is possible that all these forms were set off before the southern migration of life and that their present distribution is a secondary one.

LIFE HISTORIES AND FOOD PLANTS.

(See Life History Chart.)

In order to work out the life history of a species with any certainty it is necessary to have a given locality under observation throughout an entire season, or else a series of observations on different localities running through several years. Of the two, the former is to be preferred, but a combination is still better than either one alone. The finding of the larvæ and watching their transformations is really the only satisfactory method of determining the number of broods. Next to this in value is the occurrence of the adults in numbers, especially the males, as the males rarely live as long as the females and their preponderance always marks the beginning of a brood of adults.

For the determination of the food plant, the finding of the

larvæ is also the best criterion. Single captures of adults are of little value and often misleading, as they usually prove to be accidental. Repeated captures of adults on a particular plant or the finding of a large number at one time have been accepted in some cases, but even here there is danger of error, as would have resulted from referring *scitula* to cottonwood, where the adults are found.

While working on the life history of the Orthoptera of Colorado, from 1898 to 1902, many observations were made on the species of leaf-hoppers occurring there. This work was continued in Utah and during the seasons of 1905–6 a special study was made of *E. tenella* in connection with its injury to beets. To assist in working out this problem all species of the genus found coloring or distorting leaves were carefully observed. During the season of 1906 this work was carried on in coöperation with the Bureau of Entomology of the Department of Agriculture, and the facts discovered are included here through the kindness of Dr. Howard.

Eutettix tenella.—The adults of this species were found in small numbers on the weeds in waste places early in May before the sugar beets were up. In early June they appeared on the beets in small numbers, gradually increasing for several weeks. Egg-laying began late in June and continued into August, the great majority of the eggs being deposited in the ten days preceding the middle of July. The larvæ appeared in small numbers by July 10th and continued through August; the great majority of them, however, appeared the last ten days of July and changed to adults some twenty days later. The eggs are elongate, slightly curved, tapering at one end, and are thrust into the beet stems in a slightly downward direction. At first they are scarcely visible, but as the stem grows the slits open and they are pushed out until at hatching time they are often over half free.

Twelve females were enclosed in a cage over a moderate-sized beet and from this beet, thirteen days later, two leaf stems were removed. These stems contained one hundred and sixty-one eggs and this did not represent more than one-sixth of the beet top, indicating that at least eighty eggs, and probably more, are laid by one female. From the records of this and other cage experi-

ments the egg stage under cage conditions appeared to be from thirteen to fifteen days, and the larvæ developed in from sixteen to twenty-two days more, making the total time from egg to adult from twenty-nine to thirty-seven days, under cage conditions.

In dissecting females during the egg-laying period only from four to nine fully developed eggs could be found at one time, indicating that the eggs are developed as laying proceeds and that probably each female deposits eggs through a period of several weeks.

This species is apparently single-brooded and, like most single-brooded species, that brood extends through a long period of time, some of the earlier larvæ often maturing before the later eggs are laid.

This long egg-laying period in single-brooded species has often deceived observers unacquainted with the habit and led them to the conclusion that there were a succession of broods, and for this reason some of the observations necessary to determine these facts are given. The discovery of adults soon after the vegetation had started in the spring, indicated that they had hibernated in that condition, as it was too early for them to have developed. The presence of fairly equal numbers of females and males would of itself indicate that eggs had not been laid and the female showed no signs of eggs. When examined on the beets, June 23d, there were more females than males and the females all had large eggs in the abdomens. There had not been either time or favorable weather sufficient for a brood to have developed before this, so this was near the beginning of egg-laying for the brood of larvæ appearing in July. Just as soon as adults began to appear again a number of fresh males and females, together with a number of large larvæ, were caged and kept until frost, but no eggs were deposited. On September 12th, no eggs having been laid in the cages or in the field, and the dissection of a number of females showing that none had developed as yet, a number of insects were swept from the field and placed in a cage and kept until the beets were harvested. No eggs were found in any of the cages and the insects were still alive, indicating that they hibernate without laying eggs.

The original food plant of this species is still in doubt. In the spring it occurred on *Sarcobatus*, *Dondia*, several species of *Atri-*

plex, russian thistle, and rarely on most species of these two families of plants occurring in the waste places. Later in the season most of these insects had migrated to the beets; in one place, however, they were found in some numbers on greasewood (*Sarcobatus*) during egg-laying time, which would indicate that plant as its original host, and its known distribution also agrees well with that of the greasewood.

Eutettix strobi—The larvæ of this species were found on *Chenopodium album* early in June and continued to appear until the latter part of the month. The first males appeared by the twentieth, the females several days later, the greatest number of adults appearing the latter part of June and the first week of July, while by the middle of July the last larvæ had transformed. A number of adults were placed in a cage for the purpose of getting eggs, but no eggs were found and the adults soon died. The field on which these observations were made was pastured soon after and the pig-weed was destroyed.

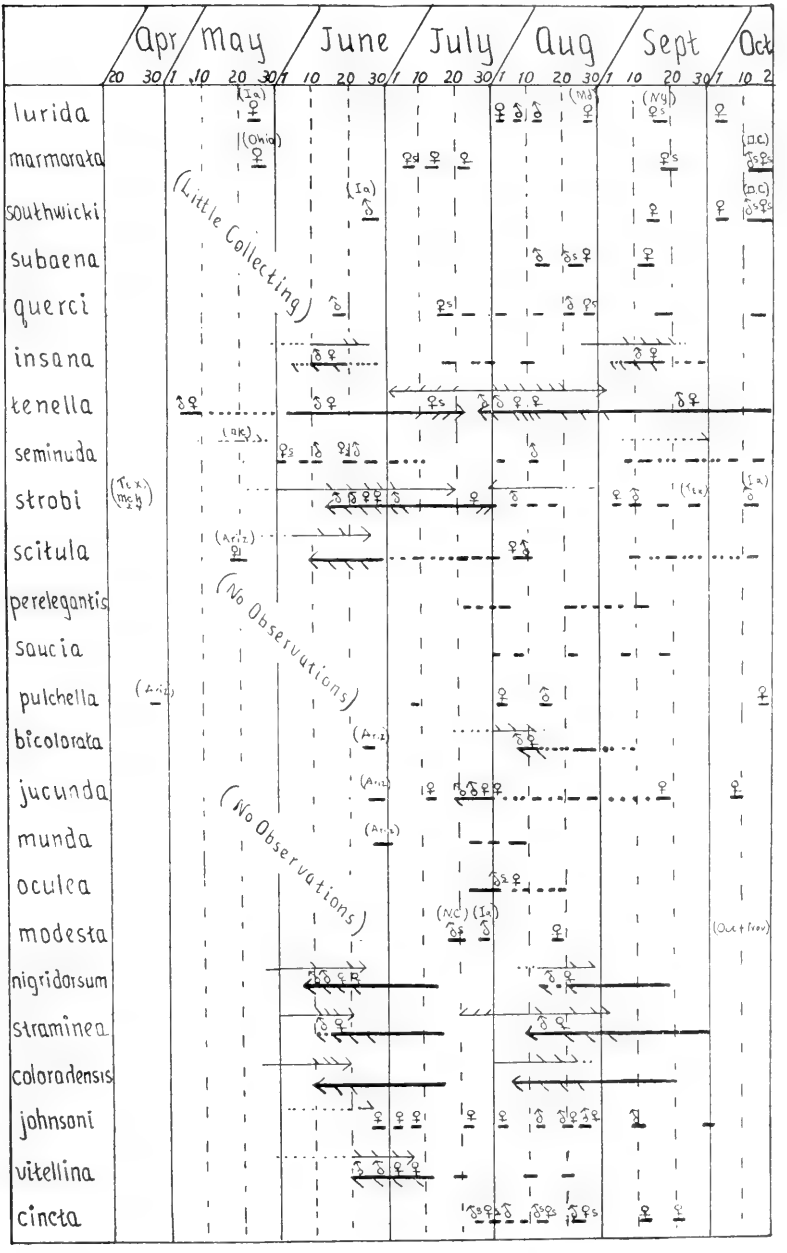
Three years' records in Colorado previous to this gave about the same dates for the first brood and for one season second brood larvæ were found, appearing the first of August and running on nearly through the month. Adults have been taken most commonly in September, males having been taken as late as September in Colorado and Texas and to October 24th in Iowa and Pennsylvania. A male from College Station, Texas, is labeled March 24th, indicating adult hibernation or a much earlier season there. Osborn ('87) records the last of the first brood for Iowa on July 25th.

This species seems to be confined very strictly to lamb's quarter in the larval stage at least, but where this plant occurs alongside of beet fields some larvæ are often found on the beets. The first record of the peculiar reddening of the leaves by this insect was by Osborn ('87). Since then it has been noted a number of times. It is quite characteristic and will be considered further under economic discussion.

LIFE HISTORY CHART OF THE SPECIES.

(See Chart on opposite page.)

The heavy line (——) shows observed occurrence of adults. The light line (——) above shows observed occurrence of larvæ of the same species. The arrow heads (<>) show beginning or end of a brood. The dotted lines (.....) show known extensions but not observed.


Apr
May
June
July
Aug
Sept
Oct
20 30 1 10 20 30 1 10 20 30 1 10 20 30 1 10 20 30 1 10 20 30 1 10 20 30 1 10 2
lurida
marmorata
southwicki
subaena
querci
insana
tenella
seminuda
strobi
scitula
perelegantis
saucia
pulchella
bicolorata
jucunda
munda
oculea
modesta
nigridorsum
straminea
coloradensis
johnsoni
vitellina
cincta
(Little Collecting)
(No Observations)
(No Observations)

Eutettix scitula.—Full-grown larvæ of this species were found, just before the middle of June, two different seasons in Colorado. With them were found adult males and a few females. From these and other records it appears that the larvæ hatch out late in May and may be found nearly through June. The adults appear by June 10th and continue through July. Adults have been collected sparingly in August and quite commonly in September, while a few have been taken into October, indicating that there is another brood of larvæ in August, but none has been found.

The larvæ have been taken in a number of places and always from *Chenopodium*, while the adults are almost always taken from cottonwood trees. The larvæ produce a small amount of reddening and curling of the *Chenopodium* leaves, but not as much as in the case of *strobi*. The powdery, pinkish color of the larvæ matches the under surface of the affected leaves so well that there is little question that their color is an adaptation to that situation. The adults are, however, rarely found on the pigweed except when freshly transformed; instead, they are found only on the cottonwood (*Populus monolifera* and *angustifolia*). This suggests that possibly the color of the pattern in the adults is an adaptation to the light bark of those trees and that the eggs are laid in the twigs. This may also explain the tree-inhabiting records of *strobi* and *seminuda*, and the failure to get eggs in the *strobi* cages. With this idea in mind all *strobi* and *scitula* records were examined and it was found that all records of larvæ being found in numbers were from locations within a few rods, at most, of trees, the *scitula* larvæ in every case being found near cottonwoods while the two worst cases of *strobi* infestation were close to rows of apple trees.

Eutettix seminuda.—A full-grown larva from District of Columbia (Heidemann), May 20th, and another taken in Iowa (Ball) October 1st, are the only larval records for this species. The adults have been taken most freely about the middle of June and again in early September, with extremes a month on each side of either date. These indicate two broods as in *strobi* and *scitula*, and from the close relationship it seems likely that the larvæ will be found to feed upon a *Chenopodium*. Wirtner ('04) gives similar dates for adults in Pennsylvania.

Eutettix insana.—Adults and larvæ were found together in abundance at Pueblo, Colorado, June 15th, and again September 15th. Collections made the latter half of July and early in August gave adults in small numbers. These dates are too far apart for a normal brood and it seems probable that they represent the beginning of the first brood and near the close of the second, but it was not possible to follow up the investigation and determine this.

This species, *clarivida* and *albida* are all very strictly confined to three or four species of the salt bushes, and all occur in the arid district where these plants abound. *Insana* and *albida* occur most abundantly on the "shad-scale" (*Atriplex confertifolia*) while *clarivida* is most widely distributed on a large spreading species (*A. canescens*), although it is often abundant on the "shad-scale." All three species occur on a smaller, yellow, and rather tomentose species that grows with the others. From these *clarivida* occasionally spreads to the russian thistle and sugar-beet.

Eutettix bicolorata is the only other species of this subgenus on which definite life history observations have been made. It seems to be strictly confined, both larvæ and adult, to the joint fir (*Ephedra trifurca*). Observations have been made only late in the season: on August 7th, at Richfield, Utah, larvæ and adults were found, the larvæ most abundant and most of the adults fresh and soft. Later in the month only adults were found.

Eutettix (*Mesamia*) *nigridorsum.*—Larvæ and adults of this species were first found making black spots on the leaves of *Helianthus* at Ames, Iowa, on July 1st, 1895. During the five years' work in Colorado numerous observations were made and a second brood established. Larvæ of this species were found early in June, 1906, on sunflower at Logan, Utah, and the locality was under observation throughout the rest of the season. The first brood of larvæ appeared late in May and the last of them transformed to adults late in June or early July. The first adults appear before June 10th and the majority of them are out before the 20th. The second brood of larvæ appeared the last week in July and continued through August. The adults began appearing a little before the middle of August, the greater number appearing about the 20th.

Both larvæ and adults appear to be very strictly confined to a few species of the genus *Helianthus*, the black spots and curling of the leaves caused by their punctures affording an admirable protection. In central Iowa it occurred more commonly on the tall long-leaved species (*H. grosseserratus*) while in nortwestern Iowa, Colorado and Utah it is more commonly found on the wild sunflower (*H. anuus*). Specimens from the *H. grosseserratus* in Utah were uniformly darker than those from *H. anuus* and the effect on the leaves was most marked in the former species. Wirtner records this species in numbers June 4th, indicating an earlier appearance in Pennsylvania.

Eutettix (*Mesamia*) *straminea*.—This species was found with *nigridorsum* on the wild sunflower at Logan and its life history followed through with that species. The adults of the first brood appeared a few days later, and those of the second brood a few days earlier, than in the former species. This may have been accidental or may indicate a slightly shorter life cycle. The Colorado records indicate about the same dates as for *nigridorsum*.

This species occurs on *H. anuus* and also on a low clump-like perennial species (*H. pumilus*) that grows on the sides of the hills in Colorado, and on this form there is less discoloration than on the annual species. Both *nigridorsum* and *straminea* apparently prefer sunflowers growing in very hot dry situations, where they are often stunted and only a few inches to a foot or more in height.

Eutettix (*Mesamia*) *coloradensis*.—This species is apparently very strictly confined to one species of sage brush (*Artemisia dracunculoides*) to which its pale green and fuscous markings well adapt it. It has been observed for several years, and in one case, through an entire season on a single pasture at Fort Collins, Colorado, and its entire life history determined. The life history is very similar to that of the preceding species, the larval period being a little shorter, so that the second brood of adults begin to appear about the 5th of August.

Eutettix (*Mesamia*) *johnsoni*.—The only larval record of this species is a full-grown specimen from Fairfax, taken June 24th, 1889, by Prof. Osborn. Records of adults captured show females

taken from this time on through July, and about an equal number of males and females taken from the middle to the last of August, indicating another brood coming on at that time. These records would indicate that this larva was one of the last of the first brood, the greater number of adults having appeared before that time. Nothing is known of its food plant.

Eutettix (*Mesamia*) *vitellina*.—The larvæ of this species have been found but once, and that was on July 27th, 1897, at Ames, Iowa, when full-grown larvæ in company with a number of adults, some still fresh, were found on the undersides of the leaves of wild roses on a grassy hillside. They were found on several different plants and always on the under side of the lower leaves, close to the ground. The leaves were more or less folded and distorted and seem to protect the insects beneath. Adult males were taken from this locality as early as June 21st and adults have been taken late in August, but only stragglers, and it seems doubtful whether there is more than one brood in a season.

Of the remaining species only very fragmentary records or simply dates of collecting specimens are at hand, and these can only be used with great caution. For the *lurida* group the record is not complete on a single variety. One female of var. *lurida* was taken in Iowa late in May, and a female of var. *marmorata* in Ohio at the same time. These two records strongly suggest adult hibernation. A large number of *marmorata* and *tristis* taken in Maryland late in October would also suggest it, while the remainder of the records on these varieties rather contradict it. *Subaenea* and *querci* have been studied in Colorado, where the former has only been taken after the middle of August, the males appearing first. *Querci* occurs in the southern portion, where little early collecting has been done. Males and females have been taken about equally in late August and September. A male taken June 18th might have been a late survivor of a hibernating brood or an early one of a summer brood.

Var. *querci* is strictly confined to the scrub-oaks in Colorado and Utah, from which both adults and larvæ have been taken. Var. *subaenea* was taken sparingly north of the oak districts, but no food plant was determined. Several specimens of *marmorata* from the Uhler collection were marked "Oak," and all of the

Colorado specimens were taken from the scrub-oaks. Of the other varieties nothing is known as to food plants.

For *cincta* records are at hand of females and males taken the last two days of July and into early August, with scattering ones later. A lot from Plummer's Island, Maryland (Heidemann), were taken August 12th, 15th and 23d, and scattering females in September. Wirtner records it in August and September from grass and weeds in open woods. The Iowa specimens were taken from weeds growing around rotten logs in a rather damp woods.

Of the subgenus *Aligia* the adults of *jucunda*, *munda* and *manitou* occur on the scrub-oaks in southern Colorado. Very little collecting has been done in these localities before July, so little is known of the early season. *Jucunda* has been taken with both sexes common late in July and on into August, while scattering ones have been taken in October. In one collection, July 22d, only males were taken. *E. manitou* was found most abundant with the sexes about equal the first of August. *E. munda* has been taken but scatteringly, but all specimens were from oak. *Oculea* occurs at the same time as *jucunda* but seems to be strictly confined to the sarvice berry (*Peraphyllum ramosissimum*) as a food plant. Where this plant and the scrub-oaks were in adjoining clumps, scattering specimens of *oculea* would be found on the oaks, but where there was no sarvice berry near, only *jucunda* and *munda* could be taken. *Modesta* is apparently an oak-inhabiting species also; specimens from Maryland, from the Uhler collection, are labeled "Oak," and the Iowa types were swept from a patch of second-growth timber, largely oak. Records from Iowa and North Carolina are about the same as the Colorado ones for *jucunda*, but the Maryland and District of Columbia specimens were taken in October and one November 1st.

All specimens of *pullata* have been taken from pine trees growing in rather warm and sheltered situations, but no larvæ have been seen. *Perelegantis* and *mildredæ* have been taken from red cedar (*Sabina scopulorum*). *Perelegantis* has been found wherever the cedar grows at the lower elevations, and in warm situations higher up, while *mildredæ* has only been found in one sheltered spot in Colorado, and is probably more southern in distribution. *E. saucia* has only been taken in single specimens from widely separated but similar situations. In every case but one it has

been taken from thinly grass-covered transition areas between the sand and the sod. Few plants were common to all these localities, but among them was a small *Eriogonum* with reddish leaves, which would harmonize well with the color of the insects.

ECONOMIC RELATIONS.

It has only been within very recent years that this group of insects has been recognized as of any economic importance. Two or three of the species had occasionally been taken on sugar-beets, but only in small numbers, and no appreciable damage was recorded. Eight of the species are, however, known to feed on the wild relatives of the sugar-beet, and probably several more whose food plant are not known will be found to have similar habits. Most of these species occur in the arid region of the West, and with the rapid extension of the sugar-beet industry into that region it was not surprising that one of these species found in the sugar-beet fields a more favorable environment than on the desert, and that a rapid multiplication occurred.

In 1905 an immense number of *E. tenella* were found in the beet fields of Utah and the adjoining part of Colorado and Idaho. As a result of their attack the beet leaves soon began to curl up, the small veinlets thickened, and the whole under surface became rough and "warty." This condition was spoken of as "curly-leaf" or "blight," and at first was not attributed to the leaf hoppers. As this condition progressed the beets almost stopped growing and threw out a new and much more numerous set of fibrous roots, to which the dirt adhered when the beets were pulled.

The loss in Utah that season varied from nearly total in one section down to about ten per cent in another, with an average of over forty per cent for the state. The loss in tonnage, together with a further loss in sugar content and purity of the remainder of the crop, brought the total injury up to over $500,000 in the one state.

In order to assist in determining whether the leaf hoppers were the cause of the "curly-leaf" condition a careful study was made of the effect of the attacks of other members of the group on their respective host plants and, in the case of *strobi*, on the sugar-beet itself. In the case of *strobi* and *scitula* the punctures of the larvæ

on the *Chenopodium* leaf first caused red spots to appear, and as these increased in number and size the leaf curled up and became distorted. The production of color is about the same whether on a large leaf or a small one, differing only in the two species, the work of *strobi* producing much the darker red. The distortion varies greatly, however, on small leaves, and especially on the young leaves of a starting plant the distortion is much greater than it is on the older ones. The distortion was also much greater on beets than it was on the wild plants in proportion to the size. One or two larvæ on small plants of either kind would often cause every leaf to curl up into a small closed knot and the plant would remain a stunted dwarf or wither and die. Most of the work of *strobi* on beets was near the margins of the fields, and in only one case were they numerous enough to do any real injury.

In the same way the attack of *nigridorsum* and *straminea* on the sunflowers produces a darkening and curling of the leaves which differs in amount according to the nature of the leaf attacked. The thin leaves of *H. grosseserratus* are often curled up into a roll by *nigridorsum*, while the stiff hairy leaves of *H. pumilus* are scarcely curled by *straminea* and less color is produced. On the true sunflower both species produce about the same amount of color and distortion, so that the difference in effect on the other two plants is apparently one of susceptibility of the plant.

In all of these cases the injury to the plant seemed to be in the nature of a gall formation, and like other galls, the specific nature of the process is still to be explained.

A careful watch was kept on the beet fields in 1906 for the first appearance of the "curly-leaf," and no sign of it was found until the larvæ of the leaf hoppers had appeared. The leaf hoppers appeared in very small numbers this year and but little "curly-leaf" developed. A number of the first plants affected were carefully examined and in almost every case the cast skins of the young larvæ could be found on the backs of the leaves while on the healthy plants they were very rare. In the case of *strobi* and *nigridorsum* but one or two larvæ would be found on a plant and on account of the protection of the color of the affected spot they remained almost stationary, while in *tenella* a number of larvæ would often be found on a plant and these were active and moving around. As a result the effect on the beet of the attack of

tenella was more general than that of *strobi*, the curly leaf appearing first on the medium-sized leaves and gradually working in to the smaller ones. The younger larvæ appeared to prefer the young leaves at the center, and it is possible that the altered condition developes with the leaves as the result of this early attack.

The leaf hoppers, as a group, are rather difficult to destroy, and this species was particularly so, kerosene emulsion at ordinary strength killing a very small number of them.

All of the species under consideration seem to thrive best in hot, dry situations, and to be able to produce the maximum effect on the plant under such conditions. The season of 1905, when so much damage was done, was an exceptionally favorable one in this respect, the early summer being excessively hot and dry.

Advantage has been taken of this fact to prevent their injuries. By keeping the ground damp, through frequent irrigations, until the beets are large enough to shade it and keep it cool, the injury has been prevented. Very early planting, in most sections, would accomplish the same results.

The leaf hoppers appeared on the beets at Grand Junction soon after they were introduced there and have apparently been fluctuating in numbers in that region ever since, as they have had much trouble with what they have called "blight" on their beets. In Sevier county, Utah, the insects have evidently been increasing in numbers for several years, as there was increasing loss each season from the curly-leaf. The winter preceding the season of 1905 was exceptionally favorable for the survival of most all injurious insects, and as a result the leaf hoppers, already increased in numbers, were so abundant that for the first time they were recognized as the cause of the trouble.

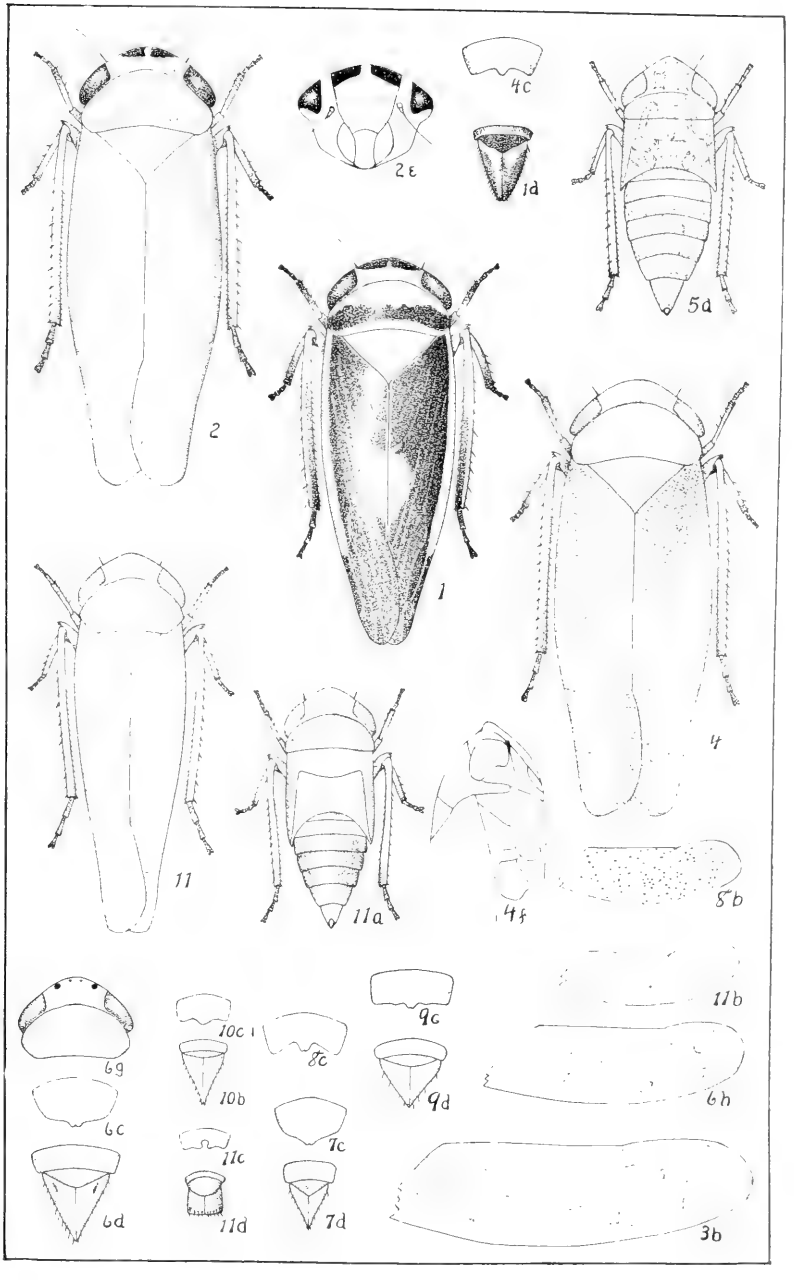
Besides the two already mentioned, *scitula*, *seminuda* and *clarivida* have been found on the beet at different times, but these latter species, like *strobi*, have not occurred in sufficient numbers to be considered injurious.

Many problems in connection with the new pest are still to be worked out. Just why one of the rarest leaf hoppers in its native environment should become the most abundant on the beets is still an open question. Possibly the fact that it is single-brooded while so far as known all the other species on the beets are two-brooded, may account for it. The adult hibernation would allow

of an early distribution on the beet fields; but probably more important than this is the fact that a single-brooded species may deposit eggs in the tissues of an annual plant, while a two-brooded one, where the winter is passed in the egg stage, must have woody tissue in which to deposit the over winter brood of eggs, and this could not be found in the beet fields.

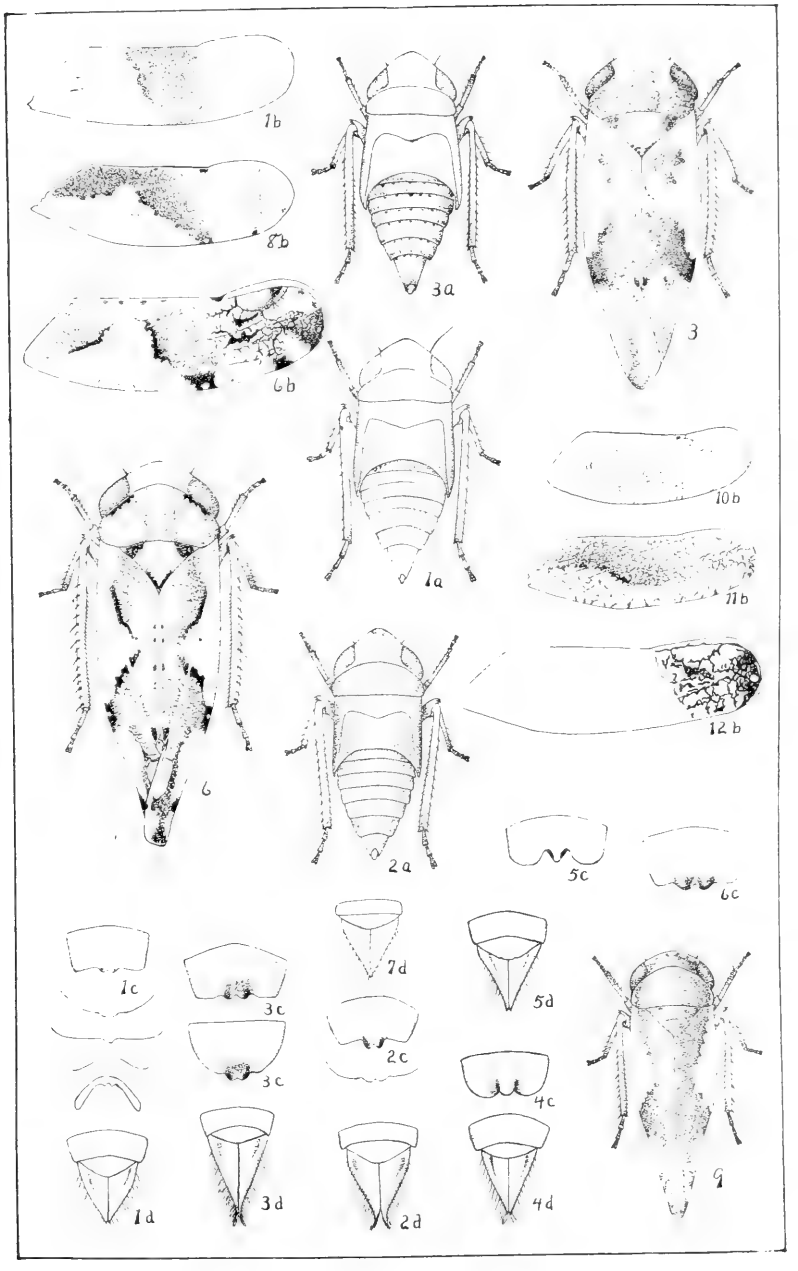
EXPLANATION OF PLATE I.

Fig. 1. *Eutettix subaenea* var. *picta*, adult; 1*d* ♂ genitalia.
Fig. 2. " " var. *tristis*, adult; 2*e* face.
Fig. 3*b*. " " var. *southwicki*, elytron. [profile.
Fig. 4. " " var. *lurida*, adult; 4*c* ♀ genitalia; 4*f*
Fig. 5*a*. " " var. *querci*, larva.
Fig. 6*b*. " *clarivida*, wing; 6*c* ♀ genitalia; 6*d* ♂ genitalia; 6*g* head and pronotum.
Fig. 7*c*. " *osborni*, ♀ genitalia; 7*d* ♂ genitalia.
Fig. 8*b*. " *insana*, wing; 8*c* ♀ genitalia.
Fig. 9*c*. " *paupercula*, ♀ genitalia; 9*d* ♂ genitalia.
Fig. 10*c*. " *stricta*, ♀ genitalia; 10*d* ♂ genitalia.
Fig. 11. " *tenella*, adult; 11*a* larva; 11*b* wing; 11*c* ♀ genitalia; 11*d* ♂ genitalia.


2
2e
4c
1d
5a
1
4
11
11a
4f
5b
9g
6c
6d
10c
10b
11c
11d
8c
7c
7d
9c
9d
11b
6h
3b

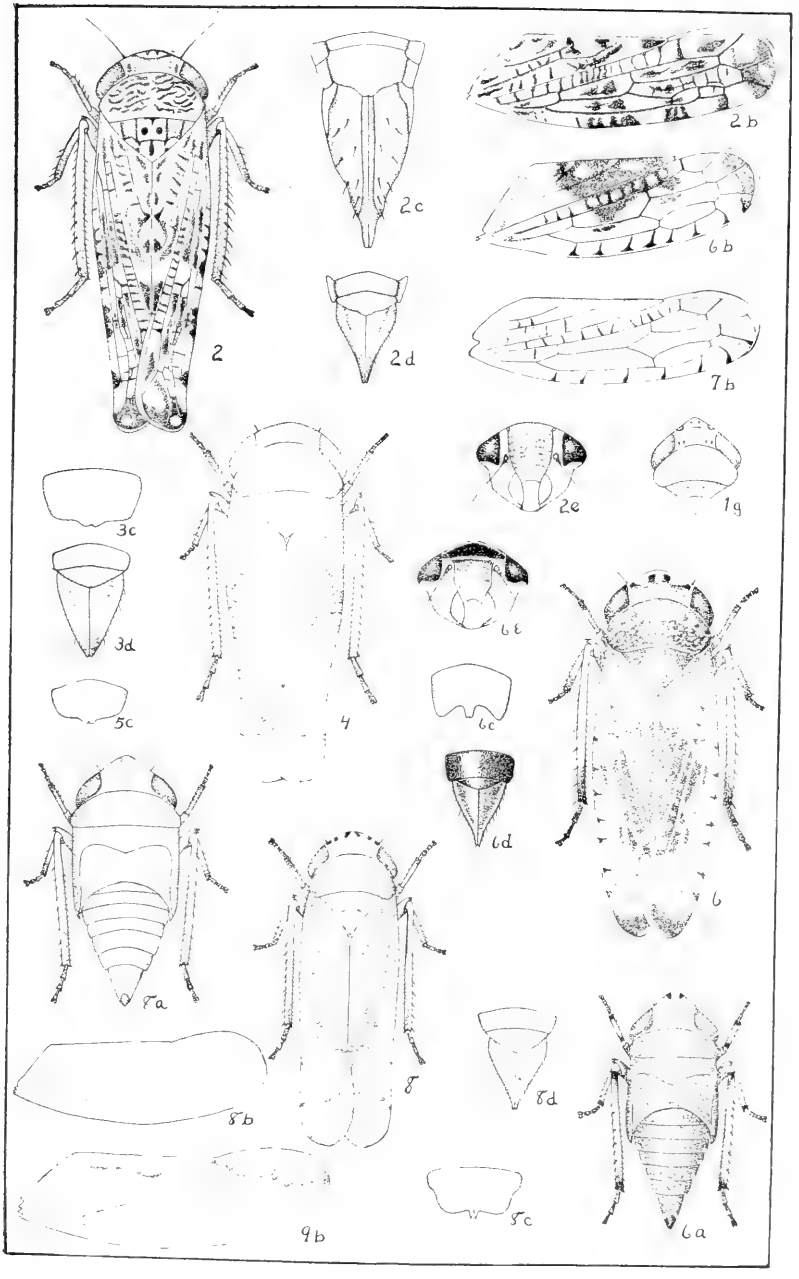
EXPLANATION OF PLATE II.

Fig. 1*a*. *Eutettix seminuda*, larva; 1*b* wing; 1*c* ♀ genitalia; 1*d* ♂ genitalia.
Fig. 2*a*. " *strobi*, larva; 2*c* ♀ genitalia; 2*d* ♂ genitalia.
Fig. 3. " *scitula*, adult; 3*a* larva; 3*c* ♀ genitalia; 3*d* ♂ genitalia.
Fig. 4*c*. " *pullata*, ♀ genitalia; 4*d* ♂ genitalia.
Fig. 5*c*. " *perelegantis*, ♀ genitalia; 5*d* ♂ genitalia.
Fig. 6. " *mildredæ*, adult; 6*b* wing; 6*c* ♀ genitalia.
Fig. 7*d*. " *snowi*, ♂ genitalia.
Fig. 8*b*. " *saucia*, wing.
Fig. 9. " *pulchella*, adult.
Fig. 10*b*. " *albida*, wing.
Fig. 11*b*. " *pannosa*, wing.
Fig. 12*b*. " *bicolorata*, wing.


1b
8b
6b
3a
3
1a
10b
11b
6
12b
2a
5c
6c
1c
3c
3c
7d
2c
5d
4c
1d
3d
2d
4d
4

EXPLANATION OF PLATE III.

Fig. 1*g*. *Eutettix* (*Aligia*) *inscripta*, head and pronotum.
Fig. 2. " " *jucunda*, adult; 2*b* wing; 2*c* ♀ genitalia; 2*d* ♂ genitalia; 2*e* face.
Fig. 3*c*. " " *munda*, ♀ genitalia; 3*d* ♂ genitalia.
Fig. 4. " " *modesta*, adult.
Fig. 5*c*. " " *manitou*, ♀ genitalia.
Fig. 6. " (*Mesamia*) *nigridorsum*, adult; 6*a* larva; 6*b* wing; 6*c* ♀ genitalia; 6*d* ♂ genitalia; 6*e* face.
Fig. 7*b*. " " *straminea*, wing.
Fig. 8. " " *johnsoni*, adult; 8*a* larva; 8*b* wing; 8*c* ♀ genitalia; 8*d* ♂ genitalia.
Fig. 9*b*. " " *palliolata*, wing.


2
2c
2b
2d
6b
7b
2e
1g
3c
3d
5c
4
6t
6c
6d
6
8a
8
8b
8d
9b
8c
6a

EXPLANATION OF PLATE IV.

Fig. 1. *Eutettix* (*Mesamia*) *cincta*, adult; 1*b* wing.

Fig. 2. " " *vitellina*, adult; 2*b* wing; 2*c* ♀ genitalia; 2*d* ♂ genitalia; 2*f* profile.

Fig. 3. A small plant of *Chenopodium album*, showing work of *E. strobi* larvæ; 3*b* a small leaf of a sugar beet, showing work of *strobi* larvæ.

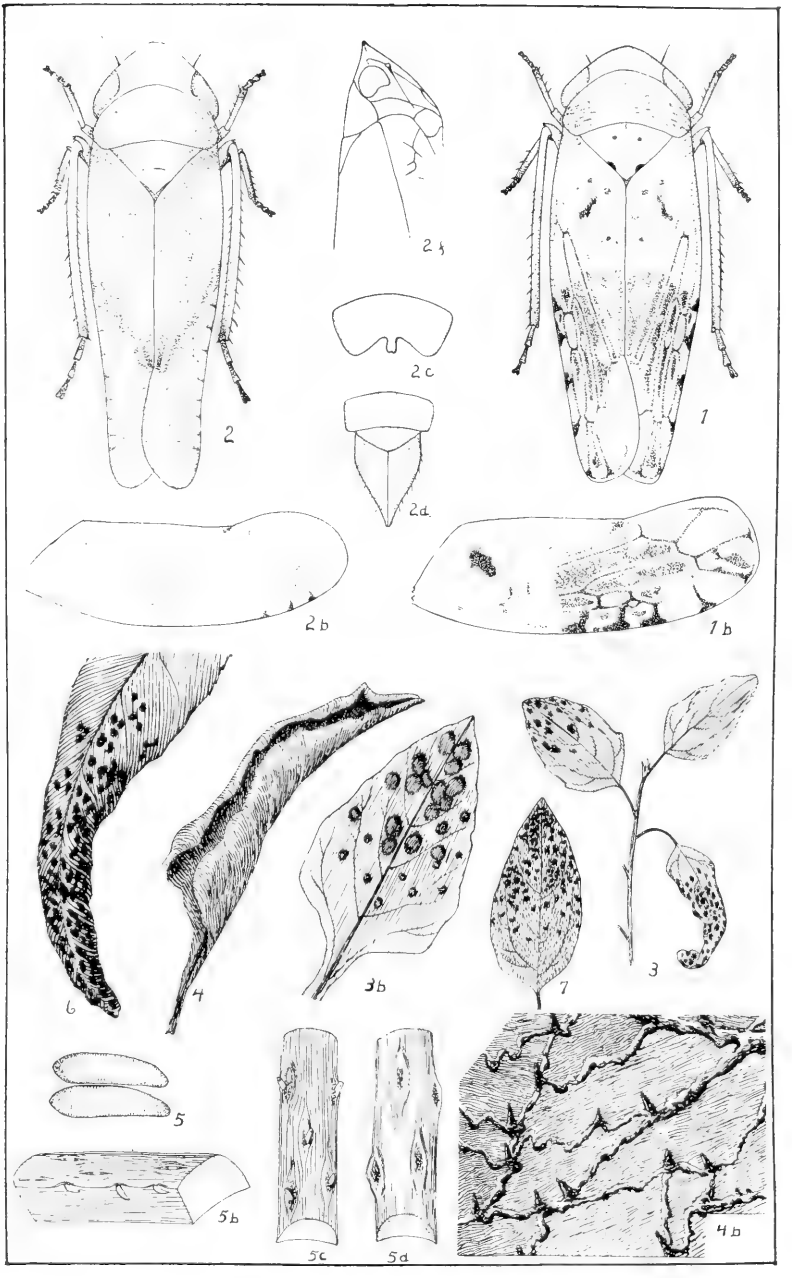
Fig. 4. A small leaf of sugar beet, showing curly-leaf condition caused by *E. tenella;* 4*b* a small section of the back of same leaf to show enlarged veinlets and "warty" condition of a bad case.

Fig. 5*a*. Eggs of *E. tenella* (greatly enlarged); 5*b* section of beet stem showing how the eggs are placed; 5*c* beet stem with eggs ready to hatch; 5*d* beet stem showing old egg scars.

Fig. 6. Leaf of *Helianthus grosseserratus* showing work of *E.* (*Mesamia*) *nigridorsum* larvæ.

Fig. 7. Leaf of *Helianthus annus* showing work of *E.* (*Mesamia*) *straminea* larvæ.

All drawings of insects are enlarged nine times except those of *E. tenella* adult and larvæ, which are sixteen times enlarged. The drawings have been made by Mrs. Ball, under supervision of the author.


2
2a
2c
2d
1
2b
1b
6
4
3b
7
3
5
5b
5c
5d
4b

MAY, 1909. VOL. XII. PAGES 96-222

Proceedings

—OF THE—

Davenport Academy of Sciences

ETHNOGRAPHIC NOTES FROM THE CONGO FREE STATE: AN AFRICAN MISCELLANY

BY FREDERICK STARR

Published from the Income of the
Putnam Memorial Fund

DAVENPORT, IOWA, U. S. A.
DAVENPORT ACADEMY OF SCIENCES
1909

PROCEEDINGS OF THE DAVENPORT ACADEMY OF SCIENCES
Davenport, Iowa, May, 1909 Vol. XII Pages 96-222

ETHNOGRAPHIC NOTES FROM THE CONGO FREE STATE:

AN AFRICAN MISCELLANY.

BY FREDERICK STARR.

The greater part of my notes made in Africa are reserved for a *Handbook of the Peoples of the Congo Free State*, which I have in preparation. In collecting the material for that work, I have secured considerable matter which, on account of its detailed character, cannot be introduced into such a handbook. This matter is absolutely new or is drawn from sources inacessible or useless, in their present form, to students. It varies, dealing with facts of physical anthropology, ethnography and folk-lore. It has been treated monographically and my first plan was to print it as articles in various journals. The objections to so scattering it, however, were immediately obvious and I have finally brought this matter, although dealing with such diverse subjects, together into one paper, which is here presented. In almost every topic treated much no doubt remains to be done: in my opinion it is most likely to be done if some one breaks the way.

We regret that we cannot present a good map. To aid somewhat in locating places and peoples we may say: from the Congo mouth to Leopoldville, at the head of the Cataracts, are Bakongo; we saw most of them at Wathen in the midst of the Cataracts district; at Leopoldville and Kinchasa are Bateke, Babuma, and visiting Bafunagani; the Kasai is the greatest tributary from the south and the first of importance above Leopoldville; far up that river, Wissmann Falls interrupts navigation and near them are Ndombe's town and the Bakuba, Baluba, Bakete, Batua, Bachoko and Baschilele; returning to the main river and ascending

it, Bateke, Bobangi, Moie, etc., are found near Chumbiri and Bolobo; next comes Irebu, where the outlet of Lake Mantumba enters, with Irebu and Lusakani; the outlet leads to Lake Mantumba on which are the stations Ikoko and Bikoro with Ntumba and Batua (Bachua); again mounting the river, Bolengi and Coquilhatville (Equator) are surrounded by Nkundu, Ileku, etc.; here the Ruki enters; further up are Nouvelle Anvers (Bangala), the chief station in the Bangala country, and Bumba; Lisala and Upoto have Upoto and Ngombe near the river and interesting inlanders behind; Basoko is at the mouth of the Aruwimi, navigation of which extends to Yambuya; above Basoko the "Arab" influence is notable at Isangi and La Romèe; Yakusu presents an interesting group of peoples, among them Lokele, Turumu, Bakumu and Bafoma; at Stanley Falls the Arab influence centres.

THE BATUA.

Three writers particularly have described the Batua—Wolf, Hinde and Verner. None of them gives photographs or serious measurements; as we can present both and our views regarding this people differ somewhat from those of these authors, we think it well to summarize their statements in connection with the presentation of our observations. Dr. Ludwig Wolf was a member of the Wissmann expedition into Central Africa in the years 1883–1885. He was the scientific worker of the group and luckily the journey into the Bakuba country was assigned to him. It was in this journey that he met the Batua, whom he describes in his report to Wissmann.* Later Wolf presented an important paper before the Berlin *Gesellschaft für Anthropologie, Ethnologie und Urgeschichte*, in which he summarizes his observations.† It is from this paper that we extract the following:

The Batua live scattered among the Bakuba, particularly near 5° south latitude, partly mixed with them, in part nominally pure and independent, in settlements in clearings in the forests. At Lukengo's court, these African dwarfs have the task of providing his daily supply of palmwine and game, as they are reputed notable hunters. All the subordinate chiefs have

* Hermann von Wissmann. *In Innern Afrikas. Die Erforschung des Kassai während der Jahre 1883, 1884 und 1885*, pp. 203-267.

† Ludwig Wolf. *Volksstämme Central Afrikas.* Zeitschrift für Ethnologie, Vol. xviii (1886) pp. 725-752.

a Batua slave for the same purpose. These Batua, desirous of withdrawing themselves from the immediate neighborhood of their oppressors, dwell usually in miserable little settlements surrounded by the forest and live upon the produce of the chase, which they conduct with bows and arrows and with traps. They are not agriculturists, nor do they possess peculiar industries. Upon stagings over the fire they dry the cut up flesh of the killed or captured animals; for this, they buy from the Bakuba and Bakete, in markets held on set days, on neutral ground in the midst of the forest, manioc, maize, etc., and weapons. They were always shy and reserved with me. For the determination of their stature I made use of a spear, upon which I had made some height markings, and which during the interview I stuck up near them, as if accidentally, and so unobserved took the measurement. In this way I found, on my first encounter with the Batua, their stature to be from 140 to 144 centimeters. The shortest was 140 cm. Later, on a lesser number of Batua, who appeared otherwise truly typical, I found the stature only from 130 to 135cm. I hold the first result to be scientifically the more important, since it was obtained on the greater number (65 out of 98 measurements) and since it agrees better with the estimates established through observation and comparison. If we had been in position to use a greater number of exact measurements, I believe we could assume the stature of the Batua to be no less than that of the Bushmen, whose stature according to Fritsch's measurements is set at 144cm. . . The bodily forms of the Batua were well-developed and entirely made the impression of normal. Pithecoid characters were never present. Prognathism was lacking. Steatopygia I saw occasionally among females; it appears to be no commoner than among black women generally.——The Batua have no well marked cult of the dead. Corpses are buried, as among the Bakuba, always by men.

In both his presentations Wolf gives linguistic data; this material we shall consider later. (See Appendix I.)

Hinde‡ makes repeated reference to the Batua, whom he calls "the little people of the forest." We extract the most significant of his comments:

Average height under 4 ft., they are both sturdy and independent. As a rule nomadic; not in large numbers in a settlement. Hunters, following game in small parties, changing locality with migration of game. . . Traveler may pass within a few yards of them and be utterly unaware of their presence, though *they* meanwhile may be watching him. . . run along a game path with perfect ease, which to an ordinary man would be impassable unless bent nearly double. . . possess an intimate knowledge of poisons and their bows and arrows . . are . . deadly engines in hunting or war. . . a man will die in from three to ten minutes after being scratched. An elephant . . scratched in the haunch by a poisoned spear fell down dead before going a hundred yards; . . a poisoned arrow . . killed a fowl I had scratched with it in about two minutes. . . shooting of three or

‡ Sidney Langford Hinde. *The Fall of the Congo Arabs*, pp. 82-85.

even four arrows so rapidly that the last is discharged before the first reaches its mark. . . able to throw a lance so that it goes in at one side of a man and out at the other. The Arab . . expeditions . . have suffered to such an extent at the hands of these small demons, that few, and sometimes none, have returned to tell the tale of how they died, without even seeing who smote them. So agile in their movements that defence is practically impossible. On seeing the flash of the firing gun (muzzle-loading) they drop, and running in, hidden by the grass, spear their opponent while he is in the act of reloading.

There are two great Bakuba chiefs—the Lukengu and Ndombe. Mr. Verner knew the Batua in Ndombe's country. He speaks of them in his book* and in a later magazine article.† Partly as the result of this article Mr. Verner was invited by the Louisiana Purchase Exposition to return to the Congo Free State and bring a pygmy group to Saint Louis. His group included Batua, Baluba and Bakuba—the two latter of course not claiming to be pygmies. The summary here given is condensed from Mr. Verner's book:

Village of three hundred at Ndombe; under direction of an appointed chief from Ndombe's family; they pay Ndombe daily tribute of fish and game; beehive huts—a framework of bowed sticks with a covering of large leaves tied on; eighty such huts sprinkled over about three acres; no agriculture; trophies of the chase hang from trees above the houses; nets for hunting and fishing spread upon poles under grass sheds; in the huts spears, knives, bows, arrows, harpoons, traps and hunting horns; *small*, yellow dogs; hunters and fishers; with their bows they shoot poisoned darts; bow from strong and tough wood of a crimson color—string of rattan fibre, pliable and strong; the hunter often shorter than his bow; arrow a light straight piece of bamboo, usually the stem of the frond of a palm; these arrows neither tipped nor feathered—simply neatly trimmed sticks, sharpened at top, cleft below, and the tip smeared with dark poison; this is decocted from the roots of a euphorbia by boiling and pressing; a black sticky scum rises to the surface in which the points are dipped.——A man of Ndombe insulted a Batua, who shot him in the thigh: he died in great agony after several hours of delirious coma. The poison was administered to a woman as an ordeal; she died in less than half an hour. A canoeman on the Kasai, attacked by Baschilele sustained a scratch on the forehead: although wound was almost invisible to the eye, he went violently insane, lingered for two weeks and died in terrible convulsions.‡ In the use of these arrows the Batua are ex-

* Samuel Phillips Verner. *Pioneering on the Congo*, pp. 258–280.

† *The African Pygmies*. Atlantic Monthly, August, 1902, pp. 184–195.

‡ It is not easy to bring these three into harmony nor to relate them to Mr. Verner's own case where his wound was sucked without harm to Kassongo—or the fact that the meat of animals killed is eaten, a small piece only being cut out. The difficulty is the second case above.

Batua, Bomashuba. Ndombe.

pert; the flesh around the wound is excised and the rest eaten; elephants, buffalo, antelope, leopard, hyena, jackals and smaller animals are killed, as are guinea-fowl, water fowl and other birds; part of the flesh is given to Ndombe, part is traded for farinaceous foods; everything is eaten from the hippopotamus to white ants; caterpillars are dried in the sun; locusts are esteemed.——In hunting monkeys, a clearing of a half acre is made in the forest; a net ten feet high and forty feet long, of tough and strong plant fibre, is stretched across the clearing; the monkeys are then driven from the surrounding forest. The monkeys in crossing the clearing and striking the net are at a disadvantage and easily killed. Roots, tubers, shoots and fruits are gathered and eaten.——Children and some women are nude; best clad have a yard of palm-fibre cloth, secured from neighbors, around waist; some wore a piece of such cloth, size of a handkerchief, suspended from the waist; some content with leaves and grass.——No looms; no weaving; skin of a large baboon a favorite article of dress; no tattooing; amulets of bones and skins of small animals; no beads, brass wire or copper, but often bright feathers.——No developed governmental system; no polygamy; little prolific; children precocious; soon shift for themselves; men hunt and fish; women gather and trade.——Average height of 50 men, 4 ft. 11⅞; 8 women, 3 ft. 11⅞; light chocolate brown; older men wear a scanty beard; cephalic index of eight adult males, 81; nose small, but more aquiline than in negro; mouth large; chin usually receding; hair almost a brown, kinky and woolly; hands and feet small and well-shaped; endurance phenomenal, fifty mile daily marches; at home in trees; sight and smell acute; cunning, treacherous, slyly dexterous, agile.——*Mudimuki mu mutwa* – Sharp as a pygmy—is a Bantu expression.——In the language are many onomatopes—*humba-humba*, elephant; *luwilya-wilya*, snake.——The sun is a god; the moon a devil; they use no images of material objects.

Bateman speaks of *Batua Bankoko* and *Batua Basinje* as "nomad dwarf tribes probably Stanley's Wanto." He says they are incorrigible thieves, nomads, robbing the plantations of settled peoples; they are excellent warriors, hardy and impudent; the Batua Bankoko prey on the Bakete.*

Stanley several times uses the name Batwa and always connects them with other pygmies. Thus, in speaking of pygmies in general, he says: "These little people have roamed far and wide. Their kinsmen are known as Bushmen in Cape Colony, as Watwa in the basin of the Lulungu, as Akka in Monbuttu, as Balia by the Mabodé, as Wambutti in the Ihuru basin and as Batwa under the shadow of the Lunae Montes."† Again: "We passed through an extremely populous district the next day, and travelled only

* C. S. Latrobe Bateman. The First Ascent of the Kasai, p. 23.

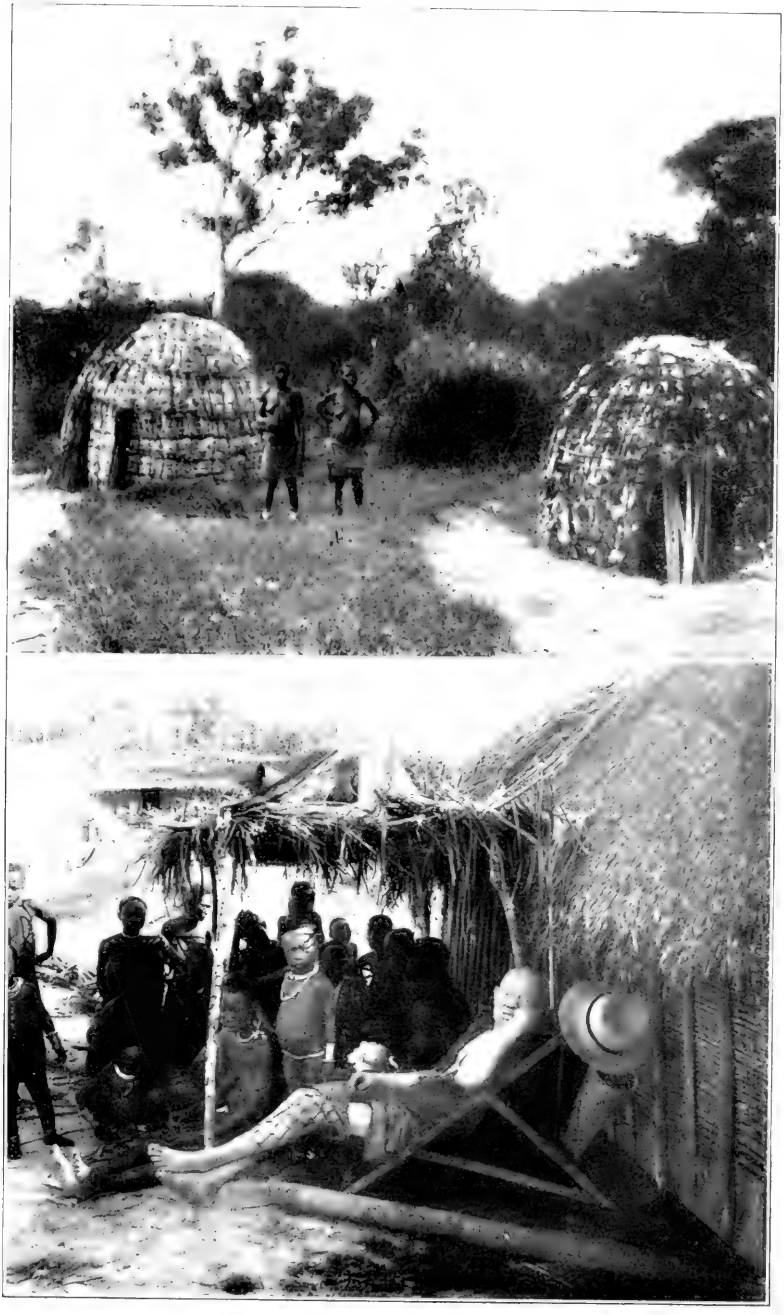
† Henry M. Stanley. *In Darkest Africa*, vol. ii, p. 42.

two and a quarter hours to reach Baki Kundi. Flanking the path were familiar features, such as several camps of pygmies, who were here called Watwa."* Again: "Scattered among the Balessé, between Ipoto and Mt. Pisgah, and inhabiting the land situated between Ngaiyu and Ituri Rivers, a region equal in area to about two-thirds of Scotland, are the Wambutti (Batwa, Akka, Bazungu). They are forest pygmies, nomad, living on game which they are expert in catching. They vary in height from 3 ft. to 4 ft. 6 in." . . Two types (of pygmies) *Batwa;* long-ish head; long, narrow face; reddish, small eyes, set close together, giving a "ferretty look, sour, anxious and querulous." ——"*Wambutti;* round faces; gazelle-like eyes, set far apart; open foreheads, which give one an impression of undisguised frankness; a rich yellow-ivory complexion."†

Such then are the Batua as others paint them. We expected to find them typical pygmies; as a matter of fact, we have been in a confused frame of mind regarding them, from our first contact with them up till now. "What shall we do with the Batua" has been an harassing question. We have seen them at four localities sprinkled over a considerable area. Our headquarters in the Kasai country were about three miles distant from Ndombe's town where Mr. Verner first saw his Batua and whence he brought his Saint Louis group. One of that group, Bomashuba, was in our employ for months and his presence at our place gave us good opportunity to see passing Batua. Ndombe himself is a Mukuba and his central town is typical Bakuba. The Bakuba house is rectangular, of comfortable size, with ridgepole and two-pitch roof; roof and walls are made of separable firmly-woven plates of matting; several houses are usually grouped together and the group is enclosed within a wall of matting screens seven or eight feet high; between these enclosure walls are narrow and irregular streets or passageways. Around Ndombe's own town are clustered other villages, Bakuba, Bakete, Baluba, and Batua, all dependent upon him. The Bakete appear to have been the owners of this region before the Bakuba; they have been crowded and are now tributaries and considered inferior beings; yet they are large, well-built fellows, who seem to be no

* l. c. p. 241.

† l. c., pp. 91-96.



Batua Houses. Ndombe.
Albino at Bumba.

cowards. Their houses are somewhat like those of the Bakuba, but the doorway differs and there are other easily recognized characteristics. The village arrangement is totally unlike the Bakuba; the houses are evenly arranged along both sides (and sometimes at one end) of a wide, straight, street; down the middle of this street, at intervals, are great fetiches and fetich trees. The Baluba are large and finely built, but they are yielding and servile and have long furnished slaves for all the region; their position with Ndombe, however, is better and more independent than that of the Bakete. Baluba houses are distinct, with grass-thatched roof and mud-daubed walls; the houses of a village are irregularly scattered along obscurely indicated ways; there are many fetiches, but these are associated with individual houses and usually not large. Any of these village types can be recognized at once. When more than one population is represented in a village the people continue to build their own house-type, so that a Bakete house may stand next to a Bakuba cluster, or a Baluba house may interrupt a line of the neatly arranged Bakete homes.

In approaching Ndombe from my headquarters, we might pass through or by nine villages upon its outskirts. A statistic regarding these is interesting:

1. *Baluba;* irregular, somewhat circular; 15 houses.
2. *Bakete;* wide, straight street; typical houses; two large fetiches in the middle of the way; 16 Bakete and 1 Batua house.

		HOUSES.
3.	*Batua* villages; with Bakete intermixed; houses arranged in a ring in each village; tangentially contiguous,	9 Bakete, 4 Batua.
4.		8 " 7 "
5.		9 " 2 "

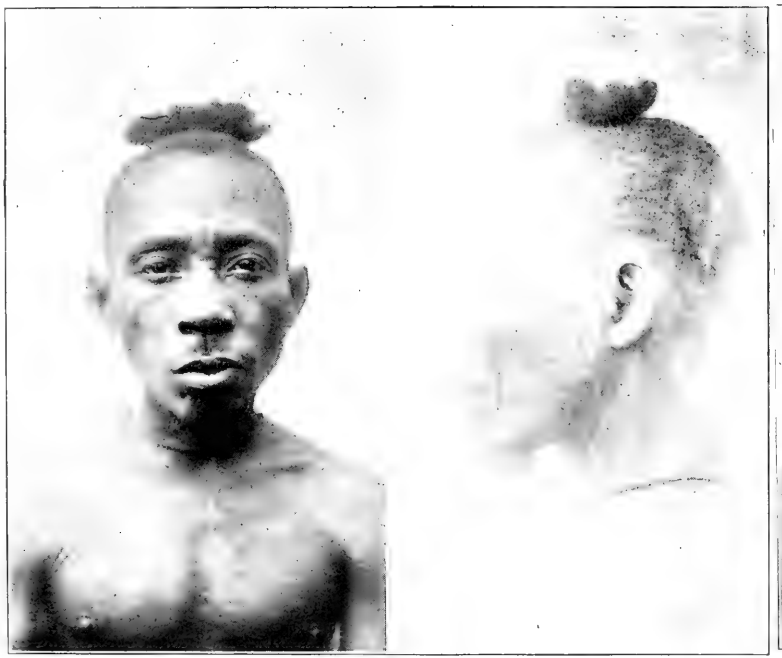
6. *Bakete;* street less clearly defined than usual; 22 houses.
7. *Bakuba;* typical; 8 enclosure groups of houses.
8. *Baluba;* typical; 18 houses.
9. *Baluba;* typical; Chicoma Pinda's town; 35 houses.

This does not pretend to enumerate all the villages bordering and clustering upon Ndombe's town but only those on *our* side of it; there are other Bakuba, Baluba and Bakete towns in other directions; we do not know of other Batua villages. It is seen that Batua occur in but four of these villages and that the total of their characteristic houses is but fourteen. We have called vil-

lages 3, 4, and 5 Batua because they are built in Batua style, a ring of houses around a central open space; in no one of the three however are there as many Batua as Bakete houses. It may be fairly assumed that Batua live in all these houses; probably the twenty-six Bakete houses are occupied by Bakete women, who have married Batua men; as descent is traced through women such houses are built after *their* style; children born in such houses would be Bakete, not Batua.

The true Batua house is hemispherical; there is a framework of slender poles stuck three or four inches into the ground below and bound together above; across these at regular intervals horizontal poles are lashed with *kodjia*, forming an almost regular square mesh-work; upon this is laid a thick sheeting of great leaves (*phrynia*?), which is held down by an external squarish mesh of tied *kodjia* (rattan). We examined one with care. It was 1695 mm. high; the doorway measured 861x358 mm.; at the middle of the floor within was the hearth, with ashes and charcoal; to one side of this was a little bed made of bambu sticks; a small heap of firewood was on the other side; at the rear was a bow stuck upright in the ground, the upper end touching the roof; from the doorframe hung a rattle and a fur-wrapped fetich bundle; against the rear rested a quiver full of arrows; a long and well made net hung from the dome; outside, stuck under the *kodjia* ties were two small animal skulls; two pieces of palm-leaf, leaned against the door, indicated the absence of the owner. (See Plate XI).

It is unnecessary to present the facts of daily life, as the quotations made above sufficiently picture them. But we do present some results of measurements upon Ndombe's Batua. And in this connection a confession is necessary; the material is *selected* —properly it should not be. The Batua are here much mixed with Bakete. Any man, however, is a Mutua whose mother was such, even though he resemble his Mukete father. Hence we saw plenty of Batua who were fine, large, fellows. These we threw out of account, We are convinced that there is a truly Batua face expression. In our work upon little Batua (or Batua of medium size) we excluded all but those whose faces appeared to warrant their name. We know quite well that this is extraordinary procedure.



Batua, Mandimba. Ndombe.

Batua, Mukuleta. Ndombe.

BATUA: NDOMBE'S TOWN.

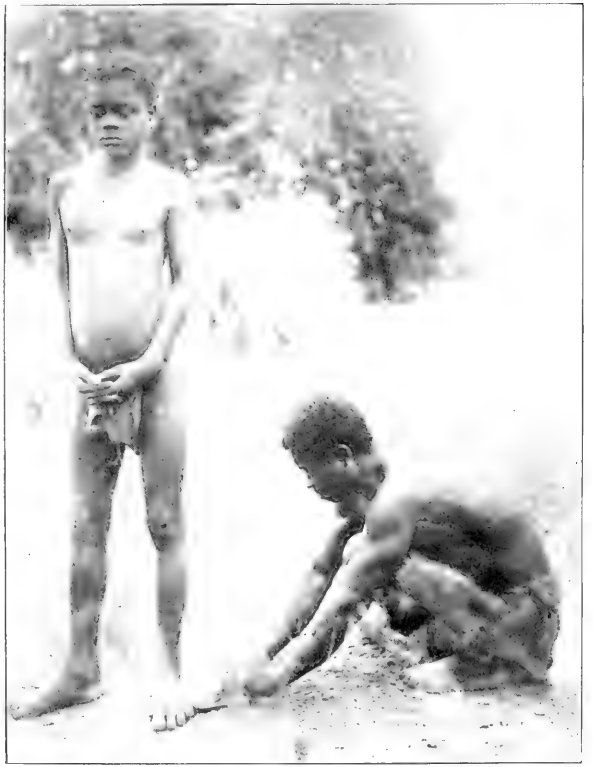
Males.	Stature.	Ceph. Ind.	Nasal Index.	Arm Reach.
Bushabu	1531.	75.	127.0	102.6+
Bomashuba	1475.	74.7+	116.2+	108.5+
Belenge.	1496.	83.6+	110.8+	107.0+
Malenge	1552.	74.8+	123.0+	104.9+
Nima	1536.	72.2+	115.7+	106.0+
Imamwanda.	1481.	79.2+	105.	104.4+
Yaiitula.	1516.	75.5+	100.	103.7+
Mukuleta	1550.	78.0+	105.0+	107.0+
Chinoa	1519.	75.7+	123.5+	101.8+
Bandungu.	1517.	68.4+	113.1+	103.5+
Shamba.	1541.	70.1+	125.6+	101.9+
Mandimba.	1427.	78.3+	———	101.7+
Diende	1513.	75.	114.2+	104.6+
Mambulu	1555.	76.6+	102.4+	106.3+
Bambui	1467.	78.8+	125.	100.
	1511+	75.7	114.75	104.2+
	=4 ft. 11.8 in.			
Females.				
Miningu	1481.	77.3+	102.8+	104.3+
Njolo.	1499.	75.9+	105.1+	101.9+
Bozu	1517.	75.5+	115.	101.5
	1499.	76.2+	107.6	102.5+

And, even with such selection, our result is disappointing. French anthropologists have agreed to call those populations *pygmy*, where the average stature of adult males does not exceed 1500 mm. Sir William Flower, in England, set the limit at 5 ft., considering this the equivalent. They are not exact equivalents, the English being a trifle larger. Our Batua lie just between the two things assumed equal. Rigidly a Frenchman must exclude these Batua from the list of pygmies; an Englishman would admit them.

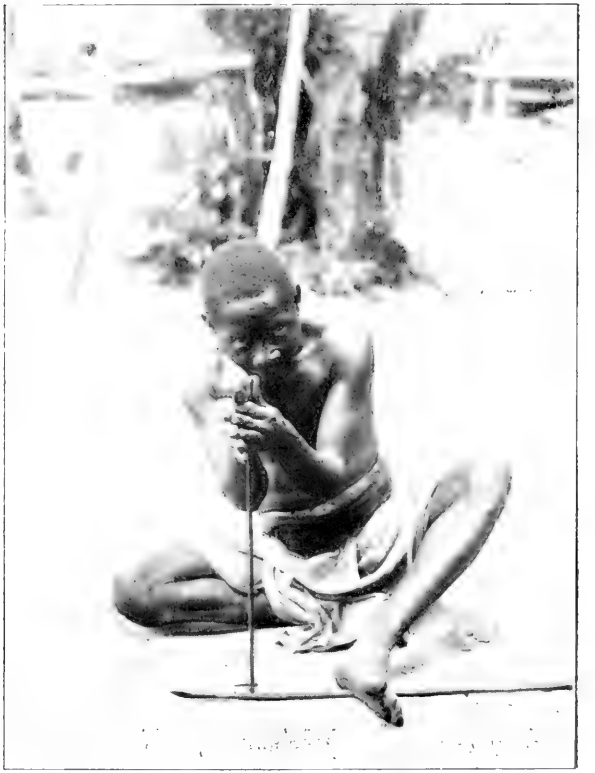
We next met Batua around Lake Mantumba, where they are called Bachua. A good many live in connection with the villages of larger people along the banks of a stream that enters the lake near Ikoko. We were at several of these towns and at one, Nkake, visited the Batua houses. They are situated at one border of the town; the houses are like those of the big people, long,

rectangular, shed-like structures, but not so high and less carefully constructed. The Batua we saw here were little, but well built. We measured two of them, both below the 1500 mm. limit; they are the two rubbing fire in our picture and are the first in the following table. These little people regularly make fire by friction of wood. The implements are a section of branch about an inch in diameter, six or eight inches long, split lengthwise, and a stick of the same wood, about the same length, bluntly pointed at the ends; both are somewhat charred and black with smoke. The section is laid upon the ground so as to slope slightly; a man with a leaf folded to protect his foot stands upon the lower end of this stick to hold it firmly; a second man kneeling, holds the rubbing stick with both hands, sets the point in a longitudinal groove freshly cut in the lower piece of wood, applies considerable pressure and rubs briskly to and fro, rapidly deepening and wearing the groove; smoke appears almost immediately and a spark soon glows in the fine dust, that is rubbed out. Ndombe's Batua also make fire by friction, but by the more common method of whirling an upright stick between the palms, the lower bluntly pointed end resting with pressure in a notch cut in a lower stick laid on the ground. From thirty seconds to a minute is ample time for the production of fire. In both regions the larger neighbors of the Batua look with contempt upon the making of fire by friction, as suited only to the despised Batua.

On Lake Mantumba, at Bikoro, we saw and measured "Bachua" from the country behind the station. From a point a little north of the station they are found, scattered in the usual fashion, to a distance of fifty miles southward. Few at any one point, they occur at many places. As everywhere, they live at the border of towns of larger people. They are said to have no special language of their own; they have no agriculture; they exchange the products of the chase for what they need from their neighbors; they are shy, timid, and distrustful; they build no permanent houses but erect temporary shelters, consisting of two upright stakes, a cross-piece and three or four palms, cut and leaning against this, the leaves being split and more or less plaited together; they do not care for cloth, except just enough to cover their private parts: they emit a strong odor; they have deeply cut and well marked temple-scarring (of the matting or plaiting



Bachua making fire by friction---rubbing. Nkake.



Batua making fire by friction---whirling. Ndombe.

Bachua Chief Boulia. Seen at Bikoro.

Bachua Woman Boloke. Seen at Bikoro.

pattern); their teeth are badly chipped to blunt points. Some of the above facts we secured by direct observation; for the rest we are indebted to Lieutenant Braeckmann, then in charge at Bikoro. We measured ten of these Batua and the results are given below. We also measured one woman, who gave more trouble than the ten male subjects.

BACHUA; LAKE MANTUMBA. NEKAKE AND BIKORO.

Names.	Est. Age.	Stature.	Ceph. In.	Nasal In.	Arm Reach.	
Mimbi.	25	1495	79.6+	105.1+	102.8+	
Mboyo.	20	1421	78.6+	102.9+	97.1+	
Bakalanga. . . .	25	1655	81.8+	112.5	105.7+	
Iloko.	22	1477	77.6+	102.6	104.2+	
Mavanya.	22	1595	75.2	110.	104.0+	
Kana.	23	1530	74.5+	125.7+	102.9+	
Mokete.	23	1653	76.4+	100.	104.8+	
Iparina.	40	1537	76.6+	123.6+	107.6+	
Bukua.	24	1571	79.3+	117.9+	97.0+	
Boulia.	35	1426	76.9+	104,8+	102.1+	Chief.
Mongo.	30	1599	75.2+	107.5+	99.	
Boulia.	22	1548	75.6+	122.2+	100.6+	
		1542+	77.2+	111.2+	102.3+	
Female.						
Moto.	21	1422	73.6+	134.3+	106.4+	Nkake.
Boloke.	22	1452	78.0+	108.5+	108.1+	Bikoro.
		1437	75.8	121.4	107.2+	

Our last personal contact with Batua (here also called Bachua) was at Bolengi, just below Coquilhatville. Here they live in similar relations to their neighbors (this time Nkundu) as elsewhere. Dr. Dye states that they are little and occur at many of the inland towns; they are known by the name of the town near which they live—"a Muchua of ——," "Bachua of ——;" they do not live in these towns but on the borders; their houses are like those of their big neighbors; they are hunters, practicing little or no agriculture; they are despised and marriage between them and Nkundu does not occur; they are timid and suspicious; there are Bachua at villages no more than one day's journey back from the mission. We saw two while at the mission, one, a male, mature

and with some growth of beard; the other female, young, but had menstruated for some months; both were little but we failed to measure them.

We believe the Batua should actually be classed with the true pygmies of the Ituri forest. They are larger than we would like but in type, face expression, character and mode of life, they are the same. The constancy of hunting, absence of agriculture, parasitic relation to large neighbors, shyness and distrust, despised condition, use of the bow and poisoned arrows, adherence to making fire by friction, all point one way. Today scattered and occurring here and there over a large area, they everywhere appear to have been the original occupants of the country.

COMPARISON BETWEEN A PYGMY, A DWARF AND A BALUBA BOY.

There has been much unwillingness at times to admit the existence of true pygmy tribes. Not unfrequently writers assert that the pygmies are in reality poorly developed individuals in a race of normal and average build, or that a whole section of a race has deteriorated under disadvantageous circumstances; that they are either actual dwarfs or badly-nourished degenerates. We shall consider the first of these suggestions, that pygmies are dwarfed individuals of a normal population.

Dwarfs occur in African populations, as elsewhere. At Lisala we examined an excellent case; he presents the characteristics of one type of dwarfs so well that it has seemed worth while to make a somewhat careful comparison between him, a pygmy, and a normal representative of the larger peoples.

The dwarf, Famba, lives at Lisala, where he is a *capita* or boss in charge of men who care for the fuel supply of the steamers. He is a Bakusu, from farther up the river; he seems to be about twenty-six years old. His face naturally produces a full growth of beard, but this is kept shaved or pulled. His features call for no special comment; his head is large; his chest broad and developed; his breasts, as in many male Africans, are notably prominent and developed; his arms are short; his hands and feet are stout and fingers and toes are stubby; his legs are much too short and are notably knock-kneed. His axillary and pubic hair are abundant; his sex organs are at least as large as those of an ordi-

Aiale, Ituri Pygmy. Seen at Nouvelle Anvers.

narily-sized man of his race. I took my usual lists of measurements upon him and some additional. He is active, industrious and good-natured.

The pygmy, *Aiale*, is a Tiki-tiki from the Mombuttu country. He was chief of a little tribe and being troublesome had been brought prisoner to Nouvelle Anvers (Bangala) where we examined him. He appears to be about thirty years of age; his natural beard growth, almost confined to chin and upper lip, is fairly full; he is notably pot-bellied, a character common in pygmy populations; his physique is good; his breasts are notably developed; his arms are long, his hands well shaped; his body is covered with short hair or bristly down; pubic and axillary hair are abundant; his sex-organs are proportional to the size of his body, or smaller. His face and features are fully shown in the accompanying portrait and I consider them and his expression quite typically pygmy. At least when a prisoner, he shows himself gentle and tractable. He speaks in a low, soft, voice and with apparent effort.

The Baluba boy, Tumba, was my photographer's personal servant. He is a well-grown boy of sixteen or seventeen years; he has no beard but his body hair and physical development are all that his age demands; he is well-built and well-proportioned, though spare; his head perhaps is a little small; in my opinion he is normal and a fair type of his people. Aiale was measured and photographed before we saw Famba and with no idea of making such a comparison as we are here making; Tumba was measured for the purpose. Some measurements are lacking, therefore, in Aiale's record.

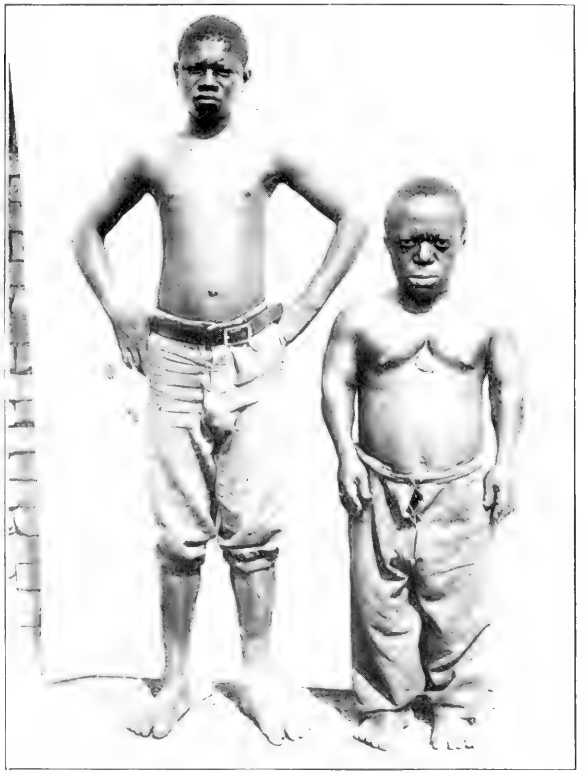
	Tumba.	Aiale.	Famba.
Height standing	1597	1386	1214
to shoulder	1308	1167	946
to second finger-tip	588	522	469
to elbow	1016	903	765
to navel	986	797	600
Fingerreach	1669	1517	1006
Height sitting	819	742	759
Shoulder-width	332	323	336
Head length	188	175	199
breadth	145	133	167

	Tumba.	Aiale.	Famba.
Face height	165.102	155.91	206.121
breadth	134	134	144
Nose height	40	42	46
breadth	43	45	44
Ear length	58	58	58
Height to chin	1384	—	981
Head circumference a	551	—	586
" " b	537	—	595
Palmar length	196	—	137
breadth	84	—	74
Plantar length	255	—	181
breadth	95	—	89

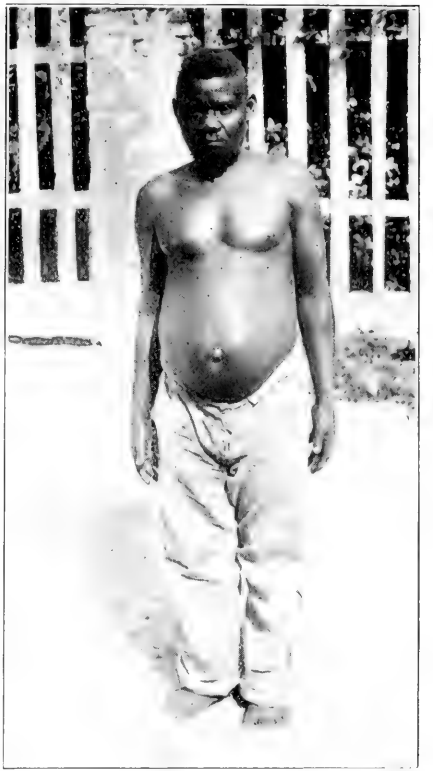
Even direct inspection of these measurements is interesting. Famba has actually the largest head of the three, both in its antero-posterior and its transverse circumferences, though the least in stature; his short arms are plainly shown in the small fingerreach of 1006, far below his stature; his face is enormous in all ways and his forehead height is great as shown by the difference between the two face heights; curiously all three have the same length of ear. But we get the most interesting suggestions from indices and proportions. Some of these follow:

	Tumba.	Aiale.	Famba.	
Arm index	45	46.5	39.2	Percentage of stature.
Fingerreach index	104.5	109.4	82.8	" "
Height sitting	57.5	53.5	62.5	" "
Shoulder-width	20.7	23.3	27.6	" "
Upper arm	18.2	19.0	14.9	" "
Navel height	61.7	57.5	57.5	" "
Head height	13.3	—	19.1	" "
Palmar index	42.8	—	54.0	Breadth to length.
Plantar index	37.2	—	49.0	" "

Several points are at once established by an inspection of these proportions. In Famba we have a typical dwarfing due to malnutrition, rickety conditions, etc.,—in other words what Brinton and others claim we have in the pygmies. Tumba, though young, is typical; his chest development and shoulder-width will no doubt become greater with age. Aiale, although his profile view



Tumba. Famba.



Aiale.

suggests somewhat of disease, is assumed to be a fair example of Ituri forest pygmies. Famba's arm is extraordinarily short (index 39.2); Tumba's is intermediate (45.) and Aiale's is long (46.5). These same facts come out strongly in the fingerreach; Famba's falls far below his stature (82.8); Tumba's is about normal for Bantu (104.5), and Aiale's is interestingly great (109.4), larger than Tumba's and than the average of the Batua given in our table on page 103. In sitting-height and shoulder-width indices Famba is far up because his upper body has the actual development due to his age and race, his dwarfing being a question of his limbs, at its extreme in his legs. Surprise is felt at Aiale's so much outdoing Tumba in the matter of shoulder-width; we have already suggested that the boy has still some development in this direction; probably, however, the little man will always maintain superiority in this respect. The head height index is particularly interesting; unfortunately we are unable to exactly fix it for our pygmy; Tumba's head is less than one-seventh of his stature; Famba's is nearly one-fifth. Comparing the length and breadth of the hand and the length and breadth of the foot, we see how ill-proportioned and clumsy Famba's hands and feet are, typical in dwarfs of his type. While we cannot give the proportions for Aiale, it is matter of common observation that pygmy peoples regularly have graceful and well proportioned hands and feet and an examination of the portrait of Aiale standing will show that he is no exception and will bring out the contrast between him and Famba.

From our comparison we fail to draw support for the idea that the pygmy is a case of dwarfing. Famba, though active and not lacking in intelligence, is a diseased dwarf; his head is frightfully out of proportion to his stature; his body is fairly normal in chest, sitting height, shoulder-breadth and sex organs; but his arms are far too short and the bad proportioning affects both upper and lower arm; his legs are short, badly formed, knock-kneed; his hands are short, broad and thick, with short and swollen fingers; his feet present similar conditions; Famba is clearly abnormal. On the other hand, Aiale presents a type of race; his head is a little large; his face, features and expression are characteristic; his body is well built altho his breasts are notably developed and he is pot-bellied; his sex organs are nor-

mal in size and development; his body is covered with short hair or bristly down; his armreach is interestingly and suggestively long; his arms and legs are well shaped and terminate in small and well shaped hands and feet; he is clearly normal.

ALBINISM.

Most travelers in Africa have met cases of albinism. Congenital absence of pigment is not uncommon among the true negroes and is often accompanied by peculiar beliefs and superstitious practices. Both Colonel Ellis and Miss Kingsley give some details.

From some cause, perhaps from centuries of intermarriage, an unusual number of albino children are born at Moree. Sometimes as many as two or three albino infants may be seen there at one time, a number out of all proportion to the usual production of such children; and at the present time, 1886, there are said to be eight albinos in Moree, which is in a proportion of about one per cent of the inhabitants. . . Albinos are, at Moree, sacred to *Aynfwa*, and, on arriving at puberty, become her priests and priestesses. They are regarded by the people as the mouthpiece of the goddess; their directions are implicitly obeyed, and in former days an albino had only to indicate a man or woman as one whose death *Aynfwa* desired and immediate immolation of the victim ensued. The enforcement of English law, under which such sacrifices are regarded as murders, has now put an end to this practice.

Among the Bantu populations of the Congo Free State, albinism is frequent. Casati reports it among the Zandeh and Emin Pasha mentions it among the Mombuttu. Tuckey encountered it in the Lower Congo region. He says:

Among the people of the neighboring towns who came down to Inga to see the white men who were stationed there, a Mafook brought with him his daughter, a girl of about twelve years of age, whose skin was perfectly white, but of a pale sickly color, though the father said she was quite stout and healthy; she had curly hair and negro features.—(Tuckey. Narrative of an Expedition, p. 383.)

Bentley describes cases at Lemvo, where there were two girls affected by it.

An albino African has a skin like an Englishman, with a tendency to pink; frizzly hair is white or slightly yellow; the eyes are pink and intolerant of light. They often suffer from some skin disease. The African features, hair, and dress seem strangely out of place with the white skin. It is rather a shock to come upon one suddenly.—(Pioneering on the Congo, i., p. 200.)

Albino Boy. Ikoko.

Of Bakuba albinos Wolf says:

> Albinic individuals, our Kakerlaken, occurred here rather commonly. The eyes of these *toka-toka* ("pallid") as they are called in scorn by the Baluba, always show more or less marked sensitiveness to light and consequent day-blindness. The color of their skin and woolly hair was a dirty blond. In their light nakedness they made a disagreeable impression . . . (Wissmann. *Im Innern Afrikas*, p. 251.)

It would be easy to cite many other incidental references.

We met with cases at various points along the river. Of four, we were able to make a fair examination.

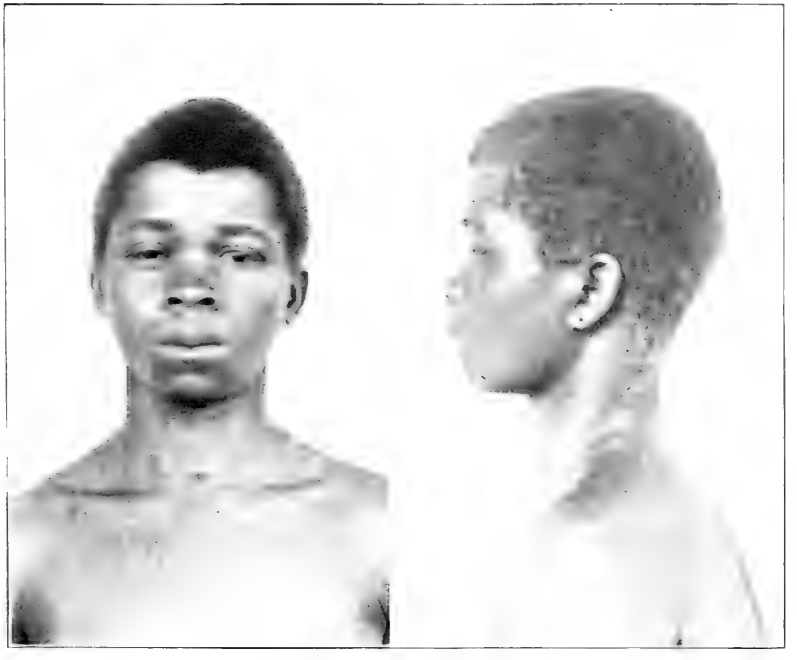
1) At Bumba we saw an adult male. He was a rather disagreeable object, with whitish skin, blotched with red and purple, and apparently easily subject to burning, irritation, and sores. His hair was pale yellow, his eyes a dull, pale, blue. He appeared distinctly out of place and gave one the uncomfortable feeling that he was a west European, who had stranded. The contrast between him and the black women and children of his household is well shown in the picture (Plate II), although he is in shadow while some of them are more or less in the sunlight. In daylight he squints, and his lips are usually parted.

2) At Ikoko lived a boy named Samuel, about four years of age. His skin is white with a distinct tinge of yellow; his hair is flaxen, with an ash tint; his eyes are rather light brown. There is a perceptible whitish down on his cheeks and whitish hair on his legs and arms. His eyes inflame readily and when we examined him the left eye was badly bloodshot. His eyelashes and eyebrow hairs are a delicate yellow—almost white. The mucous membrane of his lips is pink flesh-colored. The skin is apparently sensitive to sun-burning, as he always goes clad, although so young. The eyes have the characteristic albinic swimming movement and squint somewhat. The lips are usually somewhat parted. At the base of both the little fingers are wart-like protuberances, plainly hexdactylic. Both of the parents of the child were black; the mother is now dead. She had an older child, who is normal. The boy is quiet, plays little with other children, but is fairly intelligent. He associates much with the white people at the neighboring mission, as if he felt that he belonged to them. He is well-treated at home and is quite a favorite with his step-mother. His mother was related to two

albino women, Lusakani, living at Wangi, of whom we heard. She was perhaps their sister.

3) At a woodpost below Mobeka, we saw a young man of eighteen or twenty years named Manboni, from Bombinda. He was a well developed and strongly built fellow. The skin of his body and face was of a rosy-white, but on the chest and upper arms it was abundantly sprinkled with quite regularly round spots of a yellowish-brown. There was a considerable growth of rather stiff grayish-white hair, at least upon the chest. The head-hair was of a yellowish-white, close and abundant, forming an even cushion over the head of about an inch and a half in thickness. The eyes were blue; they constantly moved sidewise, back and forth. They are good; he says he "sees as well as any one." Still it was dusk when we made our examination, the time when albinic eyes are at their best. His parents were both black. The mother has had two other albino children—a second son of nearly the same age and a daughter of perhaps twelve years. The three are the only cases in their village. This young man is quick and intelligent. He readily submitted to examination and answered all questions satisfactorily. When I asked for a sample of his hair, his only stipulation was that he should have an equivalent tuft of mine.

4) Ndundu, Bakongo male of fifteen years, was at the Swedish Missionary Society's station, just below Matadi. The skin of his face and upper chest is of a peculiar shiny yellow-brown or white; that of his arms is lighter and not shiny. The arms are rather abundantly grown with somewhat bristly, whitish, hair; the down upon his upper lip is rather heavy and it and the other face-hair is almost white. The head-hair is a light yellow-brown, abundant and woolly; the eyelashes are lighter and the eyebrows are intermediate. Ndundu is slightly myopic and his eyes have some strabismus. He shows a little difficulty in reading. His eyes swim from side to side and this movement is notably synchronous in the two. The iris is light brown, but the pupil is nearly black. The lips and the caruncles are pale rose color. The hands are usually noticeably cool to the touch. The boy has made good school standing and is obedient and well-behaved. His record for order, neatness, and satisfactory work was the highest in a class of fifty scholars. He works in the printing



Albino Boy. Lower Congo

shop of the mission and gives good satisfaction, although a little slow. His village is Ntamba, near the mission station of Nganda, in the lower Congo. His parents are both black. There was a second child, a girl now dead; she was normal. This boy's name, Ndundu, is given him on account of his albinism. Unfortunately, in the photograph the hair appears dark; it is strikingly light.

From these four cases, actually examined, some conclusions may be reasonably drawn. The albinos of the Bantu populations of the Congo Free State have a whitish skin, with a distinct yellowish tint. It is easily sun-burned and irritated and shows a marked tendency to blotching and spotting. The chest and arms, and probably the whole body, is commonly supplied with a rather stiff, whitish hair. The face, even in the young, has a whitish down, likely to be particularly heavy on the upper lip. The head-hair, while tending to white, has usually a yellowish-brown color, and is thick and abundant. The eyes are blue or brown, pale and faded. They are myopic, have the usual albinic floating or swimming movement and notably squint. This squinting is usually accompanied by habitual separation of the lips. As elsewhere, albinism is here often accompanied by other physical peculiarities. Thus, one subject is (imperfectly) hexdactylic, another has strabismus.

Including these four subjects, we may geographically locate all the subjects of whom we heard, as follows. Ndundu says another albino boy lives in the immediate neighborhood of his town, that a girl albino lives at Lukufi, close by, and that the chief of Mbanza Manteke is an albino. Thus, we know four cases in the Lower Congo region. Two albino women live at Wangi, a Lusakani town an hour behind Irebu. They are related to Samuel who lives at Ikoko. A male albino is said to live at the mission at Lulanga. At Bombinda is the home of Mantoni and the two other albinos of his family. Between here and Bumba, we saw at least three albinos in villages as we passed, one being a baby. Our unattractive case at Bumba completes the list.

	Males.	Females.	Uncertain.
Lower Congo.	3	1	
Irebu (Wangi), Ikoko . .	1	2	
Lulanga.	1	0	
Bombinda	2	1	
Villages.	1	1	1
Bumba.	1	0	
	9	5	1

These fifteen subjects were met or reported, with no special search on our part. The actual number that might be found by careful inquiry must be large. It appears as if males were more commonly albinic than females, in this area. The number of cases is too small for the suggestion to carry much weight. Two other points may be mentioned. 1) That repeated cases are likely to occur in one family is clearly shown in the Bombinda example. 2) Heredity and atavism are shown in the Wangi-Ikoko cases. If the Wangi women are Samuel's aunts, as we are told, a grandparent of his and a parent of theirs was almost certainly an albino.

We do not know to what degree superstitious ideas are connected with albinos in the Congo Free State. Both Mantoni and Ndundu insisted that albinos are not unwelcomed at their advent, that they are not badly treated, and that they are liked. My servant Manoeli, Baluba from the neighborhood of Luluaburg, was greatly delighted whenever we secured a sample of albino hair. On meeting the first *toka-toka* we saw, he told me that the Baluba will often pay a piece of cloth (one or two month's wages) for a tuft of hair from such an one, to be carried for luck.

Not much perhaps is to be learned from the native words for albino. Ndundu says the common Kongo word for it is *ndundu*, meaning "fair;" he says they are also called *lema*, meaning "shining." In Bobangi *elumbu* (*eumbu*, *ewumbu*) is defined "albino, white dog; white men were at first denoted by this term." [Whitehead]. In Baluba: "Albino. *Sčka-muabi* (pl. *sčka-miabi*); *citoka-toka* (pl. *bitoka-toka*)". [Morrison]. My servant Manoeli always said *toka-toka* and that is the form Wolf uses in the passage quoted above. *Sčka* means "to laugh or laugh at, be amused at, deride, make sport or fun of, scoff at, taunt" [Morrison]. *Muabi* means "good luck, fortune." [Morrison]. The compound is

rather interesting. Toka means "to be or become white, be light in color, or light from moon or fire, shine, give light, be pure, be spotless, be unspotted." [Morrison]. The reduplication is probably emphatic.

TOOTH CHIPPING.

Knocking out, pointing, and otherwise modifying the teeth is common among Congo peoples. It is not the rule among the Bakongo of the lower Congo River although there are towns and regions even there where it occurs. In the higher Congo it is found among most tribes and in some is practiced upon practically every man. While occasionally done to women, it is actually a custom of males, not females. It is generally considered a "tribal mark" but it seemed to us to be often a family custom, or even an individual caprice. Probably the *Basongo meno* (a loose term applied apparently to various tribes along the Kasai River) all have their teeth pointed, and the name indicates the fact; Babuma, Bateke, Bafunagani, Bobangi, Irebu and Lusakani, apparently closely related tribes, are quite characterized by the hook-shaped chipping of No. 55; most Bangala have the simple, heavy, pointing of number 45; at Wathen, we saw a boy with the chipping shown in No. 51 and the other boys were unanimous in saying that it was because he came from a certain town which they named; the evulsion of the two middle, upper, incisors, shown in No. 3 is so truly the rule and the operation is performed so early, that in a group of eight Wathen school boys, one day at our house, only two had not had them pulled or broken out. So common is the practice, that even in art it is represented; in a wooden fetich figure shown us at Wathen, the parted lips showed two bits of inlaid white material representing the outer incisors of the upper jaw, while a gap between indicated where the customary evulsion had taken place. While all this is true, the moment one begins to make notes he finds difficulty and meets with great confusion. The custom loses ground and many of the younger people retain their teeth in their natural condition; where it maintains its hold it seems to have lost much of its significance and the pattern almost appears to be a matter of personal fancy; where the practice is vital, several types may occur in a single village or even in one family. Part of this last condition

may be due to slavery and the custom of maternal descent. Thus in a village of the Turumu, back from Yakusu, in the upper Congo region, we found a chief whose middle upper incisors were chipped to pegs and the two outer ones to points, No. 96—a rare combination, while his son had the four upper incisors pointed, after a common fashion. This difference may be due to individual caprice and indicate the unimportance of the custom—or it *may* be due to strict observance of it, the boy following his mother's blood and not belonging to his father's tribe. We confess our inability to deal with many problems presented by this much neglected subject.

Various reasons for these mutilations are given by the natives. Among Congo peoples there seems fair agreement that the breaking out of teeth is a test of bravery, showing a man's disregard of pain. This may be true among Baluba, where it is done rather late—at puberty or in young manhood; it can hardly be equally true among Bakongo where it is done quite early. I should say that I have seen boys, who had but recently cut their permanent incisors, upon whom this removal had been practiced. Among up-river tribes the modification is considered to add to personal charms. Among Lokele boys at Yakusu, many from fourteen to eighteen years of age have not yet had their teeth chipped; the modification, there consisting of a delicate sharp pointing, takes place about that time. The operation is performed by a special practitioner who receives a *shoko* (the standard of iron money there used) for his services. The Lokele say it is done "when they go a-courting," a statement which agrees with what the Ntumba at Ikoko told us, that "no girl would marry them unless their teeth were made beautiful." In the Bobangi story of *The Two Brothers* the boys traveled a considerable distance to have the work done by a skilled artist; the quality and beauty of the result were cause for praise and applause from the people of the villages through which they passed. Though constantly called "filing" in books, the operation is really usually chipping. Among Bangala (and presumably among others) the chipping is done with implements answering to a small hammer and chisel; the operator's finger is firmly held behind the tooth which is being chipped, as a support; the fee is small, only three to five

metaku (brass rods) but if the subject, in his pain bites and hurts the operator's finger, he is fined a considerably larger sum.

The practice is of course imbedded in language. In Bentley's Bakongo dictionary we find the words: "*sonsa*, to cut or file teeth;" "*ekombe*, cut teeth, after the fashionable manner when the two top front teeth are shortened to half their natural length; the space left whence a tooth has been extracted;" "*meno mampaya* or *masonswa* or *masongolwa*, the two top front teeth cut diagonally from the centre." Weeks gives the Bangala words: *munsanga*, mode of cutting teeth to points;" "*tula nsanga*, to cut the teeth to a point; *mwange*, mode of filing teeth; leaving the outer side of the upper incisors sharp points while the inner sides are cut away."

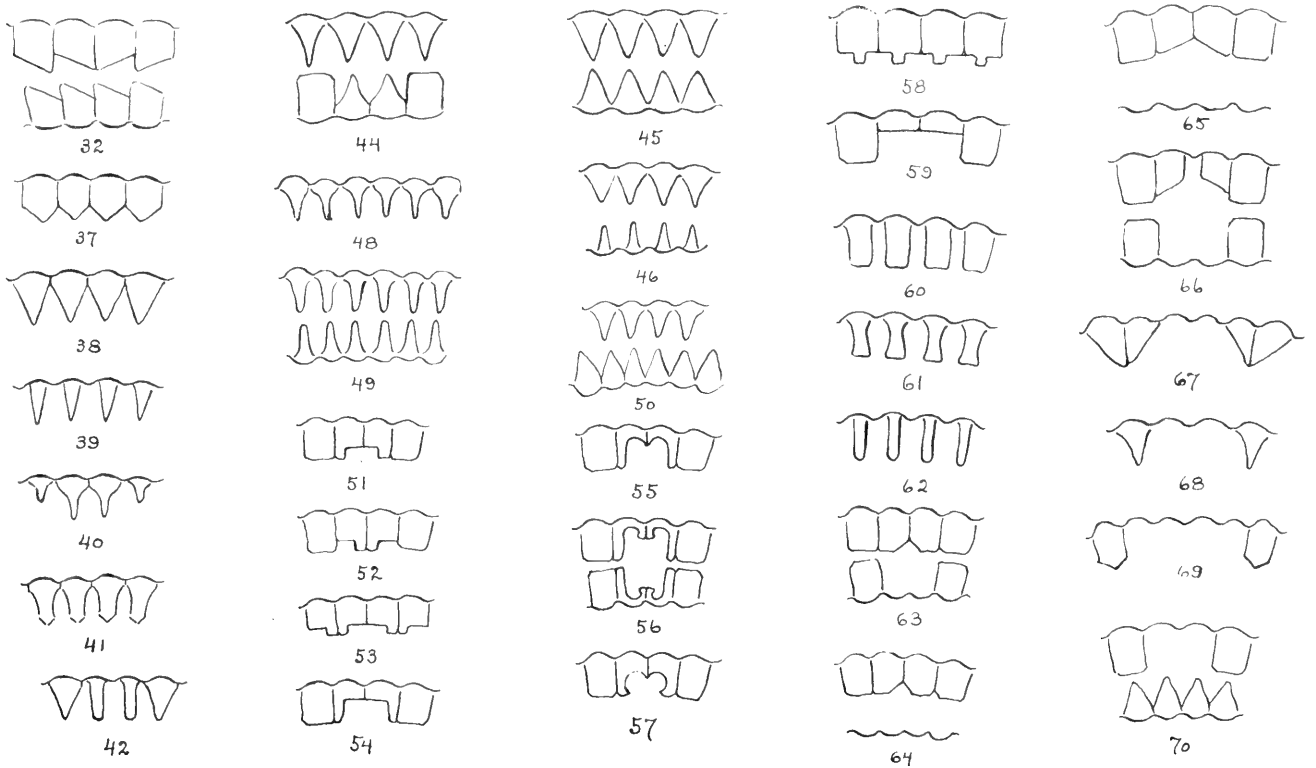
We examined the teeth of almost nine hundred soldiers from all parts of the Congo Free State, making notes and drawings of the different types of modification; we also made observations and notes upon the tribes we visited. Our drawings have been redrawn by Mrs. Bertha E. Jacques and are here presented in three pages of engravings. The material is difficult to organize and classify. We begin with the simple evulsion of any one incisor in upper, in lower, or of one in each of both jaws (1. 2. 8.); then of two incisors in upper, in lower, or in each of both jaws (3.6.9.); then of four incisors in upper, in lower, or in each of both jaws (4.7.10); other forms of evulsion are shown in 5.11.12. Chipping of the corners of middle incisors, the chipping extending to different height and varying in obliquity follow, together with analogous results apparently produced by wedging apart rather than breaking (13–17); various types and combinations of corner chipping follow, which on the one hand pass into rounded cuttings and on the other into diagonal chipping removing half the tooth (18–34); notchings of the middle of the cutting edge, though simple, are not common (35); then come types of actual pointing, produced by slope cutting or chipping from both sides, which may be stout, sharply marked, or slender, and may affect one or both jaws (36–50); teeth cut away on one side so as to leave a peg or point on the other side pass into such as are so excavated as to leave only a slender hook with point down (51–57); they may be cut away from both sides leaving a middle peg (58) or cut squarely across so as to reduce their height (59); they may be evenly re-

duced at both sides leaving parallel-sided pegs projecting from the gums (60–62); all these may be considered simple elementary forms. These elements may be variously combined into all sorts of strange combinations (63–102).

It remains to geographically locate these extraordinary tooth modifications so far as possible. This part of our task must needs be confused and unsatisfactory. Numbers 1.2.8., evulsion of one tooth in a jaw, occurs among many people; it was seen up the Kasai and in the Lower Congo. No doubt it is often a temporary condition, other teeth being removed later. Among other peoples presenting it are Batetela, Baluba, Basongo.——3.6.9., removal of two incisors in a jaw, was observed in too many tribes to warrant presenting a full list; we name Abarambo, Lusakani, Irebu, Baluba, Batetela, Basongo, Ngombe, Ngiri; it is common in some Bakongo towns.——4.7.10., the removal of the four upper incisors, the four lower, or all eight is less common but occurs in the same tribes; among our nine hundred soldiers, but one—Bangala—had all incisors out; two Baluba and a man from the Uele had four upper incisors removed; one Babemba had all the lower incisors out.——5, one Batetela had all upper incisors and canines removed.——11.12. was observed but once but the location is lost.——16 and 17 are common and found over a wide area; they differ in the slope of chipping and the height to which it is carried; of its many localities, some only are named; it is occasional among Kasai peoples, as the Baluba; it occurs at Katanga; it is common upon the Ubangi and among Azandeh, Mombuttu, Ababua, and Abarambo. These actual chippings are not always readily distinguishable from the wedgings which occur among the same peoples (13–15).——18 is a modification which is not common; we saw it from the district of the Equator.——19 and 20 came from near Stanleyville—21, from Basoko and the Itimbiri River.——22 and 23, Batetela, Walemba, Bakusu, and Abarambo.——24, where the mid-notches have been rounded, came from the Zappo Zap and their neighbors.——25 and 26, affecting only the upper jaw, are Baluba and Bakete and also from the Uele district and Province Oriental.——In 27, the slope cuts at a low angle from the outer to the inner side; 28 differs only in the slight curvature of the chipped line; they occur among Zappo Zap and in Katanga, Province Oriental and upon the Ubangi.——

1 2 8
4-7-10.
5
16
17
3-6-9
11
12
13 (14-15)
18
19
20
21
22
23
25
26
27
28
29
30
24
31
33
34
35
36
43
47

29, 30, modifications of the same idea, from the same localities. ——31 is Azandeh.——32, a strange and little pleasing form, is from Province Oriental.——33 and the upper part of 34 show the chipping away of parts of adjacent teeth so that what is left of them unite to form a point; the type appears to be most frequent from the Ubangi and Uele, though one claimed to come from Basoko.——Mid-notching of the cutting edge of an incisor was met but a few times and all noted were from one town, Baluba, belonging to the chief Chicoma Pinda; 35 was here observed, also a type not represented; the two outer, upper, incisors were thus treated, the two inner, upper, incisors were broken away, and the four lower incisors were pointed like 37, making a truly remarkable combination.——With 36, we come to pointing, which occurs widely and with some variation; Babuma, Moie, Ileku, Baluba, Azandeh are tribes presenting it.——37 differs in that the chipping does not reach the gums; it occurs among Baluba, Babwende, Azandeh and some Manyema peoples.——In 38, the four incisors are chipped quite or almost to the gums but the pointed teeth are stout; this is common and often marks whole populations; Basoko, Bumba, Stanley Falls and Ponthierville are centres around which it is common; Bangala, Lokele, Bakumu, Azandeh are among the tribes which practice it. Among Abarambo, Mongo, Basakusu and some tribes of Province Oriental, of the Bussira, etc., the teeth are more slenderly chipped, until among the Bakundu of Lac Leopold ii region and some Aruwimi tribes, they are mere slender, sharp, spikes spaced from each other on the gum as in 39.——40 is reported among Mongo and from near Equatorville and the Mongala River.——41 and 42 are from Azandeh and from Basoko, Province Oriental, and the Bussira; a good many Batua have their teeth badly chipped after the style of 41.——44 is rather uncommon, among Baluba.——45 gives Otabenga's chipping, shall we say Chichiri? It is not uncommon among Basoko, Mongo, and the populations of Lac Leopold ii and the Uele. ——46 is less common; here the lower teeth are slender, separated spikes; it occurs among Mongo and near Lusambo and in the Bussira region.——47 is rare.——48, in which incisors and canines are neatly pointed, occurs in Province Oriental and in the district of Equateur; 49 affects both jaws alike and comes from the district of Equateur; among the Basengele we have observed


32
37
38
39
40
41
42
44
48
49
51
52
53
54
45
46
50
55
56
57
58
59
60
61
62
63
64
65
66
67
68
69
70

the upper six (incisors and canines) and the four lower incisors thus shaped at once.——50, from the Ababua, reverses this, with four upper and six lower affected.——With 51, we reach the idea of cutting a tooth away at an inner or outer angle so as to leave a side peg or point; this passes into forms where the cut out segment passes from a square to a curved form and where so much of the tooth is removed that only a slender hook remains; 51, the simplest form, occurs among the Wanyale of Equateur district, Baluba, and the Mayombe in the lower Congo.——53 is from Mayombe and from Ibembo village.——The more pronounced forms like 54, 55, 56 are truly characteristic of a mass of tribes from Stanley Pool to Irebu, including Babuma, Bateke, Bafunigani, Bobangi, Moie, Irebu, and Lusakani; it also occurs among Mongo.——57 comes from the Ubangi region.——58 is common among Ngombe, but occurs locally along the Aruwimi and the Ubangi.——59 was observed in a single Bangala.——The curious separated pegs or tables produced by filing or chipping along both sides are from the Bangala, the Abarambo (60), the Azandeh and tribes around Djabir (61), and from Kutu, in the Lac Leopold ii region (64); in 63 the ends of the pegs are wider than the body left above and in 64, the plates are wonderfully thin.——The combinations are usually found among the peoples and in the same districts where their elements occur alone. Thus the removals and slope cuttings of 63, 65, are found among Baluba, 64 is from the Enclave of Lado, 65 is Warua, 66 Katanga. ——67 is from the Ubangi region.——68 is Baluba.——69 is common and widespread; the upper incisors are all removed and the canines sharpened; seventeen Bundu from Yumba all presented it; Mongo, Ngombe and Baluba all show it.——70 is Baluba.——71 is from Djabir.——72 is Baluba.——73 occurs among the Bwaka of the Ubangi region, Baluba, and Wangata of Equateur district.——74 is Lokele.——75 is Bwaka, of the Ubangi region. ——76 and 77 differ only in the slenderness of the lower incisors; the former occurs among Baluba and Bati, the latter among Bati, Bundu and Dungu (Uele).——78 is extra-limital, Haoussa. 79, Bangala.——80, Irebu.——81 and 83, from Monganzula.——82 from Manyema.——84, from Yambuya.——85, from Modambalet.——86, 87, 88, 89 present similar combinations, are not uncommon, and represent a wide range, coming from near Lac Leo-

78
75
74
73
72
71
82
81
80
79
77
76
88
87
86
85
84
83
95
94
93
92
91
90
89
102
101
100
99
98
97
96

pold ii, the Ubangi, Basoko, Province Oriental, and occurring among the Ngombe.——90 is from the Rubi River.——91 is from Katanga.——92 shows a peculiar mode of excavation which gives an appearance of exceptional depth; it is probably from the Ruki River.——93, 94 are, as we would expect, from the Mayombe. ——95 occurs at Basoko and Monganzula.——96 and 97 are from Basoko and Stanley Falls.——98 and 99, forms from the Ubangi region, are comparable with 59.——100 is Mongo.——101 is from the Bangala region.——102 I cannot locate.

This is a rather hopeless enumeration. The identification of some of the tribal and local names is difficult. It is given in the hope that it may help some later worker in the field.

GAMES OF CONGO PEOPLES.

The Congo peoples play many games. The following notes discuss the subject more fully than has before been done, but do not approximate completeness. We have personally witnessed at least forty games and our treatment of the matter is based upon these observations. We have however drawn upon such other sources as we have been able to find. Bentley makes an admirable presentation of Bakongo games;* Whitehead gives fair information regarding the games of Bobangi;† Weeks admirably describes Bangala games played at Monsembe;‡ a writer who signs himself A. E. describes some games from Tanganika.‖ All of these are actually from the area of the Congo Free State. In Steere§ are scattered data relative to Swahili games and Miss Werner** gives an interesting account of the games of the Anyangi children of the upper Shire region. These two sources of

*W. Holman Bentley. *Dictionary and Grammar of the Kongo language*, pp. 492-5; also *Pioneering on the Congo*, passim.

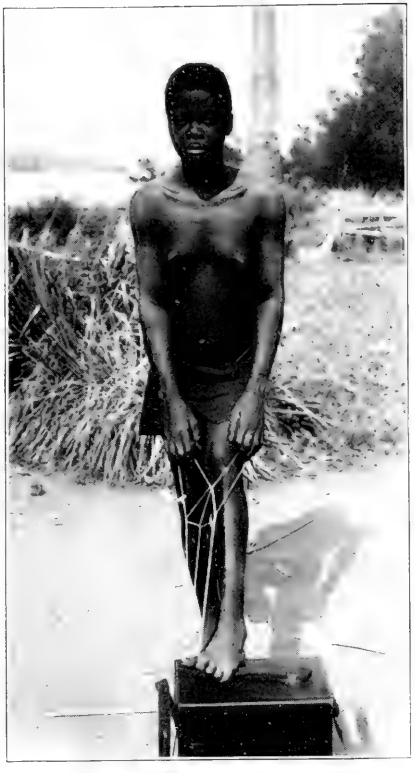
†John Whitehead. *Grammar and Dictionary of the Bobangi language*, passim.

‡John H. Weeks. *Dictionary of the Bangala language as spoken at Monsembe*, passim. This valuable work is still in ms. I owe the opportunity of consulting and using it to Mr. C. J. Dodds of Upoto.

‖A. E. *Les jeux chez les Noirs*, in *Mouvement des Missions Catholiques au Congo*, April, 1905.

§Edward Steere. *A Handbook of the Swahili language as spoken at Zanzibar*, passim.

**A. Werner. *The Natives of British Central Africa*, pp. 110-118.



Ntumba girl: string figure.

Moie boy, with miniature steamer.

information, though dealing with an area outside our field, are occasionally drawn upon for comparison.

Games are not material of easy classification. Often a game may be as appropriately classed in one as in another group. The crude classification here followed will however serve all necessary ends. Eight groups are recognized:

I. Imitative games.
II. Games with simple toys.
III. Athletic sports or exercises.
IV. Athletic games with implements.
V. Games of agility and dextrous skill.
VI. Round games.
VII. Guessing games, etc.
VIII. Games of chance; gambling games.

I. Imitative Games.

Such games are universal. Among populations of every culture the children imitate in play the daily doings of adults. The list might be indefinitely lengthened. Only a few are named as representative:

1. *Tata*, Bangala. Pretending to take care of the baby. Whitehead gives Bobangi *bwembo*, as keeping house.
2. At Ikoko, we found Ntumba children at play pretending to catch and prepare fish. They skewered green leaves together into long lines strung from one small stake to another, to represent the drying of fish; sheaths from plantains represented canoes; small bundles done up in green leaves and tied were fish exposed to the miniature fire kindled near by. After the first panic caused by our appearance had subsided all this was explained to us in detail by the children. All productive industry may be thus imitated by children.
3. At many places, particularly in the middle and upper Congo regions, boys delight to make models of steamboats in a pithy material, miniature canoes in wood, models of houses in various and varied materials. They also frequently model canoes and crews in clay. These are made for play, as pastime, and not to sell or attract *mundele's* attention. (See plate X, Moie boy with model steamboat.)

4. Boys often play at war. We made no specific note of such cases. Miss Werner says of Anyangi boys, that one side, pretending to be Angoni, carry shields and are pelted with corncobs.

Miss Werner says that "children build little houses of grass; boys make themselves little bows with arrows of grass stalks . . and girls grind soft stones to powder, pretending they are *ufa*, and carry maize-cobs on their backs for babies. . . One sometimes comes on a little group of children quietly busy and happy on a bank of a stream and finds that they are engaged in modeling figures out of clay. One does not see this art carried into adult life; and as there is no attempt to make the results permanent by burning them, they are not often met with."

II. Plays with Simple Toys.

Perhaps no distinction is justly made between the words top and teetotum. They are used as synonyms by the missionaries in their descriptions. For the sake of clearly emphasizing the difference between three distinct ideas in native tops we make a distinction in three types. For us the *teetotum* is a disk or cylindrical body pierced by a relatively long and slender shaft. It is spun by rolling the spindle between the palms and then releasing the toy. The *top* is a spinning toy set in motion by twirling it with the fingers of one hand. The *cord top* is wound with twine and thrown. All three types are common enough in the Congo Free State. Miss Werner reports the game in British Central Africa where also she found the whipped top kept up by lashing with a whip of three strands of bark tied to a bit of stick. Of course some of the games here, described as numbers 5 and 9, might equally have been in group V while playing with dolls might have been presented under group I.

5. *Teetotums.* We found teetotums and tops widely distributed. A common form is made in the Upper Congo region, among Bangala, Basoko, tribes of the Aruwimi, Lokele, etc., by piercing various kinds of flat seeds with a long and slender shaft. The spinning may be aimless or it may be for counts or, more commonly, for the tops themselves. A very common seed to be so used is a large, almost flat, somewhat round leguminous seed of dark brown color measuring 2 inches or more in diam-

eter: this kind is almost the only one seen about Basoko. At Yakusu the body of the top is a cylindrical cutting of some root or tuber (probably cassava) which is surmounted by a disk, of some rind, of wider diameter than the cylinder so that it projects beyond it. These teetotums are used in playing a regular game. Among the Bobangi the game is called *nsoko li bobinina*, from the seed used, *nsoko*. (Whitehead.) Weeks gives the verb *binya*, to spin a top or teetotum. His Bangala use the same great seed or bean, the *nsoko*. They call the seed and the teetotum from it *munsoko*, or *nsoko*. The game itself is called *juku*. The game is described as follows: "Each player has a number of prepared seeds before him. He takes the piercing stick (*mundindi*) between his palms, spins it and drops it on a table (*juku*) carefully prepared with a green plantain leaf. Another does the same. The two rapidly revolving teetotums often collide. If one is knocked off the board it becomes the property of the other, if his remains on. If one teetotum holds the board for a round the owner is *monzo*, the best spinner. Who gains most seeds is winner." Bentley, describing the same game at Yakusu, in his *Pioneering on the Congo*, says: "They gamble for brass rods and food; the next meal, or a number of plantains are a common stake. . . A boy often carries his teetotum, its foot passing through the hole in his ear."

6. *Top.* In the upper Kasai district, Baluba and other boys use seeds called *běnga* as tops. These need no preparation or alteration. They are about an inch long, pointed at one end and of convenient form and size to be twirled with the fingers. At Ikoko, Ntumba boys use a large and rather heavy seed; it is not too large to be taken between the fingers, but it has no natural spinning point. This is supplied by pinching on and shaping a tip of black gum which when hard and dry answers admirably. A shallow basin is excavated in the ground and covered over with a piece (or pieces) of plantain leaf. The tops are spun upon this prepared surface. The attempt in spinning a top is to knock an opponent's top from the field. Should both tops go off no one wins, nor if both stay on; the top knocked out belongs to the player who knocked it out.

7. *String top.* At some place near Basoko, we found boys play-

ing with clumsy tops of heavy wood, crudely cut with a knife from a block; they were wrapped with coarse cord and thrown.

8. *Popgun.* A simple popgun, consisting of a cylinder and a rammer, is common among Lokele boys at Yakusu. A wad is forced in with the rammer nearly to the end; a second one then rammed after it compresses the air and drives out the earlier plugging with a pop. The name *bobali* is applied to this toy.

9. *Ball.* Ntumba girls use a round gourd-like fruit as a ball. It is called *boiyčke.* They beat it back and forth, from one palm to the other as they walk. The motion is rapid, regularly timed, and graceful. The dry seeds within rattle almost musically. This simple play is extraordinarily pretty. Mr. Weeks mentions *ntamba*, a ball of leaves made by the Bangala, which is used in the same way. Its movement would no doubt be equally graceful but it would lack the pretty music of the dry seeds within.

10. *Dolls* are found everywhere and vary with locality. They often reproduce peculiar features of tribal practice. Thus, at Upoto we found dolls of unbaked, white, clay, cylindrical in form, rounded at the top, with the whole face covered with curved lines of dots representing the remarkable tribal cicatrization and with the nose and ears perforated for the wearing of bits of stick.——In the Ngombe villages back of Upoto the heads of young babies are artificially elongated by wrapping them around and around with a long, narrow, strip of stuff like tape. In passing an Ngombe house one day we noticed a child not more than two or three years of age, whose head showed the effects of bandaging, and a younger baby, whose head was still wrapped. The older of the two children was playing with a doll, simply the heart of a plantain tree; around the top of this crude toy was wrapped a strip imitating the bandage of the actual baby's head. This was not an isolated case; we saw a second one almost immediately; and upon our buying the two for a trifle, we caused the greatest possible excitement among the children of the village. Such as had dolls ready made rushed off to find them, while others hurriedly attacked the neighboring plantains and started to make new ones for *mundele.* Many were promptly offered by the little sellers and each

and all were carefully head-bandaged. Unfortunately these curious dolls do not last long as the plantain bud promptly shrivels in drying.*——At Yambuya we found extraordinary dolls. They were flat tablets of unbaked clay, well dried, which in outline presented no resemblance to the human body, being almost rectangular. Features were so poorly detailed as to be often unrecognizable. None, however, lacked one conspicuous mark, which we were told was the navel. Facial features or sex distinction might be completely wanting, but the navel was emphatically represented. These unrecognizable dolls are in constant use among the children. Similar attention to the navel is found in the upper Congo. Mr. Millman at Yakusu told me that in every representation of the human form it is always introduced and even exaggerated. To show the character of impressed decoration on pottery, I hired some Yakusu mission girls to make me some clay tablets, pressing the pottery ornamentation designs upon them. When made each bore a navel, which we had removed as scarcely pertinent to our purpose, however appropriate in tablet dolls. This incident led us to mention the dolls at Yambuya. Mr. Millman and Mr. Sutton Smith then told us that quite the same kind occur at Yakusu and especially in the villages on the same side of the Congo close by Stanley Falls. Mr. Smith says they are mere tablets with no attempt at representing the human outline; there is usually a rudely defined headdress, sometimes a badly-executed face, and always a prominent navel.

Miss Werner mentions *swings* among the Anyangi. We do not remember to have seen them in the Congo Free State.

III. Athletic Sports or Exercises.

11. *Hopping*. Bakongo *nsongongo*, to see who can hop the longest time.

12. *Throwing*. *Vita a mbutu*, Bakongo. Many play, dividing into parties. These parties separate to a distance of about one hundred yards. Midway between them, each party erects its town, i. e. small piles of croton fruits, four in each pile and a pile for each player. The sides withdraw to their proper dis-

* At Nouvelle Anvers the same Bangala name is applied to persons with the head artificially lengthened and the heart-bud of the plantain.

tance and then commence to pelt the towns of the enemy with other crotons until one is demolished, whereupon the victors rush upon the losing side and a general melee ensues with pelting. Often serious injury results. Some villages forbid the game. (Bentley.)

13. *Throwing*. *Ncoko*, Bobangi. The game is named from the seeds, *ncoko*, (of the *bosoko* tree), which are used. "The players divide into sides, and each arranges his number of seeds before himself, reserving one to throw at those opposite; on a seed being thrown those who are 'wounded' become the property of the thrower, and at the conclusion of the game he who has most seeds is reckoned 'King.'" (Whitehead.)

14. *Touch*. "*Ejio*, touch last." Bakongo. (Bentley.)

15. *Mwësë mwësë*. Bobangi. "Game played by boys in water when clouds chase across the sky, hiding the sun at intervals: they style themselves 'children of the leopard,' and cry for the sun until it appears again, when they resume their play until the sun is hidden again." (Whitehead.) Mr. Weeks names *munteko*, "a game at touch in the water," Bangala: this may be the same.

16. *Dancing*. Most African dances are certainly not to be considered as "games." The three here named were danced for us by the girls at the mission of the Baptist Missionary Society at Upoto. They seemed to be considered as mere amusements. *Mbanda*, a dance.

17. *Dancing*. *Io*. A dance in which the movements are one-sided shaking of the body from the waist up; two at the head of the line cross it, facing each other.

18. *Boina*, a hand-clapping dance. Two at the head of the line dance across it, to "one, two, one, two, three, time" and then take their place at the rear of the line, to be followed in the same way by a second couple.

19. *Wrestling*. "*Umbola*, to wrestle in play." Bangala. (Weeks.) Actual wrestling by young men is a favorite sport over a wide area, especially in the Upper Congo region. It is subject to definite and somewhat complicated rules.

IV. Athletic Games, with Implements.

20. *Hockey.* A game like hockey is widely played. At Wathen, among the Bakongo in the B. M. S. mission, it was the favorite game. The boys paid little attention to goals and seemed to find their joy chiefly in knocking the ball as hard as possible. While the ball may be made of wood, it is more frequently a palm-nut. Bentley says: "*Nkwa*, hockey. Two players. A palm-nut called *nkwa* is dropped on the ground and each with his stick tries to knock it to a good distance. The good strokes are registered." When we saw the game played at Wathen an indefinite number played. Weeks gives "*mbale*, hockey," Bangala. At Yakusu the Lokele name is *chengwa*.

It is probably this game which Verner describes.* He says: " . . boys . . driving a rubber ball over a field . . a game like golf; shouting out madly all the time and exhibiting as much eager interest in the course of the play as any American boys over a round of base ball, while little girls stood looking on and screaming their comments, applauding and hurrahing, as the boys rushed hither and thither waving their sticks in pursuit of the ball." This was at Luebo, in the Upper Kasai region, among Baluba. Whitehead gives "*bosānō bō botōpe*, cricket," Bobangi. At Ntumba a rather large ball is made of rubber or wrapped fibre; the players form sides, fix goals and carry sticks; the object is to strike the ball along the ground to the enemy's goal. The game is called *ninga*.

21. *Ball.* Weeks gives the Bangala "*lingendu*, ball of leaves; also game of ball." He also gives "*liba*, game of fives." A fine and lively ball game is played by the Lokele at Yakusu. Many players partake and the game is accompanied by gesticulation, yelling, crowding and pushing. The players may or may not divide up into sides. A rubber ball is used and is kept in constant motion in the air. If sides play, it is the effort to keep the ball in possession of one side, throwing it from one to another of its players. When it falls to the ground, a new round begins, the ball presumably going to the other side. Feints are made, with the intention of deceiving; signals, as inconspicuous as possible, are made to indicate to whom the throw be

*Pioneering in Central Africa, p. 129.

made; singing of meaningless refrain and words suggesting themselves at the moment, clapping of hands and dancing accompany the playing. At the beginning of a round, the holder of the ball may clap his hands, sing, and stride up and down; the rest accompany or crowd after him, until he suddenly throws and the game is on.

22. *Dart throwing. Ebonga.* At Ikoko, the Ntumba hurl light darts at a fixed mark, usually a piece of plantain stalk set transversely upon two posts.

23. *Pitching. Ntuba*, Bakongo. (Bentley.) A hole four inches in diameter is made in the ground; a mark is made about twenty feet away; the players try to toss a ball into the hole. Steere describes *kamali*, "a game played by chucking pice into a hole."

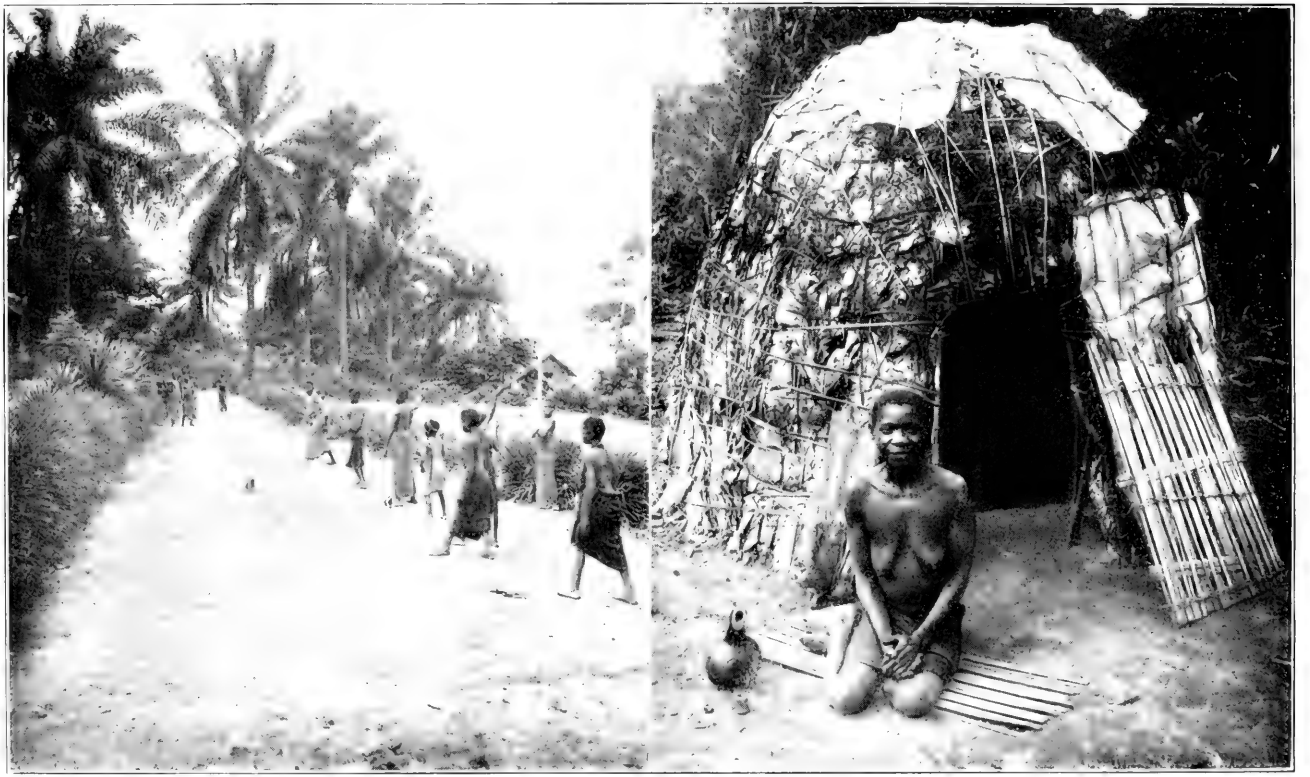
24. *Jackstones. Bana*, among Baluba women in the upper Kasai region; a hole is scooped in the ground in which forty seeds or nuts are placed; there are two, three or five players, squatted around the hole; the one playing tosses a ball up and while it is in the air grabs out a handful of seeds and places them in a heap before her, catching the ball as it falls; she then tosses the ball up again, pushes back all the seeds *but one*, and catches the falling ball; she continues until she has kept out ten, one at a time; she puts all back in the hole and retains the count in her mind; four such rounds make a game, forty catches; if she misses a catch, or leaves more than one nut out, she loses both turn and gains.——Moie play a somewhat similar game. A hole is scooped in the ground; thirteen large seeds and a ball-like fruit are used; the seeds are put into the hole, the ball tossed, and all the seeds scooped out onto the level ground; the ball is again tossed and one seed is picked up and dropped into the hole, and then another and another until all are replaced; they are then again scooped out and replaced by twos; again by threes; lastly by fours; of course the falling ball must be caught each time. We failed to secure the native Moie name for this pretty game. In Ntumba at Ikoko, it is called *bosinga;* at Upoto, it is *ibasaki*. At Yakusu, the Lokele play *likeke*, which is much the same game. The number of seeds used seems here unimportant; players

take turns, a single throw; a small ring is marked on the ground and a lot of flattish seeds lie outside of it within reach of the seated players, who are two or more in number; while the ball is in the air the player pushes one, two, three or more seeds into the ring; apparently the purpose is to leave a single seed outside the ring for one's opponent; no one seems to care to take this and when but one seed is left out, the player whose turn it is sweeps out all the seeds from the ring, scattering them as much as possible and thus begins a new game. Often the player throws the ball so that it falls upon the crown of his head and runs down over his forehead in falling.

25. *Dartlets.* One of the prettiest of games, in which great skill may be developed. We noticed it first among Moie boys where it is played as follows: several, usually four, players; they have about fifteen sections of the midrib of the plantain leaf cut into lengths of about six inches—these are almost or quite an inch in diameter, are fresh and of spongy texture; each player takes several of these and lays them side by side on the ground before him; each boy has a slender, sharp-pointed splinter or stick, seven or eight inches long; playing goes to the right, the players being seated on the ground in a circle; the first player flips or springs his little dart, so as to pierce one of the pieces of his next neighbor, who must at once try to spear the same piece; should *he* (the owner of the piece speared) succeed, he takes the turn and pierces a piece of the next boy; this one in turn has a chance to save his piece by also spearing it; should the owner of a piece speared, fail to redeem it by himself spearing it, he loses his piece to the other, who is entitled to spear again and again as long as he wins a piece; of course, if the player himself fails to pierce a piece, the play passes; the game is kept up until one man holds all the pieces. This game is widely spread. It bears one name, *ngĕnza*, at Ikoko (Ntumba), Monsembe (Bangala) and Bolobo (Bobangi.) The Bobangi tell a boy who has lost all his pieces to "go to the forest;" they call the final winner "chief."

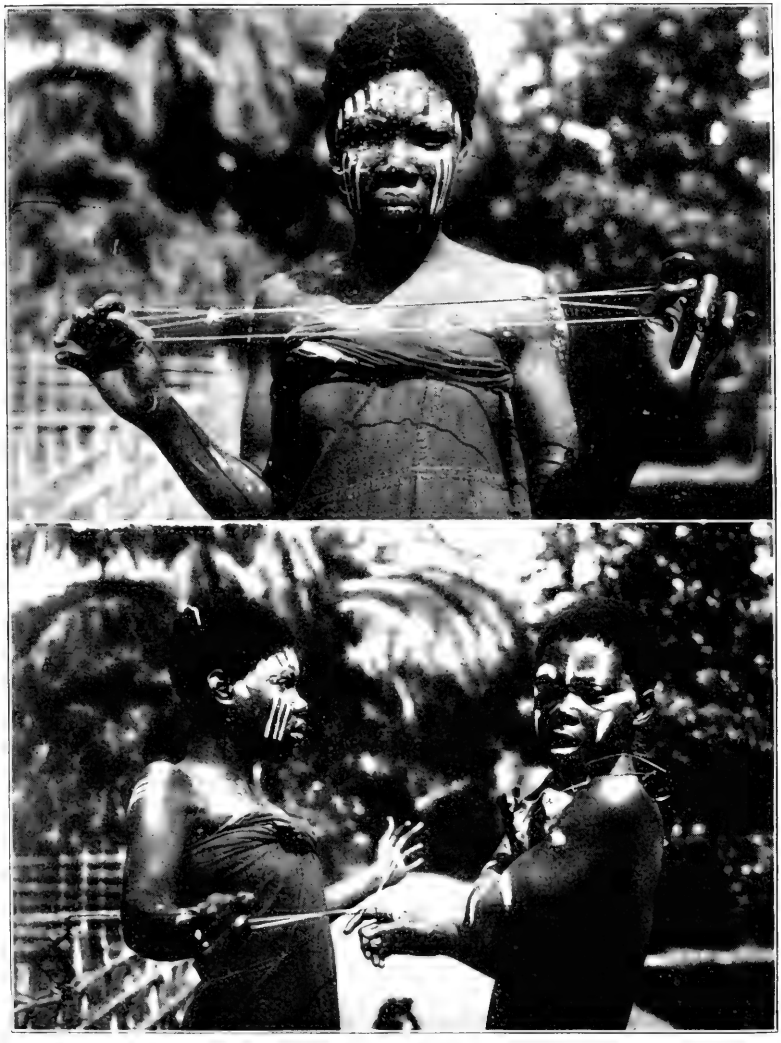
26. *Ring and Javelin.* The Moie boys are notable players of this fine game and one often meets them on the trail or in the village carrying their javelin ready for any occasion that offers.

These javelins consist of several grass stalks laid side by side and tied around at the base, which has a sharpened brass wire tip spliced in; the stalks are held together above at intervals by sliding bands of cord and are often strung with beads at the top; they are a yard or so in length. About a dozen boys play; each has his own javelin; a ring is used, which is made of leaves firmly lashed and wrapped with lianas; the ring is quite thick and heavy, measuring perhaps eight inches in diameter with a central opening of scarcely more than two inches. A dozen or more play, divided into sides of equal force; the playing takes place upon a level field; one party stands in line facing the track along which the ring is to run; the other stands in line, also facing the track but on the other side and a gap of some distance is left between the end of one line and the beginning of the other. One player takes the ring, steps into the track before his party and sends the ring rolling on its course in front of the players of the opposite party; they shoot at it as it passes; if it is pierced by a javelin, the successful thrower remains standing in his place; two from the other side advance to where he stands and from there try to transfix the fallen ring with their javelins; both may try once, or one may make the two trials; if they succeed, their success neutralizes his; otherwise, he counts. A settled system of counts prevails. The Bangala at Monsembe call this game *nkeka*, which Weeks describes as follows: "The root of a plantain is cut into a wheel and the players arm themselves with long sharpened splinters of bambu. (Wheel=*nkeka;* splinter=*mbengo*); two parties thirty or forty yards apart. A. throws the wheel along the ground toward the party B. at the other end. Those of B. throw at it. If all miss, the other party chant "thud, thud, thud, bad marksmen, die like a gazelle." If some hit and some miss, those who hit say, "We have sent our splinters right through the rim of the wheel, the most fatal part." If two hit they say "*jimi be*." If they all hit, they say, "it is absolutely lost and done for"—i. e. "it is no good looking for slaves from this side." To win: should B. hit the wheel with three splinters, three of A. become slaves—i. e. stand out of the game until redeemed; but if, on the return of the wheel to A. that party hit four, they redeem their three and take one. The game con-



Ring and javelin game; Moie boys, Balobo.

Batua house and owner; Ndombe.



Ntumba Girl and String Trick. (Game No. 30).

tinues until one side is in total slavery. The game excites great enthusiasm." The Bobangi call this game *ebënga;* the Ntumba (at Ikoko) *ikotombo.*

27. *Lungungu.* This Bakongo game is described by Bentley. Sides are formed; each player has a piece of string with a small weight at one end. One side bowls a hoop toward the players of the other side. Each of these tries to tangle it as it passes. If caught the hoop is whirled about the head and then handed back to the rolling side, which scores a loss. Sometimes the winner is challenged to "*dia e nsusu*" (eat the fowl)—i. e. to whirl the hoop and jump over it without its touching the ground.

28. *Mbemba.* Bakongo. Played like *lungungu* but the hoop is thrown in the air and not rolled on the ground. (Bentley.) (Compare with this the game *chiwewe* described by Miss Werner. One player squats down and whirls a cord, weighted at one end, around his head, so as to describe around himself a circle two or three rods in diameter, while the others jump over it; who fails to clear it takes his place in the ring.)

29. *Cat's Cradle: string figures.* Widely played. See following special discussion.

30. *String tricks.* A Bangala tailor, whom we met at Basoko, knew many curious modes of tying prisoners; to all of these, of which he showed us several, he gave the name *mukese*, prisoner. They were tricks admitting of easy, though surprising, release. ——The Balumbu have a string trick in which one seems to be securely tied with a cord about the neck; a sudden, not easily detected movement releases the prisoner. The trick is like our own, where a loop of string is put over an upraised finger, folded and placed again, and then easily withdrawn. I thought to show our trick to my informant, only to have him foil me by a quick movement of his finger, catching the loop just at the moment of intended release. It was plainly not new to him.

31. A pretty *string trick-trap* is common among Bobangi, Ntumba and other peoples of the Middle Congo. The Bobangi accompany it by a dialogue, in which the two players take the parts of the owner of a palmtree and the woodpecker that desires to

steal the nuts. The trap-figure has a lower horizontal line of string upon which the thief moves his finger from side to side as the dialogue proceeds. At the end the trap-holder suddenly releases a loop and draws the figure taut; unless the other is quick his finger is snared. The name in Ntumba is *ikoliakoli*, trap; in Nkundu, *ikoma nkoko*, trap; in Balumbu, *simbaro kendo*, a bird trap; in Upoto, *lokoko*, trap; in Bangala, *litale*, a grindstone.

32. *Seesaw. Dingavĕngue.* A string-sawing game among the Bakongo, shown me at Ikoko, by Frank. The teeth and both hands of one player and one hand of the other are used in the operation.

V. Games of Agility and Dextrous Skill.

33. *Jumping rope.* The girls at the mission at Upoto have several different ways of jumping rope—all being called *mombaka*. The three varieties noted were (a) three jumps and then run out; (b) one jump and run out; (c) two, or even three, persons at once run in, jump, and run out. Those who are not jumping stand by singing and clapping hands as an accompaniment to the rope-turning and the jumping.

34. *Titi kia lukasa.* A number stand in a ring "each loosely grasping his neighbor's left wrist with his right hand. One player then lifts his right leg over his right arm and his neighbor's left arm; he then lifts his left leg in the same way over his right arm; he then faces his two neighbors, his arms crossing, the left uppermost; then passing his left arm over his head he wheels around and once more stands as the others, the hands which clasp the wrists allowing the wrists to turn in them. To pass the legs over, *kuzula o malu;* to twist round once more into position, *bangumuka*. One side of a fresh bean pod placed in the sun will warp and turn over as it dries, hence the name of this game." Bakongo. (Bentley.)

35. *Hand-matching. Mbele.* One of the finest, most popular, and most widely distributed of Congo games. The name here given is Bakongo and we quote Bentley's description. "A game in which the players form a line, the first being called *ntotela*. One player faces the line and takes his stand before each of the

others in turn. Facing the first he throws out both his hands, then he crosses them on his breast and after this throws out one hand. The one in the line who is opposite has to do the same. If he can meet the thrust with the same hand that is put out to him three times, he stands out and the other takes the last place in the line. If he misses the three chances, his turn is past, and the player goes on to the next. If the player can go three times along the line without being played out, the last man is called *mbundu*, slave, and has to stand aside. In the case of the player being played out, and having to take his place at the end of the line, the 'slaves' take their place after him. If the player is able to play out all as slaves, the *ntotela* may return and try until he redeems himself by playing out the player. The ex-player has then become *ntotela*, and tries to play back the 'slaves.' The movements are very rapid, and the game causes much fun." Although we have often seen the game, and first among the Bakongo, we have never seen it played as here described but always as between equal sides in two facing lines, between which the challenger passes. The game is much played in moonlight nights and is usually accompanied by singing, hand-clapping, and body movements. We have never seen any indecent movement or action but Mr. Oldrieve at Wathen says there are indecent forms of it. In Bobangi it is called *ngila;* there are two varieties; hand-matching such as above described is *ngil'e maboko;* Whitehead says there are two sides, *mboto* and *eseke;* one from each side puts up his hands, claps them and strikes his arms; the *mboto* man then throws out one arm; the other must throw out the same arm or lose; twelve counts make a chief who then withdraws. At Ikoko, among the Ntumba two forms occur known as *ngwani* and *ngila*. At Monsembe, the Bangala call it *ndangu*. Weeks says: "Players form two lines facing each other; the first player of A. faces the first of the opposite B.; A. throws up both hands and brings them down with a clap and then darts out one hand; B. does the same, claps his hands and answers *tambola* and, if A.'s hand meets B.'s, A. is wounded; if A. recieves three wounds he dies; if, however, their hands do not meet the first time, A. passes on to the next and the next until he finishes all or is killed; then the next of A. tries until killed

or he has gone down the whole of B.'s line; those who are dead stand at the end of their line; B. now starts and should he lose any they are redeemed in the following way: A.'s line lost say five, B.'s line lost say four. A. counts four of his as redeemed and B. counts his four as redeemed; thus B. has lost none and A. only one; the game proceeds until one side is all killed. The sharper players always head the lines."

36. *Foot-matching. Ngil'e makóló*, Bobangi. We first became aware of a second form of the above lively game at Bolobo, where we saw boys playing in the moonlight; the players stood in two facing lines; hand-clapping, singing and body-movement made accompaniment; champions stepped out and made feint movements and then thrust out a foot; the idea and general rules are as in the hand-matching. At Upoto girls play both hand and foot-matching games; men usually only play the latter. The name seems to be *njango*, which means a "sham battle."

37. *Nene.* The girls playing form a circle; one in the centre dances, claps her hands and makes foot-passes; the other players in turn enter and must match her movements, but with the *opposite* foot; those who fail are "dead ones;" some may go through the whole test and "live." Seen at Upoto.

38. *Antelope. Nkiendi.* Bakongo. Bentley's description is followed. All but one of the players run about on all fours with face upturned; one only, *nkayi* (antelope) stands; those on all fours are 'hunters;' they scuttle about and try to touch or kick the *nkayi* with their feet; a large court has been marked out upon the ground and he may not run beyond its limits; the hunters try to pen him up in a corner; if in avoiding them he runs out of the court, everyone gets up onto his feet to chase him; who first succeeds in pretending to cut him up with a knife becomes *nkayi;* a general melée ensues, everyone else pretending to cut himself a piece, amid shouts like—"the shank for me," "the head for me," "a piece of flesh for me." There is much scuffling. Sometimes there is a rule against the hunters running from the court; if the one who is *nkayi* runs out, the first to call *nkayi anzenga* has the right to take his place.

39. *The Young Pigeon. Mwana a eyembe*, Bakongo. Two play; interlocking left hands, with their right hands each rubs his ribs; one of the players is the young pigeon, the other is the mother bird; the mother sings. The young pigeon has not yet grown his feathers; when he has grown his feathers he shall go to Mputu,* flap, flap; the young pigeon coos an accompaniment; when the song is finished the two players clap their right hands over and under the interlocked left hands, which are then separated; each then claps his hands together and strikes his right thigh, after which they lock hands and begin again. (Bentley.)

40. *Pebble-seizing. Bolenga.* Lokele, at Yakusu. One player extends his right hand and places a pebble on the back of his extended fore- and second-finger; his opponent by clapping his two hands, or swinging and closing one hand, tries to snatch the pebble off; when successful he takes his turn at balancing the pebble on his hand.

41. *Hand-clapping game.* There are many of these, some of which are graceful and dextrous. We noticed them especially at Bolengi, among the Nkundu, but they are widespread; they are most played by girls and women. One common one presents two variants. (a) Two girls play; they join hands, raise them and then separate them with a forcible, downward, movement; they then clapped their own hands, slapped down, clapped, slapped up, &c., &c.; of course when one slapped down, the other slapped up so that the palms of the two met. (b) Varies in the opening; they join hands and then simply separate them outward; the game proceeds as before.

42. *Hand-clapping game.* Nkundu at Bolengi. Two young women play; they have an elaborate sequence of movements, clappings, slappings and so on; part after part of the body is touched and named in order; a set song is sung in which each part of the body touched is mentioned and considered.

VI. Round Games.

43. *Tangazu.* Lokele, at Yakusu. The players form a moving circle, clap hands in unison and go with a dancing-jumping step.

* Whiteman's Land.

44. *Ebōbe.* Bobangi. The players sit in a ring; one stands in the centre; one or more rise from the seated ring; the person in the centre rushes to touch one before he can resume his sitting position; one so caught takes his place in the ring. (Whitehead.)

45. Spider. *Esangu ngungu.* Bakongo. The players join hands and dance around one in the middle called *esangu ngungu*, 'spider;' he attempts to seize one of the dancers by the leg and drag him down; the victim cries out a set formula; the chorus replies; five pairs of remarks and responses are made; the last response made by the victim is long and in it all the players are named. (Bentley.)

46. *Dibulungu.* Bakongo. The players form a ring, seated with legs extended in front of them; one places a ball upon his knee and with his leg jerks the ball so as to roll it upon his neighbor's knee; if the ball is let drop to the ground, the one at fault goes into the ring and dances. (Bentley.)

47. *Monkuku.* Bobangi. One bids his fellows laugh; they do so and then become sober again; he then tries to make some one of them laugh; if he succeeds, this one must take his place in the ring; in concluding, they sing a teasing song about the one who could not make his fellows laugh. (Whitehead.)

48. *Bolotaka.* Upoto. The players form a circle; each in turn goes dancing and hand-clapping into the circle; should the dancer back up against any of those behind her, they push upon her back with one or two hands, according to her position with reference to them; she is usually pushed twice in this way; at each of these touches it is supposed that a child is born and the touches are supposed to support her that she shall not fall; there is singing and hand-clapping accompaniment.

VII. Guessing Games, Etc.

49. *Hide and Seek. Mabömba.* Bobangi.

50. *Blindman's buff. Njimina.* Bakongo. Always played inside the house. (Bentley.)

51. *Mokale-mokale.* Bobangi. One player is sent into hiding and in his absence one member of the company curses him; he is then summoned, all crying together *mokale-mokale;* he guesses

at who cursed him; if right the curser takes his place; if wrong he goes out again, is again cursed and recalled. (Whitehead.)

52. *Who's got the button?* There is a group of games corresponding to this old favorite. *Nkandi a ngongo*, Bakongo. The players sit in a ring; a palmnut is passed from one to another; each pretends to pass it on but tries to avoid its being seen; one in the centre watches and springs upon whom he suspects; the person upon whom it is found becomes watcher. *Nduku*, Bakongo. The players are in two parties, who seat themselves in facing lines, feet to feet; a cloth is thrown over the legs and a small article, as a ball, is passed under it from hand to hand; a player on the "ins" side challenges one on the other, with the word *funguna* (confess) and attention being given he asks *ku ntu a nani?* (who has the ball); the person challenged has to make the guess; if right, the ball goes to his side.——*Nkulu-nkulu* is the Bangala equivalent described by Weeks. Two lines of boys sit on the ground opposite each other; the first in each line is *moloi* (husband), the rest are *bali* (wives); each wife interlaces her fingers forming a hollow with her palms; the husband takes a small article and passing rapidly up and down the line of hands, drops the article into one of the hollows; the opposition now guesses the location of the article—

Opposition,	*baninga-baninga.*	Players, *ehi.*
	bakuta-bengi.	*ehi.*
	banyango babilulu.	*ehi.*
	obe na nkulu, abete mungita.	*kililit.*
	bakunguika.	*kililit.*
	motu yona! (that person).	

If the guess is right, the article is shown and the side that hid it loses, the opposition coming in; if the guess was wrong the person holding the article holds it up, saying *ehi nabuti mwana* (oh, I have a child); it counts one game for them.—A similar game from Tanganika is described by A. E. under the name *mpeta*. It consists in concealing an object and guessing who holds it; one player walks about within the circle and pretends to deposit a small article with each person; as he goes around he cries "*fikere, fikere*" (hide, hide); each, pretending to accept it, replies "*wakalimbola*" (let them hunt); the round finished, the hider calls "*angaliahuko*" (attention) and guessing follows.

53. *Sand and seed game.* Among the Moie, where we first noticed it, this game is popular; men and boys play; the players sit in a ring and each heaps up a little mound of sand before him; one takes a small seed (the red and black "black-eyed-susan"), which he holds between the tips of two extended fingers, shuffles it into the sand of his heap, and throws out a handful into the open space before the players; in it goes the seed; the next player indicates the space within which he believes it to lie, spanning his fingers as widely as possible and using his thumb to mark the centre, the spanned finger to describe an arc; if he is correct as shown by brushing away the sand within the area indicated, he takes the seed to conceal it; otherwise the original hider plays again. The Bobangi name of this game is *nteti*, which is the name of the seed used; should the seed not be covered by the sand when thrown out any player may grab for it; among the Bobangi sides are chosen; a guesser who fails becomes a 'slave' or gives one from his side as a 'slave;' should a 'slave' seize the exposed seed, he becomes free; the side which gets the most slaves wins and its leader is called *mokónzi* (king, chief). So Whitehead. In Ikoko the Ntumba call the game *loteitei*.——The Bakongo game as described by Bentley varies considerably from these. It is called *nkiambiembie*, from a *nki* seed being used; it is hidden in one of five little heaps of sand or dust; the person guessing must brush away the four heaps that do *not* contain it, leaving that one in which it is concealed; if correct, it is his turn to hide; a register of games is kept.

54. *Odd and even. Nxibidi=mpingi*, Bakongo. Several players, as four, sit on the ground around a record diagram; one of them shuffles his hands and holds them out closed; the player to his left guesses in which one a small object is concealed; if the guess is wrong, the hider scores one on the diagram and hides again; if he is caught he makes no score and yields his play to the next player. The diagram, marked in the sand, is a central circle from which run two spirals; there are about fifteen lines on each side of the central circle; one who scores draws a line across the outer of these spiral lines, extending the cross-line at each count toward the centre; whose record line first reaches the centre wins. The use of the English name

of "odd and even" for this game is Mr. Bentley's idea, not mine.

55. *Number guessing. Ngongo.* Lokele game at Yakusu. There are two or more players; they sit on the ground with piles of pebbles before them; one grabs some from his pile and holds out his closed hand; the player to his left guesses how many pebbles he has; the contents are displayed; if the guesser was right, the play passes; if wrong, the original player continues.

56. *Dibala.* Bakongo. Two or three agree to play; after this has been agreed upon, if any player forgets the name of some person or thing, or hesitates, the others strike him; he calls out *dibala dileketa;* they reply *muna ntu a nani* (on whose head)? he answers *muna ntu a* ——(on the head of ——) naming an acquaintance; the beating then stops. (Bentley.)

57. *Ncu ncu.* Bobangi. The players form two sides, each of which takes the name of a fish; one member takes a handful of palm kernels and throws them before him one by one, naming a fish for each; when he names *their* fish, the kernel is carefully watched by those who bear it; then on each side there is chosen a *mokati* and a *molungoli;* the *molungoli* turns his head, while the *mokati* puts his finger on the kernel acknowledged to be the one thrown at the time the name of the fish was mentioned; this done the *molungoli* turns his head and tries to select the one on which the *mokati* put his finger; the side which secures most kernels wins. (Whitehead.)

58. *Samuna.* Bakongo. Telling a story with interspersed songs and action. (Bentley.)

59. *Charades and riddles. Ngwala.* Bakongo. (Bentley.)

60. *Slang, secret language. Jimu.* Bangala. (Weeks.) This is to be carefully distinguished from the secret language learned at the time of initiation into the puberty society.

61. *Epapunga.* Bangala. They make a sucking noise with the lower lip inside the upper one; one unable to do this with the rest is "killed," i. e. drops out; the game continues until all but one are killed. (Weeks.)

VIII. Games of Chance; Gambling Games.

62. *Luela.* Bakongo. Bentley mentions this as "African backgammon." I know nothing of it. Can it be some form of mancala?

63. *Ebënzako.* Bobangi. Lot, which is sometimes taken by holding a number of reeds (one of which is knotted in the middle) in the hand, each of the interested parties drawing; the decision affects him who draws the knotted reed.

64. *Lobesi* is the most widely spread and favorite means of gambling; it is typical in the Middle Congo as among the Bobangi, etc. In the regular game six pieces are used. At Ntumba these pieces are made from bits of white-men's plates, white on one side and with color decoration on the other; these are chipped and then rather carefully ground around the edges to fairly round form; they are flat on both sides and from a half inch in diameter up; they are thrown like dice and counts are taken from the combination of white and colored faces; each possible throw has its name and value:

6:0 *nseba*,	best.
5:1 *lowŭ liò imo*,	lose.
4:2 *lowŭ*,	lose.
3:3 *bote*,	gain.
0:6 (colored) *mpidi*,	best.

Of *lobesi* among the Bobangi Whitehead says the counters, *mbesi*, have a light and a dark side; two throws are allowed; the stakes are taken when in both throws all fall alike, whether dark or light; a clap of the hands follows the throw. Glave* was located early among the Bobangi. He tells us: "pieces of pottery are chipped into wheels about the size of a quarter of a dollar; one side is whitened, the other burnt black. The player takes an odd number of these pieces in one hand and throws them on a mat, first betting upon either black or white; and, of course, if the majority turns up his color, he wins." This is so unlike the modern game that it is interesting, if true. With this he gives a story, which sounds like a romantic fiction, of a man, Ndobo, who had gained wealth and power, becoming a great chief at Ikengo, a hundred miles from Luko-

*Six Years of Adventure in Congo-Land, p. 132.

lela. He finally organized his greatest trading expedition, taking many slaves down to Chumbiri. Here he found a game in progress; he entered—lost, lost, lost—all his stock, ivory, and slaves; his opponent was tireless; Ndobo staked his own freedom, lost, and found himself the slave of one whom he had once owned.——Lobesi is played under the same name among the Bangala at Monsembe; Weeks describes it clearly; the six counters are called *mbesi;* the light side is *nke*, the dark side *mpili;* the stakes, *libeta*, are taken up when the counters in three successive throws fall all dark side or all light side up; the person putting down stakes is called *mobeti wa libeta;* the place of playing is *ekali;* the turn to play is *ngala;* to demand a second throw is *pula;* the throw 3:3 is *miu matu.*

65. *Wadi* is the similar game among the Bakongo. Eight disks are used with white and colored sides; they are usually cut from calabash rind and are called *mpanza;* they are thrown and yield the following counts:—an even number of whites—2.4.6.8 loses; when an odd number of whites turn up, or all are black, gain. "In this game the natives play for money, and often heavy stakes are laid, sometimes even slaves." (Bentley.)

66. *Kulukuta*, Bakongo, is like *wadi;* the loser, however, must eat chili peppers, even up to as many as ten; he may even be compelled to rub them in his eyes; one who has lost ten times and been thus punished may be excused from more.

67. Through the region of *lobesi's* greatest popularity, a second game quite similar to it, but played with four pieces, is found. Among the Bangala this game is called *mode.* In many regions the pieces used for it are cowrie shells ground down from above and below; we found such pieces in use at Ikoko, among Ntumba, where the following values of throws were given to us: 4:0, best; 2:2, good; 3:1, bad. It may be this game which Verner found among the Baluba. " . . a circle of gamesters seated on the ground; a few seashells would be tossed into the air and the point of the game depended on how they fell, each player taking his toss-up in turn. In this way men have been known to gamble away successively their cowries, merchandise, goats, houses, slaves, wives, children and finally their own freedom."*

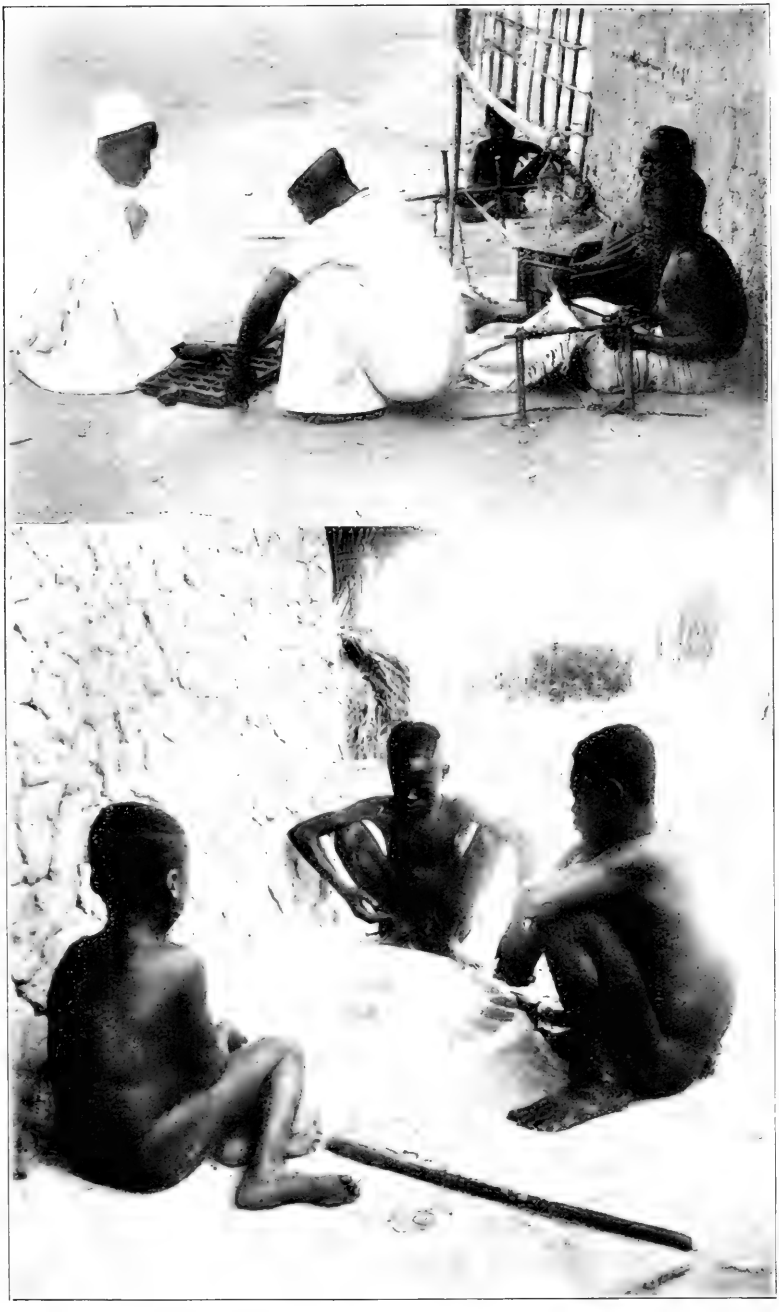
* *Pioneering in Central Africa*, p. 128.

68. *Shobo*. Bakuba; *Bubale*. Baluba. Whatever Verner's game with a few shells may be, whether the same as the four-piece *lobesi* of the Bobangi and Ntumba or not, there is a four-piece throwing game of chance, which is highly popular in the district where he was located. The counters commonly used are made from flat seeds by splitting them through horizontally; there result two pieces, each with a flat white surface and a slightly convex brown surface (the outside of the seed); in throwing the pieces are usually stacked carefully on one another, white side down; they are then flipped up into the air, an exclamation for luck being usually made; five falls are possible:—

1 b. 3 w. opponent gains and plays.
1 w. 3 b. " " " "
2 w. 2 b. player gains and plays again.
4 b. " " " " "
4 w. " " " " "

Cowries (the currency of the region) are the usual stakes; "boys" often play and lose their week's rations within an hour after being paid; they bet their shirt, their month's wage of cloth; they always have the pieces for *bubale* in their "box;" young and old, male and female play.

69. *Mancala*. This game, found in the whole Mohammedan world, or a game similar to it in principle, occurs in almost every part of the Congo Free State. Perhaps it is well to distinguish between true *mancala*, played upon a board pitted with a relatively small number of holes, or upon earthen copies of the same and a mancala-like game played in a series of numerous holes scooped out in the ground. While such a distinctive idea is useful, actually these two kinds are connected by all sorts of intermediate forms. *Mbao*, described by A. E. as played at Tanganika and equated by him with *mancala*, perhaps comes as near as any to the standard type; there the board has four lines of eight hollows each and the game begins with two nuts (or seeds or cowries) in each. At Dima on the lower Kasai we found the Baluba from further up the river using a clumsy and badly made board, a squarish block of wood with four lines of seven holes each. Words given as equivalent to *mancala* in various languages are: *lodika*, Bangala; *luela*, Ba-



Mancala; above Stanley Falls (From S. Smith).
Mancala table, Bumba.

kongo; *lolemba*, Ntumba; *bönzö*, Bobangi. The Arabs photographed by Mr. Sutton Smith* above Stanley Falls, in his Sakandu trip, were playing true *mancala* on an actual *mancala* board. At Irebu we saw a fourteen-fourteen line of holes in the ground for mancala; the game began always with three nuts in each hole, eighty-four in all; here the players were two as in regular mancala; and the rules so far as we could see were regularly followed.†——At Bumba we saw two fine play boards constructed of rammed clay and built against house walls. One of these is shown in our illustration. This is surely not true *mancala*, although the same thing in principle. In the upper Kasai region, Baluba-Bakuba country, we found *chisola*. There were thirty-two small basin holes scooped out in the ground; these were arranged in a large circle; the game begins with three palm kernels in each cup, ninety-six pieces in all; three or four play standing at quadrant distances; each has his starting hole; the person at the north perhaps begins and the playing and the play go to the left; the first player picks up the three kernels from his starting hole and drops them one by one into the following holes in order; he keeps playing until the pits in the hole next following his play are o or two; he ever returns to the hindmost hole of his series; players overtake one another and dispossess them; but it has repeatedly been said that no white man can understand the intricacies of *mancala* and I begin to believe it true. At Nkundu we found a great circle of fifty-eight pits, the greatest number we have noticed.

70. *Nkenka*. Bakongo. A hole four inches in diameter and two feet deep is dug in the ground; it is half filled with ground nuts and then filled up with well hammered earth; a piece of palm midrib is made into a kind of fork with several prongs; this is violently driven into the hole; the player wins all the *nguba* (ground nuts, "goobers") brought out.

71. *Looela*. Under this name, plainly the same given by Bentley

*By Mr. Smith's kindness, we are able to reproduce this photograph.

†Capt. Tuckey in 1816 found *mancala* in the lower Congo region. He says: "They amuse themselves with a game which is played on a piece of board, having twenty-eight circular hollows on its surface, but I could not learn the principles of the game." *Narrative of an Expedition to explore the River Zaire, usually called the Congo*, p. 198. The Captain gives a diagram; the arrangement of the holes is the common fourteen-fourteen.

for *mancala*, Capt. Tuckey refers to a game of which we have no further information. He says: "The only game we have seen them play at was a kind of drafts named *looela*, the implements of which are a flat stone 18 inches square with 16 cavities grooved in it, and a small stone in each cavity, as in the annexed figure." The diagram presents three series of five holes each arranged in quincunx order one above the other so that they suggest three + signs, the holes in the vertical bars forming a vertical line of nine holes; to the right of the transverse of the middle + is the sixteenth, isolated hole.

STRING FIGURES: CAT'S CRADLE.

So far as I know, nothing had been printed in regard to "cat's cradle" or string figures among the dark peoples of Africa, at the time when I entered Africa. When inquiring about games, at my headquarters in the Upper Kasai region, I had asked regarding "cat's cradle" but secured no information although both Otabenga and Manoeli were in my *entourage*. Just after this fruitless search, I read Leo Frobenius' *Ursprung der Kultur*, dealing with the cultures of Africa, and had been impressed by his clear definition of "Malaio-nigritic Culture." Knowing that Haddon had found a wealth of string figures in Melanesia, I was curious to know whether a similar rich development of them could be found among Congo peoples. I was unable to begin a search until I had reached the Middle Congo district at Chumbiri, as I was working my way up the great river to Stanley Falls and beyond. We first met figures among the Bobangi at that place; at Ikoko on Lake Mantumba, the Ntumba have many and interesting forms; at Bolengi they are common enough among the Nkundu; they occur up the Ruki River around Bonginda and Bangandanga; at Nouvelle Anvers (the old Bangala Station) the Bangala are well acquainted with figures; at Upoto they are made in variety by both Upoto and Ngonde; at Basoko no local figures were encountered, though Bangala and Balumu located there knew some; above Basoko we found no new forms and few at all; down the river from Chumbiri we found none, although we made some inquiry; we know, however, that there must be many there as scattered Bakongo in the Upper Congo told us of them. Even

where we failed to find them, there are no doubt plenty of string figures and the sixty or more figures we encountered are no doubt but a small part of the harvest that will reward a diligent search.

These African string figures differ from our "cat's cradle" in that each figure is made for itself by one player and then taken down and another constructed; there is usually no trace of the ingenious removal by a second player, whereby a new figure is produced. Each figure seems to have its name, although often the constructor cannot give the name of a figure he has made. Our usual procedure was to take down names in each language, whenever a figure was encountered; where possible new figures were photographed; prints were promptly made and a set of them was always carried for the identification of old and the discovery of new designs. The player often has less difficulty in naming a figure which he has upon his fingers, than in constructing it from the repeated name. This at first seems strange but is really natural. It was inconvenient for our work, however; sometimes it was impossible to photograph a new figure at once, though quite easy to take down its name; later when we were ready to photograph, the player might not be able from the name to recall the figure wanted or to recall the stages in its construction. At first this caused us to doubt the actuality and fixedness of the names, but this doubt disappeared, although we not infrequently failed to secure the remaking of the desired design. Most of the gaps in the numbering of our figures and in the series of figures itself are due to this difficulty. The numbers attached to the figures are serial, in the order of finding and recording. We found, on final sifting, that a few figures had been duplicated—the position of the hands with reference to the camera giving an apparent difference that did not actually exist. While such duplication leads to some gaps in the list, it has seemed best to leave the original numbers. There are two cases of confusion in numbering, which however are mentioned when they occur. We regret not to be able to report the mode of construction of our figures; their value would be multiplied if we could do so; we had Dr. Haddon's system of recording with us, but confess that personally we find extraordinary difficulty in applying it. The cuts here given are traced from the original photographic prints and reproduced by zinc-etching.

On emerging from "the dark continent," we found that others had been busy and that black Africa was no longer a virgin field as regards string figures. Mrs. Caroline Furness Jaynes' remarkable book* had appeared and three articles had been printed in a single number of a journal.† We are not then pioneers in publishing data from this field. In his introduction to Mrs. Jaynes' book, Dr. Haddon says:

> No cat's-cradles or string tricks have hitherto been recorded from Africa. I have for some time been aware of the sparse occurrence of one or two string tricks from that continent, but very recently my friend, Dr. C. W. Cunnington, has collected fifteen patterns and three tricks from various tribes in East Africa, mainly in the neighborhood of Lake Tanganyika; these will I hope be published by the Anthropological Institute of London. Three of these begin with Opening A, the rest have varied beginnings. In four cases the final patterns are similar but the construction differs in each case. Three figures possess movement. The pattern known as *umuzwa*, "a wooden spoon," made by the Ulungu of the south end of Tanganyika is "practically the same in result as the Cherokee figure 'Crow's Feet.'" One string trick from Wajiji is precisely the same as *kebe mokeis*, 'the mouse,' from Murray Island, Torres Straits, a trick also known to the Omaha Indians. "Several patterns are known to widely separated tribes, but under different names. Mrs. Jaynes' discovery of a Batwa Pygmy pattern is of great interest, and it will be noticed that, like the majority of those since known from Africa, it has an original opening.

Mrs. Jaynes gives three examples from African blacks—one string trick and two figures. The string trick called 'the mouse' is found among the Wajiji of British East Africa and the Batua pygmies who were exhibited at St. Louis in 1904. One figure, *umuzwa*, a wooden spoon, is from the Ulungu of British East Africa; the other, which she calls "pygmy diamonds," she secured from Otabenga‡ at the Exposition. *Umuzwa*, occurs in our Congo series, No. 32. And Otabenga's design is properly within our area. Cunnington gives nineteen tricks and figures, Parkinson sixteen, Haddon nine. Some of them are easily iden-

*String Figures, a study of Cat's Cradle in many lands. New York: 1906.

†String figures and tricks from Central Africa, William A. Cunnington; Yoruba string figures, John Parkinson; String figures from South Africa, Alfred C. Haddon. Journal of the Anthropological Institute of Great Britain and Ireland. Vol. xxxvi. (1906.) pp. 121-149.

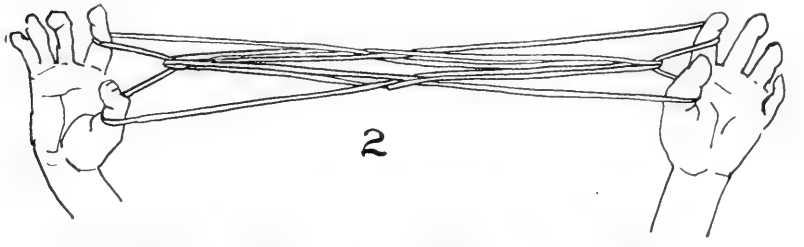
‡Otabenga is not of the Batua; I am not sure that he should be called a pygmy. Mr. Verner calls him a *Chi-chiri*, or a *Chiri-chiri*, whatever that may be. The boy came from the country behind Bassongo and was a slave. He was captured in a war expedition and sold to the Exposition.

tified with ours. Cunnington's No. 1, Parkinson's No. 1 are our No. 21; Cunnington's No. 5 and our 32 are one and so are Mrs. Jaynes' *umuzwa;* Cunnington's No. 15 is comparable with our No. 24; Parkinson's No. 11 is our 22.

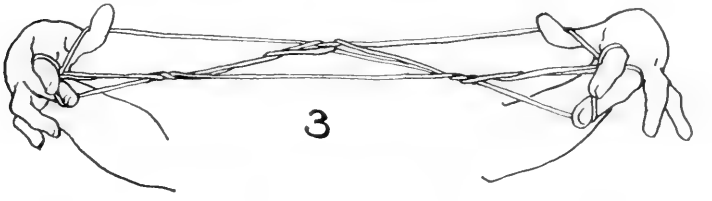
STRING FIGURES.

1. *Bana*, child. Ntumba. The general name for the game. The figure is the same as 24, which see.

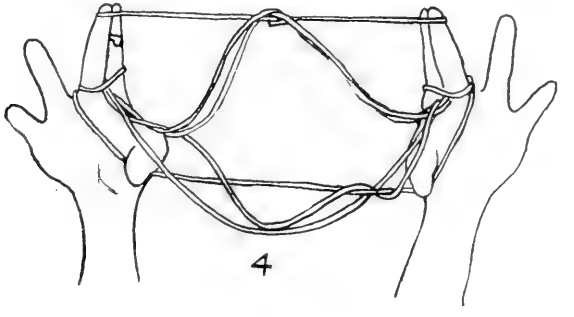
2. *Mwele*, boy. Ntumba; *bon'a huajĭnde*, boy. Nkundu; *mobale*, boy. Bangala; *mwana wa doeli*, boy child. Upoto; *mototo moromi*, small boy. Balumbu.



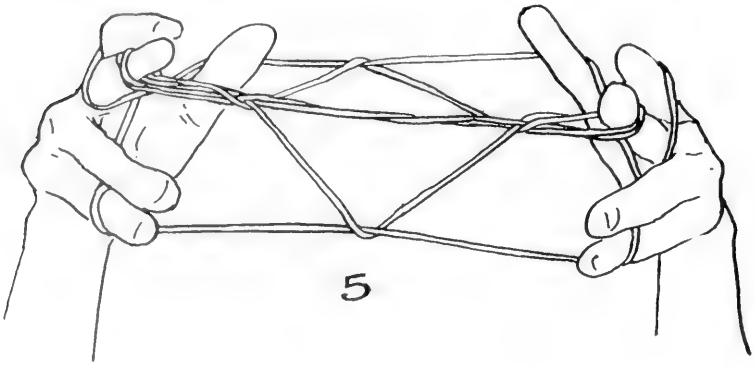
3. *Lokalatinge*, to pinch with the finger nail. Ntumba.



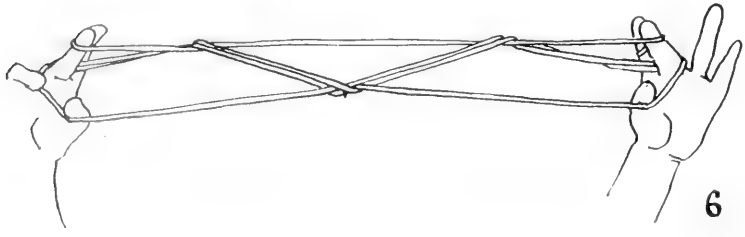
4. *Nchonge*, moon. Ntumba; *moi*, sun. Bangala.



5. *Itumbantondo*, house and ridge-pole. Ntumba.

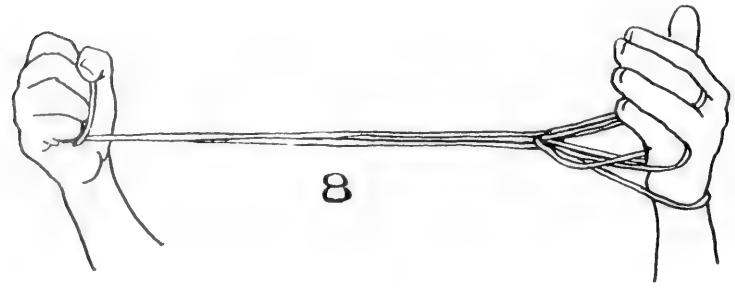


6. *Ntzomi*, freeman. Ntumba; *tsungi*, moon. Ngombe.

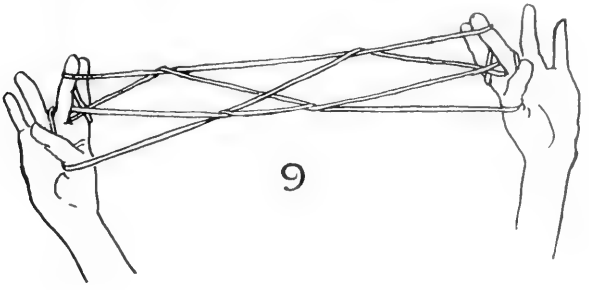


7. *Mpengi*, housewife. Ntumba.

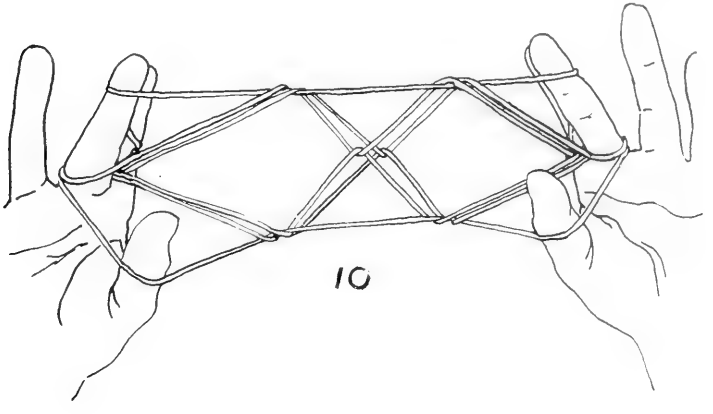
8. *Ipuka*, calabash bottle. Ntumba; *ilonda ia uta*, calabash bottle. Nkundu.



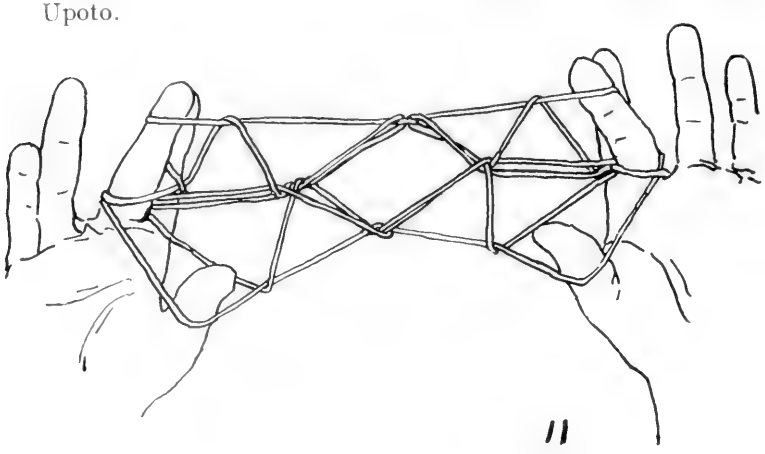
9. *Maiyoma mpongo*, fish eyes. Ntumba; *baiiso ba npongo*, *npongo* eyes (*npongo*, a sort of large fish). Nkundu; *libundu*, a fish. Bangala; *mboku*, a sort of large fish. Upoto; *mabingi mawali*, two buildings. Ngombe.



10. *Ingubčlopati*, shield. Ntumba; *bwele*, place where mother and child are buried. Bangala; *ndjoto inei*, four stars. Ngombe.

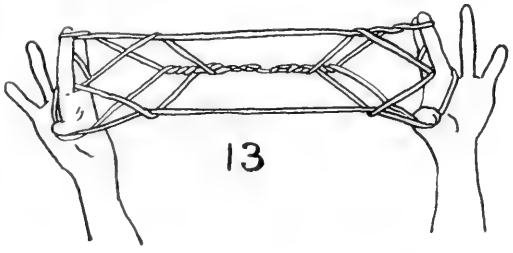


11. *Moto*, star. Ntumba; *owĕle*, moon. Bangala; *ngondo*, moon. Upoto.

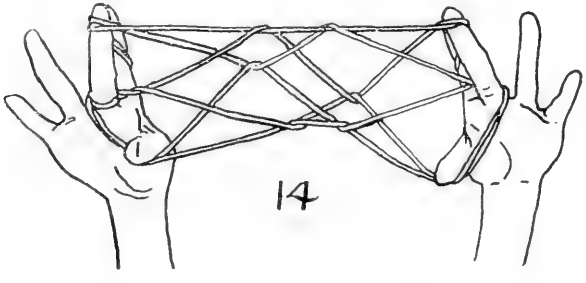


12. A string-trick trap; see *Games*, No. 30.

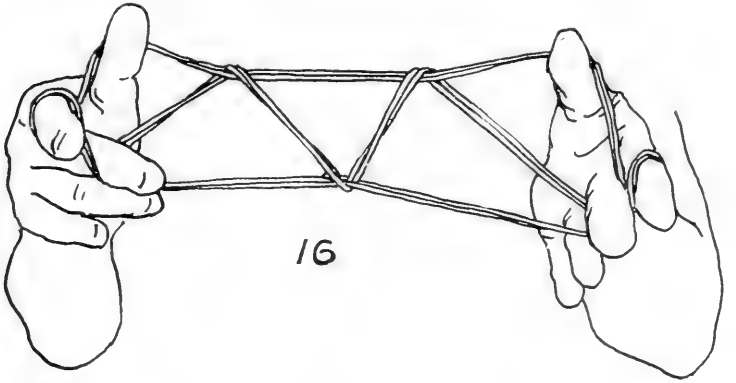
13. *Melamensoli*, monkey-tails. Ntumba.



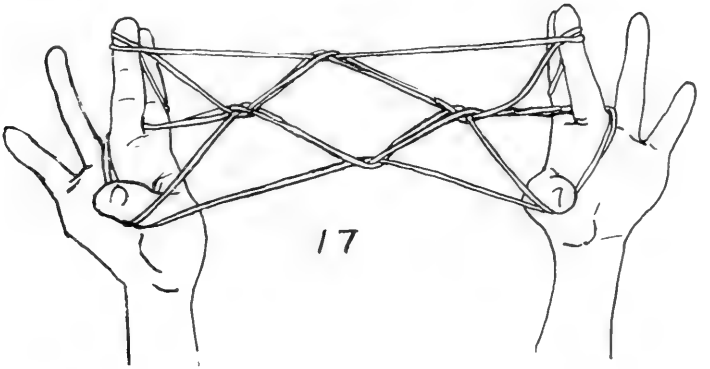
14. *Baizondeke*, bird eyes. Ntumba; *baiiso ba ndeke*, *ndeke* eyes (*ndeke*, the bird that eats the palm-nuts). Nkundu; *kasambamba*, a forest leaf. Bangala; *tofulu nkama*, birds in hiding; *cheya*, (eyes of the bird *cheya*.) Ngombe; *misu ma kusu*, parrot eyes. Upoto; *niondji*. Bakongo.



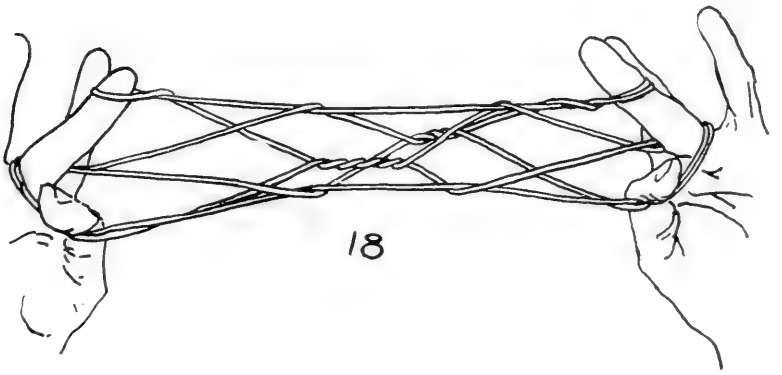
15. *Bascndjekčle*, the pleiades. Ntumba. Same design as last.
16. *Maikandzŭ*, beginning of house-building. Ntumba.



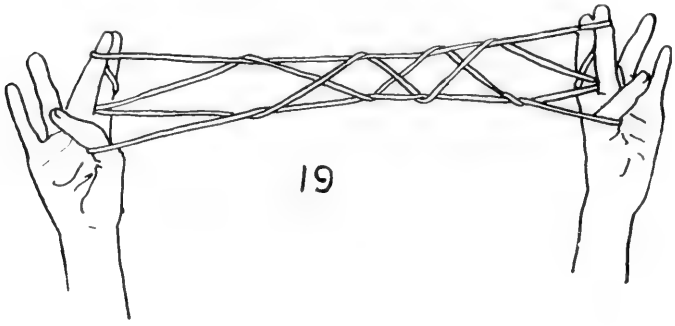
17. *Etokwa*, well of water. Ntumba.



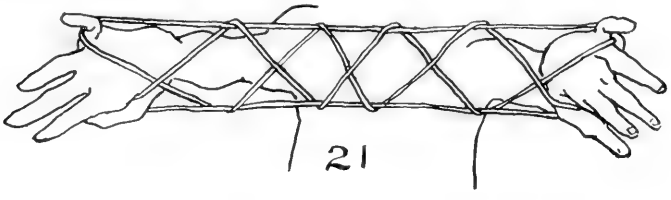
18. *Moliko*, firewood. Ntumba.



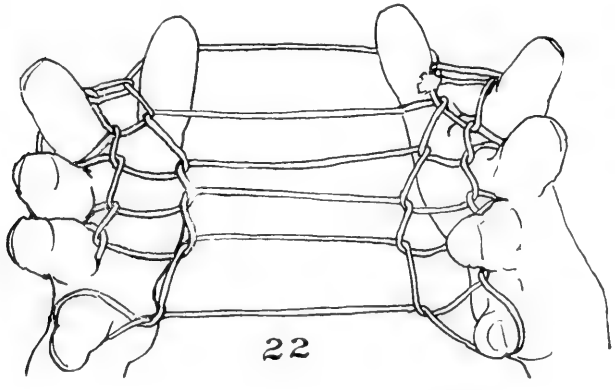
19. *Melongomčmponde*, line of swimming fish. Ntumba; *sangendote*, (small) fish. Bangala; *maondu*, small fishes. Upoto; *bombalu*, the leaf of a tree (two small, two large, leaflets.)



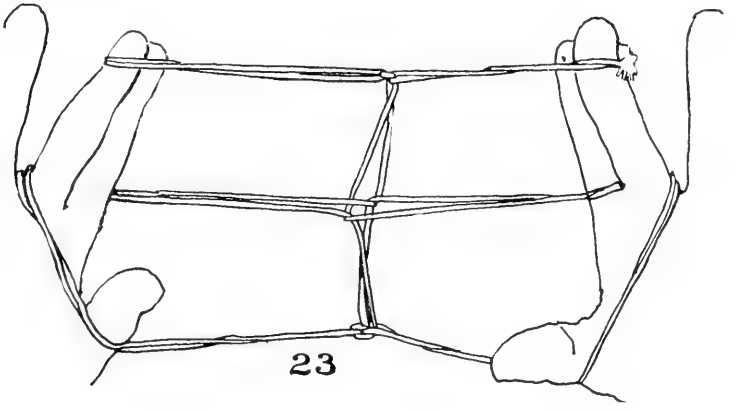
20. *Ndzo*, snake. Ntumba.
21. *Mabalongo mankuma*, boa constrictor. Ntumba.



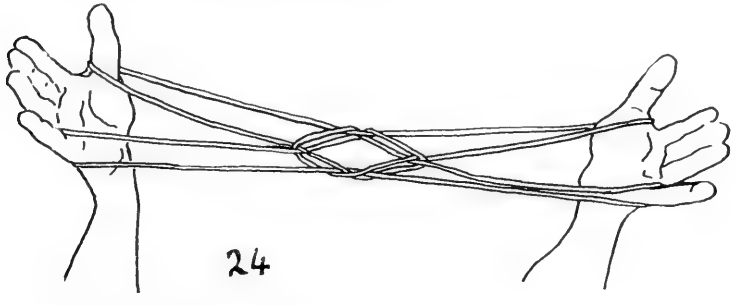
22. *Ntange makale*, ghost's bed. Ntumba; also Bakongo.



23. *Etentomba na Bakwala*, (the road from) Ntumba to Bakwala. Ntumba; *mala mabe na ndilu*, narrow road through fields. Bangala.

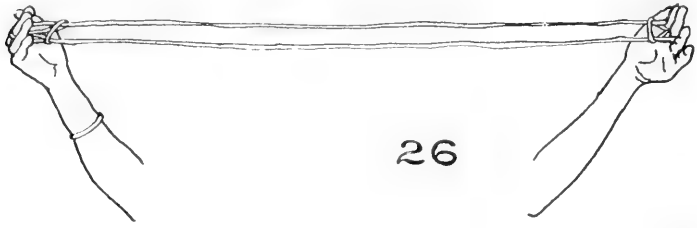


24. *Naintu*, woman. Ntumba; *bon'atu omoto*, girl, woman. Nkundu; *mwasi* or *mwashi*, girl, woman. Bangala; *mwana wa montäka*, girl child. Upoto.



25. *Malamencholi*. Ntumba.

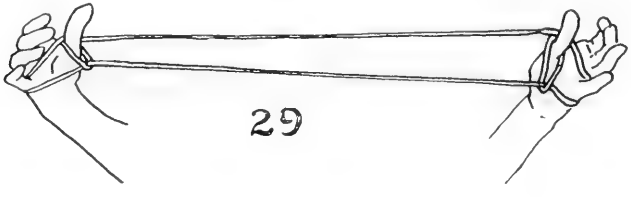
26. *Iwu na nkengu*, razor. Ntumba; *lotebu*, razor. Nkundu; *motun na nyama*, ears of an animal (a rat). Bangala; *motono makaku* monkey head. Bobangi.



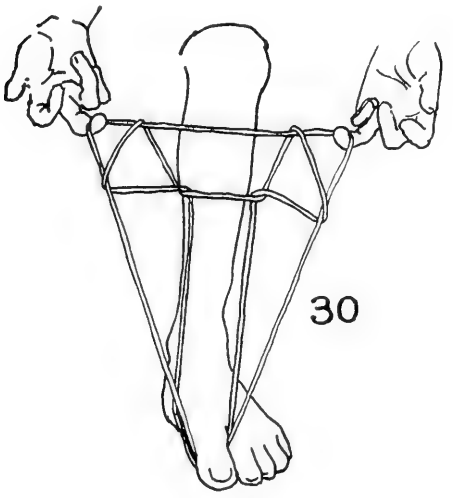
27. *Iumbi*, axe. Ntumba; probably the same as *waka'longa*, knife and hoe, Nkundu. This is the first of a series involving hands and foot at once. (Also see Plate XII.)

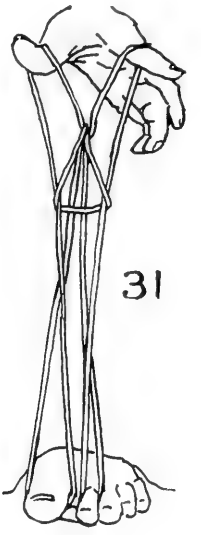
28. *Nkole la ngomo*, big drum and little drum. Baroki; but the name is given in Nkundu.

29. *Ifulu leka leka*, bird perch. Baroki; but the name is given in Nkundu.

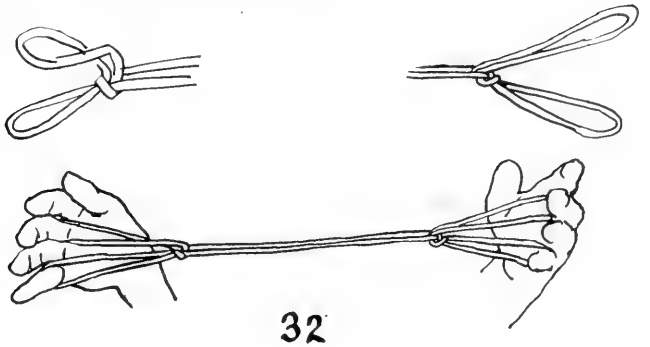


30. *Nkongo*, sickle. Bangala.
31. *Mobio*, fresh—i. e. not stale. Bangala.

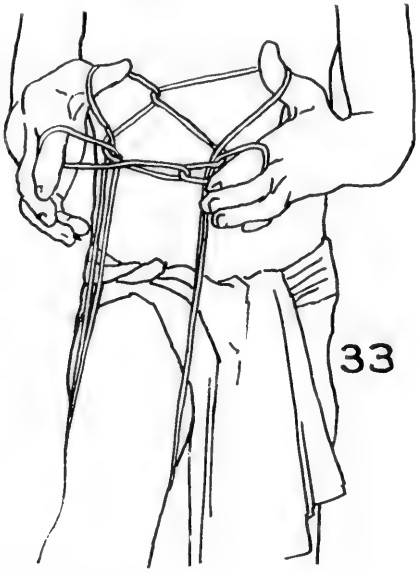




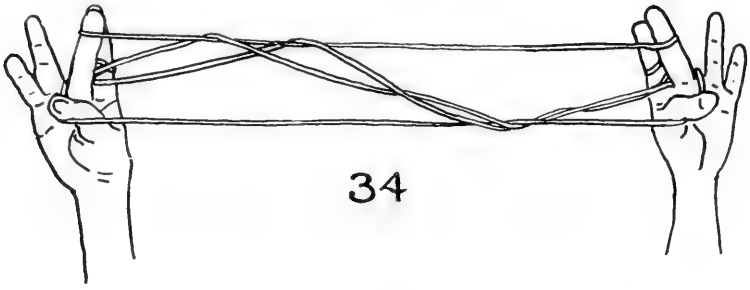
32. *Mbangba*, throw-knife; Bangala.



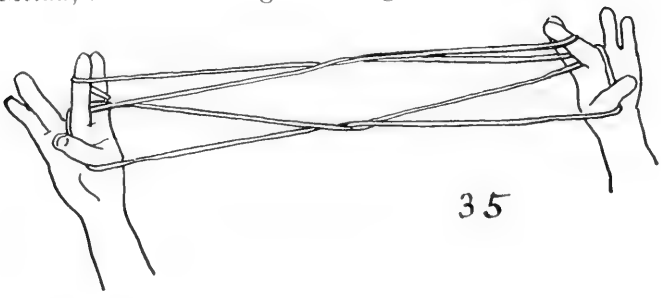
33. *Nkoli*, crocodile. Bangala.



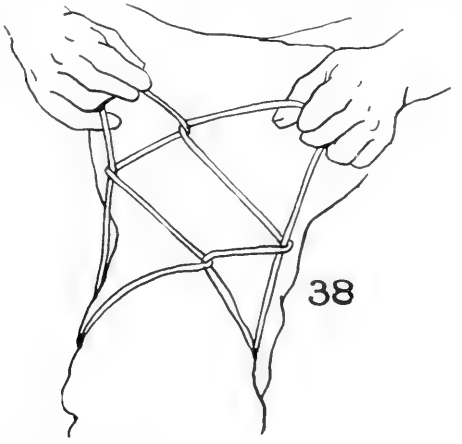
34. *Monkilo*, woman's crest cut. Bangala.



35. *Molua*, a river in Mongala. Bangala.

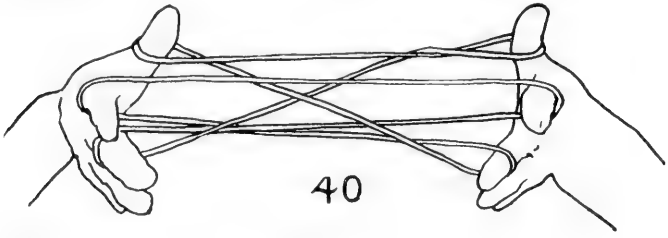


36. *Masanga*, maize; or *massanga*, palmwine. Bangala.
37. *Ndjoko*, elephant. Bangala.
38. *Dakun na nkoli*, house of the crocodile. Bangala.

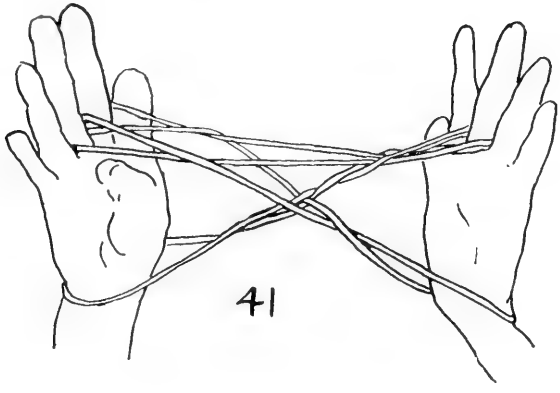


39. *Butebu*, louse. Bangala.

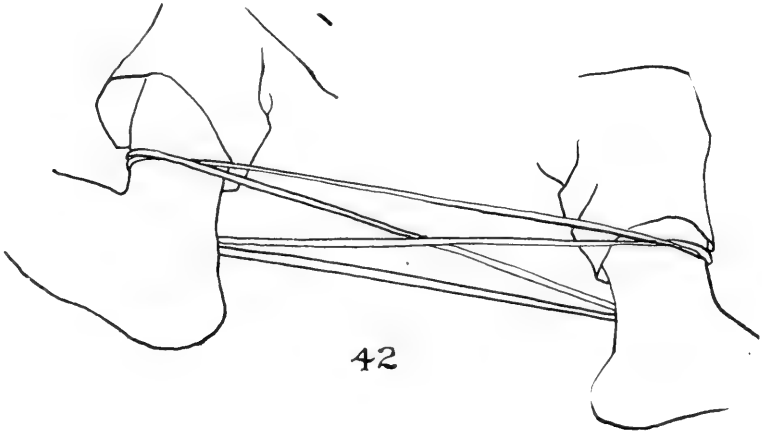
40. *Mamimu*, a man's teeth. Bangala.



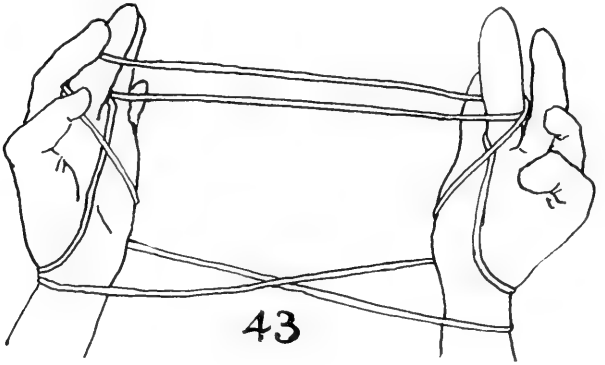
41. *Mboto*, a large fish. Bangala.



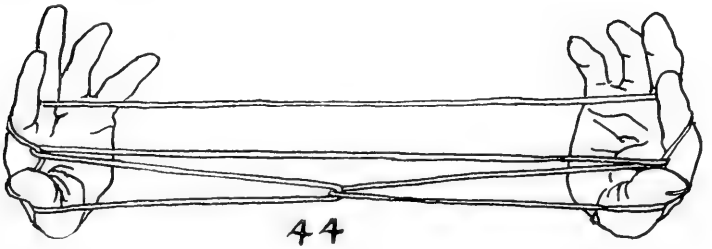
42. *Nkosu*, crawfish. Bangala.



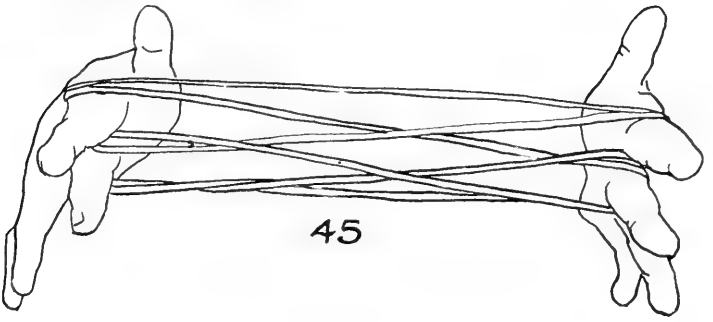
43. *Sanduko*, box. Bangala.



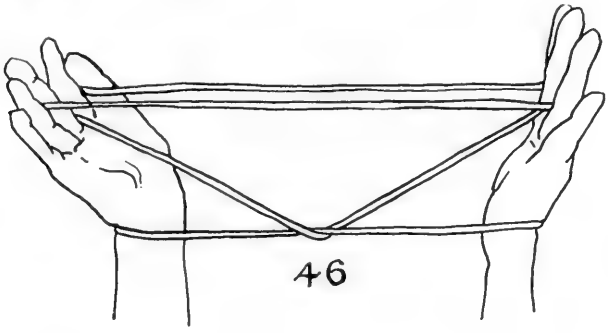
44. *Boboko*, a large fish. Bangala.

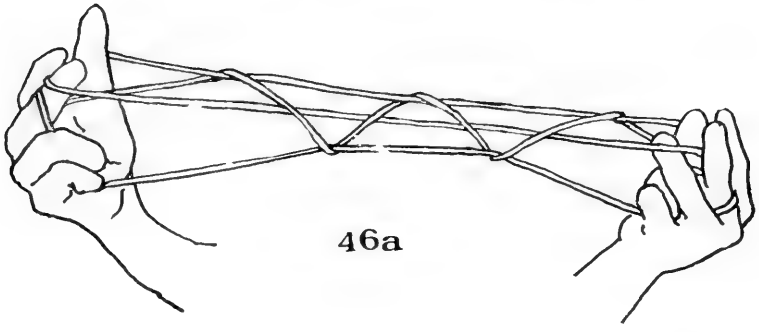


45. *Boboko njano*. Bangala.



46. *Ndaku*, house. Bangala; *ndako*, house. Ngombe. This name is duplicated but the two patterns are different. No. 46 is Bangala; 46a is Ngombe.



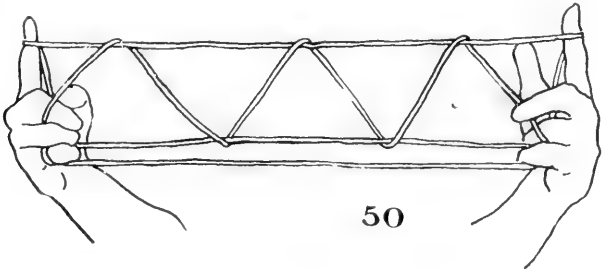


47. *Demba ya nkolo la moombo*, corpse of the owner of the slave. Upoto.

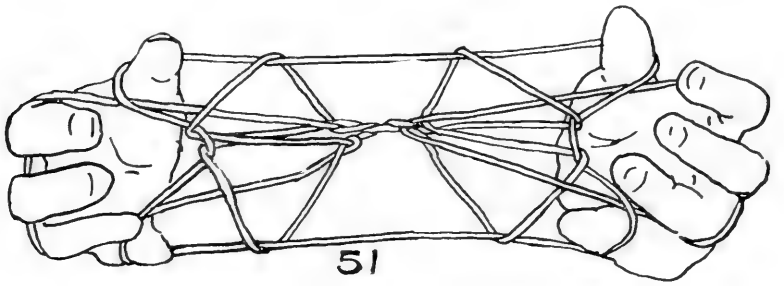
48. *Maliko mawali ndelo otei*, two rivers with a separation between. Upoto.

49. *Monkili*, cicatrix over the eyes. Upoto.

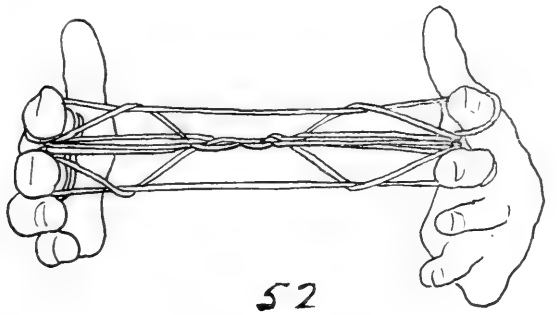
50. *Nguba*, shield. Ngombe.



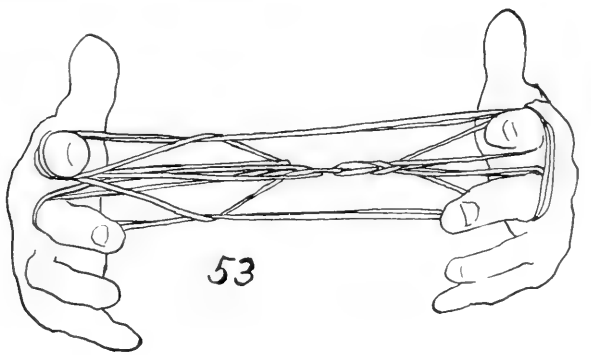
51. *Ngua*, snare. Ngombe.



52. *Mobagwa*, the long knife. Ngombe.

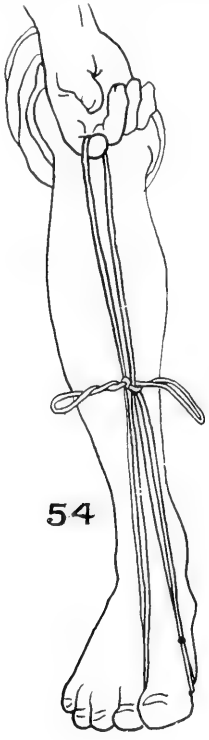


53. *Mbumbo*, knife. Ngombe.

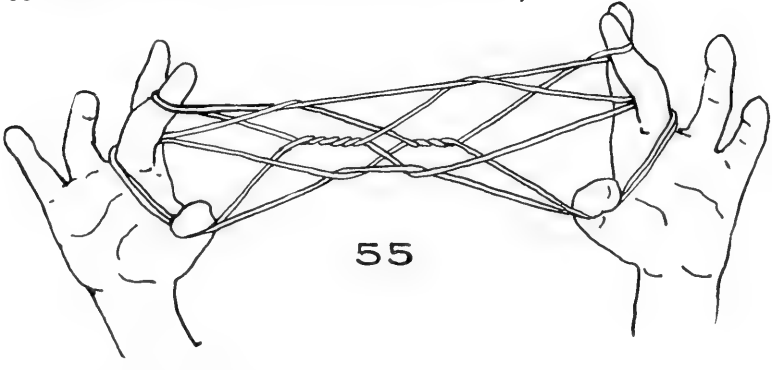


Numbers 53, 52, 51 are a series, one developing out of the other in the order *here* given.

54. *Maeli ma sembe*, the breasts of the fish. Ngombe.



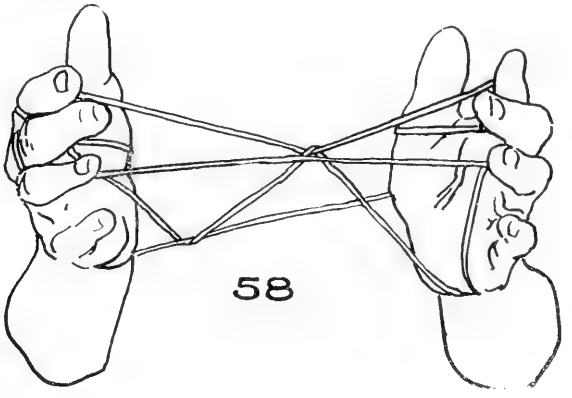
55. *Mbako*, town. Upoto. Cf. 14 and 15.



56. *Likongo*, long knife. Ngombe.

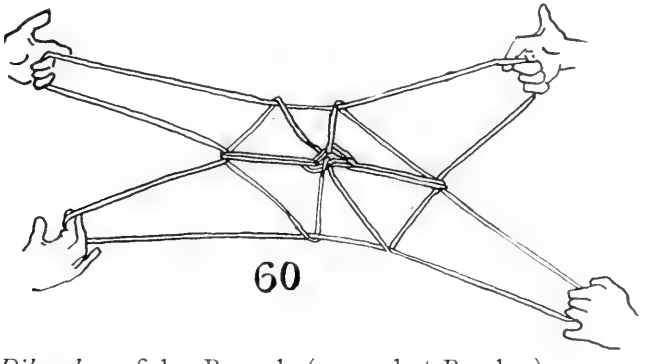
57. *Bwako*, bed. Upoto.

58. *Ndjela libĕnge*, path with pit for animal. Ngombe.



59. *Eheya*, i. e. net for *eheya;* the name is also applied to No. 14, but the figure here numbered is different. Upoto.

60. *Sänza*, mouth. Bangala; the first stage is named *ngau o ngainto*, the final *etc e lobola*. Ntumba. This is one of the most interesting and peculiar string figures. Two strings and two boys are necessary in its construction. The first player forms the central figure (small enclosure and larger enclosure of six sections) called *ngau o ngainto;* the second player takes the figure onto his hands, slightly changing its form; the first then puts in the other string. The compound figure is named *eti e lobola*. The cord is double around the central core and the lines right and left from core are double.



61. *Dibundu*, a fish. Bangala (secured at Basoko.)

From the above we are warranted in stating that a rich series of string figures is made throughout the greater part of the Congo basin. The recurrence of the same design, with the same name, (or if not the same name, one easily related to it) clearly indicates a common origin for many of these figures. Probably many local forms have developed independently in addition to the older common types. The field is yet almost untouched; not a single locality has been completely studied.

Turning now from the preceding simple, definite and well-established facts, we find a perplexing problem. My personal servant in the Upper Kasai, Manoeli, a Baluba from near Luluaburg, accompanied us upon our later journey up the Congo proper. When in the Kasai region, we made a desultory effort to find string figures with no result. Neither Manoeli nor any other member of our force (which included Otabenga, he of the pygmy diamonds) seemed to know any. When we were at Ikoko, with our work upon string figures at its height, noting and photgraphing figure after figure, Manoeli rose to the occasion. It was near evening and our players had left; the boy picked up a loop of string, and with great animation, to my profound astonishment, made in rapid succession fifty-one string figures; as he made them he gave me names, which I wrote down; it was too late for photography. His interest was keen; there was no hesitation; figure followed figure—and such figures! name followed name—and such names! Nothing like them is on record. None of his figures were symmetrical; rarely were they made only on the fingers, most of them were also on the wrists; none had simple names such as make up the regular series; they seemed rather to be descriptions with reference to different parts of the design—intersections of cords, spaces, loops all seemed to have distinct names or call for special comment; and as he mentioned one and another part or feature, he lip-pointed to the part in question. The whole performance seemed of the nature of a story to which the string figures were an illustrative accompaniment. He plainly saw men, death, palavers, salt, medicine, Baluba, in his figures. Later on, when I desired to photograph and study his figures, the boy was reluctant and it was impossible to pin him down to the list which I had copied. What figures he made and explained may or may not coincide with his first lot; I cannot identify them.

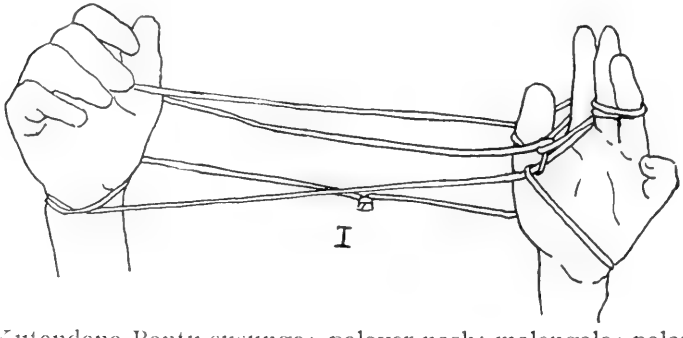
I hesitate to present material to which so much uncertainty attaches. I never met anything else like it. It may have been a passing fancy of the boy—the whole thing may have been an improvisation of the moment; it may be that it is a custom in his district to improvise stories and illustrate them with such figures —or to make such figures and explain them; or there may be definite and formal stories with string accompaniment. The material may be worthless, but it may serve to direct attention to an interesting subject. So we present Manoeli's original list of names or explanations, and such later figures as we photographed, most of them with their comment.

BALUBA CAT'S CRADLE FIGURES: MANOELI.

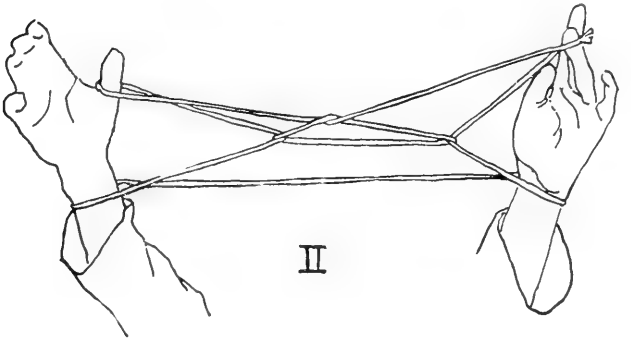
1. Baluba ndula kufuka.
2. Lukuanda budimi buankulu.
3. Mwĕnzhi katĕngele uaukubala.
4. Biakufwa biakabomba biakaiamulu.
5. Diba kunyima mundzhi kumpala.
6. Kukwata muibi mumadimi.
7. Sĕsu isatu idikwabĕndi.
8. Diba kwia na malufu bakufwa isatu kuya kufwa.
9. Muntu bakumakengĕsha nematuta.
10. Mai lubulänzhi luäbituta.
11. Biakuba ndangana biakunyanguka.
12. Gondo pilama kumichi.
13. Michi ichuka gudiukosa.
14. Diba bidikulu bakĕla mwĕndzhi bibombo nadiba.
15. Bakakualunga michi nebenakale.
16. Bantu isatu kumbelu yubĕnde.
17. Buntakila nkula.
18. Bulalu kabwena bwimpe bantu badibachibuke.
19. Bakwaka ningaläla.
20. Bantu tokubaladika tokubapa bushi bakutandangana.
21. Bantu kabena badibäsue kabena bäsue.
22. Mawezha bizhimba swabizhimba.
23. Bantu isatu kufwa nadiba.
24. Mushifu nĕmaioa.
25. Yondo nadiba kushipa.
26. Chibunda maioa.

27. Lubumina kuba.
28. Bana ba kotandangana muchisĕso.
29. Kaba kwaka muchifia lumungula.
30. Bana isambombo bionane momichi ya matolo.
31. Gondo hwakĕla bushi bibombo.
32. Pilăma momatue.
33. Lusĕnsi luchidia maioa.
34. Chidimu nabuloba biakufwa.
35. Bakakela mwana gondo mufwĕ.
36. Chula ninyoka kufwa.
37. Kafia kutanda ne mai.
38. Biakufilama mubuidimi.
39. Katenda uabakalazha chienda kaiyande kaiyibakwabo.
40. Budimi bakabuto chikĕmo.
41. Dingumba michi.
42. Gondo uaukubala kulu.
43. Chidimu ne maioa lumungulu loakudima kaluena lutodio pokufuka loakudima.
44. Chisa kudima.
45. Chinudi nwĕnza nuncu nchini.
46. Midibatambe kutandanga na.
47. Taba bidioidio.
48. Muchifongofongo nwĕnda bimpe.
49. Tuiai kwabula.
50. Muntu mukazhi kena momanyi mokosha luefo.
51. Kufaka manga abungi kenamasue bwanga bumwe bwaukusu.

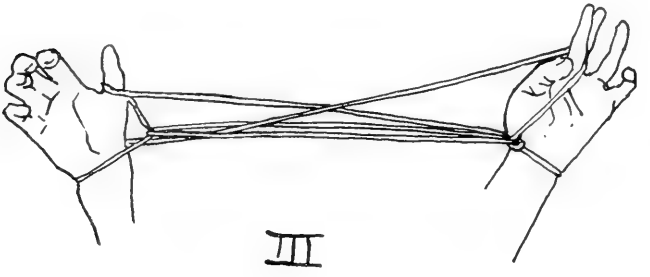
ch=in chair. c is hard.



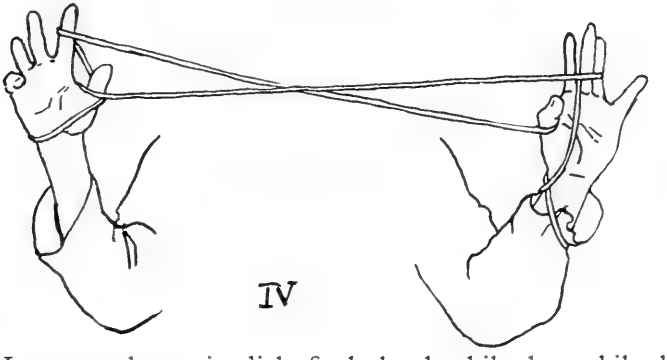
I. Kutandana Bantu susunga; palaver nash; malengala; palaver malengala.



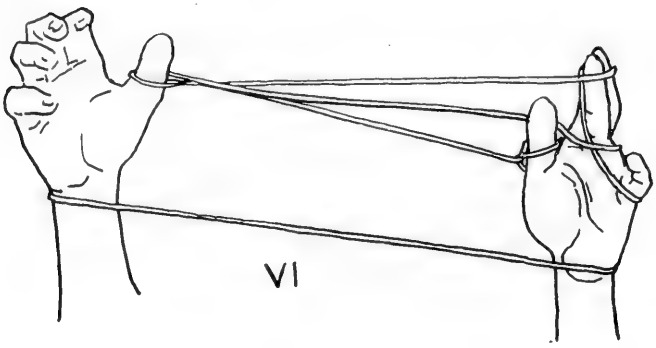
II. Lomanisha ponda kwenda; kwebela kulua fofu; malengala nasha; kulakela nasha.



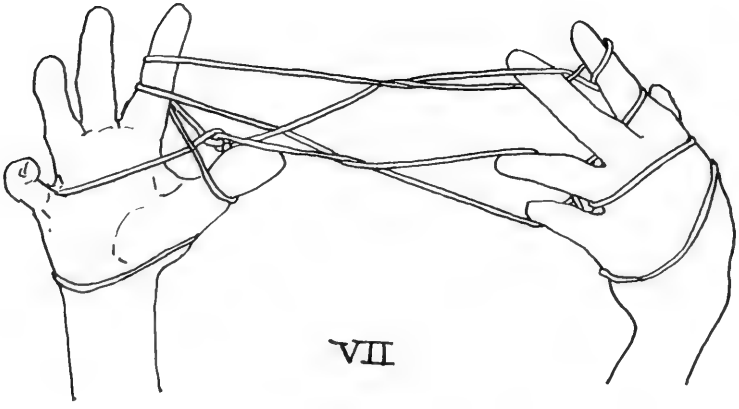
III. Katende chidima kalekale.



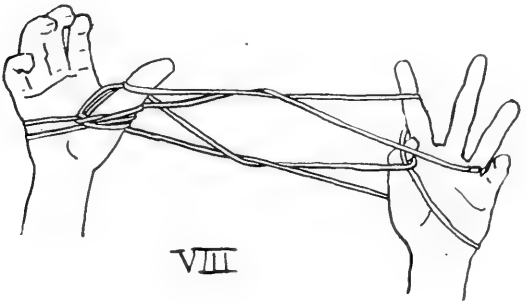
IV. Lumwe palunga iandi kufia kulua kushika kwambika kifu kakese kushika.

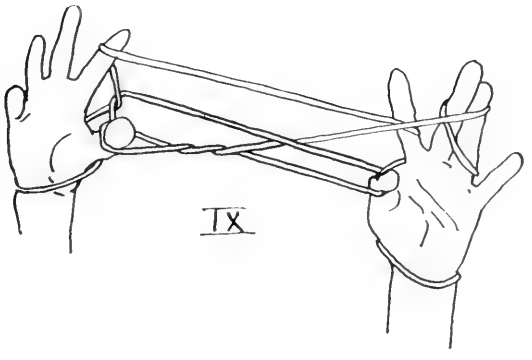


VI. Diba naluf̆ef̆ele kudisanga; shinga hif̆ef̆ele kwenda kutangila shinga.

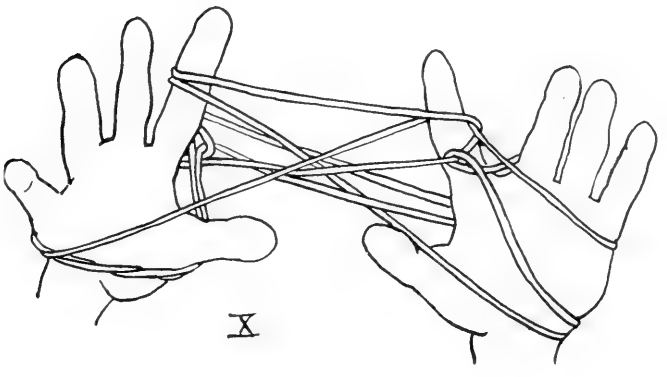


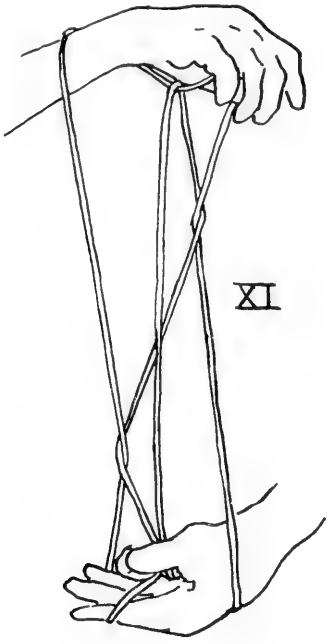
VII. Bala badi muchiiĕsu; chingunza michi chidifu.



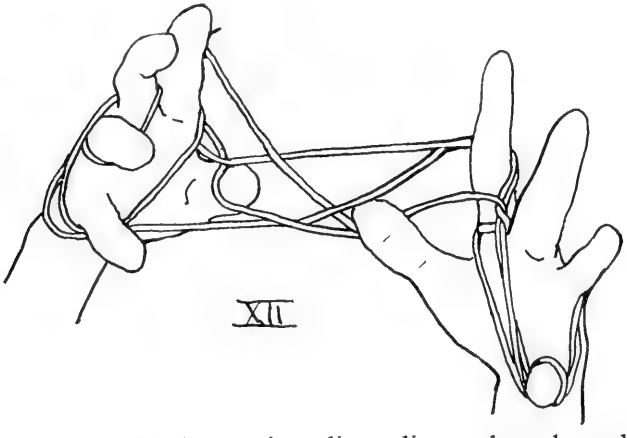


IX. Chidimu kwenda kufika nasha; katabaka chidimu kulua.





XI. Kupinda kana mikolo na malengala nasha; kwenda kulua kufwa also.



XII. Bantu badi bafwe tuai mudina; dina malengala nash; bia-kula bimpe. The general meaning is that good dead go to heaven, bad to hell.

Notes.

1. Whitehead gives the general name *meso ndende*, cat's cradle; Billington, at Chumbiri, says that the true name in Bobangi is *meso mandende*, meaning primarily lattice. This name is also given specifically to one of the figures with the meaning "lattice." The Bobangi man at Chumbiri, who was our first informant, made several figures but denied being an expert, and said the Bobangi have many figures. He only recalled names for two—*man* and *woman*.
2. Frank and Vinda, helpers of Mr. Clark at the mission of Ikoko on Lake Mantumba (where we found our richest harvest), are Bakongo. They recalled and constructed five forms, which we failed to photograph. We do not know whether they are included in the list given. The names of these five are—*dikonde*, net; *mbwetali*, star; *nlungu*, canoe; *nkiambu*, bridge; *dikumbi*, steamer—made with hands and a foot.
3. The *Nkundu* helpers were the girls at the mission-house at Bolengi. They made eight patterns all of which we had found at Ikoko, among the Ntumba; all of them bore names, which were Nkundu equivalents of the Ntumba names already written.
4. While the Nkundu girls were making figures, Captain MacDonald of the mission steamer, Livingstone, became interested and sent for a Bonginda woman from the steamer. She once knew many but had forgotten most. She made five designs, "fish eyes," "boy," "bird perch," "houses of the Foto and the Lumbi" ("pygmies"), and "little drum and big drum." The last three were new. She gave the names in Nkundu, but the attribution of the figures should be to the Baroki.
5. At Basoko we made little inquiry and failed to find any actually local figures. A chief, Ausu, was there "from up the river;" his people knew the game well, calling it by the usual name *mwana*, child, but could make no figures. A Bangala tailor, long at Basoko, made many figures, some of which were new; these are credited to the Bangala in our list. A boy named Sumenge here gave us several figures which he said were Balumbu, his tribal name; among his were *lingčle*, band, much like No. 12 (see Games); *afuto*, a fish, very like No. 6, and a new one, which was not definitely noted.

PROVERBS OF UPPER CONGO TRIBES.

Various writers have printed collections of proverbs from African tribes. These collections have usually come from true negro, not from Bantu, tribes. Examples of Congo proverbs are scattered through many books. Of collections of such proverbs we may mention Taylor's *Saws from Swaheli Land*, Ruskin's *Proverbs, Fables, Similes and Sayings of the Bamongo*, and Cordeiro da Matta's *Jisabu, jiheng'ele, ifika ni jinongonongo, jesoneke mu Kimbundu ni puto kua mon'Angola*. The latter title may be translated *The philosophy of the people in Angolan proverbs* and the author was a native of Angola.

In 1904 Mr. Farris (Bakola—native name) and Dr. Royal J. Dye, located as missionaries at Bolengi, close to the Equator, and but a short distance below Coquilhatville (formerly Equatorville) printed a collection of Kkundu proverbs under the title *Bakolo bi'ampaka ba Nkundo. Bikolongo la nsako. Beki Bakola otakanyaka*. [Stories of the elders of Nkundo. Adages and proverbs. Gathered by Bakola.] The collection consists of three hundred and thirteen proverbs and forms a small 16° volume of twenty-three pages. It was my purpose, with the assistance of Dr. Dye and native helpers, to reprint this whole list with translation and explanation of all the proverbs. Fever prevented my carrying the plan to completion. Part of the collection is here given. The order and numbering of the original are followed, although a few "dark sayings" have been omitted. The use of proverbs among the Nkundu is general. It is a common custom, when a younger person meets an older or wiser one, to ask the aged or wise man for an *ekolongo*—i. e. a saying or proverb, a bit of wisdom.

A small collection of Ntumba proverbs is given. These were neatly written down for me at Ikoko by a native who had learned to write in the mission school. They were translated for me into English by Frank, a Bakongo by birth, who knows the language of the Bobangi, Ntumba and Bakongo and speaks excellent and discriminating English. He is one of the native preachers assisting the Rev. Joseph Clark at Ikoko. Unfortunately, there is confusion in his numbering of the translations. It has seemed best then to give only the English version of these proverbs.

A few Foto proverbs are here given. These were secured for me by Annie M. (Mrs. William L.) Forfeitt. They are printed just as she wrote them down.

NKUNDU PROVERBS.

1. Aki'mi l'omi, ncukaki senenge,
   Njobwey'omi, njoluka senenge.
   When I had a husband, I did not divide the waters;
   When my husband died, I divided the waters.
   (The figure is drawn from water in the forest, divided into small streams or threads by streaks of mud. The meaning is—I became fickle—divided in mind and purpose.)

2. Aolocwela nkumba.
   He has become hunch-backed.
   (He humps over one task; sticks only to one thing.)

3. Baanga 'aki eka nkoko l'isëli,
   Mbile 'aanga, mbile 'alolombo.
   The timid one with the elder of reputation,
   One day they fear him; one day they beg of him.

4. Bacwaka lifaiya ek'iseka: "Meka meka;"
   Njocwa lifaiya ek'iseka, mela mela. (Lolo.)
   You scold the leopard
   And you scold the people who are with him.
   (You cannot blame one person in a group who have done wrong. Scold one, scold all.)

5. Bafela nkoi, bafel'and'ol'anza.
   They spread a net for you and you saw it;
   Now that you are caught, you grumble.

7. Bank'a'nzala, we kika mbimbe!
   These are hungry; you are the only one to be filled!

8. Baino 'aki mbuji.
   The footprints of the *mbudji*.
   (The *mbudji* is the water antelope. The leopard met her in the way and said "I am tired; let me go along with you and your family;" he was afraid of her horns so took the rear; she led the way, her young ones following. Leopard ate one after another; then said to himself "The young ones gave me no trouble; I will take her from behind." When you are weak, don't show your weakness.)

9. Bakinaka nd'okitake.
   They give bountifully to the one who receives (entertains?)
   (He who refuses, gets nought.)

10. Bakoka; wangana; tokel'a we mo?
    They gave to you; you deny; what shall we do with you?

11. Bokotomaki nda'telo;
Wambambo nd'ojiko!
They sent you up onto the roof;
What are you feeling for up there in the loft (storage place)?

12. Bana ntasonganaka'dongi.
Children have not all the same faces.

13. Banjuol'a nkesa
Nk'anyomaki l'okolo.
They greet me in the morning;
At night they call me names.
(Good to my face; bad behind my back.)

14. Bank'afe,—outotenola jimo!
Two plantains only—you eat one!
(You cut away the support beneath you!)

15. Baoka nyongo nd'okeji;
Balongo baocia ngele;
Bakanela bokofo wa nyang'oleki.
They killed their mother in the swamp;
Her blood has gone down the river;
They think her fickleness was extreme.
(She brought ill-repute on them.)

16. Basangi nyango ntayaotajak'iwawa.
Who have the same mother are not poisoned by the same snake.
(They will assist each other in danger.)

17. Basi ndomwa: "Feca ça."
Water in your mouth; "blow fire."
(When in debt and your creditor is urgent; this said, is equal to "Give me a chance.")

19. Batuj'ituji a mboka wete l'alaki.
The smith is smithing in the path because of teachers.
(They have been taught their trade. Instruction is necessary: it must precede accomplishment.)

20. "Beliya, tocikele nkoi ije ikae!"
"*Beliya*, give the leopard his place."
(The *beliya* is a small animal. Insignificant beings must give way to important ones.)

21. Besoombo locwela:—
Bacwa jombo bafocutela.

The leaves of *besoombo* thrown down:—
Are in the grave and in every turn.
(The *besoombo* is a sacred plant, the leaves of which are used in secret ceremonies. The proverb means that an article once taken from its proper place is never restored.)

22 Biçe'pe isan'isangi!
Two countries—do they imitate each others' games!

23. Bita nkombe o l'onto o f'a nsoso;
Bas'ilongo o l'ont'ofea mbombi'aoi.
Scare away the hawk, you people who have no chickens;
Scold your relatives, you who do not know how to keep counsel.
(You're a fool to scare away hawks needlessly;
You're a fool to alienate your relatives.)

24. Bobimbo nko lobya,
Nk'ome w'etuka.
The *bobimbo* bears no great flowers;
But what large fruit it has.
(Show is not always a sign of substance.)

25. "Bobina ntoata, ngomo nkeketela!"
"You have not had a dance; why are you carrying a dance drum?"
(The thing does not concern you. Why meddle in another's business?)

26. Bocik'a nsoso:
Ng'omanga ntokumba, ifoyala lobi enkolonkoko.
Spare the chicken:
If the wild-cat does not take it, it will become large.
(Do not despise small things.)

27. Bofaiy'ekendo, jidak'obe.
The fickle stranger, has bad ways.

28. Bofaiya nko nyango, nk'oki'nd'omocwela.
The motherless stranger, enters everywhere.
(An ill-mannered person is assumed to have had no maternal care and instruction.)

29. Bofaiya ntayasukaka.
The stranger never limits himself.
(One at home should, of course, do so.)

30. "Bojang'okam! nkocikaki nda lofaka,
Okici ndansi okeli mo?
Nyama en'asembe ekukoji na?

My net! I left you hung on a stick,
You are down, what are you doing there?
What animal's tread has pushed you aside?

(Said in joy, when one thinks he has gained something. The net is a snare net for catching animals.)

31. "Bokale, nyang'olenga,
Ofonjukol'emi ecima."

"Comrade (partner, or wife) lest you should betray me
Do not break down my dam."

(A person who hates you will get you to do something that seems all right, to harm you.)

32. Bokeke aleba, ba nkal'atonga.
Foolish fish! They are building a fence about you.

33. Bokeng'a mpota, jobong'a nganja,
Boele wa'kaci ntawocwamaka,—
"Oyofat'entoku, bonto f'eduku."

The *bokeng'a* is cut, the *jobong'a* is hit with a stick,
No one enters the verandah of the *dji'kaci*,—
The one who has wronged the peaceable one accuses him, although he is blameless.

(The *bokeng'a*, *jobong'a* and *dji'kaci* are three different kinds of fish; the two first are peaceable, the last is quarrelsome. The meaning is that a quarrelsome man attacks all and is best avoided.)

34. "Bokenge wa ngoya! ncikokela joi,
Tososongo tonko ca-i?'

Fish of my mother! I have done you no harm,
Why shake your head at me?

(Fish of my mother, means the speaker. It is equal to the exclamation Ah me.)

35. Boke nk'ifaka,
Asesaki nyama l'akata,
L'ola w'ifaka inkina.

Boke had no knife,
He tore his meat with his fingers
For lack of other knife.

(*Boke* is a mythical person. This proverb is said when a person is asked to lend the only thing of a kind he possesses, and is equivalent to a refusal.)

36. Bokila bolindola, banganju bataye.
The game has come home, but the greens are not cooked.
(When everything is ready for action, but delayed by the non-appearance of one person, or absence of one thing.)

37. Bokilo l'okanga nta buna.
Nkele nta yela mba.
Those related by marriage are not accustomed to fight,
The unripe palm grove yields no nuts.
(Those related by marriage look forward for returns of value. Persons interested together in future profits have a powerful incentive to keep the peace.)

38. Bokitasi w'angala ng'ol'a wani,
Ma ncici nga nda jembo.
The habitation of a scold is like the heat of the sun,
That of a quiet woman is like the coolness of the spring.

39. Bokoletaka ntakendaka l'onto.
The quarrelsome man does not go with others.
(The word *bokoletaka* means a combination of all quarrelsome and disagreeable traits. Such a person is shunned.)

40. Bokolo boki engambe l'onoju.
The old man's offer to the boy.
(This is not equivalent to "Hobson's choice," but is in the same class. The old man said to the boy "That thing you have there fits me; here, take this in trade." It is said when an undesired, but unescapable, exchange is offered.)

41. Bokonji mulumusu:—
Nkingo ea njoku efoong'elefo.
The ant hill is solidly banked up:—
An elephant's neck is not made to hang a bell from.
(Don't waste time in attacking a strong thing.)

42. Bokune oki nkema.
The younger brotherhood of the monkey.
(Large monkeys always precede: lesser ones follow. The expression is used when an older brother snubs you or when some other person demands a superior recognition.)

43. Bokwokwo aokyela jev'a, mbolo y'oca.
Bokwokwo wakes up with the sun.
(*Bokwokwo* is a morning bird. The meaning is "You are eternally summoning people before the judge with palavers: but you will find how it is yourself.")

44. Bokwokwo la jeva, engambe nk'okwokwo;
Bokwokwo atefela, jeva ataye.
Bokwokwo and the sun, *bokwokwo* is up first;
Bokwokwo speaks, the sun has not yet come.

45. Bolando djicangafofi lotomo djim 'ele njwa.
Bolando was sent by the snake.
(*Bolando* is a small, venomous insect. The proverb is equivalent to saying "the little fellow does this because his master sends him." An insignificant enemy may be egged on to wrong us, by a more important and serious one."

46. Bolango wa kongontala.
The *bolango* of the praise-seeker.
(The *bolango* is the climbing-hoop, used in going up the palm-tree after the juice, which fermented becomes palm wine. It is a means of mounting. Reference to the climbing-hoop of the praise-seeker is equivalent to urging a man to attend strictly to business.)

47. Bolemo wa jeka bosila mpamba.
The work that you are learning, exhausts or wearies you.
(Perhaps, conversely, practice makes easy.)

48. Bolemo w'onto wa bakabaka.
A man's trade never ends.

49. "Bombambo, endimola w'a paki,
Okus'olo'ompompo.
You *bombambo*, when the *djipaki* is taken away
How will you stand the wind?
(The *bombambo* is a large tree of soft wood; the *djipaki* is a well-grown strong tree. Said to one who depends upon another.)

50. Bombolo besise—
"Baninga basisel'ilongo,
Wosisel'elaji!"
The *bombolo* halloas
"Your brethren shout to their relatives;
You shout to the empty forest."
(The *bombolo* is a small animal, somewhat like a monkey: it cries a-o a-o. The term your brethren, means the other animals. The question appears addressed to the *bombolo*. The cries of other animals have some result; his halloa is vain, meets no response.)

51. "Bomongo'a nyama,
W'a yuka y'esofo!"

He himself has meat
And you come with a basket of entrails!
(This is stronger than our "carrying coals to Newcastle.")

52. Bomongo w'eanza aokila toma:—
"Bofaiya, ambol'isungi, wocwa."
The man of the house fasts:—
You, visitor, pick up your lamp and go to bed.
(When a man and his wife quarrel, get out of the way.)

53. Bomongo w'ilaka aomel'asi,
Bafaiya bif'ongol'ekoko.
When the mourner for the dead, himself drinks water,
Visitors will pick up sugar-cane.

54. Bon'oa nsonso bokele,
Jasa nde, bonkan'okae.
The child of the hen is the egg,
What do you want, I am his relative.
(When a man has a palaver, his son has a right to take part in it.)

55. Bondenge boki njoku:—nk'omonkolo:—
Ayomele, boyokwe, k'ayomele, boyokwe.
The fruit that was eaten by the elephant: there was only one:—
He ate it, he dropped it, he ate it again, he dropped it.
(A man with one wife. This is used as a slur upon the christians at the mission.)

56. Bondenge aokwa ndanse.
Nko nyama e fokuluta.
The fruit that has fallen
There is no animal, but drags it about.
(All kick the man that is down. The proverb is also often applied to christian converts who make no angry reply.)

57. Bondenge jatana mboka:—
Bomoto ntayaka ntefeji ng'ey'ome.
Fruit lying in the highway:
A woman never has so strong a voice as her husband.

58. Boninga al'eka'nde,
Yakiliki yeke!
The brother who is always at home (in his own house)
Lies back at ease, in his strength.
(A man's house is his castle.)

59. Bojiko botongi, nk'engambe al'eko.
The loft (store-room) is tied strongly, when an elder is present.
(An elder gives stability to a gathering; a chaperone should be present.)

60. Boninga l'ona,
W'a tola ca'bota.
The friend who has a child,
You laugh at his generosity.
(You consider all other parents indulgent. Would some power the "giftie gie us.")

61. "Bonkonkomo! oamba nkasa, oamba nkombe,
Mpaoyale w'a na?"
Bonkonkomo! you bend this leaf, you bend that leaf,
Where will you stay.
(The *bonkonkomo* is an insect living in the forest. Troublesome fellow! you bother one, you bother another; to whom can you go?)

62. Bonoju asana nd'asafa,
Asela nyango l'ise 'olemo.
The child who plays in the mud
Makes trouble for his father and his mother.

64. Boseka nkoi, lokola nkingo.
The friendship of the leopard; a claw in your neck.
(Like nursing a serpent.)

65. Bosoombo nko lituku,
Bokombe nko lokole,
Boselenketa nko lela.
The leaf has no beauty,
The papyrus (reed) has no hollow,
The lizard has no path.
(The explanation given "a song of good cheer (of food)" means nothing to me. Perhaps the meaning is akin to Eat, drink, and be merry, for tomorrow we die. (?)

66. Bosai'omonkolo bondotaji mpota,
Beuma beyokoka l'alongo?
One finger gashed,
All the fingers are covered with blood.
(If one in a family does ill, all are smirched. Probably also, if one suffers, all are involved.)

67. Bosai'omonkolo nt'imolak'esiji nd'oca.
One finger does not get the lice out of the head.

68. Bosaka ca,
Nyam'efoso,
Ifak'ontuni.
The palm-oil is hot (for the chop-food)
The meat is in its skin,
The knife is dull.
(The meat must be taken out of the skin and cut up before the chop can be prepared. The meaning may be much the same as No. 36. It may perhaps also mean, that a good workman has his tools ready.)

69. Bosaso ondongol'efoso.
Your rebuke of noise causes greater noise.
(The remedy is worse than the disease.)

70. Boseka boki lokongoto la losankele.
The friendship of the ant and the caterpillar.
(Something like that of the lion and the lamb. When a caterpillar drops from a tree, the ant eats him.)

71. Bosoki w'ojiba bokita lobi ntando.
The humble brook, becomes tomorrow the great river.

72. "Botema! amby'okanela,
Onkaka ntaata."
The stomach stops wishing:
The giver has no more.
(It is necessary to be content with what you can get.)

73. Botema nganji, Jibaci yuwe.
The stomach is large, the purse small.

74. "Botema nkombe, jikata ingulu,—
Oleke y'onto, ike nko ndeya.
Nkombe's stomach, *ngulu's* hand
You eat from others, you feed none.
(*Nkombe* is a greedy and ravenous hawk. *Ngulu* is a little animal with sticky feet. The second line carries the full explanation.)

75. Botute 'a mpongo,
Eoka l'omenge,
Bolango ondumbi mbela nd'ikelele.

The pestle gets the fat
The mortar gets the leavings,
The climbing-hoop is left on the verandah.
(The plodding worker, through whose unobtrusive help a result is gained, is neglected and unrewarded.)

76. Bowa ntasambaka mbula.
Mpela ntasambaka biani.
Boseka ntasambaka aoi.
The season of low water is not rainless,
The season of flood is not sunless,
Friendship is not without unkind words.

77. Bowa onga nk'ambula,
Boseka onga nk'aoi.
The season of low water is best without rain,
Friendship is best without unkind words.

78. Boya w'itefya.
The friendship of the mischief-maker.
(It calls up the man who professes friendship, while he plots troubles.)

80. Ebimbakaka l'ekalemaka,—
Oakaka nk'ebimbakaka.
The wideawake man* and the sleepy fellow
Who *has* is the wideawake one.
(*Literally—the fellow whose feet are together.)

81. Ebusu efoleya walekele nkautau.
Afterpains do not feed the woman who has borne children more than once.
(You have eaten; I have not. I sit down to eat and you, from greed and stinginess, ask for more.)

82. "Ecima, cikala, oleki'engololo."
High-water pools are left, the babbling brook obliterates them.
(A wife prized and loved for some high quality, spoils all by talkativeness.)

83. Ecina ea weza w'esai.
The quiet worker divides (apportions) with his fingers.
(Said in sarcasm of persons who plan and systematize but do not accomplish.)

84. Efekele ey'otaka;—
Bont 'o kinda olengeji elaji.

The stump of the *botaka;*—
A person stuffed with the loneliness of the deserted village.
(Said of the last survivor of a family line.)

85. Efoji aki nk'olombo;
Mpaka ey'onto aki nk'inkuni.
The old and withered leaves were once green sprouts;
The oldest man was once a babe.

86. Efoji ey'okengesano;—
Bosaji w'okali ntaofomwak'etaka.
The old and withered leaf has shrivelled:—
Your wife's workman should not be struck.

87. Efombo ecwa wato.
The well-appearing man is passing in a canoe.
(A man appears well and you exclaim over his fine condition; he is below sores and filth. "Distance lends enchantment.")

88. "Efomi, mela ntongi,"
"Botema, melak'atanda,"
Mpak'ey'onto ntasambak'iso'a wanya.
The *efomi* produces its sprouts,
The stomach produces its proper fruit,
The oldest of men is not without a grain of sense.
(Neither translation nor meaning are clear. Perhaps, everything has its use.)

89. "Ekei, kok'okwa,"
"O le l'ilongo kok'aoi."
Harden the salt, a broken pot,
Who has relatives, show forth deeds.
(After you have made your salt, you can break the pot. Do not destroy a bridge until you have passed over it. Keep your friends, by good action, as long as you are likely to need them.)

90. Ekeng'okwa. Baolek'ekeng'okwa.
Hard salt: they have passed over to hardened salt.
(When people have become fixed in one idea.)

91. Ekoko walala.
Knife; going and going.
(*Ekoko*, a large knife. The saying applies to a woman of value, who is *all the time* working; not entirely praiseworthy. Cf. All work and no play makes Jack a dull boy.)

92. Ekoni la limeko,
Botuci la lila.
The invalid and his groans,
The doctor and his food.
(A practical suggestion; the doctor should not be left without food.)

93. Ekota el'a nkolo ntaifomwak'oambo.
The aged person who has a master is not struck with a whip.

94. El'etongo o nd'oseka.
The place of a brawl is with those who are friends.
(A man's enemies are those of his own house.)

95. Elewiji ea wij'oloko:—
Towoki o joi, nta towenaka.
The news of the place by the *boloko*
We hear but do not see.
(No one ever goes there; the people are dangerous and quarrelsome.)

96. Emi'a we'ayokende,
Iyaya nkako,
Iselengani nk'ako.
You and I, friends, are going together,
There was scant generosity,
There was also a little deceit.
(Miserly treatment breeds deceit.)

97. Emi la'bong'efelo'atefela.
I and my leg* were talking.
(*My knee and thigh. This answer is made when someone asks what you have said—your remark not being intended for him.)

98. Engambi l'ikute,
Jino j'ilongo.
The old man who is frugal
Is hated by his relatives.

99. Engambi nko'doka; Wete inkunya ileko.
The old man may not have a devil; but he is mean.

100. Enganyu ea yuka;—
Abwaka o nd'okongo wa nkolo.
The dilapidated basket spoils;—
It rots on the back of its master.

101. Enkweele aolemel'efekele.
Enkweele praises the stump.
(*Enkweele* is the woodpecker, boring into a stump. His judgment regarding stumps need not be of the best.)

102. Entumola bona, nyango oka,
Jidelo j'ona, nyang'ekeseji.
You tease the child; the mother hears,
The child's cry causes the mother sorrow.

103. Esang'osato, lofole lonyola yuka.
The hand* that you carry under your arm; will one of the fingers† overfill a basket?
(*Hand: i. e. a cluster of bananas side by side; †here no word means finger—one of the bananas in the cluster is meant. The meaning is —do little things overcome you, you who are able to do great ones.)

104. "Ensansabiengi! amby'omboma la bianga, em o kwekeji."
Ensansa! stop pricking me. I am the one who has been useful to you.
(The *ensansa* is a nettle-bearing tree. You nettlesome fellow; don't hurt me: I am your friend.)

105. Esenga ca wanya;—
Atumbak'ona ca, nk'of'okae.
The fool burns the child;—
But, wisely, not his own.
(It is usually some one else's property that is lost or injured by the blunderer.)

106. Esombo ca nkosa ntayaka ng'oca.
The bundle of *nkosa* never clumps up into a head.
(*Nkosa* is a fibre used in net-making. The meaning is said to be wickedness is never gathered together; it is distributed evenly.)

107. Esongo mpampa l'olima!
The nodding of the bare head causing praise, how much more that of one crowned with feathers.
(Generosity, condescension, should be proportionate with rank.)

108. Esukulu aanga mpoko o nd'ekele.
The rings of *esukulu's* eyes begin in the egg.
(*Esukulu* is the owl.)

109. Esulu ndajiko, basi ndanse,—
"We wecaki l'otefe ane!"

The bog above, water below,
You who pass, will you float on it?

(The meaning does not seem uncertain. The explanation given is less clear than the proverb itself—a person's stomach may be evil; his mouth good; be careful, you will get your feet wet.)

110. Etuka ea mba ntakweka nko kol'ekasa
Nkang'efoso ntaseka l'omi nko and'okale.
The bunch of palm nuts never falls
Without catching up some leaves.

(So the chief of scolds never quarrels with her husband without involving a fellow-wife.)

111. Etumbe ntabelak'isano y'otofe.
An invalid does not seek the game of hockey.

112. Fafa aontanga waji,
"Baina'a nyama, lonkolonga."
My father has called me a wife,
The animal's tracks are plainly seen.

(Whereas I considered myself a daughter, I am treated like a wife; before I had pleasant tasks, now I endure drudgery.)

113. "Fanza yuku nd'ilombe,
Mpang'oat'ilongo."
Hang up the basket in your house
And you will have relatives.

(Stay at home and you will have visitors.)

114. Ibw'a bienelo,
Joso bienelo.
Death or troubles: troubles first.

115. Ifulu akwena nk'osongo.
When you have no weapon you see the birds.

116. Ifulu ilek'onkena ntayetaka.
The birds that eat the *bonkena* do not come by your asking.

(*Bonkena*, a kind of fruit. It is not necessary to be called to your regular meals.)

117. Ifulu ntafondana nd'ajiko
Afondaka o ndanse.
The bird does not rot, up above,
It rots down on the ground.

(No matter how long a visitor stays, he goes home to die.)

118. Ifulu yotutama la jumbu.
The bird is approaching its nest.

119. Ik'akona; "Mbwa yotute!
Onjetela mbwa ansilole?"
"*Iko* is sick; dog, come and doctor him."
"Call the dog for me and let him finish me?"
(*Iko* is the porcupine: dogs kill porcupines. If you and I are always quarreling, when I get into another palaver I will hardly call you in to settle it.)

120. Ikasa nda ngonda,—"ombombe."
The little leaf in the forest,—hide me away.
(A needle in a haystack.)

121. "Ikasa, wuola mpaka,"
Lokend'a mpela wanya nk'oc'oso.
The little leaf asks the older one,
In the journey at floodtime wisdom is with the one going before.
(Ask advice of elders; get direction of those who have been over the road.)

122. Ikoke y'olanga;
Wa, wa, k'aoc'obunda lobi nd'otamb'okae.
The slowness of *bolanga;*
Carefully, carefully, tomorrow he gains the treetop.
(*Bolanga* is an edible caterpillar. Slow but sure.)

123. "Ikokila,—nk'ifak'ifaka?"
A bloody quarrel,—only a knife and a knife?
(Always fighting; unable to reason peaceably.)

124. Ikonongo la nk'ekila,
Ekila nde ilokwanaki.
A disagreement where neither takes advantage is all right,
The wrong is where one takes it today, the other tomorrow.

125. Ilaka etongo, nk'um'aleji.
The funeral is noisy, where there are many mourners.

127. "Ilemva jumba,—amby'ofat'okoji,
Bontoli wa ntatenya af'one."
Who is tired of the load should stop scolding the carry-band,
The carry-band that breaks is not this one.
(It is foolish to blame the faithful helper for what he has not done.)

129. Ilomb'amat'amato,
Nkamb'icwa la'e.
There are only women in the house;
Why (or how) has the *nkamba* disappeared?
(The *nkamba* is a fish that is tabued to women. Our native helper, himself a christian, parallels this by "There are only christians in the house; how has stealing occurred.)

130. Ilombe ya nsekola ntilongamak'etondo.
The house that is moved does not settle down evenly again in its rafters.

131 Ilonga ndengela afondaka nyama,
"Lolango j'oninga, oyofela waj'oke mongo."
The game in a trap, not looked after, rots,
Love for another, you forget your own wife.

132. Ilong'eseke, em'a w'acike.
The relatives are dead of pestilence, you and I alone are left.
(Are you going to divide what you have with strangers? Generous abroad, stingy at home.)

133. Ikomb'a nsoso;—ifolekan'awawa.
The chicken's little bill;—passes by no worm.
(The glutton eats all.)

134. Impamba y'omb'a y'ontoli.
The feebleness of the *y'omba* and the *y'ontoli*.
(They are two vines. They are really strong and tough. The reference is sarcastic. "Appearances are deceptive.")

135. Impoto iki bokangu.
The law that *bokangu* made.
(The *bokangu* is a bird; the law he made was that no bird should drop excrement in the river. This he then did himself. It were easier to tell ten what to do, than to be one of the ten to do it.)

136. Isano isana Balumbe, Nkundo ntayaka;
Nkundo te'asana, Balumbe baoya.
The Balumbe play games, no Nkundu go;
The Nkundu play, the Balumbe come.
(The Balumbe are the despised little Batua; the Nkundu consider themselves greatly superior to them.)

137. "Isan'a ntando, l'ofe'azi."
You play in the river, and do not know how to swim.

138. Ise ea ncikela,
Nyango ea nkaya,
Akolanga o mbile eki woat'ofambe.
Your adopted father, and the woman to whom you have been given, love you only the day when you have meat.

139. Iso'ma fio, nk'o leki webi.
We are all equal; no one exceeds another.
(Said in sarcasm; when due respect has not been shown.)

140. Isosongo iki'a mboka ea ndomba,
Toyangola'a nkolo y'akelekele.
The little stumbling-blocks in the market path,
The master's *toyangola* are made to bleed.
(*Toyangola*, a little fissured excresence on the foot. Trifles and insignificant troubles cause pain.)

141. "Isungi ya ngoya,
Oncik'em'esanga,
Nkina cif'isama.
Firebrand of my mother,
See me into the uninhabited place,
Perhaps we shall hide.
(Said of a person who is always suggesting impracticable plans.)

142. "Isungi y'ontoni, onkokol'ojinga;
Lolango lofa mposa onkokol'efoso;
Mpokosekw'otema lo f'elango.
Firebrand of *bontoni* wood, stop smoking,
Love without desire, stop talking,
I shall not place my affections where there is no warmth of love.
(*Bontoni* wood is yellow, undesirable as fire-wood, giving out much smoke and no heat.)

143. "Itamba ikokosokoji ngombo,
Out'ojikota konji."
The little tree that saved you from the buffalo,
You turn and cut it for a post.
(Ingratitude. For some petty advantage you sacrifice those who have done you a service.)

144. Itamba ile mpona ifulu ntakotamaka,
Boyalo w'efoso bonoju ntokusaka.
The tree full of stinging ants never has birds roosting on it;
Children cannot stand the home where scolding is constant.

145. Itenel'imo nt'isambak'ofambe.
There is no place without meat.
(There are other places than yours; unless you treat me better I shall go elsewhere.)

146. Itoji te: "Tosiza,"
Iluze te: "Mpak'icike."
Itoji says: "We are done,"
Iluze says: "Something remains."
(They are birds eating palm-oil nuts. The application is to quarrels. After a palaver, one man says "well, it is past;" the other, "by the way, we have not settled this yet.")

147. "Ifaka nk'imonkolo, osomba nsoso!"
Mpa osese nsoso la-e?"
Only one knife, and you give that for a chicken!
What will you carve the chicken with?
("As if you sold your cloth for thread with which to mend it.")

148. Iy'atumba ngonda,
Ekokombe aseka!
They are burning the forest,
The dry grass laughs at it.
(One laughs at another's misfortunes, not realizing that he is involved in the same ruin.)

149. Iyo bankelaki, njaki o ko;
Nkajimole: "Woleki'obe!"
When they swindled me, I kept silence;
When I turned it on them: "oh, you're a sinner."

151. Iyonza njoku, lolola nguma;
Ivaka ya nsasesa jembi.
Iyonza an elephant, *lolola* a python,
With *jembi* as the knife to cut them.
(The *iyonza* is the introductory present given to a guest; *lolola* is the secondary present. *Jembi* is a venomous snake. The meaning is, that since you came here there have been only palavers and troubles. Dr. Dye says he quotes this when people come to trouble him.)

152. "Njambo, nkokokimele lobi bafumba."
Notwithstanding all my long endurance, tomorrow I will pursue you with biting ants.
(*Njambo* corresponds to the introductory phrase. Patience ceases to be a virtue.)

153. Jelez'iyoko,
Bakusa nkoi,
Wiso w'ebulu embanda.
In the front yard murderers,
In the back yard leopards,
In the door of the inner room an *imbanda*.
(*Imbanda*, an evil spirit, much feared. There is danger everywhere around.)

154. Jembi asembi l'otondo,
Bon'ow'okulaka asembi l'ibwa.
Jembi stretched out on the rafter,
The chief's child stretched out on the floor—dead,
Cause great fear.
(*Jembi* is a venomous snake.)

155. Jemi jiki'ofaji.
The pregnancy of the *bofagi*.
(*Bofagi*, a kind of fish. The meaning is "still-born in miscarriage." "Much ado over nothing," or "the mountain labored and produced a mouse" are approximate parallels.)

156. Jeva nda'kielo, nda'kielo.
The sun is in the rising, in the rising.
(This is but the beginning of the matter.)

157. Jibololo la Wengi baduka ntando,
"Looma Wengi, Jibololo acikale,
Jibololo aleki'oloko w'akambo."
Jibololo and *wengi* were swimming in the river,
Kill *wengi*, *jibololo* is left,
Jibololo comes out ahead in the contest.
(*Jibololo* is a fish with scales; *wengi* is the electric fish. The good and the bad are together; the bad is killed, the good remains. Truth is mighty and will prevail, is perhaps analogous.)

158. Jibongi nta ongak'ontumbekela.
It never does to have another burn the brush-heap for you.
(If you want a thing well done, do it yourself.)

159. Jibuka la Ngila bayaki,
Ngila ayokend'oseka,
Nd'ende la mponde.
The gray monkey and the black monkey came from same town,
The black monkey made friends with the white-faced one.
(Desertion of old friends for new.)

160. Jikafo nd'otema; Jibaci 'ondenge.
Presents from the stomach; ability small.
(Your impulses are generous: your achievements limited.)

161. Jikafo nta alak'etondo.
The presents are not by looking at the rafters.
(At a distribution of gifts, it is well to look out for your share.)

162. Jiso aolela; Wete jolo aofola.
When the eyes have tears, the nose runs.

163. "Jiso wengi, botemaindenge;
Oleki o y'onto, ike nt'okafaka."
Your eye is like the electric fish;
Your stomach urges you on.
(The electric fish is everywhere. The meaning is you are always present to eat with others but you never share with them.)

164. Jituk'a ntela l'ain'okai.
The delight of bananas; the teeth are on edge.
(There is always some flaw in the cloth.)

NTUMBA PROVERBS.

1. How can you drink its soup if you eat not its flesh?
2. Poor at home, in another town you make a show of being rich.
3. A palaver that is not yours, best to be silent.
4. No person goes up and down a place without cause.
5. Make no friendship with a disobedient man.
6. A woman may say "I do not eat this," when she eats a thing just like it.
7. A bird without a mother feeds itself by its own mouth.
8. A man who is whole fits better for a dance than a lame man.
9. You are short; all people are not made of the same height.
10. Unkind father loves his child when the mother is present.
11. A selfish man likes others to give him their things.

12. If I have a little fever and no one salutes me, I will not be saluted by anyone when a great fever comes.
13. If you did not get sick when you were young, you are sure to get sick when old.
14. A dispute between two friends, though the palaver finishes, they will have a thought of it in their minds.
15. Nobody can walk strongly if he is unwell.
16. A person who is invited for food, if he fails nobody is to blame.
17. You cannot say a thing without hearing it.
18. You show kindness to a person who hates you, unkindness to one who loves you.
19. Unkind person is not helped when sick.
20. You are loved when you have money.
21. If your mother did know how to make pots, do not despise others.
22. Work hard, when you get the money your whole family will join you.
23. A motherless child receives no presents.
24. A multitude of people may complain of hunger, but you can never tell if one has eaten.
25. Do not hate other people as long as they have their own food, but hate your own relatives and you will avoid trouble.
26. A kind man often gets into trouble.
27. A plantain near the roadside does not flourish; every passer plucks from it.
28. A hateful man does not feel happy.
29. You steal when hungry. When you get more than you want you are not able to eat it all.
30. A hawk does not know how to fish, but when it finds a dead fish people chase it.
31. You may dislike to strike a boy, but he himself thinks he is strong enough.
32. Bad *ngola* does not return to him who sells it.
33. A multitude talk of something; another joins them, but he does not know the beginning.
34. Though you have relatives, a quarrel may separate you from them.

35. When it is other peoples' palaver you laugh; but when it is your own you are silent.
36. A friendship is as hard as wood while things are pleasant; but as weak as a cord when trouble comes.
37. While two persons are rich they visit and walk together, but if one becomes poor or sick the other passes his house.
38. Your cloth is worn because there is no money.
39. When you are at home nothing happens, but when you are away something happens.
40. A family's palaver is kept silent; that of others is displayed.
41. If you are a great eater, work for yourself.
42. Do not love a person for his beauty; you do not know his ways.
43. Do not fear a person for his bigness; when you seize him he is as weak as a leaf.
44. A good day does not last long.

Most of the proverbs in this list are immediately understood. A few call for a word of comment or explanation. Numbers 1 and 6 relate to food tabus, of which there are many among the Congo peoples. By such tabus a person is debarred from the eating of one or another kind of food, temporarily or permanently. The world over, much ingenuity is shown in the effort to escape the disagreeable consequences of a law, while observing the letter. These proverbs are aimed at such subterfuges. The spirit and intent of the prohibition is as truly broken by drinking soup made from an animal as by eating its actually forbidden flesh. Proverbs 10 and 23 mean much more in a polygamous community than they would among ourselves. Each wife of a polygamous husband has her own house; each is jealous for her own children. A large share of the quarrels in African villages grow out of difficulties between children of different wives. The man who desires a happy atmosphere in his home life is wise to treat the children of any one of his wives with notable affection, while their mother is near. The falling mentioned in 16 is due to lack of strength from need of food. A man at another's table should eat all he can: if he fails to do so, he only is to blame. 17: Practically equivalent are our "chickens come home to roost," and "a bad penny always turns up." Numbers 22, 25, 26 and

27 are of one piece. It does not pay for a man to be thrifty and saving unless he, at the same time, suppresses his inclinations toward generosity and hospitality. The man who *has* will be preyed upon as long as his hoard lasts. The man easily accessible (the plantain near the roadside), who readily recognizes the claims of blood, is sure to be stripped. 24 is the cry wrung from the man who receives constant appeals for help. Everyone is ready to take what he can get; no one cries enough. Complaint is common; the expression of satisfaction rare. If you tell a man how well off you are, he will cease to give you favors—he may even become a drain. In number 30 we find that in Africa, as elsewhere, they pounce upon the petty and miserable offender; the great criminal escapes. 31: No matter how weak and insignificant the attack, nor how natural good-nature may lead you to overlook assault, vigorously repel every assailant. 32: *Ngola* is the ground camwood, of a fine red color, which is used to smear the body. The meaning appears to be that, as it is bought for immediate use and its return involves trouble and delay, the quality will be overlooked.

BOPOTO PROVERBS.

1. Mai ntse muta ko likolo.
   Water below but oil on the top.
   (To speak fair before one's face but evil behind one's back.)

2. Lua mbanje la monoko mw'ao mene.
   Fish for your own mouth.
   (Don't expect to eat what others have worked to obtain.)

3. Mobuka nkoni asamala nkbengu.
   The woodcutter sleeps with small sticks.
   (The one who boasts of his woodcutting has to sleep by a fire of small sticks.)

4. Moduka loma asama luga.
   The man of possessions sleeps hungry.
   (The rich man has to leave all when he dies.)

5. Nga njali fa momongo wa itoko, altemeli mofembo.
   I am the owner of the mat and sleep on the hem.

6. Boliko yatona inde lifano, afalala.
   The river rejects advice and increases in size.
   (The river refuses islands and spreads abroad. A man refuses advice and spoils his work.)

7. Mokongolo moluki molei.
   The one who searches eats.

8. Wafela nsembe, wacikala la lofei.
   You had a fish; you are left with the smell.
   (The fish has been stolen.)

9. Maundu mawale motango lisanga.
   Two parties, the same story.
   (The two parties in a quarrel have not the same story.)

10. Ebuba likolo mai maiki ntse.
    Rushes on top, water below.

11. Ao fa ifula ngafa litale.
    You a bird; I a stone.
    (In pursuit, the pursuer if outrun cries, "You are a bird, go ahead; I am a stone.")

12. Mpota ya mbwa lako mososi.
    The sore of a dog no cleanser.
    (A person without helpers.)

13. Wabunga nduka, wale minganga.
    You don't know how to fish; you must eat fishtails.

14. Toomanaka anyango.
    Let us kill one another's mothers.
    (Two are eating together. One says, "Let us eat your food first." The other retorts with the proverb, suggesting that when one portion is eaten the other will move off and not share his food.)

15. Ntula awei, ilenge bamole mafefe.
    The fish is dead, children have eaten his tender body.
    (The *ntula* is difficult to kill and often attacks, but the flesh is very tender. When a strong man is absent children can spoil his goods.)

16. Motolitoli mosei mwaebanga, kale la sango.
    Kalenda eseka, iyosila inde, koi toke.
    A selfish or greedy person eats with his father; looks at his friend; when finished, says "Friend, let us go."
    (A person accepting food from his father and offering none to his friend who is with him. This refrain is sung in derision.)

STORIES.

Stories from Congo populations are scattered in scant number through various books of travel and information. Reference will here be made only to fairly accessible material in English. Swahili as a trade language is spoken through a large part of the Upper Congo region but the Swahili people do not live within the Congo Free State area. Much has been written upon this language and many collections of stories told in it have been printed. Four Baluba stories from the Upper Kasai are given by Verner* with the titles *How the beasts killed Kamienda's Mother*, *The story of Kamienda and Ncudu*, *The leopard, the man and the antelope*, and *Mutumba, Kabululu and Kabundi*. Stapleton† presents the native text and English translation of three stories, *Esende and Mobembe* (Cf. Hare and tortoise), *Tondolo and the animals*, and *The ape and the woman*. These are (Ba)ngala, (Bo)poto and (Lo)kele, respectively. The Rev. John H. Weeks, long stationed at Monsembe, has printed Bangala stories in *Folklore*.‡ The titles are: *Concerning a person*, *Concerning the owl and the partridge*, *About a certain person*, *Palaver of Nkongo*, *The two bundles*, *The birth of Libanza*, *The adventures of Libanza*.

The Folk-Lore Society has printed a collection of thirty-two stories collected by Mr. R. E. Dennett among the Fjort of the French Congo, neighbors and relatives of the Bakongo of the lower Congo River.§ Mr. Heli Chatelain has given us a fine piece of work in his book of Angolan tales.‖ Therein he presents fifty stories in the Kimbundu text with literal English translation and valuable critical notes. Here again we have a work dealing with neighbors and not with actual inhabitants of the Congo Free State. In 1893, Henry M. Stanley published a little book of stories collected from his Congo men.** Leo Frobenius, who spent

*S. P. Verner. *Pioneering in Central Africa*, pp. 318–323.

†W. H. Stapleton. *Comparative Handbook of Congo Languages*, pp. 224–232.

‡J. H. Weeks. *Stories and other notes from the Upper Congo*. Folk-Lore; vol. xii (1901), pp. 181–189, 458–464; vol. xv (1904), pp. 326–331.

§R. E. Dennett. *Notes on the Folklore of the Fjort (French Congo)*. Vol. xli of the publications of the Folk-Lore Society.

‖H. Chatelain. *Folk-tales of Angola*. Memoir 1 of the American Folk-Lore Society.

**H. M. Stanley. My dark Companions and their strange Stories.

more than a year in the Upper Kasai region, made a large collection of Baluba and other stories.

In 1894, Rev. John H. Weeks published a little book of the stories of Monsembe (Bangala). It was printed upon the Baptist Mission Society's press, with the title *Mabanza ma Monsembe* and was a crown octavo of forty-three pages. Some of the stories from this little book are included in those printed in English translation in Folk-Lore mentioned above. It is hoped that Mr. Weeks will translate and print the remainder of his collection. In 1895, the Rev. John Whitehead prepared a first reader for the B. M. S. schools, which was in Bobangi, and was called *Monkana mo boso mo tanga*. It was printed at Lukolela. Ten years later the press of the same Society, then located at Bolobo, printed a reader prepared by Messrs. D. Dron and J. A. Clark, with the title *Mambi ma ndenge ma boyekoloka. Mputa na bice bi Bobangi.* Both of these books contained stories in Bobangi. Those in Mr. Whitehead's book are all Bobangi stories; some of those in the other are from the Foto, though presented in Bobangi. Frank* translated eight of these into English for me and they are here given. In presenting them we have changed his form of expression as little as possible. Numbers ii, iv, v, vi are from Mr. Whitehead's book; numbers i, iii, vii, viii are from the other volume. Number viii is Foto; the others are Bobangi.

I. Two brothers.
II. Wife, husband and child; Mpokobikiako.
III. Mompana and his four wives.
IV. Pelepele and the tortoise.
V. The tortoise and the eagle.
VI. The tortoise and the wildcat.
VII. The dog and the *ncinga* fish.
VIII. The jackal and the goat.

I. The Story of Two Brothers.

In their town there was not a person who knew how to file teeth.[1] They heard that there was a good tooth-filer in a certain district. They said: "Let us take plenty of food and go to that country and stay there ten days." They went. They were

*See p. 176.

three days on the way and on the fourth day they arrived at the place and went to see the tooth-filer. He asked them what they wanted. They answered, "We have come to have our teeth filed by you." "Which one shall I take first?" asked the filer. "Take me first," replied the older one. So he filed the teeth of the older one first, but they were not done well. He was not pleased with them and many said they were badly done. Then the younger went to have his done; many praised him because they were done so well.[2] Men and women praised him and gave him presents, and said: "Your teeth are done better than your brother's." The older brother got mad and said, "All right." The filer asked them for the pay for his work. They paid him. Then the older said: "Younger brother, let us return home." They came to a certain town. The people asked them to show their teeth. The older showed his first, but they did not like his. The younger showed his; they liked his much. They went on their way, and slept two nights on the road. The older brother got mad and threw the younger into a hole. The younger brother said: "Brother, take all that I received from the young men and women, praising my teeth, and do not throw me into this hole." The elder answered: "No; you have shamed me." "What have I done?" he asked. "Did I fight you? Did I curse you? It is those people who have caused you shame, not I." "No," replied the older brother, "You shall die in that hole, even though you were years in doing so." The younger begged—"Be merciful to me, your younger brother." The other answered: "Yes, you showed your pretty teeth; people did not like mine, but yours." The younger brother said: "Take me out of this hole, that I may honor you." But he said: "My mercy for you is over, because you have shamed me before the eyes of the people," and he went home. When he arrived, the father and mother asked him, "Where is your brother?" He said: "He stayed because the young men liked him so much." The father and mother said: "All right; let him stay there, because he did not tell us." The slaves of the parents said: "Let us go after your son." They said: "No, leave him alone; he will come." The poor boy slept three nights in that hole, without food and water. Some women said: "We are going into the forest, after some leaves." So four of them went. And, while they were plucking leaves,

the boy heard them and asked: "What is that?" When he heard human voices he tried to sing a song. He sang:

The plucker of leaves,
Since he was here,
I and my brother went to get our teeth filed,
But his were only half done,
Since he was here,
But mine were fully done,
Since he was here,
My brother got mad and threw me in a hole
Since he was here.

He sang three songs, but they did not hear him. When he sang the fourth one they heard him and went to the hole. They said: "What are you doing in there?" He answered: "I and my brother went to have our teeth filed; his were but half-done, mine were fully done. He got mad and threw me into this hole. I have been here now three days without food and water." They said: "All right; we will take you out and take you home." They cut a long stick and set it in the hole and said: "It will be like a ladder." Then they brought him out and gave him some of their food and water, and then took him home to his parents. His parents asked: "What has made our son so thin?" He said: "My brother was mad at me and threw me into a hole because our teeth were filed by the same man and mine were liked better than his." The father said: "Yes, my older son is cruel." Then he paid the women who took up his son from the hole two thousand brass rods.[3] He said: "You shall never go away again with your brother." He gave his son many presents, saying: "My son has come back from death." And he dressed him with beautiful things and said: "All right; you are saved; sit down; your brother is a wicked and cruel man." The older brother was much ashamed and remained for three months in his house, because of his shame. For a whole year his parents gave him no cloth and refused him food.

II. The Story of a Wife, Husband and Child.[4]

A man called his wife and said: "Let us go and cut down a palm tree. The wife was with child. The husband climbed the tree and when he was cutting one of the branches, he said:

"Mama! look out, I want to throw down a branch." "All right; down with it; I will catch it," said the wife. He threw down seven; she caught them all in the same way. When he had climbed to the top of the tree he cried "Mama, look out of the way, I am going to throw down a bunch of palm-nuts." She answered: "Yes? when you threw down the branches, did I not catch them? Will I now fail to catch the bunch?" The husband threw down the bunch of palm-nuts; it fell on her; the child came out; the wife died. When the man saw the death of his wife, he fell himself and died. The child tried to help himself, by struggling; he was able to stand. In a little while he was able to walk and to know names of people in the forest. He went along and met a blacksmith making a small hook. He then went fishing; then he caught three fish and went away with them. He met his grandmother. She was eating carrots. He said: "Mother, are you eating only carrots; take these three fish of mine and eat them and leave only the bones for me." When she was left with the three fishes, she ate them and all the bones. When Mpokobikiako came, said he: "Mother, where is my fish?" The grandmother answered "I have eaten it all." Said Mpokobikiako, "Where are my bones?" She said "I left them here. Maybe a dog has eaten them." The little child said: "Mother, I will show you something." Said the grandmother, "A small child like you! What will you show me?" He sang a song:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave my grandmother,
Grandmother, go down stream,
Grandmother, go up stream.

It was too hard for the grandmother to go up and down stream. Grandmother gave to Mpokobikiako a basket of carrots.

Away went Mpokobikiako with his basket of carrots. He met a fisherman with fish-traps eating fish alone.

Said he, "Why are you eating fish only?" The fisherman replied: "Because I have no other food, my brother." Said Mpokobikiako, "Take my carrots and eat them, but leave the parings for me." After a time Mpokobikiako came and said, "Fisherman, where are my carrots?" "I have eaten them all,

brother," replied he. Said Mpokobikiako. "Why! have you eaten the parings also?" "Yes," answered the fisherman. Mpokobikiako said "I will show you something." The fisherman replied, "You little fellow! what can you show me?" "Wait," said Mpokobikiako, and he sang this song:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave my grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
Fisherman, go down stream,
Fisherman, go up stream.

The fisherman tried; he could not; he gave him fish, *ngolo*.

Mpokobikiako went along, went along. He met a blacksmith eating *kwanga* alone.[5] Said he to the blacksmith, "Why does a big man like you eat *kwanga* alone?" The smith replied: "Brother, because I have no fish." Mpokobikiako said: "Eat mine, but leave me the bones." Away he went. He returned and said: "Smith, where are my fish?" The blacksmith said: "Ah! brother, I have eaten all; what can I do?" Mpokobikiako said: "I will show you something." "What can a small boy like you show me?" said the smith. Mpokobikiako sang him a song:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
The fisherman gave me fish, *ngolo*,
The *ngolo* I gave the blacksmith,
Blacksmith, go down stream,
Blacksmith, go up stream.

The smith tried; he could not. He gave him a knife.

Mpokobikiako went along, went along. He met a butcher cutting up an antelope with a splinter of bamboo. He said, "Friend, why do you cut up an antelope with a bamboo splinter?" The butcher answered: "Because I have no knife." Mpokobikiako said, "Here, take mine; but if you break it, save me the pieces." Then he went away. The butcher lost the knife. Mpokobikiako

came and said, "Give me my knife." "Ah! brother," said the butcher, "I have lost it." Mpokobikiako said, "I will show you something." Said the butcher, "Ah! little brother, what can you do?" Mpokobikiako sang him a song:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
The fisherman gave me a fish, *ngolo*,
The *ngolo* I gave the blacksmith,
The blacksmith gave me a knife,
The knife I gave the butcher,
Butcher, go down stream,
Butcher, go up stream.

The butcher tried; he could not. He gave Mpokobikiako the leg of an antelope.

Mpokobikiako went on, went on. An eagle snatched away the leg of the antelope. Said Mpokobikiako: "Eagle, when you eat this meat leave the bones for me." Mpokobikiako went away. Presently he returned and said, "Eagle, bring my leg of antelope." The eagle said, "I have eaten it all." Mpokobikiako said, "Shall I show you something?" The eagle said, "Show me." He sang him a song:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave my grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
The fisherman gave me a fish, *ngolo*,
The *ngolo* I gave the blacksmith,
The blacksmith gave me a knife,
The knife I gave the butcher,
The butcher gave me the leg of an antelope,
The leg of antelope, eagle took it,
Eagle, go down stream,
Eagle, go up stream.

The eagle tried; he could not; he gave him a hat of feathers. Mpokobikiako went on, went on. He met a town dancer with-

out a feather head-dress. Mpokobikiako said: "Friend! a big man like you, dancing without a head-dress, how is that?" Said the dancer, "It is because I have none." Mpokobikiako said: "Take mine, but if it breaks save me the pieces." Off he went. For some time the dancer danced in the head-dress and lost it. Mpokobikiako came and said, "Give me my head-dress." The dancer replied, "Brother, the thing is lost; it is no matter." Mpokobikiako said: "I will show you something." The dancer said: "What can a little boy like you do?" He sang him a song:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave my grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
The fisherman gave me the fish, *ngolo*,
The *ngolo* I gave the blacksmith,
The blacksmith gave me a knife,
The knife I gave the butcher,
The butcher gave me the leg of an antelope,
The leg of antelope, eagle took it,
Eagle gave me a hat of feathers,
The hat of feathers I gave the dancer,
Dancer, go down stream,
Dancer, go up stream.

The dancer tried; he could not; he gave Mpokobikiako a drum.

Mpokobikiako went on, went on. In a slippery place he fell down and broke his drum. Mpokobikiako said: "Slippery place, I will show you something." The slippery place said: "What can a little boy like you show me?" Mpokobikiako sang his song, saying:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
The fisherman gave me fish, *ngolo*,
The *ngolo* I gave the blacksmith,
The blacksmith gave me a knife,
The knife I gave the butcher,
The butcher gave me the leg of an antelope,
The leg of an antelope, eagle took it,

Eagle gave me a hat of feathers,
The hat of feathers I gave the dancer,
The dancer gave me a drum,
Slippery place broke the drum,
Slippery place, go down stream,
Slippery place, go up stream.

The slippery place tried; it could not; it gave Mpokobikiako a planted garden.

Mpokobikiako went on, went on. He met giver, the river, which was calm. Mpokobikiako said: "I will wash my fruit in giver, the river." When he was washing them the waves carried them all away and he had nothing left. Mpokobikiako said: "Giver, I will show you something." "What can a little boy like you show me?" said giver. And Mpokobikiako sang his song:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
The fisherman gave me a fish, *ngolo*,
The *ngolo* I gave the blacksmith,
The blacksmith gave me a knife,
The knife I gave the butcher,
The butcher gave me the leg of an antelope,
The leg of an antelope, eagle took it,
Eagle gave me a hat of feathers,
The hat of feathers I gave the dancer,
The dancer gave me a drum,
Slippery place broke the drum,
Slippery place gave me a garden planted,
The fruit of my garden was scattered by giver, the river,
River, giver, go down stream,
River, giver, go up stream.

Giver, the river, tried; he could not; he gave him a fish, *mboto*.

Mpokobikiako went on, went on. He came to a woman, who had just borne a babe, eating cooked leaves of cassava. Said he: "Mama, when a woman is in your condition she eats fish; why do you eat this?" She answered, "Because I have no fish." Mpokobikiako said: "Take this fish of mine, but leave the bones for me." He went away. After some time he returned and said: "Give me my fish." The woman said: "I left the bones here,

but cannot find them." Mpokobibiako said: "I will show you something." She answered, "What can a boy like you show me?" He sang his song, saying:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,
The three fishes I gave grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
The fisherman gave me the fish, *ngolo*,
The *ngolo* I gave the blacksmith,
The blacksmith gave me a knife,
The knife I gave the butcher,
The butcher gave me the leg of an antelope,
The leg of an antelope, eagle took it,
Eagle gave me a hat of feathers,
The hat of feathers I gave the dancer,
The dancer gave me a drum,
The drum, slippery place broke it,
Slippery place gave me a garden planted,
The fruit of my garden was scattered by giver, the river,
Giver, the river, gave me a fish, *mboto*,
The fish, *mboto*, I gave to the woman with child,
Woman just delivered, go down stream,
Woman just delivered, go up stream.

The woman tried; she could not. She gave him the baby. He took it.

Mpokobikiako went on, went on. He met seven women bathing and washing pieces of plantain. He said: "Women, you ought to wash babies; why are you washing pieces of plantain?" They answered, "Because we have no babies to wash." Mpokobikiako said: "Take my baby and wash it." Away he went. While the seven women were washing the baby it suddenly died. After some time Mpokobikiako returned and said, "Women, bring me my child." The seven women gave him the child. When Mpokobikiako looked, it was dead. Said he: "This is not my child." He scolded, scolded, scolded, scolded. Then said he: "I will show you something." Said they: "What can you show us?" He sang them a song, singing:

Mama and papa bore me, Mpokobikiako,
I, Mpokobikiako, took my hook,
With my hook I caught three fishes,

The three fishes I gave grandmother,
Grandmother gave me a basket of carrots,
The basket of carrots I gave the fisherman,
The fisherman gave me the fish, *ngolo*,
The *ngolo* I gave the blacksmith,
The blacksmith gave me a knife,
The knife I gave the butcher,
The butcher gave me the leg of an antelope,
The leg of antelope, eagle took it,
Eagle gave me a hat of feathers,
The hat of feathers I gave to a dancer,
The dancer gave me a drum,
The drum, slippery place broke it,
Slippery place gave me a garden planted,
The fruit of my garden was scattered by giver, the river,
Giver, the river, gave me a fish, *mboto*,
The fish, *mboto*, I gave to the woman with child,
The woman with child gave me the baby,
The seven women killed the child,
Seven women, go down stream,
Seven women, go up stream.

The seven women tried it; they could not. They said: "Take us, ourselves." Mpokobikiako took them all and went off with them. He came to his place and built seven houses for his wives and one for himself.

III. Mompama and his Four Wives.

Mompama had four wives. He said to them: "I am going into a far country to trade." So he took his money and other things and food for the journey. He went away for four years, and in the fifth year had not returned. His wives said: "Our husband has been away for four years, and here it is now the fifth year; let us send his son to look for him." The son went and sought him, but knew not where his father had died. He said: "I will return." He met a maker of palm-wine and asked if he had seen his father. The maker of palm-wine replied: "If you want me to show you the place where your father died you must dash[6] me something." He answered: "I have nothing, so I will go on." He went along and met a fisherman. The same thing happened as with the wine-maker. On his way he met a blacksmith. Here the same thing occurred. He arrived home

without his father's wives knowing that he was coming. They asked him, "Where is your father?" He answered them, "I followed my father's journey but did not see where he was buried. When I was returning home I met three men—a maker of palm-wine, a fisherman and a blacksmith. They said unless I paid them, they would not show me where he was buried; but, I had no money." The women replied: "Very well, we will ourselves go there." After three days the son died. The women said: "Where shall we find a man to lead us on the road?" One of them said: "No matter; I know the way; let us go." A second said: "Let us go; I know his grave." Another said: "I am a doctor; I know how to raise him from the dead; his spirit will return." They said: "How shall we cross the river that is there?" The fourth one answered: "I am the one who will cross you over; if I stretch out my leg, you can all walk across upon it. They walked for three days and arrived near the place where the grave was; but they were on the other side of the river. They told the woman to stretch out her leg as she had said, that they might all cross over. She told them to close their eyes.(7) They closed them and she stretched out her leg. It became as a log of wood. Then she said: "Open your eyes." They opened them; the log lay across. She said: "Walk on it; go over." After they had gone over she went across also and her leg came as it was before. They came to their husband's grave. One of them said: "Bring me some medicine." She laid it upon the grave. The husband said: "I am coming." When they had dug the grave to remove the bones they placed the medicine among the bones. Their husband became again a man. They asked him, "Why did you come here? you have delayed here four years." He replied: "No matter; death met me; but now I am saved by you." One of them gave him food. After he had eaten they started on their journey. When they reached the river they said to the fourth wife: "Cross us, that we may get home." She said: "Close your eyes." They did so. She changed her leg into a log of wood. Then she said: "Cross, and go on the other side." All crossed over. When they reached home the man brought out four rings and four beads. One wife said: "I will take them all for myself." Another said: "I will take them for myself." Another said: "No; there are eight things for four

of us; let each take two." Thus they quarreled. Then they went to a judge. One said: "I was the guide upon the way." Another said: "I deserve it all because I raised him from the dead." Another said: "It belongs to me because I crossed you over the river with my leg." The other said: "I should have it because I showed where the grave was." Then they went to the king's town with their palaver. The king said: "Show me the things that the palaver is about; tell me your stories." One of them said: "I am the healer; I raised our husband from the dead." The king took a bead and a brass ring and gave them to her, saying: "You did well in raising him; go with two things." Another said: "I was the guide over the trail that my husband travelled." The king gave her a bead and a ring and said: "You did well in knowing the way; take these things." Another said: "I crossed them over." He gave her a bead and a ring and said: "You did well in crossing them." The other one said: "I was the leader to the grave." The king gave her a bead and a ring. After judgment was given they went home. The husband said, "I was saved by you."

IV. Pelepele and the Tortoise.

Pelepele and the tortoise made friendship. Pelepele always went to the home of the tortoise. Whenever he went there the wives of the tortoise made food for him. The tortoise said: "Friend, I also want to visit your home." Pelepele said: "Friend, you cannot go to my home because it is far away." The tortoise said, "Pelepele always comes to my home; I also want to go to his home." Pelepele always said it was far off. Said the tortoise, "It is not so far; I will plan a trick." So he said to his wives, "Tie me up in a parcel with plantain leaves; when Pelepele comes give it to him and tell him "your friend is not here, but has left this parcel for you; do not open it until you reach home." The wives did as had been planned. When Pelepele came they gave him the parcel and told him what their husband had said. Pelepele went home with it and told his wives to untie the parcel that the wives of the tortoise had given him, in their husband's absence. When they untied it they found the tortoise within. Pelepele said, "Friend, why should a big king

like you hide himself?" The tortoise answered, "I made this plan because you deceived me, saying that your home was very far." They disputed. The tortoise called together the headmen of the town to settle the palaver. Pelepele paid three hundred brass rods to the tortoise for being in the wrong.

V. Story of the Tortoise and the Eagle.

One day the tortoise and the eagle made friendship. After making friendship the tortoise invited the eagle to visit his home in three days' time. The eagle went home. After the three days he dressed himself and off he went and his friends followed him to the home of the tortoise. When they arrived the tortoise gave him a chair and mats for his friends to sit on. He then brought three bunches of plantains and two goats to present to the eagle. Said the eagle, "Give them to my men to eat; I do not eat them; it is my custom to eat no animals in all the world except the gorilla." The tortoise said, "Friend, the gorilla is a very difficult thing to get. Where can I get it?" With this he gave him some fish. The eagle refused. Then said the tortoise, "Well, I will do it somehow." He went to the bird, *lototi*. Said *lototi*, "I advise you to go to some place where gorillas pass; sit there; catch and kill one and then take it to your friend. The tortoise went to a place where gorillas pass, as he was advised by the bird *lototi*. When the gorillas came he caught a young male and killed it. He carried it to the eagle, who took it and went home without any palaver with his friend. "I am going home; in three days' time come and visit me," he said. After the three days, on the fourth day, the tortoise called his men. He went in front; they followed him to the home of the eagle. The eagle brought out a chair as his friend had done. So the tortoise and his friends sat down. The eagle presented him with four bunches of plantains and three sheep. The tortoise said, "Friend, I have seen your presents; I will take them for my men to eat; as for myself, I do not eat any animals." The eagle brought him a wild pig. The tortoise said, "Eagle, even if you brought all the animals of the earth, I cannot eat them at all." The eagle went and brought three large fishes. The tortoise refused them. The eagle said, "Friend, you will not take any meat nor fish, what then

will you have?" The tortoise answered, "Friend, all the fish of the world I never eat, except a living fish named *nina*." The eagle went to the river to fish for one. He caught two of them, but they were too small. At last he got a large one. He fought with it until he lost most of his feathers and had to walk on the sand like a wading-bird; he began to cry and said this friendship business must cease. The people, who were at home, heard him and said, "The eagle went out to fish and now is crying; what for? And he says friendship must be broken; why?" His children went and brought him home. When he arrived he said, "The tortoise and I must separate." The tortoise called the head-men together; and so did the eagle. The tortoise said, "I and this friend made friendship; he came to visit me; I made presents; he said all the animals of the earth I eat not, but a gorilla; I went into the forest, brought one, and presented it to him. Then he went home. In a few days I went to visit him. He gave me some things; I did not like them, but a living fish named *nina;* he went for one but it was too powerful for him; listen to all this." The eagle also told his story. The judges said, "Tortoise, you are right, you have won. The eagle loses. He desired to break friendship without cause." The tortoise went home.

VI. The Story of the Wildcat and the Tortoise.

The tortoise walks in a rolling manner; the wildcat walks in a sly way. He met the tortoise and laughed at him—"ha, ha, ha." Said he, "You walk in a rolling manner; how far can you go?" The tortoise answered, "Why do you laugh at me? I am faster than you." The wildcat replied, "Oh! can you go faster than I? Look." So he went a little way and then returned. "Can you beat me?" said tortoise. "All right, let us race. We will choose a distance and see who is the fastest and will arrive there first." So they agreed and made a race. The wildcat ran through the forest. "I will be the first and he will be the last," said the tortoise. The tortoise went rolling on until it was twelve o'clock, one o'clock, half-past six, his race was ended and he sat down to rest. "Why have you come?" asked the people at the town. The tortoise said, "I am racing with a wildcat; has he not ar-

rived?" They answered, "No, he has not arrived here." The king of the town was kind and said, "Be comfortable until your friend comes." So he sat down. The wildcat thought to himself, "The tortoise will not arrive there until very late; I am hot; I will rest awhile." When he came to a shady spot he laid himself down and went to sleep. A small bird sat on the branch of a tree eating fruit. It looked down and called to the wildcat; it threw a nut at him, which fell near the wildcat's nose. The bird then remained still. The wildcat stopped snoring. The bird threw another nut; it sang "ki-ki-ki-ki." The wildcat woke up, arose and said, "Time has flown; I must continue my journey." Off he went, slowly. The cock crowed "cock-a-doodle-doo." The wildcat said, "What noise is that?" He stood still. The cock again crowed. Said the wildcat, "I know that noise; I will go and hunt there." He came up to the place. The cock crowed again on the right hand side. The wildcat crept along on the ground to the fowl; he caught it and killed it. "Its flesh is good," said he. "I will eat it and then, with new strength, go on my way. The tortoise is still far behind." After he had eaten it he said, "Now my body is light; and the tortoise, I suppose, is rolling along." Night came; the tortoise sat down; the king sat down with his men to eat. Suddenly, the wildcat arrived. Said the tortoise, "Ah, friend, have you come?" "Yes" answered the wildcat, "but how is it with you?" The tortoise replied, "You laugh at my rolling gait, but you did not beat me. And you, sly one, how did it go with you?" "I slept a little and then I went after a fowl." The king rose and said, "Look, my children, there is no swiftness in fickle people, but in those who are earnest."

VII. The Dog and the Ncinga Fish.

A king made the law that no one from his town should go hunting. He said, "When I die, you must keep that law." After some time he died, and left two children. The people said, "We are hungry; we will ask the king's children." They said to them, "Your father made a law that no one is to hunt." The children said, "Do you want to go to hunt?" They replied, "Yes." The children said, "No; you cannot go, because father

left the law for us to keep it." But they did not mind the king's children and said, "We will go." When they went one had a dog with him, the other had the fish, *ncinga*. They killed many animals. The one who had the dog said, "Friend, you take the dog and I will take the fish." They were returning home. The one who carried the *ncinga* said, "Let us go around this bush; we might get another animal." So they went around it and killed one deer. The man carrying the *ncinga* said, "If we had refused, we would not have got this deer." The other said, "I have lost the dog." His friend replied, "Is that not the dog we are hunting with?" He answered, "I found this one; your dog is left in the bush." The other said, "All right; you have found a dog, let us go home." The dog's owner went ahead; the finder of the dog followed behind. The front man found a log and hid himself behind it. The one who followed came along with the dog and put one of his legs over the log. The hidden man seized it and said, "I have found a leg." The other answered, "Friend, it is my leg." The man said, "No; your leg is there; this is another one." The other said, "Friend, you make a palaver with me because I found a dog." "No," said he, "I am not making palaver; you found a dog, I have found a leg, let me cut it off." "No," said his friend, "let us go to the judge." They went to the judge. The children of the king said, "What palaver is it?" One of them said, "The two of us went hunting; I had the dog; he had the *ncinga* fish; in the bush we killed many animals and were coming home. He said, "Let us go around this small bush; we did as he said and killed one deer. He said, 'I have found a dog.' I said, 'All right; let us go.' But when we came back I found his leg under a log of wood." The judge said, "I cannot decide favorably to either of you because you disobeyed the law." He said, "You return your friend's dog and you return your friend's leg, since you did not cut it off." The judge finished their palaver.

VIII. The Jackal[9] and the Goat.

The jackal and the goat walked together. They saw a basket in the road. The goat said, "What is inside of that basket?" "Let me see," answered the jackal." He took the basket; it

was tied; he shook it and broke the string; good *kwanga* fell out. The jackal said, "They are mine; I broke the basket open." "No, it belongs to him who saw it first," replied the goat. "If you take the *kwanga* I shall horn you with my horns." The jackal showed his teeth and looked at the goat's long horns. When the goat saw this he thought "I do not want to be torn by those long fangs." Then said the jackal, "Why should we glare at each other? Do you see this lot of stones together? Let us try which is the strongest; you select one stone and I another; who makes his stone fall out first will take the *kwanga*." The goat agreed. Then they tried. The goat tried first, making a lot of noise with his horns. But no stone was dislodged. The jackal said, "You are not strong enough." The goat tried again with so much force that he was hurled backward by the blow and broke his horns. When the jackal saw that he laughed and said, "Ah! brother, now the *kwanga* is mine." The goat said, "No, you have not yet knocked out a stone; if you take the *kwanga* I will butt you with my broken horns and trample on you." "All right," said the jackal, "I will dislodge a stone; it is easy to do so." Then he dug away at the ground with his feet. The stones fell and his legs were injured. They looked at each other; one had broken horns, the other lamed legs. In fun, the goat said, "Take the *kwanga*, I do not want them." "I cannot," said the jackal, "my legs hurt me too much; take them yourself." "Truly, I will do as you say," said the goat, and he went to get the basket. But he could not find it. While they had been fussing, someone had passed and taken away the basket of *kwanga*. "My brother," said the goat, "look at our foolishness. If we had divided the food at first into equal parts, we would have suffered no injury. My horns would not have been broken and your feet would not have been hurt. We would have been happy together."

Notes to the Stories.

1. We have elsewhere called attention to the importance of tooth-filing and to the fact that the art is professional.
2. The singing of praise to the stranger is common; so is the heaping on him of adulation, flattery and gifts.
3. Through a large part of the Congo Free State brass rods are currency. Even in transactions where they are not the actual medium of exchange, values are expressed in them. The brass rod is a fixed length of brass wire of established thickness. Its length, though fixed for any locality, varies from place to place. Near Bolobo the brass rod is about 8 inches in length and perhaps ⅛ of an inch thick. Its value there is about one cent in United States money.
4. The cumulative story is a common and favorite type in Africa. As in our story of *the Old Woman whose pig would not go home*, a series of refusals or failures are usually incurred, but the story always results in the final advantage or success of the long-thwarted hero.
5. To eat *kwanga* alone is uncommon. It would usually evidence extreme poverty. At least some dried fish is desired with it.
6. "Dash me something." Dash is found in Africa wherever English has penetrated. The word is used both as a verb and a noun. As a verb it means to give a present—or, rather, a bribe. It is extremely common for a person who is asked to do a favor to demand dashing. As a noun, the word means the present or bribe given or asked.
7. Probably the eyes are ordered closed that the magical process may not be witnessed. It is less likely, but not impossible, that the order is due to modesty. Even among people wearing as little clothing as these Africans, unusual, non-customary, exposure of the body or portions of the body is disliked and avoided.
8. So Frank translated *bokwango;* in Whitehead's Bobangi dictionary it is said to be "a kind of white-breasted fish-eagle." (This refers to word "eagle" in title of story V.)
9. Frank is inconsistent in this story, sometimes calling the goat's enemy "leopard," sometimes "wolf." The Bobangi word is *ebobolo*, which Whitehead defines "a kind of animal, probably hyena or jackal."

APPENDIX.

I. A Batua Vocabulary; taken from the Batua at Ndombe.

While in the Upper Kasai region we made a vocabulary of the Batua living in Ndombe's territory. Wolf's was taken among those of the Lukengu's region. More than twenty years had passed since Wolf made his list, but the resemblance between these two vocabularies is notable.

	Ndombe.	Lukengu.
Sun	luba	diuba
Moon	kwadi	kuehdi
Fire	tuvia	
Water	mandji	manschi
Palm	makete	
Pig	n'gulu	
Goat	mbui	
Elephant	n'jo	
Hippopotamus	n'gubu	
Leopard	n'goe	
Antelope	mbaria	
Hen	nkoko	
Milliped	nongolo	
Head	itui	ihtueh
Hair	npuh	n'puh
Eyes	mahso	mahso
Eyebrow	nkikĕ	
Eyelashes	djeia	
Forehead	buzu	
Mouth	mohmo	molohmo
Chin	n'djalu	
Beard	n'djalu	
Tongue	lolehmi	
Teeth	mahnu	mahnu
Cheeks	mabangi	
Nose	dilu	dohlo
Ear	mashimba	
Neck	kingu	
Adam's apple	muminu	
Breast	ntulu	
Nipples	mabĕle	
Abdomen	kwoshkwaiibu	
Navel	yibulu	
Shoulder	ikeva	
Axil	muzimoriabŭ	
Back	niuma	
Seat	inio	
Penis	muzumbe	
Scrotum	mahbia	
Arm	kohko	kobohko
Elbow	n'kongwani	
Hand	ikama	
Fist	lakomĕ	
Fingers	belŭ	biala

	Ndombe.	Lukengu.
Toe	indeto	
Nail	biala	
Leg	kubinde	kupinde
Foot	ikati	
Knee	ilu	
Skin	ikoba	
Rib	nbalu	
House	n'djuh	n'duh
Mat	izaza	
Bed	ilako	
Head rest	kwasŭ	
Bow	bohta	buhta
Arrow	n'schehho	schehbo
Shield	n'gabu	n'gabo
Knife	kibulu	
Axe	ihkenge	
Musical instument (metal keys)	kekwambi	
Drum	ngoma	
Cowries	m'pasi	
Brass rods	nkanu	
Hook for basket	lokovo	
Carry basket	motĕte	
Suspended basket	kikala	
Canoe-shaped covered basket	kibombe	
Basket (Zappo Zap)	mutunga	
" (small pouch)	kakidimba	
" (small, deep)	muzungu	
Bellows	buturi	
Cloth	kilamba	
Palmoil	makuta	
Beads	maico	
Cap (Bakuba)	lokite	
Camwood	mutatu kula	
Palmwine	makana	
Sick	mutumo bialo	uabelle
to cough	lokwalu	nakotolla
to thunder	ibanda [toma	n'bulla kukumanscha
to rain	n'bula ngutuma-	n'bulla mukeke
to die	uaukua	uangua

II. A Non-Bantu Vocabulary from Ndungale, back from Upoto.

While we were visiting at the Mission of the Baptist Missionary Society at Upoto, on the Upper Congo, some men came from Ndungale, a village eight or nine hours' journey inland. The missionaries state that their language is notably unlike Foto, Ngombe and other Bantu languages of that region. The determination of the line separating the Bantu from the true Negroes is important and every fact assisting in that determination has interest. We therefore collected a list of words. The list is a special one recommended by Leo Frobenius. Mr. William Forfeitt and Mr. W. R. Kirby aided me to secure the words.

1	Bow	dohe	26	Smith	sunduangi
2	Bow, wooden part	we (wood?	27	Bellows	mokomba
3	Bow string	kue	28	Anvil	iyondo
4	Bow end knob	kokole	29	Hammer	iyondo
5	Arrow	ngofa	30	Tongs	kaka
6	Sun	hefale	31	Charcoal	chele or chese
7	Moon	he	32	Iron	bende
8	Pleiades	bole bole amaseka	33	Loom	gesatacho
9	Evening star	asogebahu	34	One	elimi
10	Heaven-sky	ahalu	35	Two	bina
11	God	akongo	36	Three	beela
12	Fire	lilage*	37	Four	ififi
13	Water	ngome	38	Five	kabi
14	Earth	tinoze	39	Six	ibebela
15	Stone	temele	40	Seven	ifibela
16	Squat	chonjolocho	41	Eight	ifififi
17	Sit	aduachio	42	Nine	ibwa
18	Sit, legs at side	adohelo	43	Ten	akalabea
19	Sit, legs crossed	bakana la ve	44	Eleven	akalabea te umi
20	Tobacco	liangali	45	Twelve	akalabea te bina
21	Pipe	jongo	46	Fifteen	akalabea to kabi
22	Manioc	molembekula	47	Nineteen	akalebea to ibwa
23	Manioc in water	mbotu	48	Twenty	litindale
24	Maize	ndungu [kanie	49	Twenty-one	litindale te elimi
25	Banana	mokani, pl. mo-	50	Plantain	pongo, pl. pongose

*ahone lage, "Give me fire."

JUNE, 1910. VOL. XII. PAGES 223-240

Proceedings

—— OF THE ——

Davenport Academy of Sciences

DESCRIPTION OF A NEW COCCID SPECIES, GEROPUTO AMBIGUA, WITH NOTES ON ITS LIFE HISTORY AND ANATOMY.

BY DAVID T. FULLAWAY
LELAND STANFORD, JR., UNIVERSITY.

Published from the Income of the
Putnam Memorial Fund

DAVENPORT, IOWA, U. S. A.
DAVENPORT ACADEMY OF SCIENCES
1910

PROCEEDINGS OF THE DAVENPORT ACADEMY OF SCIENCES.
Davenport, Iowa, June, 1910 Vol XII, Pages 223-240.

DESCRIPTION OF A NEW COCCID SPECIES, CEROPUTO AMBIGUA, WITH NOTES ON ITS LIFE-HISTORY AND ANATOMY.

By DAVID T. FULLAWAY
LELAND STANFORD, JR., UNIVERSITY.

The present paper contains the description of a new species of Coccidæ, *Ceroputo ambigua*, together with a short account of the insect's life-history and notes on its anatomy. It represents the result of a year's study of the insect in the field and in the laboratory. While the insect is at present of no economic importance, it possesses considerable interest from other points of veiw, especially in its biology; and the numerous departures in its anatomy from described types of structure in the Coccidæ has made it seem worth while to give its structural characteristics in some detail. The writer desires to express his grateful appreciation of helpful suggestion and advice from Professor V. L. Kellogg, under whose direction the work was done, and of assistance from Mr. E. M. Ehrhorn and Mr. R. W. Doane.

LIFE-HISTORY.

Ceroputo ambigua is found on the salt marsh grass or pickle weed, *Salicornia ambigua*, growing on the marshy flats of the bay region in the vicinity of Stanford University. As far as known, it is confined to this plant, but how extensive its geographic range is the writer has not been able to ascertain. The plant itself is not restricted to the mentioned region and the insect may therefore be widespread.

During the summer the insect is very conspicuous on the salt marsh grass on account of its white waxy covering. The young

crowd out upon the fleshy tips and mass together in such numbers that the upper portions of the plant are almost totally obscured (see Pl. I, fig. 1).

There is but one yearly generation. The first young appear about July 1st, from eggs laid 3 to 12 days previously, beneath the marsupium (caudal wax filaments) of the mother, where they are hidden from view. The eggs are elongate elliptical, about .31$^{mm.}$ long; yellowish green when first laid, later golden yellow, and covered with a waxen bloom.

After being hatched the young remain in the protection of the marsupium for several (3 to 4) days. They are naked and soft when hatched, just as at ecdysis, but a waxy covering immediately begins to form from the secretions of glandular epidermal cells, and by the time the young leave the marsupium the covering has assumed definite form.

Growth is very gradual, but is more rapid in the warm summer while the host plant is fresh and succulent, than in winter. With the advent of the first frost the life processes seem to be retarded. When first observed (in September) it was usual to find only the young on the stem-like leaves; the adult forms were usually concealed at the base of the plants on the procumbent stems or in the mat of soft earth and dried grass about them. As the winter wore on the numbers on the leaves became fewer; the larger part were on the ground.

When first hatched and after ecdysis the insect is active and moves about from one spot to another. Its motion, however, is slow and wandering and soon gives place to a rigid quiesecence and fixity. The adult forms often become slenderly attached by filaments of their secretions.

No distinctions of sex can be made in the young or larval forms. There are three stages in the life of the female forms before maturity is reached, while the cocoon from which the mature male emerges is developed from larvæ in the second stage. The first indication of the male is the formation of its test or cocoon.

The duration of the larval stages was carefully noted, but can be given only with approximation on account of the difference in rate of development in the laboratory and in the insect's natural surroundings.

The first moulting occurs in from 20 to 50 days. The process

is simple. The inelastic cuticle, unable longer to accommodate the already enlarging body, is broken through and left behind. The rent occurs well forward. In the cast skin the venter remains intact behind the antennæ, but a large portion of the dorsum is carried off as the insect breaks its way out. All the appendages as well as the chitinous setæ of the mouth-parts, which extend deep into the interior of the body, appear in the cast skin. It is interesting to note the rate of growth as shown by daily measurements of the first larvæ:

1st	day	length	.32	mm.	width	.18	mm.
2nd	"	"	.32	"	"	.18	"
3rd	"	"	.33	"	"	.18	"
4th	"	"	.33	"	"	.18	"
5th	"	"	—		"	—	
6th	"	"	.35	"	"	.18	"
7th	"	"	.35	"	"	.19	"
8th	"	"	.52	"	"	.32	"
9th	"	"	.52	"	"	.32	"
13th	"	"	.58	"	"	.32	"
20th	"	"	.58	"	"	.36	"

After the moult the insect (2nd stage) measured .65$^{mm.}$ long and .36 wide. The lateral and caudal wax filaments showed an equal daily augmentation. At the end of the 5th day the dorsal ridges become distinct and with the increased length of caudal and lateral filaments after the 10th day the wax ornamentation assumes distinct character.

The first larval stage is characterized by 7-jointed antennæ. In this particular the second larval stage is not different, but besides the evidence offered by the moulting the second larval stage is peculiar in shape—it becomes more rotund by reason of increased width over length. Four days after the moult it measures .38$^{mm.}$ in width and .65$^{mm.}$ in length. While naked and soft just after ecdysis, in four days the lateral wax filaments are .10^{mm} long and the caudal .13$^{mm.}$ The insect soon recovers a perfect waxen covering, which appears closer and more compact than in the first stage. In the second stage also the integument is darker than in the first.

The insect remains in the second larval stage from 90 to 150 days. Growth is slow; the insect is immobile most of the time,

and its appearance, after the waxen coat is fully formed, remains practically unchanged.

In early spring (last week in February) a second moult occurs. At this ecdysis the insect (now in the third larval stage) measures $1.37^{mm.}$ in length and has 8-jointed antennæ. With the approach of spring activity is renewed and the insect grows rapidly.

The third larval stage extends over but 20 days.

On March 18th the first adult female was observed, with 9 antennal joints (Pl. I, fig. 2). The third moult occurred a few days before.

The first male cocoon was observed March 4th. The cocoon (Pl. I, fig. 3) is a compact white waxen test with a firm interior lining but externally formed of loosely woven and fluffy waxen filaments. It is usually found loosely attached in a position sheltered from the light — an indication of negative phototropism in the larva as the time for transformation approaches. Several days before the emergence of the male—and indicating in a way the completion of the transformation—the cocoon is broken open posteriorly and through the opening are protruded the two waxen filaments afterwards so conspicuous. This so-called pupal stage occupies 26 days. The first adult male in my laboratory lot emerged on March 30th.

The fully formed male (Pl. I, fig. 4) is very different from the adult female or any of the larvæ. It is long and slender, dark-colored, and in parts heavily chitinized. Mouth-parts are absent (as well as wings); the small head is a chitinous box bearing long hairy antennæ and numerous simple eyes. The thorax also is somewhat box-like and well protected with chitin. The abdomen is composed of eight segments, none of which is very much chitinized, and terminates in a chitinous style, on either side of which is a long waxen filament.

The male is very active. It moves about rapidly using its antennæ actively. It soon finds the female (if at hand) and copulation takes place at once. The sexes remain in copula ten to fifteen minutes and one male was observed to fecundate three different females within an hour.

The life of the male is comparatively short, lasting usually not more than two weeks. The female, too, endures but a short time after the eggs have formed and been hatched, but this is several

months after fecundation; the female in the meantime increases enormously in size. Practically the whole body is given over to egg formation and as many as eighteen well-formed eggs were found in one individual that was dissected. When the period of egg-laying has passed, the adult female, reduced to a mere shell, dries and hardens and its body gradually dessicates.

Several hymenopterous parasites were bred from the species and it is preyed upon also by a small Coccinellid, *Scymnus guttulatus* Lec.

DESCRIPTION.

Ceroputo Ambigua sp. nov.

Adult female (Pl. II, fig. 5).—Body, with waxy secretion removed, elliptical in shape, anterior end somewhat truncated, posterior end incised. Color yellowish brown. There are eight abdominal segments besides thorax and head. Segmentation indistinct toward head, especially at lateral margins, where it is almost imperceptible. Ventrally only seven abdominal segments distinguishable, the first being fused with the metathorax. Ventral surface of thorax divided into numerous small areas by elevations and depressions of surface. Dorsum somewhat convex, but surface not even; central portion elevated; the surface is ridge-like, sloping on either side of median line almost to lateral margins—which thus form a flange on either side. There are two pairs of spiracles opening ventrally, one prothoracic, the other metathoracic, and on the eighth abdominal segment is the chitinous structure known as the anal ring, lying collar-like in the mouth of incision.

The integument for the most part is soft and smooth but is thickened in places along the periphery to form more or less knob-like discs or plates. These are 17–18 in number on either side and extend from anterior to posterior end in generally even line. They are distributed segmentally as follows: head (on either side) 4–3; prothorax 2, mesothorax 2, metathorax 2, abdominal segments each 1. Other chitinous structures appear on the surface, but these with the exception of one large transverse elliptical opening on 3rd abdominal segment are apparently internal structures serving for the attachment of muscles. The surface also

bears spines and hairs in great numbers, interspersed with wax gland openings of two distinct types.

The spines (Pl. II, fig. 8), which vary in length from .017$^{mm.}$ to .029$^{mm.}$, are of characteristic shape, and are inserted in a chitinous plate which rises as a supporting base abruptly from the integument to about one-sixth the length of the spine. The spines are widest at a point one-third their length from the base, which is slightly above the point of insertion into basal support. They narrow somewhat descending into the support, and distally narrow more abruptly to a sharp point.

The spines are mainly confined to dorsum, although found also to some extent on ventral surface especially towards periphery. They are very conspicuous on chitinous plates or discs. On the first disc there are about 30, 2nd about 50, 3rd about 25, 4th about 14, 5th about 35, 6th about 18, 7th about 40, 8th about 17, 9th about 29, 10th about 26, 11th about 28, 12th about 24, 13th about 25, 14th about 27, 15th about 27, 16th about 27, 17th about 40. On the head there is an elongated patch of spines on either side of the median line. The patches extend over a little more than one-half the length of the head, and are widest about the center, narrowing at either end. Each patch contains about 29 spines. There is also a smaller patch caudad on either side of the head, close to the lateral margin, containing about 20 spines. There are a few spines cephalad on the prothorax—a patch of 3 or 4 on either side of the median line and a scattered few beyond these. On the margin on either side is a well formed patch of about 13. Caudad there are more — a patch of 7 on either side of median line, closer together than those cephalad; beyond these a scattering few and on the margin on either side a loose patch of about 10. On the mesothorax the spines are again concentrated caudad and towards the center. On either side of the median line and close together there is a patch of about 8, on the margin on either side a loose patch of about 12 and an imperfect double row connecting these. On the metathorax there is a patch of 16 spines medially caudad and scattered over the whole remaining surface. On the abdominal segments except the 8th, on which there are none, the spines are gathered closely in median patches, with scattered spines extending to the margins. On the 1st abdominal segment there are 14, 2nd 13, 3rd 11, 4th 17, 5th 16, 6th 18, and

7th 16. On the 5th, 6th and 7th segments there are well defined patches of about 7 spines on either side near the margin.

The ventral surface bears in great numbers hairs of varying lengths, the average size being .1mm., distributed in a general way uniformly over the whole surface but caudad somewhat longer and more thickly set.

Wax gland openings of the type shown in Pl. II, fig. 6, small discs with incised margins and three tubular openings, are distributed over the whole body, although they are much less numerous on the ventral surface than on the dorsal, where they are nearly always found in connection with the spines. Their distribution corresponds in a general way with the distribution of the spines and they are conspicuously present on the chitinous discs or plates. Wax gland openings of the type shown in Pl. II, fig. 7, are confined to the ventral surface and are rather evenly distributed although somewhat more numerous caudad.

The eyes (Pl. II, fig. 9) are simple and prominent; conical in shape, with rounded apex.

The antennæ (Pl. II, fig. 10) are composed of nine segments. The third is the longest, the ninth somewhat shorter, the first and fifth of equal length but shorter than the ninth, the sixth and seventh of equal length but shorter than either first or fifth, the second is still shorter, and the fourth and eighth of equal length but still shorter. The formula is as follows:

3 9 (1 5) (6 7) 2 (4 8)

The length of the several joints in mms. is: 3rd .19, 9th .14, 1st and 5th .13, 6th and 7th .12, 2nd .11, and 4th and 8th .10. The basal joint is the broadest (.13mm.), the second less broad (.075mm.), the third still less (.065mm.) and the remaining joints still less but equally broad (.06mm.), the last joint somewhat expanded with pointed end. Hairs on the antennæ numerous; they are sparser on the basal segments and on the last segment there are many at the summit.

The legs (Pl. II, fig. 11) are about 2mm. long, the first pair shorter than the other two. The average length of different segments is: coxa .37mm., trochanter .12mm., femur .56mm., tibia .62mm. and tarsus .22mm. The legs are all strongly chitinized, dark brown in color, and much beset with hairs. On either face of the tro-

chanter are four circular openings similar to the large disc-like wax gland openings. Claw is large with blunt tooth towards apex and two long hairs, about the length of the claw, at the base.

The rostrum or beak (bristle sheath of Sulc) is composed of two segments, the distal one deeply grooved on upper surface and thickly set with hairs.

Anal opening (Pl. II, figs. 12 and 13) elliptical in shape; anal ring a chitinous band bearing six long and rather stout hairs. Perianal glands in two rows, with a break above and below the ring, the two rows merging into one at the free ends. The rows also branch dichotomously at the six anal hairs, where there are four rows instead of two.

Vagina between 7th and 8th abdominal segments, with the margin of the opening denticulated.

A waxy secretion covers the dorsal surface and extends outwardly from the margin in the form of waxen plates or filaments. The configuration of the dorsal secretion accords with the distribution of the wax glands. There is a prominent ridge from head to anus with less prominent lateral ridge on either side. Cephalad on median ridge is a well-formed tuft representing secretion of the patch of glands on the head. Lateral plates or filaments correspond to the marginal discs or plates, but sometimes two or three fuse together. Cephalad they project forward; caudad they are turned back and are wider. Those near the anal ring join with a tuft from the median ridge and turn aside to disclose the wax-covered anal hairs. The wax covering the main portion of the dorsum is thrown into transverse divisions corresponding to the segments on which the wax is secreted, the intervening free spaces corresponding to the intersegmental sutures, where there are no glands. Cephalad and caudad tufts appear also in the lateral ridges.

Length, 2.8 to 4.6mm. Habitat, salt marsh grass (*Salicornia ambigua*) near Stanford University, Cal. Type specimen in the collections of the Entomological Laboratory of Stanford University.

First larval stage (Pl. II, fig. 14).—Outline, color and segmentation as in adult. Surface likewise covered with wax. Lateral discs 18 in number, the first on the head in this stage represented by two. Wax glands and spines similar but fewer in number.

Spines 1–5 on lateral discs, 3 on head, 5 on each thoracic segment, 4–6 on abdominal segments in even transverse rows. Wax glands interspersed with spines. Hairs sparse and longer caudad. Bristle sheath, stigmata, anal ring and last segment of abdomen as in adult. Antennæ (Pl. II, fig. 15) 7-jointed; formula:

7 3 (6 1) 2 5 4.

Length of individual segments in mms.: 7th .11, 3rd .058, 6th .055, 1st .055, 2nd .05, 5th .049, 4th .047. The broadest is the basal, the next broadest the 2nd joint, the 3rd next and equally broad the rest, except the last, which is somewhat expanded and ends in a point. Hairs on the antennæ generally in circles at the middle of the joints: on the 1st 3, 2nd 3, 3rd 4, 4th 5, 5th 5, 6th 5, 7th 15, of which about 8 are at the summit.

The legs are strongly chitinized, the fore-legs a trifle smaller than the mid or hind legs. The several joints measure in mms.: coxa .055, trochanter .04, femur .16, tibia .16, tarsus .16. Wax gland openings on trochanter similar to those in adult.

Length .96 mm.

Second larval stage.—Outline, color and segmentation as in the adult. Surface likewise covered with wax. Lateral discs 18 in number, 5 on the head. Spines and wax gland openings similar to those in adult, although fewer. Spines 3–10 on chitinous discs or plates, 15 on the head in a large group, 20 to each thoracic segment, much scattered, 5–10 on each abdominal segment in transverse line. Hairs on ventral surface sparse. Antennæ (Pl. II, fig. 16) 7-segmented; formula:

3 7 1 2 (4 5 6).

Length of individual segments in mms.: 3rd .135, 7th .13, 1st .08, 2nd .075, 4th, 5th and 6th each .065. The 1st is the broadest, the 2nd less, the 3rd still less and the others equally broad except the last, which is somewhat flattened and ends in a point. Hairs on the antennæ somewhat scattered in position to the 5th segment, distad of 5th they are arranged in circles at center of segment. On the 1st segment there are three hairs, on the 2nd 3, 3rd 4, 4th , 5th 6, 6th 8, 7th 15, of which half are at summit.

The legs are as in other stages. The several joints measure in mms.: coxa .15, trochanter .09, femur .27, tibia .26, tarsus .19. Wax gland openings on trochanter similar to those in adult.

Length 1.4–1.7 mm.

Third larval stage.—Outline, color and segmentation as in adult. Surface likewise covered with wax. Lateral discs 18 in number, 5 on the head. Spines and wax gland openings similar to and about as numerous as those in adult. Their distribution corresponds with that in the adult. Hairs on the ventral surface almost as numerous as in adult, and bristle sheath, stigmata, anal ring and last abdominal segment similar. Antennæ (Pl. II, fig. 17) 8-segmented; formula:

3 8 (1 4) 7 (5 6) 2.

Length of individual segments in mms.: 3rd .15, 8th .13, 1st and 4th each .10, 7th .095, 5th and 6th each .09, 2nd .07. The 1st is the broadest, the 2nd less, the 3rd and following segments equally broad but less than the 2nd. Last segment flattened to breadth of 2nd and pointed at tip. Hairs on antennæ arranged segmentally in circles at center of segment; on the 1st segment there are 4, on the 2nd 5, 3rd 8, 4th 4, 5th 7, 6th 6, 7th 9, 8th 20, half of which are at summit.

The legs are as in other stages. The several joints measure in mms.: coxa .15, trochanter .09, femur .35, tibia .37, tarsus .23. Wax gland openings on trochanter similar to those in adult.

Length 2.18–2.28 mm.

Adult male (Pl. III, figs. 18 and 19).—Body covered with waxy secretion without definite pattern. When stripped of wax, general outline elliptical, color yellowish brown; more thickly chitinized parts black. Segmentation distinct; well defined head, three thoracic and eight abdominal segments. Greatest width of body at 3rd abdominal segment, narrowing gradually to head cephalad and to style caudad. Head small, box-like, heavily chitinized, with a median dorsal and ventral suture; mouth-parts entirely absent. Thoracic segments of about equal width. Prothorax bears dorsally on either side near lateral margin a small chitinous plate which extends inwardly as an attenuated strip to meet that of other side. Ventrally there is near lateral margin on either side a triangular plate, one angle of which joins the dorsal plate and the other the posterior margin of the head. The mesothorax bears dorsally a chitinous shield covering the entire dorsal surface except for two median areas which are unchitinized. The dorsal shield is continued on ventral surface as a broad chitinous band which laterad is confined to the anterior portion

of the segment but mesad widens so as to reach the posterior border. There are no wings, nor vestiges of wings. The abdominal segments are narrower than the thoracic; between the metathorax and first abdominal segment and the first and succeeding six abdominal segments, dorsally and ventrally, there is on either side of median line a thin strip of chitin. The posterior border of the seventh abdominal segment is a broad chitinous ring bearing dorsally near lateral margin on either side a long seta whose base is in a deep pit. The eighth abdominal segment bears the style, a chitinous triangular structure with broad base and caudally directed point. The lateral margin of the dorsal plate is recurved slightly to form a sheath for the elastic penis. Stigmata as in female. Body generally covered with hairs which on abdominal segments are in transverse rows at center of segment, and on the bosses of lateral margins are gathered together in clumps.

The eyes are simple, generally small, and 16 in number.

The antennæ are long and 10-jointed. Formula:

3 4 7 (8 10) 5 9 6 1 2

Length of individual segments in mms.: 3rd .31, 4th .27, 7th .22, 8th and 10th .21, 5th .18, 9th .17, 6th .155, 1st .14, 2nd .09. The first is the broadest, the second less broad, the third and following joints still less but equally broad, the last somewhat flattened. The antennæ bear long hairs on every joint; on the first there are about 7, 2nd about 6, 3rd 14 in four rings, 4th 13 in three rings, 5th 7 in two rings, 6th 7 in two rings, 7th 8 in two rings, 8th 12 in two rings, 9th 10 in two rings, 10th 15 in two rings and half at the summit.

The legs are long, the several segments measuring in mms.: coxa .21, trochanter .115, femur .57, tibia .8, tarsus .31. They are thickly beset with hairs.

Length 3.9 mm.

Pupa (Pl. III, fig. 20).—Pupa surrounded by a white waxen test about 4.6$^{mm.}$ long, loaf-shaped without carinæ or other ornamentation. Pupa golden yellow in color, shape and general appearance that of adult male, but parts not fully formed. Antennal and pedal joints loose but distinct. Head not box-like. Style short, blunt.

Length 3 mm.

NOTES ON ANATOMY.

The anatomy of the Coccidæ has been amply treated in the classic studies of List[1], Mark[2], Targioni Tozzetti[3], and Putnam[4], as well as in the more recent papers of Kuwana[5] and Moulton[6], based on work done in this laboratory. That of *Ceroputo ambigua*, however, shows some variations which are worthy of note.

Mouth-parts.— The mouth-parts, as in other Coccidæ, consist of an external fleshy labium (often referred to as the rostrum) and an internal chitinous framework, more or less box-like, in which the buccal setæ (the actual piercing organs and therefore comparable to mandibles and maxillæ) originate and by means of which they function.

The chitinous framework lies in a horizontal plane in the median line and opposite the base of the fore legs. The box—if it may be called that—has a ventral surface coextant, the most of it, with the integument of the ventral surface in its position; also two lateral surfaces. The top of the flat-lying box is open, the dorsal surface is more or less open, and there are open spaces in the lateral surfaces. The base is formed by a convergance of all the planes, therefore is more or less pointed. The box-like structure is supported by bands of chitin which form the boundaries of the respective openings (see Pl. III, figs. 21 and 22). The surfaces presented intact consist of chitin lamellæ and with the bands form a more or less strong and rigid box. Comparing this structure with the one in *Orthezia cataphracta* described by List,

---

1. *Orthezia cataphracta* Shaw. Eine Mónographie von Joseph Heinrich List. Zeitschrift f. wiss. Zoologie. Bd. XLV, v., pp. 201-287. Mit 6 tafeln.

2. Beitrage zur Anatomie und Histologie der Pflanzenläuse, inbesondere der Cocciden, von E. L. Mark. Archiv f. mikroskop. Anatomie. Bd. XIII, pp. 1–59. Mit 3 tafeln.

3. Studii sulle Cocciniglie. Memoria di Adolfo Targioni Tozzetti. Memorie della Societa Italiana di Scienze Naturali. Tomo III, n. 3. Con sette tavale.

4. Biological and other Notes on Coccidæ. By J. Duncan Putnam, Proceedings of the Davenport Academy of Sciences, Vol. II, pp. 293-347. 2 plates.

5. Notes on the Life History and Morphology of *Gossyparia ulmi* Geoff. By S. I. Kuwana. Bulletin of the Imp. Cent. Agri. Exp. Station, Tokyo, Japan, Vol. I. No. 2, pp. 1–19. 2 plates.

6. The Monterey Pine Scale, *Physokermes insignicola* (Craw.). By Dudley Moulton. Proceedings of the Davenport Academy of Sciences, Vol. XII, pp. 1-6. 4 plates.

if we imagine the anterior margin of the ventral surface to be strongly chitinized so as to form a band, it would correspond to his "*Querbalken.*" The "*unter*" longitudinal bars are absent, for the ventral and lateral surfaces are continuous, and the angle of incidence here is effaced by a gentle rounding of the two surfaces. The anterior margin of the lateral surfaces are two bands which connect the ventral and dorsal surfaces. The anterior margin of the dorsal surface is a band which connects the bands forming the angle of incidence of the dorsal and lateral surfaces (corresponding to List's "*ober*" longitudinal bars). There are two short bars on either side extending from the posterior margin of the lateral open spaces into the interior of the box. These it is believed function as supports for the bases of the buccal setæ —they have comparable structures in *Orthezia cataphracta*. Besides the bands already mentioned—those forming actual bars—there is a band limiting the anterior edge of the parts of the dorsal and lateral surfaces that are intact, thus completing the boundaries of the dorsal and lateral openings. All this is apparent in the figures.

The framework, as before mentioned, lies on or forms part of the ventral body-wall, where it finds one point of attachment. At the same time numerous strong muscle-bands inserted in the dorsal surface attach it to the dorsal body-wall.

In the interior of the chitinous framework is an elongated chitinous structure known as "rudder," "infundibulum," or otherwise by various authors and supposed to function in part as a pharynx. It arises from the base (posterior surface) of the framework, although independent of it, i. e., not fused with the chitin lamellæ of this part although attached at its base. The structure is broadest in the middle and tapers at either end, the anterior end lying free, although attached to the walls of the chitin framework by numerous fine strands of muscle, and terminating at about the level of the anterior opening. This structure forms an incompletely closed tube, i. e., it is open for some space above the middle of its dorsal aspect. In its lower portion it functions as a sheath for the buccal setæ, which arise as previously described where the spurs project from the lateral surfaces, and tapering down to fine bristles converge and unite into a common bundle as they enter this bristle sheath. At about the point of entrance

of the buccal setæ there is a circular opening, to which, it has been believed by some, the œsophagus leads.

The labium is fleshy, not a chitinous structure; it is conical in shape and projects from the venter just back of the framework. It has, naturally, as the organ by which nourishment is directly secured, considerable freedom of motion. It is divided on its ventral surface transversely by a deep furrow and again longitudinally. The latter furrow distally lays bare the chitinous tubular core which accommodates the buccal setæ. The labium is covered externally with the body integument bearing spiny hairs. Internally it is composed largely of muscle bands attached on the one hand to the chitinous walls and on the other to the tube traversing it. This tube is enclosed to about the middle of the labium in a thin elastic sac. The sac in the interior of the body encloses the loop of the buccal setæ between the framework and the labium; it extends as far back as the sixth abdominal segment close to the ventral wall and it is supposed by its elasticity to control the protrusion of the setæ. Its walls consist of three layers, an outer and inner membranous layer and a middle layer of rectangular cells.

The buccal setæ are thin chitinous rods, four in number. They are not hollow but grooved on one face, and lie closely appressed in a bundle, the bundle at tension pressing against the walls of the sac or pocket. The grooves thus lie either opposite or against a flat surface forming three hollow tubes along the whole length (Pl. III, fig. 23).

Alimentary Canal (Pl. IV, fig. 24).—The alimentary tract presents some difficulties when it comes to separating its several parts, on account of its many convolutions. Some parts, however, are readily recognized. The extremely slender œsophagus joins cephalad with the pharynx, and after passing through the œsophageal collar (nervous system) bends backward and continues into the thorax. Continuous with the œsophagus and still extending caudad is the greatly enlarged short and sac-like proventriculus. Succeeding this is the long, thick-walled and much convoluted intestine; and this finally merges into the enlarged sac-like rectum, which opens into the anus. The Malphigian tubes, several in number, are also much convoluted in their course but are readily recognized by their thin transparent walls with large nucleated cells.

Salivary Glands (Pl. IV, fig. 25).—The salivary glands consist of a single pair of glands, one on either side of the body in the region of the chitinous box of the mouth-parts. The two glands are united by thin tubes carrying their secretions, which enter into a common duct a short distance from the glands and pour the secretion into the mouth. The glands themselves consist of a number of closely bunched spherical lobes, each lobe made up of several large nucleated cells.

Nervous System (Pl. IV, fig. 26).—The marked fusion of the ganglia results in a complete cephalization of the ventral nerve chain, which lies ventrally in a median position, cephalad of the bulk of the intestinal coil. There are six ganglia in the chain and each consists of two lobes, as is plainly seen in cross and longitudinal sections. The large, triangular and distinctly lobed supra-œsophageal ganglion (brain), which lies above and in front of but partly in the chitinous framework of the mouth-parts is connected with the smaller lobed infra-œsophageal ganglion, lying below and back of the mouth-parts, by two slender commissures. The œsophagus in its upward course after leaving the pharynx passes between these commissures, which with the ganglion in front and the one behind form the so-called circumœsophageal ring. The three thoracic ganglia, large, flat above, convex below and somewhat depressed in the center, are well marked. The single abdominal ganglion is small and also somewhat attenuated.

The innervation, as far as can be observed, is very simple. Two nerve pairs arise in the brain, a pair of large nerves, the optic, proceeding from the anterior region to the eyes, and a pair of smaller ones, from the under side, to the antennæ. Each of the thoracic ganglia gives rise to a pair of nerves, doubtless for the innervation of the thoracic appendages, and two nerve pairs proceed from the posterior part of the abdominal ganglia innervating the abdominal region.

The ganglia consist apparently of an axillary fibrilar substance (*Punktsubstanz* of List) surrounded by large ganglionic cells, the whole enwrapped in a thin transparent membrane.

Wax Glands.—The wax glands (Pl. IV, fig. 27) are modified hypodermal cells lying just beneath or to a greater or less extent below the chitinous integument and interpolated in the more or

less regular rectangular cells of the hypoderm. They occur in the larvæ and adult female on the dorsal surface, usually about a spine, and in the adult male in a bunch caudad on either side of the origin of the setæ, and otherwise scattered over the dorsal surface. They are more or less spherical or oval in shape and consist of several large nucleated cells. The spherical or oval gland usually narrows distally to form a neck, which merges imperceptibly into a chitinous mouth. Externally the mouth is circular in shape with notched edges, and within the mouth are three or four wax openings or pores. The glands pertaining to the caudal wax filaments of the male are below the surface and have very long necks.

Respiratory System (Pl. IV, fig. 28).—The greatest difficulty was experienced at first in attempting to make out the details of the respiratory system. Exuviæ mounted in balsam showed the spiracular openings and portions of the tracheæ but nothing of the finer branches of the latter. Immersing living material suddenly in glycerine was tried later and specimens were obtained in which the whole tracheal system was outlined—by the refraction effect of its contained air—to the minutest ramification.

There are two pairs of spiracles, each pair being joined by a transverse trunk. The main tracheal trunks, of which the spiracles are the exterior openings, divide a short distance from the spiracles into several branches, of which the transverse trunk is one. In the case of the anterior system of tracheæ there are three other branches (supplying antennæ, fore and mid legs, alimentary tract and fore body), which divide again and subdivide; in the case of the posterior system, four other branches beside the transverse trunk (supplying hind legs, alimentary tract and hind body), which also divide again and subdivide until the proximate as well as the remotest portion of the body is supplied with appropriate tracheoles. The spiracular opening itself (Pl. IV, fig. 29) is funnel form, the outer rim more or less wrinkled and imperfect; the walls are of perceptibly thick chitin. The walls of the main tracheal trunks are also strongly chitinized to some extent.

Reproductive Organs.—In the female the reproductive organs consist of right and left ovaries, oviducts, spermatheca and vagina. In the male they consist of right and left testes, vasa deferentia, seminal vesicle and ejaculatory duct. The ovaries of the larval

female (Pl. IV, fig. 30) are fairly large sac-like bodies, rather wide caudad and tapering cephalad. The oviducts are long thin tubes uniting into a common duct before opening to the exterior of the body. In the fecundated female the ovaries are greatly proliferated (Pl. IV, fig. 31) and consist of many oval shaped ovarial tubes which open into a central tubular passage connecting with the oviducts. The oviducts unite into a common duct, which is somewhat enlarged at about its middle, to form the spermatheca, and ends in the vagina. The testes of the male (Pl. IV, fig. 32) consist of two large oval-shaped bodies tapering cephalad. At the posterior ends arise the vasa deferentia—narrow ducts which unite to form the ejaculatory duct. The lower end of the ejaculatory duct is chitinized and forms the elastic penis.

EXPLANATION OF PLATES

PLATE I

Fig. 1. *Ceroputo ambigua* in natural habitat.
Fig. 2. Adult female.
Fig. 3. Male cocoon.
Fig. 4. Adult male.

PLATE II

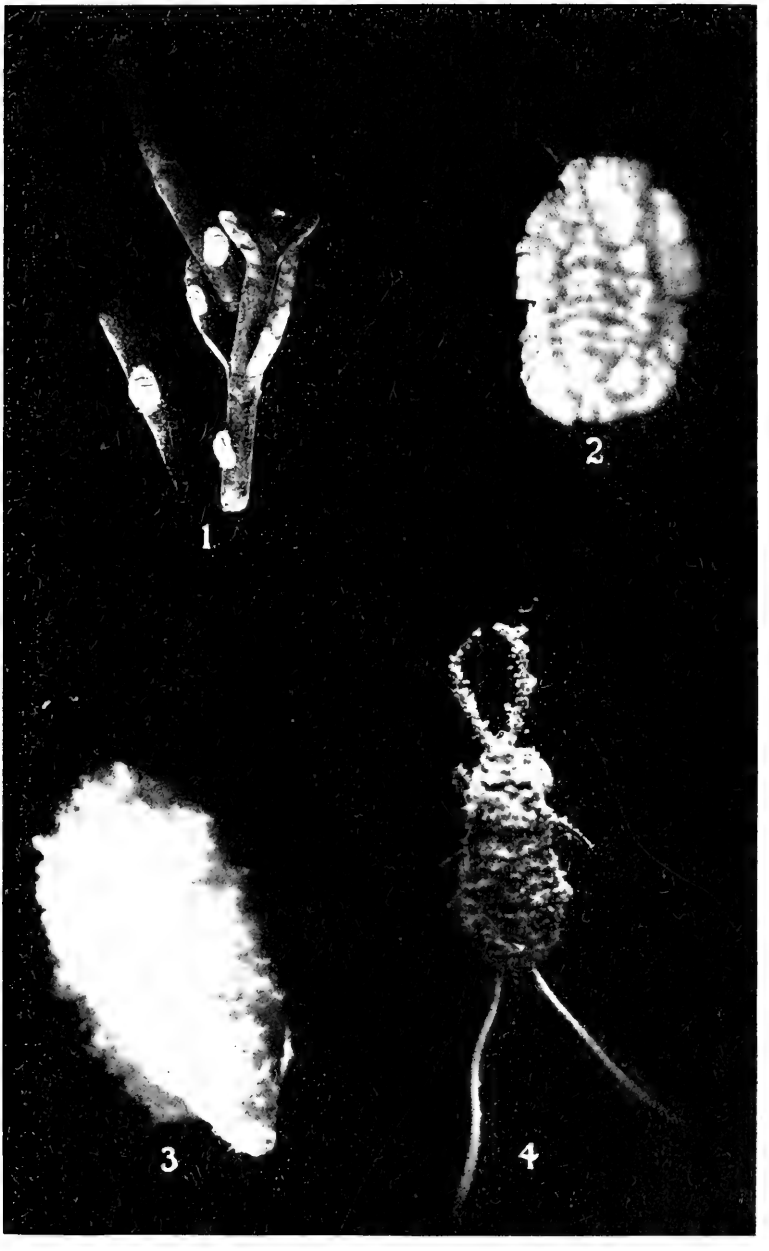
Fig. 5. Adult female: (a) dorsal view; (b) ventral view—mature specimen.
Fig. 6. Section of dorsal integument, showing spines and wax-gland openings of one type.
Fig. 7. Section of ventral integument, showing hairs and wax-gland open- of another type.
Fig. 8. Spine: (a) dorsal; (b) ventral—enlarged.
Fig. 9. Eye.
Fig. 10. Antenna of adult female.
Fig. 11. Leg of adult female.
Fig. 12. Anal opening, showing arrangement of perianal glands.
Fig. 13. Anal opening (drawn from section).
Fig. 14. Larva, 1st stage, ventral view.
Fig. 15. Antenna of larva, 1st stage.
Fig. 16. Antenna of larva, 2nd stage.
Fig. 17. Antenna of larva, 3rd stage.

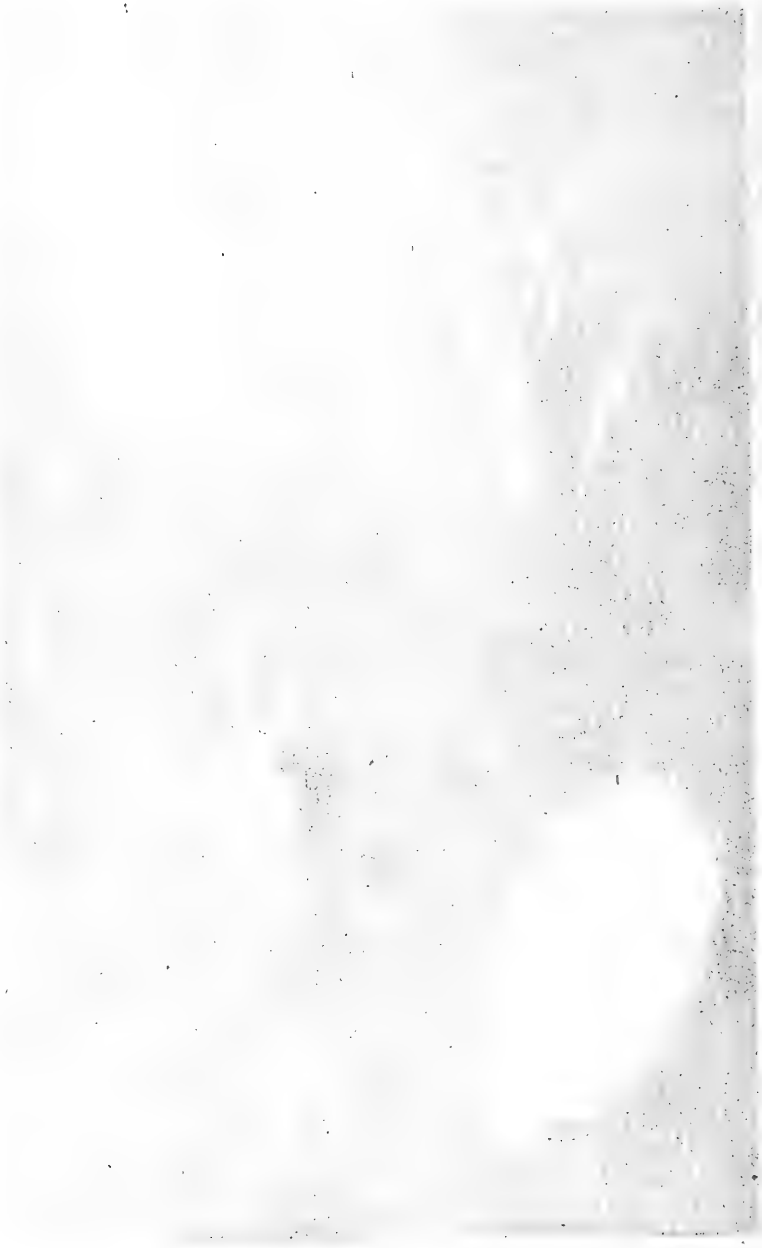
PLATE III

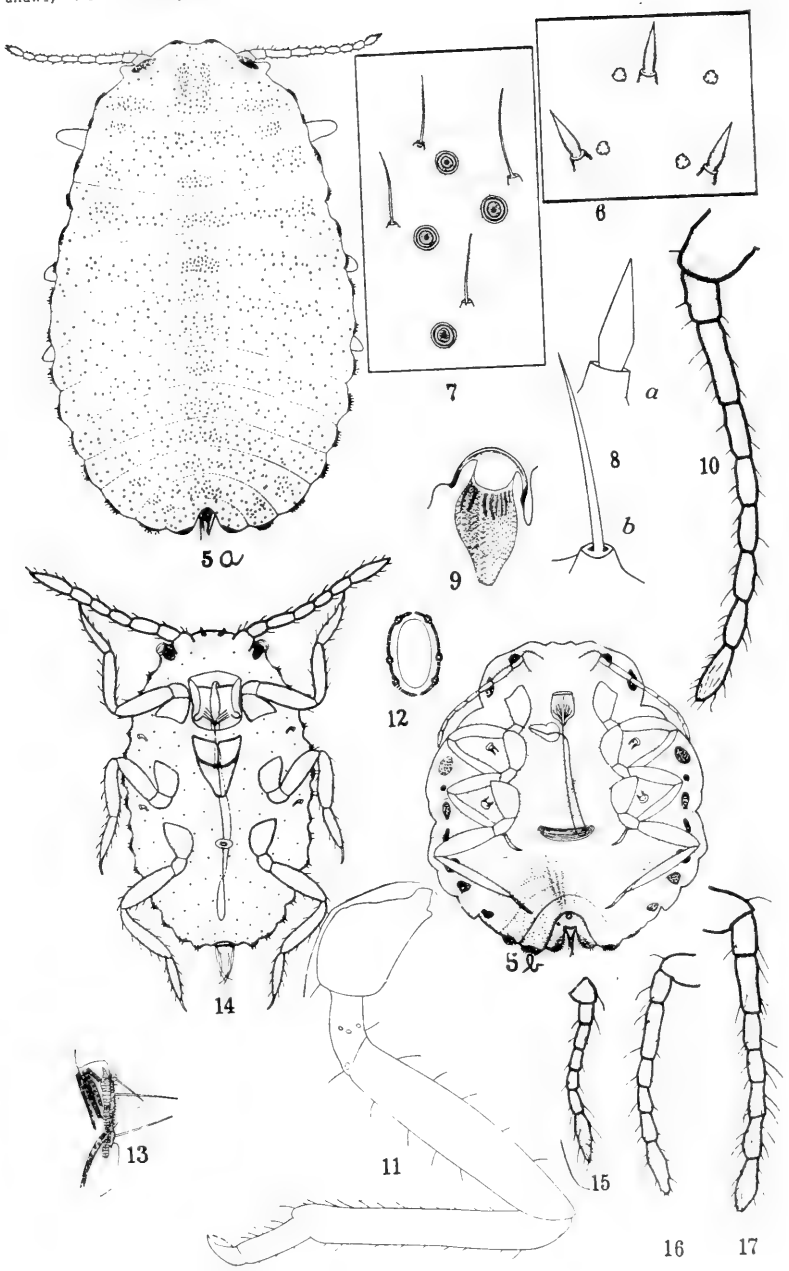
Fig. 18. Adult male, ventral view.
Fig. 19. Adult male, lateral view.
Fig. 20. Male pupa.
Fig. 21. Chitinous framework of mouth-parts (drawn from dissection).
Fig. 22. Mouth-parts (in outline).
Fig. 23. Buccal setæ (cross section).

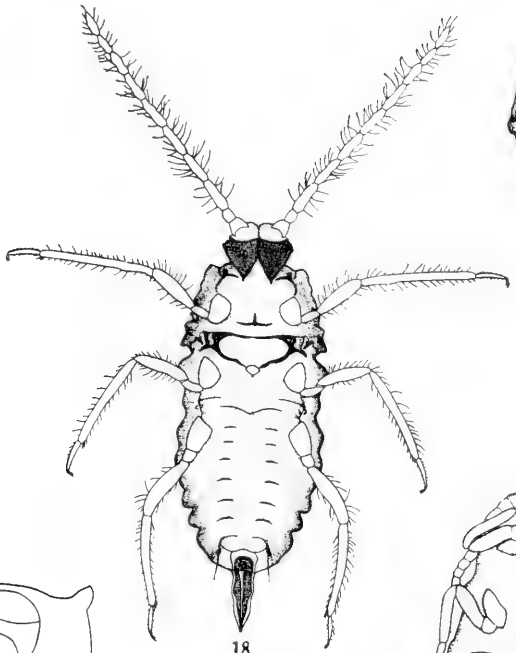
PLATE IV

Fig. 24. Alimentary canal.
Fig. 25. Salivary glands.
Fig. 26. Nervous system: (a) horizontal longitudinal section; (b) sagittal section; (c) cross section.
Fig. 27. Wax gland.
Fig. 28. Respiratory system.
Fig. 29. Spiracle.
Fig. 30. Ovaries of larva.
Fig. 31. Ovary of adult (from section).
Fig. 32. Male reproductive organs.

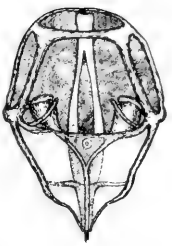

1
2
3
4



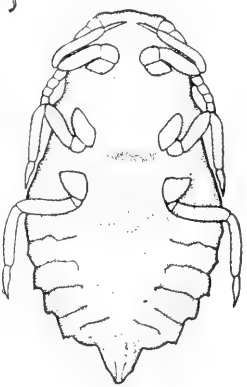

5a
6
7
8
a
b
9
10
12
14
5♀
11
13
15
16
17



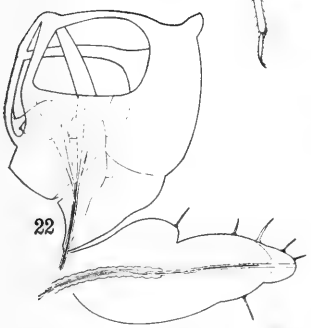
18



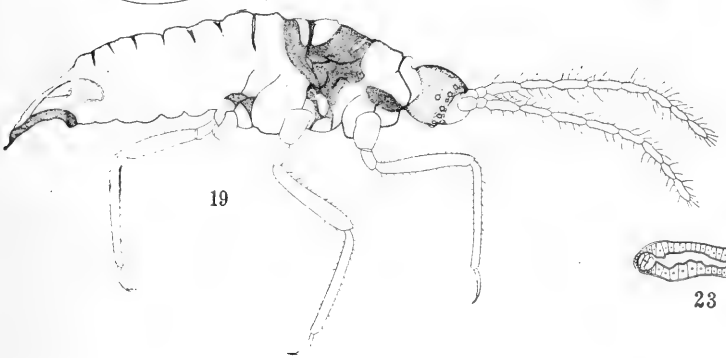
21



20

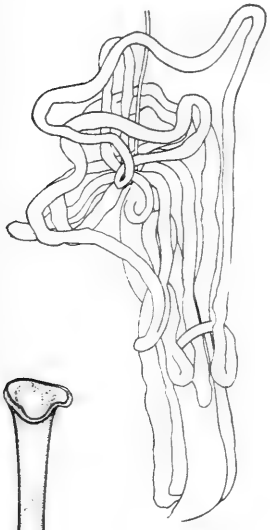


22



19

23



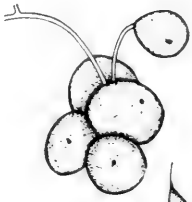
24

26 a

26 b

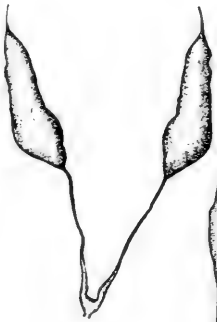
26 c

29

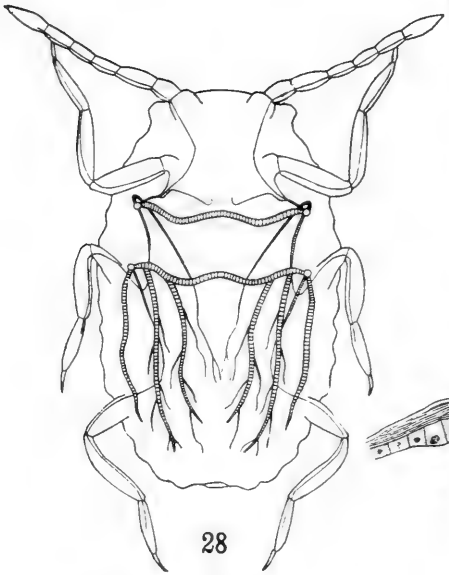


25

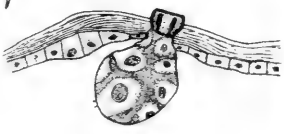
31



30



28



27

32

FEBRUARY, 1914. VOL. XIII. PAGES 1-46

Proceedings

— OF THE —

Davenport Academy of Sciences

THE NAZCA POTTERY OF ANCIENT PERU

BY DR. MAX UHLE

THE DAVENPORT COLLECTION OF NAZCA AND OTHER PERUVIAN POTTERY

BY EDWARD K. PUTNAM

DAVENPORT, IOWA, U. S. A.
DAVENPORT AGADEMY OF SCIENCES
1914

PUBLICATION COMMITTEE

ELIZABETH D. PUTNAM, Chairman

A. D. FICKE J. H. PAARMANN Dr. C. H. PRESTON

EDWARD K. PUTNAM, Acting Editor

Papers published in the Proceedings of the Davenport Academy of Sciences are now distributed as separates as soon as printed. It is planned that the last section of each volume shall contain reports of officers and records of meetings, to be sent out with title-page, table of contents, index, etc., for the entire volume. Such a section will shortly be issued to complete Vol. XII.

The present papers begin Vol. XIII.

The authors of the various papers are alone responsible for what is contained in them.

The date on the signature line of each form gives the time of printing.

DAVENPORT, IOWA,
February, 1914.

Published from the Income of the
Putnam Memorial Fund

Borcherdt Printing Company
Davenport, Iowa

FEBRUARY, 1914. VOL XIII. PAGES 1-46

Proceedings

— OF THE —

Davenport Academy of Sciences

THE NAZCA POTTERY OF ANCIENT PERU

BY DR. MAX UHLE

THE DAVENPORT COLLECTION OF NAZCA AND OTHER PERUVIAN POTTERY

BY EDWARD K. PUTNAM

DAVENPORT, IOWA, U. S. A.
DAVENPORT ACADEMY OF SCIENCES
1914

THE NAZCA POTTERY OF ANCIENT PERU

BY DR. MAX UHLE

[Dr. Max Uhle, the author of the accompanying paper, who is known the world over through his research work in Peru, is now a resident of Santiago, Chili, where he is engaged in archæological work under the Chilian government. Dr. Uhle is the discoverer of the Pre-Inca necropolis at Nazca in southern Peru, in which he found the exquisite pottery which has created so profound a sensation in archæological circles, and which he has made the subject of his paper. Following the excavations made by Dr. Uhle, others continued where he had begun, and one enthusiastic collector was able to assemble approximately a hundred objects. These, together with a representative collection from other districts in Peru, were acquired by the Honorable C. A. Ficke, Ex-President of the Davenport Academy of Sciences, while traveling in Peru in the year 1911, and by him presented to this institution. Before being shipped from Lima the collections were critically examined by Dr. Uhle, who was at that time director of the National Museum at Lima. Reference to the Nazca pots in the Davenport Museum, all of which are shown in the accompanying illustrations (Plates I to XIV) and described in the paper "The Davenport Collection of Nazca and Other Peruvian Pottery," by Edward K. Putnam, in the present volume of the Academy's Proceedings, will add to the interest in Dr. Uhle's paper.—EDITOR.]

Among the great variety of early Peruvian pottery we note especially four types which appear more beautiful and valuable than all the rest, and each of which marks one of the principal periods of the early cultural history of Peru. The first of these groups is the Tiahuanaco ware, the decorations of which appear in the style of the ancient monolithic gateway of Tiahuanaco on the shores of Lake Titicaca. The second group is formed by the old Trujillo pottery, a fine decorated ware, coming from the region of Trujillo as far as Samanco in the north, and formerly named erroneously "Chimu" ware.

The Inca pottery is the third group, distinguished for its almost classical shapes with a very sober sort of decoration upon it; the center of this ware was Cuzco. The fourth and last discovered type is the Nazca ware, the subject of this paper. This last group is doubtless the most attractive of all; in quality, polish, and decoration, it is unsurpassed by any of the rest.

Up to a few years ago the various classes and types of Peruvian pottery might be seen in collections, private and otherwise, jumbled together with no other consideration than for shapes or sizes; or all the black ones were placed in a row here, the red ones of about the same size there; or all those with face decorations together, those with tubular necks also arrayed in symmetrical order, and so forth, without the least regard for their provenience, age or fitness. Hence, the first and most needed step for the archæologist was that of bringing order into this chaos, to determine by means of serious research work the relative age of each one of the different types of pottery and its chronological position in relation to the rest.

During his explorations of the ruins and cemeteries of Pachacamac the writer ascertained and conclusively determined the historical position of the ancient culture of Tiahuanaco. These same explorations likewise gave abundant and conclusive proofs of the fact that the Inca civilization formed the topmost or most recent stratum in these cemeteries, as it does in all the other points along the coast of Peru, a result which is absolutely in harmony with the comparatively recent origin of that culture.

In order to determine the age and position of the so-called "Chimu" ware of Trujillo, the writer undertook the exploration of the ruins of Moche, near Trujillo, during the first one of the Hearst expeditions, under the auspices of the University of California, 1899 to 1900. Quite in accord with his own expectations, but contrary to a generally accepted theory, it was proved by means of these researches that the culture of Tiahuanaco was by no means the earliest of Peruvian cultures. Proof of this are ancient monuments of gigantic proportions having cemeteries at their base full of the most beautiful

decorated pottery of that so-called "Chimu" type, and which, beyond all doubt, dated from a period long before the Tiahuanaco culture had appeared in that district.

This important question definitely settled I could turn my attention to a new task, no less interesting. This was the determination of the provenience and the historical significance of a type of pottery of which the Berlin Museum für Völkerkunde possessed, since the seventies of the past century, a group of four specimens, there never afterward having been obtained any additional pieces nor any new information concerning their provenience. I still recollect the enthusiasm with which the late Adolf Bastian, the founder of the Museum für Völkerkunde, extolled these few strange and wonderful objects, the like of which never had been seen before as coming from Peru, and how he saw in them the key that would reveal to us relations between ancient Mexico and ancient Peru. He rightly pointed out the strong similarity to Central American art in the perfection of the technique of this ware, its polychrome decoration and its rich figure designs. The monster appearing in these designs showed to him a distinct recollection of the feathered serpent, which plays so prominent a part in the myths and sculptures of Central America. Therefore, it was most deeply regretted that the limitation of the material and the lack of data concerning its origin always cut off such interesting speculations just at the point where they become the most absorbing. I do not remember ever to have seen any objects of this type in any other European museum. The Museum of Natural Sciences in New York in 1902 possessed one single specimen of this ware, which among the wealth of treasures there was hardly noticed.

Thus, after having solved and settled the Chimu question in 1900, and owing to the inspiration of Professor Bastian, I determined to study the question as to the provenience and the cultural significance of this type of polychrome ware, of which I had seen those few specimens at Berlin. I had noticed there that some of these objects were marked in the catalogue as coming from Ica and Chala. This region so far was known only by its production of wine, native Peruvian cotton, and oranges. It had never been explored at all in an archæological

sense, as it never seems to have occurred to any one to look for ancient remains in this district. Here I saw before me a new field of work, which would also give me an opportunity to trace the development of ancient cultures in the south of Peru. Through my explorations at Pachacamac I had obtained a chronological cross-section, so to speak, through the cultures of central Peru and through the work in Moche I had succeeded in getting the same for the northern provinces.

I started out for an expedition to last two or three years and I set myself the task of obtaining a cross-section through the cultures of southern Peru in a line from the Chincha valley through to Cuzco.

The first zone I came across was the ancient realm of the Chinchas, who occupied such a prominent place in the pre-Spanish history of the country. Next I started to explore the region of Ica where I hoped to find proofs for the origin of those polychrome objects of the Berlin Museum.

From there my journey would have taken me by Lucana, where in ancient times a number of different languages are known to have been spoken, by Ayacucho and Abancay to Cuzco. I also was convinced that by making such a geographical section through to Cuzco I would obtain some more material to prove exactly the origin of the Incaic culture, concerning which there was at that time much less positive knowledge than we possess at present.

However, I was only able at that time to carry out the first part of this program, as I was called back to California in the middle of the year 1901. By that time I had obtained a fairly complete picture of the development of cultures in the valley of Chincha, while in the Ica valley (14° South Lat.) I had entirely accomplished my chosen task.

I arrived in the valley of Ica in November, 1900, and at once purchased riding mules, upon the backs of which the district was explored in every direction, excavations being made here and there as well. In many spots I noticed quantities of potsherds strewn over the surface, the polychrome coloring of which fragments was beautifully preserved owing to the very dry climate. The character of the designs, however, was not the one I was looking for. It was the same as I had observed

in the adjuncts of graves I opened in Chincha valley, the pottery showing simple geometrical patterns, resembling textile or basketry designs, and was everywhere in the Chincha district associated with artifacts of the Incaic type. The excavations I made here in the Ica valley only furnished the same results. Hence, it was clearly demonstrated that all these remains dated from the last period of the pre-Spanish development of this local culture. The abundance of these remains and the very good state of preservation of their colors was also due to their comparatively recent date.

A few weeks later I succeeded in finding a cemetery of a somewhat different type. The general character of the pottery still was the same as in the previous cases, but here the Incaic artifacts were entirely absent; instead there appeared decorative elements in the pottery designs which connected them somewhat with the style of Tiahuanaco. In spite of this discovery the result remained unsatisfactory until the end of the year, as far as the main purpose of my search was concerned, that of finding traces of that precious polychrome ware of the Berlin museum. This civilization seemed to have vanished completely, without leaving the smallest trace, or it might never have existed in this valley at all!

In the month of January of the new year (1901) I was invited to visit the hacienda Ocucaje, twenty-five miles from Ica. My host was Dr. Mazzei, whom I had known at La Paz, Bolivia, and who had previously made archæological collections from Peru and Bolivia, later acquired by Italian museums. This hacienda occupies an enclosed valley about three miles in diameter and separated from the Ica valley proper by a solitary mountain. The soil here is extremely dry. Only during the rainy season in the Cordillera the little Ica river carries its water during a few weeks as far down as this valley, while there are many dry years when none comes at all. Furtunately for this region is the circumstance that there is a substratum of gypsum (sulphite of lime) underlying the top soil, which retains the humidity so that at least there always remain some subterraneous filtrations, otherwise the vegetation of the valley would be scorched out of existence by the torrid heat that blazes all the year around from an ever unclouded sun

and untempered by any cooling breezes from the sea, which are cut off by the intervening mountain. All the surrounding mountain slopes and any elevations visible are covered with sand dunes hundreds of meters high. The landscape has a completely tropical character. Palms grow here and dates ripen in many districts. Extensive groves of algarrobe form the natural vegetation of the valley, only interrupted where exterminated in order to give way to plantations of grape vines, fig trees and the native Peruvian cotton shrub. The arid mountains of gypsum contain numerous well preserved skeletons of palæontological creatures, some rocky elevations in the valley are covered with petrifacts of conchs and turtles. It seems as if in this remote solitude creation, in its development, had been standing still for thousands of years.

After having made a number of minor excavations with the same negative results as all the former attempts, I was riding one day around the sandy edge of the valley when my eye was arrested by a simple potsherd lying upon the ground. It proved to be a fragment of a large bowl, quite undecorated but for a band of red coloring along the upper rim. My attention was thereby roused at once. Only in objects of the Tiahuanaco period I had so far found this characteristic feature. I decided to dig in this place. Quickly the necessary workmen were brought together and a donkey was set to work to carry all day long the supply of drinking water from a spot three miles away where water was to be found in the river bed at about three feet underground. The first day's work proved that the long sought cemetery had, at last, been found and that the beautiful polychrome ware had been located!

The burials lay scattered far apart in the sandy soil along the edge of the algarrobe groves, and only after a great deal of shoveling were the individual burials laid open. Adults were interred at a depth of from six to eight feet; the pits were from four to five feet long by an equal width. The body was deposited sitting against one of the side walls, usually the western one so as to face the east; and two or more polychrome vessels were deposited near the dead. Several poles of algarrobe wood were then laid across the body in a slanting way like a roof, upon which the entire pit was filled up with sand.

Some especially rich burials were found in pits ten feet deep and having a side length of six feet. Poles horizontally laid formed the roof, which, in turn, was weighted with stones or adobes of a conical shape, after which the filling in with sand followed. Children were interred nearer the surface inside of large urns and there were usually a few small objects as adjuncts.

The contents of the burials were not well preserved, excepting the pottery. Some of the skulls, deformed into an elongated shape, were in some instances tolerably well preserved. Metal objects were entirely absent from among the grave adjuncts. Inside of some of the urns, together with the remains of small children, were secured fragments of plain but very fine fabrics and some extremely interesting braidwork, forming a fringe set with diminutive human figures. However scant and fragmentary these textile remains were, they still helped to prove in the same degree as the pottery that it proceeded from a people of high technical abilities.

Soon a number of similar burials were discovered in two different spots, and even three cave burials were found in the nearby rocky slope, these without any adjuncts. Two of the bodies were of adults; the egg-shaped mummy-pack was well

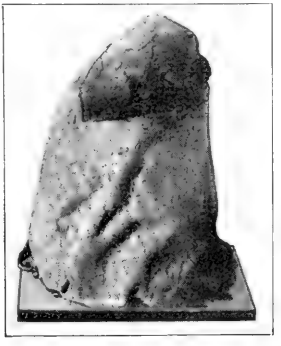


FIG. 1.—Mummy cloth

preserved. One of these was wrapped in a white cotton cloth with lace-like open work, the pattern of which with its complementary fish design (or serpent?) proved its belonging to this period (text-fig. 1). The mummy was surrounded by a

variety of charms, sticks with feathers upon them. All of these, together with the mummy, are now in the museum of the University of California. The other adult mummy crumbled to pieces upon its arrival at Berkeley. The third one was that of an infant and was found strapped upon a sort of a cradle and suspended by cords from the roof of the cave. The little cranium still was bound tightly with a T-shaped bandage, closed in the back, this for the purpose of deformation. Unluckily, it fell to pieces in spite of all possible care during its transportation to the United States.

After thus having proved the presence of this culture in the region of Ica, I soon succeeded in locating the same in various spots further up the valley and thus to gather in quite a representative collection.

My intention of exploring the adjoining district of Nazca was—unfortunately—frustrated by my being called back to California. As soon as I had left the scene of my last explorations my workingmen, who had become quite experts, under my training, continued alone and in secret to search for this most valuable and rare pottery. Thus a vast amount of this beautiful ware was unearthed and found its way to Lima, where all was greedily acquired by dealers. Many additional cemeteries were located by these *huaqueros* and entirely rifled.

During the last ten years, since my first discovery of this beautiful ware, our knowledge concerning the wonderful culture that produced it has been continually increasing. Always searching for aditional material I explored the district of Palpa and Nazca, upon the other side of the desert that stretches ninety miles south of Ocucaje, also exploring all the adjoining territory in search of this culture. Thanks to these researches, we now possess a pretty adequate idea of the extent and geographical distribution of this culture, of its characteristic features, its historical position as well as of the influence it must have worked upon the development of subsequent cultures in the various parts of the country.

As the principal seat of this culture we must assign the region of Nazca as far as Chincha, the latter being one of the most fertile valleys upon the coast of Peru. In the *quebrada* of Pisco, which cuts deep into the district between Ica and

Chincha, this culture extended upward of two days' journeys from Ica as far as Huaitara, 9,000 feet above sea level.

It is easy to distinguish certain varieties among specimens of pottery of the same culture. Some will show a greater variety of colors, others are plainer; some show severe outlines in their figure designs, while others are marked by a free and flowing treatment, which often degenerated into a mass of meaningless staff or arrow-like points and scrolls around the original nucleus of the design. It appears that those designs which are distinguishable by the more severe treatment of the figure ornament in union with the richest harmony of its coloring, must be considered as representing the earlier type. This latter class up to now has come to our knowledge as produced exclusively by the valleys of Ica, Pisco and Chincha, while in the articles coming from Palpa and Nazca the freer treatment seems to predominate. More recent information also enables me to include in this group the region of Acari, situated at one or two days' journeys south of Nazca. But at this point it appears, even more so than in Nazca, that still more recent developments of the same designs predominated.

Towards the north, the region of Cañete is still quite unexplored. It is separated from the valley of Chincha by a strip of desert of only forty-five miles in width and seems in older times to have formed a part of the southern cultural region; it is possible, therefore, that this culture may have extended beyond Chincha overlapping this district. Thus the entire area occupied by this ancient civilization seems pretty clearly circumscribed.

I have tried to demonstrate elsewhere that the influence of this culture upon other subsequent ones must have been much more extended and far-reaching than the above geographical limits seem to indicate. The people to whom this culture belonged were evidently acquainted with seafaring. For in the neighborhood of Chancay, about fifty miles north of Lima, I have discovered a certain class of pottery objects of the same type, which in their turn in this locality had originated later developments of a very different cultural aspect.

In a paper presented to the Congress of Americanists at Stuttgart, 1904, I detailed the relations existing between the Ica-Nazca and the early Trujillo cultures which at a certain remote period apparently predominated in the regions of Chancay and Lima, and of Pachacamac also, as I have stated elsewhere (XVI Congress of Americanists, Vienna, 1908). So it will be seen that the apparent influence of this southern culture extends mainly northward. However, there are also remains in certain parts of western Argentine the type of which would be almost incomprehensible without the assumption, for this and kindred species, of a Peruvian origin, as I have shown in a paper read before the XVII Congress of Americanists at Buenos Aires (1910). Although we still are lacking the convincing proofs it would be plausible that such a powerful culture as that of the region between Nazca and Chincha undoubtedly was, might also have sent out offshoots eastward into these remote regions; the connecting links for this assumption must be looked for and laid bare by slow degrees.

A peculiar feature observed in connection with this south Peruvian culture is that its seat is always restricted to arid valleys, which have scarcely any running water and which are covered with groves of algarrobe, surrounded by boundless stretches of sandy desert. It remains a mystery for what reason the narrow sandy strips along the edge of the algerrobe groves are all completely covered with vast cemeteries of this character. To judge from these numerous burials there must have been a dense population in these same regions, and it is difficult to understand by what ways and means they could subsist in this arid land as it appears to us today. The theory that the climate of that region might have undergone a change since those early days, cannot be upheld, since there are no additional circumstances to be found in support of it. But turning our attention to the Argentine we see that in that country a culture developed itself which bears a good many points of similarity with the Peruvian type and which, too, preferred arid regions and similar groves of algarrobe. Thus one might be led to think that these people preferred these

conditions of surroundings to all others and perhaps even drew their nourishment from the algarrobes, as is still at the present day the case with the natives in the interior of the Argentine province of Catamarca.

Our knowledge of the ancient Peruvian culture from the region of Chincha to Nazca is derived mainly from the great wealth of pottery that has been brought to light so far. In the valleys of Pisco and Chincha there exist some mounds of large size, composed of round balls of adobe, which belong to this period also. They must have been temples or something of that nature, but at present are in such a ruined state that it is difficult to distinguish them from natural elevations. Of metal objects produced by this civilization I have, so far, only secured one single specimen, a piece of hammered gold, having an interesting mythological design upon it; it is now in the museum of the University of California. Doubtless implements of metal must have existed and been used by these people, as one may infer from the painted designs upon the pottery where they are occasionally represented, but they are not preserved in these burials of such a very ancient date. The bodies, too, have nearly all disappeared, with the exception of a few craniums, rather well preserved, which were secured during these explorations; these were mostly dolicocephalic and deformed into an elongated shape. This ancient people also had the custom of suspending the heads of slain enemies in the manner of trophies, in some instances the back part of the skull was cut off, leaving a mask-like face, which had a hole cut through the frontal bone for suspension.

Outside of the great mass of pottery there have gradually come to light some few fragments of textiles, thanks to the extreme dryness of the climate, which was favorable to the preservation of fabrics, while perishable objects of other materials have mostly disappeared. A number of fragments of tissues were sent by me to the University of California. The Museum of Lima owns a beautiful poncho of tapestry, adorned with mythological figures, belonging probably to the end of this period; there are also a number of ornamental bands of tapestry dating from about the same period.

Quite unique, both for the workmanship and the artistic character of their decorations, are a number of textiles brought to light quite recently (1911). In these fabrics we find mythological figures and naturalistic designs represented in the same bold style as those painted upon the pottery (text-fig. 2). Bright colors in beautiful soft tones as we see nowhere else in Peruvian textiles, distinguish these fabrics. I

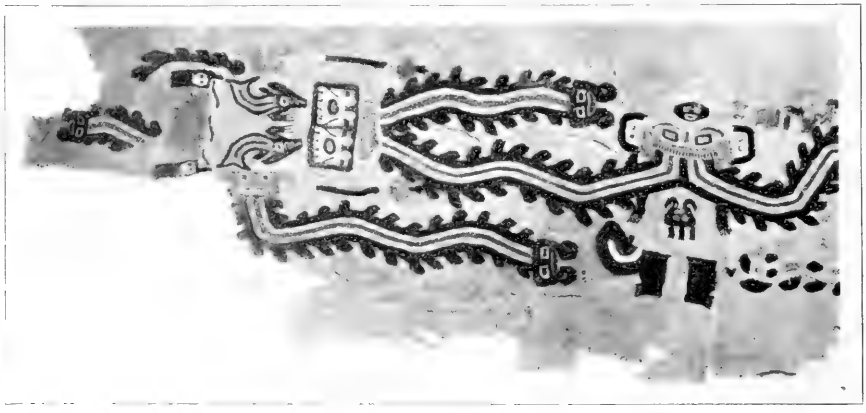


FIG. 2.—Fabric

here present a few of these. There is a narrow band among them (text-fig. 3), covered with a design showing humming birds and flowers in a beautiful variety of colors upon a back ground, the drawing of which is so naturalistic that it might be a modern product. Very pretty, indeed, are the specimens of braidwork, a sort of fringe studded with diminutive human figures, all knitted out of woolen threads in many colors and forming another bright example of this highly developed culture. The later specimens are now to be seen in the museum of California.

These few examples illustrate the high degree of development that this culture had attained in its textile art and which is quite equal to its pottery, and from these we may form an estimate of the general culture possessed by this highly gifted people.

Among the different types of pottery we notice as the fore-

most class the bottle with single or double tube. There are also low, flaring cups, plates, and a class of tall slender cups which have a remarkable resemblance, both in shape and ornamentation, to those shown in the Museum of Guatemala, Antigua, and recovered in that neighborhood. Figure vases are not numerous in this ware.[1]

The painted decorations of these objects are their most attractive part. We find among the ornamental designs, such of human beings, animals, plants with flowers and fruits,

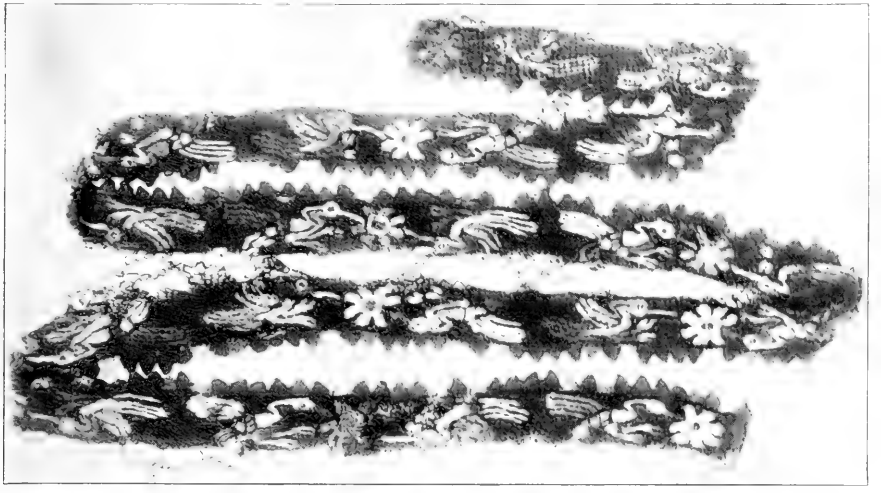


FIG. 3.—Fabric

some of these very realistic. Others again show animals and human beings in combination with mythological attributes. There never appear any deities of such a decided anthropomorphic type as that of the image upon the Gate of Tiahuanaco, as well as of other figures of that period.

[1]Examples of most of the types alluded to by Dr. Uhle are found in the Davenport collection, and are pictured in the accompanying plates. For the bottles with single and double spouts, see Plate XII; for the low flaring cups, Plates IV and VII; for the tall slender cups, Plate VIII; for figure pots, the unusually fine vase on Plate I, and compare Plate XIII. For textiles see Plate XIV.—EDITOR.

On the other hand, there is a wealth of designs showing monstrous creatures of a zoomorphic type, such as centipedes, crabs, birds, and possibly also whales. The creature resembling the centipede appears most frequently in these designs. Motives derived from this figure may be traced through a large part of the ornamental designs of this period. Very numerous among these are fabulous beings, which consist of a combination of a human form attached to a snake-like body of the centipede. These are the figures which caused A. Bastian to compare them with that of the feathered serpent of Central America. We also find simple naturalistic scenes represented among the designs upon this pottery, such as a hunt for vicuñas with arrows, while the animal is grazing between the cacti of the mountain side; or we see a sort of scaffolding from which are suspended a row of trophy heads; or there is a graded temple-pyramid, in the interior of which are deposited the skulls of the human sacrifices, while on one side the priest with the sacrificial knife in his hand is ascending the grades to sacrifice an animal, and on the other side an individual appears to be dancing. In one design is seen a llama attached to a rope, while in all similar representations in ancient Peruvian art the llama usually appears as walking with its load unfettered. In this manner we learn to know many sides of the general culture possessed by this interesting people, but mostly those of their religious ideas, which seem to have been associated with no end of monstrous beings.

Of the personal appearance of this people we are able to gather only a few general notions from these pictures. According to the latter, they must have been slit-eyed, similar to the Aimaras of Bolivia or like the sons of eastern Asia. They wore richly ornamented clothing. The head was covered; at times it was wound turban-like with braided bands, pieces of cloth or slings, as was the general custom in ancient Peru. The fabulous creature, part human part monster, is always pictured as wearing a rich feather crown, extremely like those of the Zapotec or Maya figures of Central America.

It is impossible as yet to say where this peculiar culture originated. Not one of the finds in hand so far gives any indi-

cations whatever of previous stages of development of the same civillization. This still may be forthcoming, however. Judging from the objects, such as we gather them at present, it might seem possible that the culture had been imported from outside in its complete state. We are not prepared to venture a guess as to which people was the bearer of such a civilization. It is useless to try and connect forcibly certain cultures as typical of certain nationalities, as is still so frequently done in connection with Central American types. Cultural types may change, nations remain. The same people that may thousands of years ago have possessed one particular culture may at another age be given to quite a different one. Thus it was in Europe and so it is everywhere. There is also a danger in this anxious endeavor to connect certain cultural forms with given nationalities, that those facts which may be known of their history only are apt to tangle up the clear thread of the practical development of their cultures. From these considerations I resign myself simply to state the cultural forms and their history, leaving aside the, as yet, unsolved question as to the people or race itself.

Although we do not know where the people or this peculiar culture came from, we are nevertheless fully able to know its relative age as compared with other well-known cultures of ancient Peru. In northern Peru the ancient so-called Chimu culture of the region of Trujillo was the oldest one among the different civilizations known to us; it even preceded in that region the Tiahuanaco culture. The same position in southern Peru is occupied by our "Nazca" culture. It ran its course to the end before the Tiahuanaco culture began to appear in this region. We are in the fortunate position to survey the cultural development of this particular province and see it before us in an uninterrupted line from the earliest Nazca, or "Proto Nazca" type, down to the culture of the Incas. Only this present "Proto Nazca" culture appears as if standing outside, aloof from this entire course of development. Still some of its ornamental motives have been preserved in the cultures which succeeded that of Tiahuanaco, and so these, too, furnish us with a local proof of the great antiquity pos-

sessed by this culture in the south of Peru, as well as within the entire cultural history of Ancient Peru.

Lima, Peru,
December, 1911.

THE DAVENPORT COLLECTION OF NAZCA AND OTHER PERUVIAN POTTERY

BY EDWARD K. PUTNAM

While traveling in Peru in 1911, the Honorable C. A. Ficke secured and presented to the museum of the Davenport Academy of Sciences, of which he was formerly president, approximately four hundred objects illustrating Peruvian archæology. By far the most interesting and valuable collection was that of the beautifully colored Pre-Inca pottery from Nazca, considered the center of the Southern Coast culture. Of this ware Mr. Ficke brought home nearly one hundred choice and representative specimens.[1] From other parts of Peru there is a large collection of the black and of the dull red modeled or molded pottery from the north coast, chiefly from Ferrenafe, Chiclayo and Trujillo. There are also representative specimens of various styles of pottery from the coast region between Huacho and Pachacamac, and of pottery showing Inca influence.

The size and importance of this collection seem to justify the publication of a report and brief description of the objects. This is especially true of the Nazca pottery, only recently discovered and still rare. For this reason the Davenport Academy of Sciences is fortunate in having secured from Dr. Max Uhle the accompanying interesting paper describing the discovery of this type of pottery and discussing its relative place in the sequence of cultures in Pre-Inca Peru. All the Nazca pottery in the Ficke collection is shown on the accompanying

[1] See also the introductory note to the preceding paper "The Nazca Pottery of Ancient Peru" by Dr. Max Uhle.

plates, which therefore illustrate Dr. Uhle's paper as well as the present description. In regard to the balance of the collection it would be too great an undertaking at the present time to discuss it thoroughly. This pottery is therefore simply pictured, with brief notes. The data as to localities for all objects outside of the Nazca collection were compiled from the labels attached to the objects when received at the Academy museum. Unfortunately the locality of a number of specimens is not known.

For the Davenport Museum, the Ficke gift of Peruvian pottery is a valuable addition in that it supplements the extensive collection of ancient Mississippi Valley pottery now in the museum. This North American pottery, consisting of over 1,300 specimens, has been studied and described by Prof. W. H. Holmes, of Washington, in an illustrated paper, "Ancient Pottery of the Mississippi Valley," published in Vol. IV. of the Proceedings of the Davenport Academy of Sciences, part of the material being also used in his writings for the Bureau of Ethnology. A study of this Mississippi Valley pottery is made more interesting and instructive by a comparison with the Peruvian.

I. NAZCA POTTERY.

There are in all ninety-six specimens from the Nazca Valley in southern Peru.[1] Of these one is a syrinx, or pan-pipe, of reddish clay with burnished or polished surface (Plate XIV, fig. 1). Another is a piece of fabric in the shape of a narrow band or belt (Plate XIV, figs. 2 and 3), the brilliant colors being well preserved. This leaves ninety-four pots proper. The collection appears to be typical as to shape, color, design and quality of workmanship.[2]

[1] For the location of Nazca and the other Peruvian localities mentioned see the sketch map at the end of this paper, Plate XXVII.

[2] For comparison with the Ficke collection at Davenport here described, the collections of Nazca pottery in the Paris, London, and Berlin museums have been examined. Unfortunately it has not been feasible to visit the few other museums containing specimens of this unique and interesting ware.

In shape the Nazca pots are comparatively simple, and with a few exceptions do not show any modeling. A majority of the pots have a rounded base, with no handles, with no lip, and with the brim as wide as any portion of the pot. All the vessels shown on Plates III-IX are of this general type, ranging all the way from low flat bowls to tall narrow vases. Compare the low porringer-like bowls on Plate III, the cup-shaped vessels such as those on Plate IV, the beakers on Plate IX and the peculiar and interesting tall cylindrical vases on Plate VIII. These tall cylindrical vases seem to be especially characteristic of the Nazca ware.

For most of these shapes the sides may be either upright or flaring out. In two pots (Plate X, figs. 1 and 2; cf. also Plate XIII, fig. 1) the upper portion is slightly contracted and there is a simple lip. In the other pots or jars shown on Plate X the top is still more contracted and there is a low spout (broken off in three cases) but no handles or eyelets for suspension. Figures 1, 2 and 3 on Plate XI represent jars with this low wide spout, but each with two eyelets for suspension by a cord (cf. Plate XIII, fig. 1). Plate XI, fig. 5, has a knob where one of these eyelets should be, and nothing corresponding on the other side. Three pots (Plate XII, figs. 1, 2 and 3) have a central spout and a single curved handle. The third of these is a bottle with a high narrow neck. Three other pots (Plate XII, figs. 4, 5 and 6) have a double spout with connecting handle, a form not infrequent in other classes of pottery from the Peruvian coast. One pot (Plate XIII, fig. 3) has two fairly wide spouts but no connecting handle. The only complete double-bowled pot is shown on Plate XIII, fig. 1, but Fig. 5 on the same plate is half of a double pot, the other portion being lost. Of these Fig. 1 has wide mouths and is not of the musical type. Fig. 5 would appropriately have been a whistling pot but the spout seems not to have been so fashioned. While there appears to be considerable variety in shape, on the whole the form of the Nazca pottery is simple, though generally well-proportioned and with graceful lines.

In these Nazca pots there is next to nothing of the fine modeling and molding of ornament and figure that marks the

pottery of the northern coast of Peru. Only in a few cases is modeling resorted to at all, and then apparently to reinforce the effect of a painted human face or figure. Thus there is a slight projection of the nose and other features in Plate IX, figs. 2, 4, 5 and 6, Plate XII, figs. 1, 5 and 6, where the spout is made to represent a human head, and in Plate XIII, figs. 2, 3 and 4. In Plate XIII, figs. 5 and 6, which will be discussed later, the modeling is more elaborate and skillful. It is interesting to note that there is no trace of modeling in the case of the conventionalized rows of heads discussed later, nor in the grotesque semi-human figures. The more realistic faces seem to have suggested modeling.[1]

But the striking feature of the Nazca pottery is not the shape, nor the modeling, but the beautiful and unique painting, with its rich use of color and its varied design. As pointed out by Dr. Uhle in the accompanying paper, it was the polychrome nature of this pottery which first attracted attention to it, and it is this polychrome nature, more than anything else, that makes this ware distinctive.

A few words regarding the colors represented in the Nazca pottery herein illustrated may not be out of place. Plates III to XIV are reproduced from photographs taken on red-sensitive plates with color screen giving full correction, assuring as accurate a rendering of color values as is possible in monochrome. Five of the pots, selected as most typical of the coloring of the group, are shown in their true colors, in Plates I and II.[2] In these plates the actual pots have been photographed direct and reproduced by the four-color process, giving, it is hoped, more satisfactory results than obtained from colored drawings.

Almost all of the pieces contain much white or yellowish

---

1 Cf. the figured pots shown in Berthon, Nouvelles Archives des Missions Scientifiques et Littéraires, N. S. Fasc. 4, Plate I; Joyce: South American Archæology, frontispiece; and Uhle, XVI Congress of Americanists, (Vienna) fig. 18b.

2 Plate I is the same figure as is shown on Plate XIII, fig. 6. Of the four figures on Plate II, Fig. 1 is the same as Plate IX, fig. 1; Fig. 2 the same as Plate VIII, fig. 3; Fig. 3 the same as Plate VI, fig. 5; and Fig. 4 the same as Plate IX, fig. 8.

white, and some black. Deep red, red, orange-red, yellow and gray are each represented on about fifty per cent of the pots, while orange tint and brown are on only about half that number. About a dozen of the vessels have a little pink in the design; six, violet or violet-red tint; and one, blue. Fourteen pieces show traces of light blue in the ground color of the sides, generally only on one side of the vessel, while the rest of the ground color of the same vessel is white or yellowish white. The sides are usually covered with one or more bands of white (sometimes black, red, or yellow) ornamented with designs which are generally in many colors. In over half of the pottery the side is almost covered with a single broad ornamented band, separated from the unpainted base by a narrower solid band of red, black or brown. Twenty-seven of the vessels have their sides ornamented with series of narrower, figured bands, while their bases are painted white except in a few cases where the bases are black, reddish, or uncolored. In many of the pots there is also a painted band, generally reddish, reaching down the inside of the pot about one inch from the brim.[1]

The ornamentation of most of the Nazca pots in the Ficke collection is more or less conventionalized, though in some there is a more natural and realistic treatment. Motifs are most frequently drawn from the human face or figure in various aspects and combinations, sometimes in association with monsters or animals. Motifs are also drawn from various animals and plants, and perhaps from astronomical bodies or meteorological phenomena. There are other designs that appear to be simply geometrical. No one can be sure of this, however, because what appears to be geometrical may be a degenerate conventionalization.

ANIMAL FIGURES, ETC.

Of the animal figures proper shown in the Davenport collection perhaps the most natural are the four bird designs on

[1] These details as to the color used in the decorations on the Nazca pottery are furnished by J. H. Paarmann, Curator of the Davenport Museum, who made the photographs for the plates and also the tracings from the pots used for the text-figures.

Plate III, figs. 3 and 10, and Plate IV, figs. 7 and 12. These are well drawn and delicately colored.

Fish figures are used in the design on the richly colored pot shown on Plate XIII, fig. 1, a rather unique specimen in the collection. This pot, with a dark background, also shows snails and perhaps other marine objects, all encircled by gracefully curved seaweed. One-half of this double pot has not been painted except for the fish ornament on the inside of the brim. Fish are used for an ornamental band to decorate Plate V, fig. 6, and in a different form Plate III, fig. 6. What seems to be a highly conventionalized fish design, found elsewhere in Peru, is found on Plate X, fig. 4.[1] The figure on Plate IV, fig. 3, appears to represent some kind of an aquatic object, as do the more conventionalized figures in the bands on Plate III, fig. 1, and Plate VI, fig. 2. It seems to be noteworthy that pottery ornamented with fish or other aquatic designs should be found in an almost dry valley like that of Nazca.

The llama is represented on Plate X, fig. 3, the arrow-like figures perhaps suggesting a hunt. Mice are found in connection with the human-monster figure, Plate II, fig. 1 (text-fig. 2).

Designs of two or more forms that may represent pods or beans of some plants are found on Plate V, fig. 7, and on Plate VII, fig. 8, as well as in connection with certain human-monster (Plate XI, fig. 2) or human (Plate XIII, fig. 3) designs.

Of the various geometrical designs, parallel lines, dots, bands, zigzags, diamonds, triangles, rectangles, circles, checks, scrolls, frets, etc., it will have to suffice to call attention to their variety, to the frequent recurrence of the same figure, the stair pattern for instance, and in some cases at least to the skill with which they are handled. Some of these show the influence of textile art; others very likely can be traced back to conventionalized ornament. Generally they are in narrow bands or otherwise secondary to the main figure of the pot, but in other cases they furnish the chief decoration (Plate VIII, fig. 4; Plate IX, fig. 9; Plate XII, fig. 2, etc.).

1 Cf. C. W. Meade: "The Fish in Ancient Peruvian Art" in the F. W. Putnam volume, pp. 126 ff.

FIGURE POTS

Of the human head and human figure pots, mention has already been made of those in which modeling is used to reinforce the effect of the painting. Plate IX, fig. 2, shows a dark brown face in low relief and the varied ornamentation indicates the dress of the individual. Plate IX, figs. 4 and 6 show faces with raised noses. In both there is a hood-like head-dress coming down close over the eyes and caught under the chin. In both there are bands around the forehead, which may indicate a turban. In Fig. 4 there are two wide oblique strokes from the eye across the cheek, while in Fig. 6 of the same plate there is a red triangle under each eye. In Fig. 4 the lines for eyebrows and mustache are notched and there are a number of upright lines on the chin, perhaps to represent a beard. In this Fig. 4 there is a clearly marked blue triangular pendant to each ear. In the large face at the bottom of Plate IX, fig. 5, there is a slight projection of the nose. In Plate XII, figs. 1, 5 and 6, the spouts are modeled and painted to represent human heads. In the last of these the flaps of a shawl are crossed and fastened under the chin, while down the front the straight lines of varied colors almost surely indicate a gay feathered poncho.

Of the pots shown in Plate XIII, Fig. 2 represents a round-faced and round-bodied being with red arms and legs. Fig. 3 has two spouts, each for a similar figure. On these faces lines outline the hoods and there are also red and black lines that indicate bands that cross the shoulders. The red arms are bare and in each hand are held three or four objects, perhaps pods. Similar objects are found in Plate VII, fig. 8, and perhaps elsewhere. In Plate XIII, fig. 4, a brownish pot, the arms are slightly modeled and one of them holds some object like a club or fruit.

The quaint human figure in Plate XIII, fig. 5, is playing a pan-pipe in which five mouth holes are indicated.[1] Just such a

[1] Cf. Charles W. Mead: Musical Instruments of the Incas, Plate IV, figs. 1 and 2 (Amer. Mus. of Nat. Hist. Guide Leaflet No. 11). Cf. also the figure playing a pan-pipe shown by Uhle: Pachacamac, Plate 5, fig. 5.

pan-pipe, or syrinx, is found in the collection and is shown in Plate XIV, fig. 1. This figure has a hood like that in Plate IX, figs. 4 and 6. The white band over the shoulder is like an epaulet. There is a white girdle and breechcloth and the bottom of the pot indicates the bare red legs and feet.

But the gem of the figure pots in the collection is the patient personage shown in Plate XIII, fig. 6, and in color in Plate I. In this the head stands out in high relief, the arm is successfully separated from the body and the bent knees are effectively modeled to show the squatting position. The feature of the dress is the black and white checkered poncho thrown over the shoulder and running around the body. Above this are large squares of several colors which may indicate another garment. Below, the body is bare, except for the white breech cloth and girdle. The feet, drawn under the body, are indicated in the painting. On the head is a maroon turban with white bands and with pendants at the sides of the eyes. Form and color are both skillfully used and the primitive artist deserves credit as a modeler as well as a painter. Unfortunately this pot was not recovered complete, but even in its fragmentary state it makes an attractive artistic appeal.

ROWS OF FACES

The human face is often used in rows running around a pot. These appear merely like ornamental bands but they may have other significance. Of these there are at least four types. First is the row of full faces, always with yellowish color and open eyes. Typical examples are found in Plate II, figs. 2 and 4, but rows of these faces are used in a number of other pots. Cf. Plate III, figs. 5 and 6, Plate VIII, fig. 5, and Plate IX, fig. 9.

A second type is in profile, with sharp nose and chin, closed eyes, and with a conspicuous upright head-dress. A good example of this is the top band of Plate II, fig. 3. Other cases are Plate III, fig. 7, Plate VII, fig. 9, and Plate VIII, fig. 8. At first glance this type suggests a North American Indian with chieftain's feathers. Closer examination shows that this

head-dress is a modification and simplification of the three-pronged or three-feathered head-dress of the multiple-face human monster.[1]

A third type of faces in rows appears to have for its distinguishing characteristic a cord-like line emanating from the forehead or nose and ending in a knot or tassle. Possibly this cord is that by which the heads of victims were suspended. These faces are in profile with the eyes open in Plate V, figs. 1 and 2, in both of which cases the chin appears to be bearded. There is a similar profile face with the eyes closed on Plate IV, fig. 10. On this same pot a gap between the ordinary heads is filled with a single upright full face with the eyes closed and with a line coming from the top of the head. A full face, with the eyes closed and the line coming from the top of the head, is also found as the chief decoration of Plate X, fig. 2, but with less human character. A narrow band of these faces is also found in Plate VIII, fig. 8.

A fourth type, much conventionalized, is found in three bands around Plate VI, fig. 6. The mouth, eye, nose, and ear can all be distinguished. This same face is found between the spines in Plate VII, fig. 7, and Plate III, fig. 12. In the first of these two it appears to be still more conventionalized in a band down the side of the body (text-fig. 1). A comparison of these figures would make an interesting contribution toward a study of the development of convention in design in primitive art.

Besides these general recurring types there are other more or less peculiar faces or parts of faces, some perhaps drawn from these types or from some of the human-monster forms, and some so conventionalized as to be hardly recognizable. Cf. Plate II, fig. 3, Plate VII, fig. 9, Plate III, fig. 12, the lower row in each case, also the narrow middle band of Plate IX, fig. 5. Four faces radiating from the center like rays of the sun are found on the upper surface of Plate XI, fig. 4, making an effective decoration.

[1] Compare also the profile faces on the side panels on the stone gateway at Tiahuanaco. Stübel and Uhle: Tiahuanaco, Plate 15.

In connection with the repetition of faces in rows, attention may be called to the constant recurrence of the human face in other designs. In the human-monster figures the face is the most prominent and most stable feature, the typical face remaining even when the body and other features are almost entirely modified. Moreover additional faces are frequently indicated whenever there is a possible excuse for so doing. At the end of a tail or a tongue, anywhere, we may expect a Nazca artist to put in the few strokes necessary to suggest a face.

The full human figure, while rare, is shown in the curious beings in Plate IX, fig. 3, and another remarkable creature with a human face at least is found in Plate XI, fig. 1.

HUMAN MONSTER FIGURES

Thirty-one of the pots in the Ficke collection, or approximately one-third, represent in some form or other a combination of man and beast, an uncanny human-monster. Some of these may perhaps be nothing more than men in the dress of a bird, or of a serpent, or a centipede, or scorpion, or some other animal. Others might perhaps be called animals with men's heads. Others look like multiple faces surrounded by tentacle-like projections. But all of them seem to be curiously inter-related. It is possible to establish certain groups or types, and yet without exception some of the characteristics of each of the groups will be found in others. This is especially true of the typical faces. A careful examination and comparison of many examples of these human-monster figures should help to make clear the evolution of the types. A description of the pots in the Davenport collection is here undertaken as a contribution toward such a study. In doing so the human-monster figures are for convenience tentatively classed into six type-groups.

TYPE A.

Of the various human-monster types the first to attract attention is the formidable creature shown on three of the Davenport pots on Plate II, fig. 1, (same pot Plate IX, fig. 1),

Plate VII, fig. 7, and Plate VII, fig. 6. Of these, Plate VII, fig. 7, (text-fig. 1) is one of the fine pots of the collection, made of well baked clay, very thin but sound, precise in its shape, and with a smooth polished surface. The drawing is carefully done, the lines straight, and the varied colors laid on smooth and even.

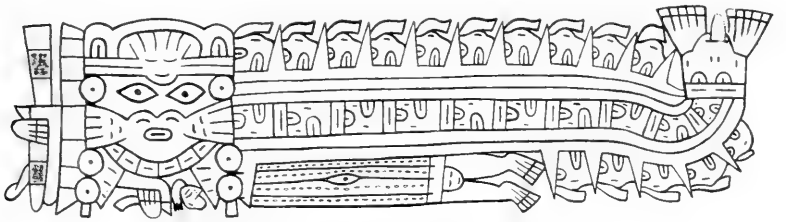


Fig. 1—Type A (Plate VII, fig. 7)

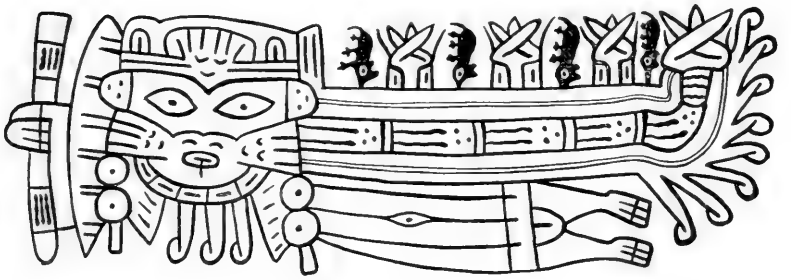


Fig. 2—Type A (Plate II, fig. 1)

The figure itself may be described as having a human face and hands, a body the upper and main portion of which is that of some lower animal, perhaps a centipede or scorpion, the lower part of the body feathered, and human legs trailing back from this lower part of the body. The head is always turned so as to show the full face, raising an interesting problem in the psychology of primitive art: why is it that certain peoples cling to the full face, seldom using the profile. The face itself has what appears to be a "mouth-mask" extending with wing-like projections to each side. There is a similar narrower band across the forehead with a simplified human face in the center, a three-lobed "crown" above, and wing-like extensions to the

sides.[1] There are two or more disc-like ear pendants on each side. Especially noteworthy is the extended right arm grasping a staff, much as in the Tiahuanaco stone figure. These characteristics are common to the three pots mentioned.

There are certain differences. In Plate VII, fig. 7, (text-fig. 1), the left hand is bent under the face and is grasping a human head. The upturned tail ends in a human face with extended tongue and with hands. The spaces between the spine-like projections are filled with a conventionalized human face and the same face, still more conventionalized, is used as the ornament for the band down the center of the body. In Plate II, fig. 1 (text-fig. 2), also a well made and well preserved pot, tentacle like projections are found under the face and along the under side of the body. On the top of the body the pointed spines of the other two figures are replaced by a three pronged design between which are figures of mice. The same device appears at the end of the tail instead of the face in the other two cases. The figure in Plate VII, fig. 6, has both of the hands extended and grasping the staff instead of one as in the other.

The type of face and figure on these three pots is found on specimens in Paris and London as well as in Davenport.[2] In the British Museum vase, figured by Joyce, the feathered lower body is contracted and the shortened human legs are under the body, so that the top-heavy body is apparently standing upright. In this figure the two hands grasp the staff, and the body has the typical pointed spines and the face at the end of the tail.

TYPE B.

There are four pots, Plate VII, fig. 3; Plate IV, fig. 5; Plate VII, fig. 5, and Plate V, fig. 9, in which the face is more or

[1] In connection with this "crown" and its face, attention may be called to the frequency with which in primitive South American art men are represented with a head-dress typifying some animal with the face directly over the man's forehead.

[2] Cf. Berthon, Plate III; Joyce, "The Clan-Ancestor in Animal Form as depicted on Ancient Pottery of the Peruvian Coast," in Man, Vol. XIII, text-fig. 1, page 114.

less similar to that described for Type A, but while the body corresponds to the upper part of the body in Type A, the feathered lower part and the trailing legs are absent. It has the wave-like spines, the colored bands, and in all cases the band of dots, lines, spots, or figures down the center. In three cases the body is rounded at the end, but in Plate VII, fig. 5 it has a face and hands at the end. This is not surprising, for the Nazca artists put faces everywhere.

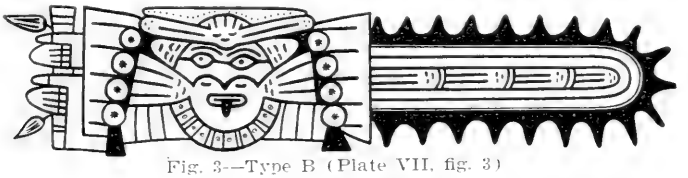


Fig. 3.—Type B (Plate VII, fig. 3)

Of the faces on these pots, that on Plate VII, fig. 3 (text-fig. 3), is an excellent example of the face figured on the best Type A pots, as Plate II, fig. 1. It has the two hands extended and grasping the staff as in the others.

With this type of face in mind, when we examine Plate IV, fig. 5, we find that the face is horizontal on the pot instead of vertical. Otherwise the typical features of "mouth-mask," "crown," etc., are still present, although the mask has wings more like a butterfly and the crown is more plume-like. Both hands are extended on around the pot and both are grasping the staff exactly as in Plate VII, fig. 6. When this pot is held sideways so as to get the face upright the hands appear something like pendants hanging downward from the face. On Plate VII, fig. 5, the wings of the mask extend upward more and the crown is differently shaped. The hands reach out in front but are not grasping a staff. The tongue is prolonged and has a small face at the end. On Plate V, fig. 9, the face is simpler. The mouth-mask is not prominent or is perhaps absent, but the crown is present, divided into three almost equal lobes. The two hands are extended but much conventianalized and the staff is absent. The tongue is prolonged.[1]

[1] A similar pot is figured in Joyce, Man, Vol. XIII, text-fig. 3, page 115. In the Berlin museum is a pot with a figure of this type with an extended body in the shape of a letter S, curved up over the vessel and down the other side.

Taken as a group the resemblance between the figures of this group and those of Type A is marked, the chief difference being the omission of the feathered lower part of the body and the trailing human legs.

The centipede (?) body, with the wave-like spines and the central ornamental band, is found on Plate V, fig. 4, as a design running around the pot, without head or tail. The upper portion at least of the ornament on Plate III, fig. 12, is apparently of the same origin. The same is probably true of the band around the pot shown on Plate V, fig. 5.

TYPE C.

Next to be considered are three pots, Plate VII, fig. 1 (text-fig. 4), Plate VII, fig. 10, and Plate XI, fig. 3, with a human-bird figure. The horizontal lines rather clearly indicate feathers, and the wings and tail are shown. Along the top of the

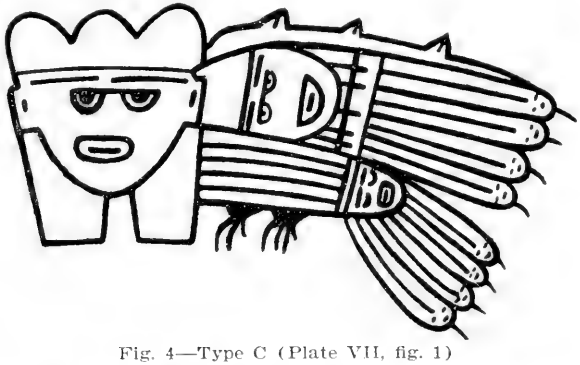


Fig. 4—Type C (Plate VII, fig. 1)

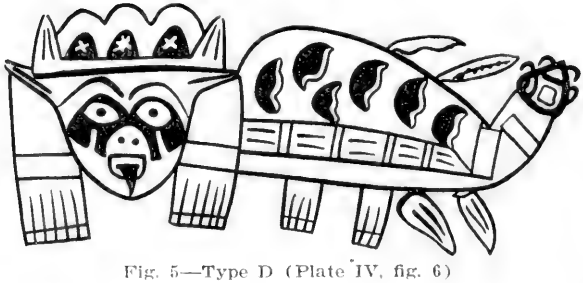


Fig. 5—Type D (Plate IV, fig. 6)

body is a narrow band with spines as in the Type A figures. It resembles the spines along the back of a sturgeon. In all

cases there are two feet under the body, and not trailing as in Type A. In Plate VII, fig. 1, the feet are those of a bird, in Plate VII, fig. 10, those of a human being, and in Plate XI, fig. 3, doubtful.

In all cases the heads are upright and show the full face. They are simpler than the typical face of Type A, being more like the face of Plate V, fig. 9. The "mouth-mask" is not present, but the three-lobed "crown" is. There are flap-like pendants to the face resembling the hands in Plate V, fig. 9, except that they are not fingered.

TYPE D.

Very like these human-bird pots except that the figure is more like a reptile than a bird, are the three pots, Plate XI, fig. 2 (text-fig. 5), Plate IV, fig. 6, and Plate IX, fig. 10.[1] In all these the long tail is curved upwards as in Type A. There are two feet on which the body rests, the toes being marked. The head in Plate XI, fig. 2, and Plate IV, fig. 6, is upright and shows the full face. In Plate IX, fig. 10, it is horizontal. The hands (or fore feet), in all cases fingered, appear like pendants to the face as in Plate V, fig. 9, and all the figures of Type B.

The faces bear a close resemblance to those of Type A. The "mouth-mask" is in evidence in Plate XI, fig. 2, and Plate IX, fig. 10, and the three-lobed "crown" in Plate XI, fig. 2, and Plate IV, fig. 6.

All three figures have podlike projections hanging or flying like banners from the head or body. This pod, recurring as it does, must have some significance.

TYPE E.

We come now to a long series of grotesque faces very typical of Nazca pottery. On first appearance these appear to be nothing but a confused mass of multiple faces and tentacle-like projections. A closer examination shows that these complex figures are composed of various elements, almost every

[1] A figure of this type is shown by Forbes, Illustrated London News, fig. 1, Dec. 6, 1913.

one of which is present in one or more of the types already discussed. This is especially evident in the four pots taken to represent this type, Plate VI, figs. 3 and 4 (text-fig. 6), Plate

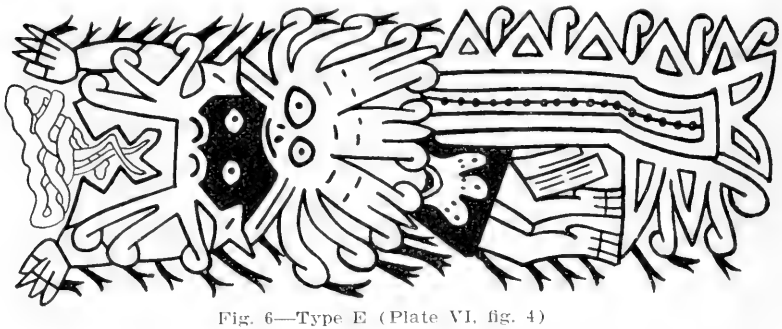


Fig. 6—Type E (Plate VI, fig. 4)

II, fig. 4 (same pot Plate IX, fig. 8), and Plate IX, fig. 7. In all these there is a spined or jointed body very much like the upper part of the body in Type A.[1] There are the same trailing legs in all cases in almost exactly the same form and position. The feathered under part of the body is replaced by what looks like a wide girdle or short skirt, with an extended bifurcated tail piece. The arms and hands, except in Plate II, fig. 4, in which they are missing, extend outward horizontally, but do not grasp a staff.

An examination of the face or faces makes it possible to single out the elements of the typical faces of Type A. The "mouth-mask" is much narrowed and splits at each side into four elongated scrolls or tentacles. On the other hand the three-lobed "crown" is much enlarged and each of the three lobes developed into three-pronged tentacles. In addition there are tentacles extending to the sides. The face on the crown, which was regularly suggested in the Type A pots and occasionally in Type B, is given much greater prominence; in fact, it appears as the chief face of the figure, although the eyes of the old original face are always found below this crown and above the mouth-mask. It does not seem possible that the regular recurrence of these elements could be accidental. The

[1] For comparison with this position of the legs and girdle compare the painted figure on the pot shown by Berthon, Plate I.

feature of this type that perhaps more than anything else gives it its distinctive appearance is the development of the tentacles.

a b

Fig. 7a—Type E (Plate II, fig. 4). 7b—Same, reversed

The figure in Plate II, fig. 4 (text-fig. 7a), is upright on the pot instead of horizontal as usual, so that it seems to be standing on its feet. The spined body appears more like a flowing head-dress than a body proper. But when the figure is reversed (text-fig. 7b), and placed in the same position as the others, the relationship to the type is apparent.

In Plate IX, fig. 7 (text-fig. 8), the body is much shortened and contracted; it is less a feature of the design. The hands are also poor and are not successfully connected with the balance of the figure.

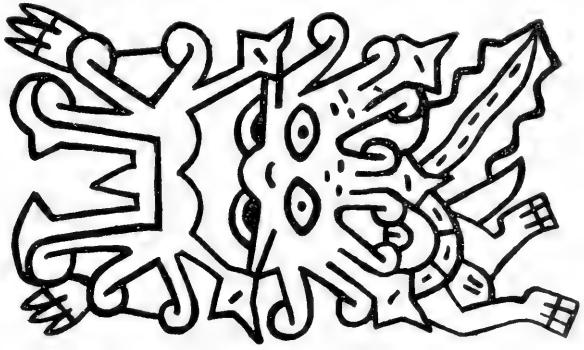


Fig. 8—Type E (Plate IX, fig. 7)

An interesting feature of this type, as well as the following, is the addition of small barbs or thorn-like projections to the edge of the figures wherever space gives opportunity.

TYPE F.

In the next group of pots, Plate II, fig. 3 (text-fig. 9), Plate VIII, fig. 7, and the upper band of Plate I (text-fig. 10),[1] there

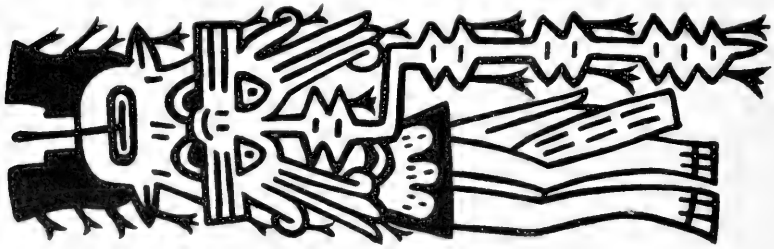


Fig. 9—Type F (Plate II, fig. 3)

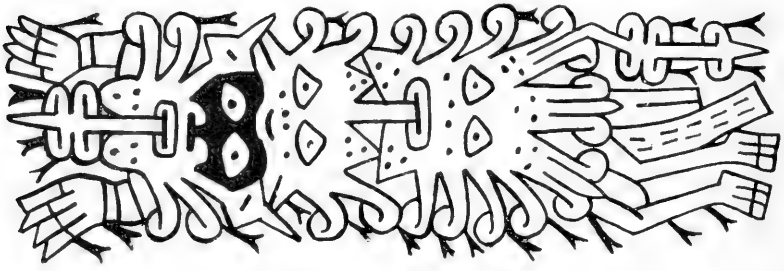


Fig. 10—Type F (Plate I)

is a general resemblance to the figures of Type E. The extended hands are the same, but in Plate II, fig. 3, they are not fingered, although the thumb is indicated by the outline. The "mouth-mask" is indicated in at least three of the figures on Plate VIII, fig. 7, and on Plate I, but not so clear on Plate II, fig. 3. The three-pronged or three-plumed "crown" is evident in Plate II, fig. 3 and in Plate I, in which last case it is doubled. The extended human legs, with skirt and tail piece, are found in all three cases.

The unique feature of this type is the body, which is now contracted into a prolonged tentacle of uniform width, generally with two right-angled bends to bring it to one side so as to avoid the legs. It is pointed and there are two or three groups of rounded or pointed projections. It is like the spear-

[1] Examples of this type are figured in Joyce, Burl. Mag., text-fig. 2, and in Berthon, text-fig. 19.

head end of certain of the mouth-mask and crown tentacles of the Type E figures.

Another feature is that in these pots the tongue is regularly extended and in form often resembles the pointed end of the contracted body. This extended tongue serves reasonably easy as a connecting link between multiple faces. Thus in Plate I, (text-fig. 10), there is a duplication of the crown, the central tentacle of the lower face becoming the tongue of the upper one.

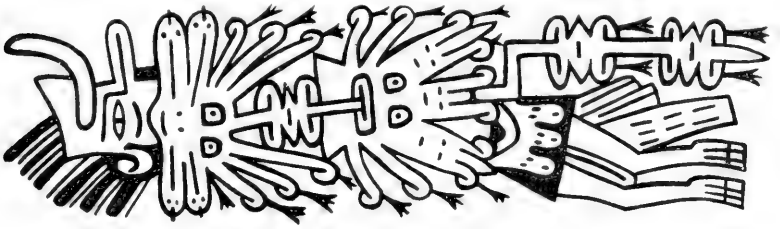


Fig. 11—Figure on Plate IX, fig. 5

There seem to have been humorists in Nazca as well as inventors and devotees of the grotesque. As evidence there is the figure on Plate IX, fig. 5 (text-fig. 11). Here there are the extended human legs, skirt and tail piece as in the others, the contracted body, and a duplicated "crown" with the tentacle of one face becoming the tongue of the other. But when we look for the regular conventionalized face, mouth-mask and hands, we find instead a caricature of a face drawn in profile. The long nose would do for Cyrano de Bergerac. The extended tongue, equally long, would do for a naughty child. The horn-like ear is equally prominent. The eye, as would be expected, is drawn as though seen from the front. The face resembles that in the lower band on Plate II, fig. 3, but as would be natural for a humorist it is more realistic.[1]

MISCELLANEOUS FORMS.

The number of types might be still further increased. In addition to the figures already described there are in the Dav-

1 Cf. the tall vase figured by Uhle, XVI Congress of Americanists (Vienna) fig. 18b, page 368.

enport collection eight or nine pots with different designs probably derived from the types noted, especially from E and F, and it is reasonable to suppose that a study of other available collections of Nazca pottery would add new varieties. Of the figures on the eight or nine Davenport pots just mentioned some may be types, others confused, simplified or degenerate forms.

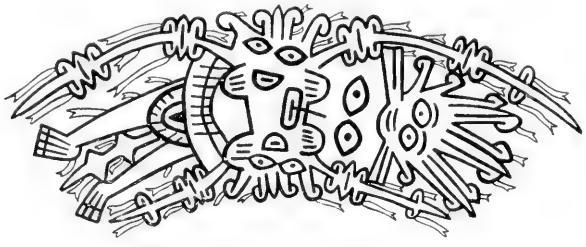


Fig. 12—Figure on Plate VI, fig. 7

A single pot in Davenport, Plate VI, fig. 7 (text-fig. 12), shows an interesting design bringing out many elements of the last types. When the pot is held sideways, the figure is seen standing on erect legs. The lower part of the body is surrounded by a girdle. The mouth-mask element is widened and at each side is the now familiar type of re-duplicated face facing the center. Above this are the eyes of the original face and above that the crown with its face and its three prongs each with three divisions. The outer tentacles of the side faces of the mouth-mask are lengthened and extended upward and downward.[1]

Plate X, fig. 8, represents a confused form with hands and legs and distorted mask and crown.

The ornamentation of Plate X, fig. 6, is typical of the face part of Type E, as will be seen by a comparison with Plate VI, fig. 3, but the hands, legs and body are entirely omitted. The ease with which the hands, body and legs drop off is shown in some of the pots already described in which in repeating the figures on the ornamental bands, the artist has omitted these elements. Thus the body and legs are omitted in three of the

[1] This figure bears a general resemblance to that shown on the frontispiece of Joyce's South American Archæology.

figures in Plate VIII, fig. 7, being found in only one. The hands, body and legs are all omitted in one of the figures on the upper band of Plate I.

Still more of the typical features are omitted in the upper band of Plate II, fig. 2, in which all that is left is a series of four faces developed from the crown type, connected with the tentacle-tongue combination, the lower face having a bifurcated tongue.

What perhaps might be considered another type is found in Plate VIII, figs. 5, 6 and 8. Of these Fig. 6 has an upturned human face, and rudimentary human hands are preserved in two or three of the four figures. In the others there are eyes and tentacles, but the meaning of the figure seems to be gone.

The rather effective decoration of Plate XII, fig. 4, and perhaps the crab-like creature of Plate X, fig. 9, make use of the elements at least of the figures under consideration.

Looking back over the series as described we find that many of the features of the highly developed human-monster found in what has been called for convenience Type A are found preserved through many of the other types.

The "mouth-mask" has been traced in Types B, D, E, and F, and in some of the miscellaneous forms. The "crown," almost always with a face, and with three lobes first and three tentacle prongs or three plumes later, is found persistent to the end; in fact, the face on the crown becomes the chief face of the decoration in some of the other types. The staff grasped by one, or two, hands is found only in Type A and two examples of Type B. The two extended hands in one of the Type A pots recur in all the Type B pots, are found in flap-like projections, generally fingered, under the faces of the Type C and D pots, are found in practically all the pots of Types E and F, and in a rudimentary state even in some of the degenerate designs. The centipede (?) upper part of the body is emphasized in Type B, is suggested by the spined back of the bird figures of Type C, is perhaps related to the animal bodies of Type D, is clearly present in Type E, and is preserved in a much contracted form in Type F. The bird-like or feathered lower portion of the body is absent in Types B and D, but there is

a bird body in Type C and a bird dress is indicated in the skirt or girdle and tail pieces of Types E and F. The extended human legs of Type A occur regularly in Types E and F in the identical position.

Undoubtedly this figure has some relationship to other human or human-monster figures found elsewhere in Peru, or in other parts of South and Central America. There are elements that suggest certain features of the stone figures at Tiahuanaco and Chavin de Huantar as well as pottery figures from other portions of Peru in Tiahuanaco style.[1] But it is not the purpose of the present paper to enter into that discussion. Nor is it the purpose of the present paper to go into the origin of the figure, nor its mythological or other significance. Nor is it the purpose of the present paper to discuss why these Nazca people, skilful as they were in drawing, preferred to devote their efforts to these grotesque combinations of man and beast, instead of portraying the human figure in its simplicity and beauty. Evidently for them this human-monster figure had a peculiar fascination. Its importance in the Nazca Valley is shown by its persistent recurrence on such a large proportion of the pots in the Ficke collection at Davenport.

Taken as a whole, the samples of workmanship and art left by these early inhabitants of the Nazca Valley give an impression of great mechanical skill in manufacture of the pottery, which is fine in quality, thin, with a smooth surface, and carefully shaped. Although apparently made without a wheel, a segment would show an almost perfect circle of uniform thickness. Equal skill is shown in the drawing of the lines which are in some cases almost as fine as though drawn with a modern draftsman's pen. Skill is also shown in the uniform laying on of color, to say nothing of the very remarkable knowledge which enabled them to use such a variety of colors in their painted decorations. From the artistic point of view, the most conspicuous feature of the Nazca work is this luxurious use of color in their designs. While ordinarily

1 Cf. Uhle: Pachacamac, Fig. 16, page 26 and Uhle: Moche, Soc. des Americanistes de Paris, New Series, Vol. X., Plate Vb, and fig. 16, No. 2.

the primitive artist in any part of the world is satisfied with one, or with two or three colors, the Nazca painter used from six to twelve. Generally these colors are used so as to produce a pleasing harmonious effect. The drawing is sometimes handled with considerable delicacy and grace, and always effectively, even in the fantastic and grotesque human-monster and multiple-face figures. While there is some beautiful and lifelike drawing, as in the case of birds, the constant repetition of the same figure on many pots shows that Nazca workmen in general copied, imitated and modified, probably more than they created. This accounts for an increasing conventionalization, for an increasing perfection of work in the hands of a superior craftsman, and on the other hand for a tendency to degeneration in the hands of a careless or ignorant workman. The luxurious use of color corresponds to a somewhat similar multiplication of detail in the design. The Nazca artist added ornament to ornament, seldom leaving any nook or corner uncovered. This means that he cannot be judged by "classic" standards, but judged by his own standard he must be given credit for having produced, under unfavorable conditions, objects of unusual and remarkable beauty.

II.—NOTES ON THE PERUVIAN POTTERY OTHER THAN NAZCA.

In addition to the Nazca pottery there are in the Davenport collection presented by Mr. Ficke close to three hundred specimens of pottery and other antiquities from other parts of Peru. The wares represented are of types more familiar to American and European museums containing Peruvian collections and will therefore be described more briefly, although every pot is figured in the accompanying plates (XV to XXV) and the miscellaneous articles of wood, copper, silver, stone and fabric are shown in Plate XXVI.

In absolute contrast with the richly colored Nazca ware is the collection of black pottery numbering over one hundred specimens, more than half of them from Ferrenafe and Chiclayo, both near Lambayeque on the far northern coast of

Peru.[1] In all of these whatever artistic merit there may be comes from the form, and the modeling and molding of design and figure. On the whole these pots have good shape, some of them being very graceful, Plate XX, fig. 11, for example.

As might be expected there is a great variety both in shape and design. In contrast with the rather open ware of Nazca most of them have globular bowls and there are tubular or funnel-shaped spouts. They may be without handles (Plate XX), with a single curved handle (Plates XXI and XXIV), or with an inverted Y handle (Plate XXIII). There are also pots with a peculiar W-shaped combination of spouts and handle (Plate XXIV, figs. 12, 15, 16 and 17). Of the double pots, the so-called musical or whistling jars, there are eleven specimens in this black ware (Plate XXV). Three pots (Plate XV, figs. 1, 2 and 3) are of "Inca" type with pointed base.

While a few of the pots are plain most of them are ornamented. This may be done by indentation or low relief, or by realistic or conventional modeling. The spout or the bowl itself may be used to represent some object, or the whole pot may be a realistic imitation of some animal or plant. An examination of the plates will, in addition to human figures, show birds, fish, puma heads, llamas, monkeys, serpents, shells and perhaps other animals as well as gourds, maize, pods and other fruits. Some of these, like the fruit (Plate XXII, fig. 19), must be an almost exact replica of the natural object. On about a dozen pots (Plate XX, fig. 13, etc.), there is a peculiar sprawling figure with upturned head, and with extended legs and tail, in all cases the spout coming up through the body of the animal. Perhaps even more interesting are the pots representing human faces or figures. While some are types and without much individuality, others, like Plate XXIV, figs. 6, 8 and 10, are more realistic. Curious are the twin figures shown in Plate XXV, fig. 4, with joined hands. Two doll

[1] All the pots shown on Plates XX to XXIV are of this black ware, as are all the double-pots on Plate XXV with the exception of the first two figures. Other black pots are shown on Plate XV, figs. 1, 2 and 3 and Plate XIX, figs. 7, 8, and 27.

figures (Plate XIX, figs. 7 and 8), both from Ferrenafe, are also of black ware.

In many ways similar to the black ware just described is the dull red pottery, ranging from a dark brick red to a pale terra cotta. The majority of the specimens of red pottery are unpainted,[1] but in many simple use has been made of paint. A dozen or more of the specimens come from Ferrenafe, although the black ware appears to have been the common form in the northern part of Peru. In shape and method of treatment the red ware is on the whole much like the black. A number of these red ware pots have the inverted Y handles (see Plate XVIII), but none in the collection have the W-shaped combination of spouts and handles, and none are of the two-bowl type.

An interesting specimen is the pot from Trujillo with a well modeled human face (Plate XVIII, fig. 2). Others show animal or plant forms. The use of indentation and low relief is also found, examples being a bird design on a flattened pot from Ferrenafe (Plate XVII, fig. 12) and a conventionalized geometrical design on a Chiclayo pot (Plate XVIII, fig. 12).

On the painted dull red ware white paint is the most commonly used, or there may be combinations of white, brown and black paint. Sometimes this appears merely as bands of white paint, (Plate XV, fig. 18). In other cases white or other paint is used in addition to low relief, molding or modeling. (Plate XV, fig. 12, Plate XVIII, fig. 5, Plate XVI, fig. 1, Plate XVII, fig. 9, Plate XVIII, fig. 6).

A number of pots (Plate XVI, figs. 11, 16, 17, 18, 19 for example) are of a rather coarse ware, with black and red paint, or simply black paint, on a white background. The ornament is in straight lines or at most much conventionalized. In at least one case from Huacho (Fig. 19), with a net-like design in red and black, the textile influence is very apparent.

---

[1] Unpainted dull red spots are figured as follows: Plate XV, figs. 6, 9, 11, 16 and 19; Plate XVI, figs. 2, 3 and 8; Plate XVII, figs. 1, 6, 8 and 12; Plate XVIII, figs. 1, 2, 9 and 15; and Plate XIX, figs. 18, 19, 24, 25, 26 and 28.

Several of the figure pots and dolls also have white, black and red paint (Plate XIX, fig. 20) or white and black paint (Plate XIX, fig. 12), the latter from Chiclayo.

Fig. 13—Vase with maize design

There is one beautiful vase of somewhat coarse red ware entirely covered with a white "slip" (Plate XV, fig. 8, text-fig. 13). This is a small gracefully shaped vessel resting on a slender base. The design, which stands out in strong relief, represents growing maize plants with stalk, leaves, ears, and

tassels. Around the rim is a band the incised ornament of which is made up of neat scroll work. There are no data to show from what portion of Peru this specimen came. It is, of course, not surprising to find maize, or Indian corn, in Peruvian decoration. Ears of corn have been found preserved in burials and can be seen in the New York and other museums. Ears of corn are also represented in various examples of Peruvian pottery. In the Davenport collection there is a small stone object (Plate XXVI, fig. 22), in the shape of an ear of corn.[1]

Another white vessel on a similar base but with a wider bowl is peculiar in that the bowl is double, the inner bowl being solid and the outer covering made of open work. The base is also perforated. There is a frog clinging to the rim. This vase (Plate XV, fig. 7) comes from Huacho.

Three pots, with delicately and gracefully drawn designs in red paint over a white or creamy surface, are of interest on account of the difference between the classic restraint of their ornament and the wanton luxury of the polychrome pottery from Nazca. One of these pots (Plate XVII, fig. 10) shows a long-billed bird; another (Plate XVIII, fig. 16) is geometrical, while the third (Plate XVIII, fig. 17) has a beautifully curved scroll terminating in the bare suggestion of a bird's head. While the exact locality from which these pots came is not known, they are of an early type which is associated with Trujillo and that portion of Peru.[2]

Two beaker-shaped vessels (Plate XVI, figs. 5 and 7), the first from Huacho and the second undetermined, appear to show Tiahuanaco influence. The first of these, a dull brick red pot, has a very conventionalized band around the rim. The second, a coarse vase with a rough surface, is painted in black, brown and white, representing an upright human figure with a peculiar head-dress.

1 Reiss and Stübel: Ancon, Plates 105 and 106; Meade: Peruvian Mummies, Am. Mus. Nat. Hist. Guide Leaflet 24, page 17; Joyce: S. A. Archæology, Fig. 27d.

2 An appreciative discussion of the artistic merit of this ware, by Sir Charles Hercules Read, is found in the Burlington Magazine, Vol. 17, pp. 22 ff.

A very deep rich coloring, with a general tone of mahogany or reddish brown, characterizes several pots, interesting examples being a pot from Pachacamac (Plate XVI, fig. 14) and one from Huacho (Plate XVI, fig. 13), the design of both showing textile influence. Both of these have an exquisite effect. A somewhat similar pot is shown on Plate XVI, fig. 15. Almost equally rich coloring of somewhat the same tone, but duller, is found on an Inca-type pot (Plate XV, fig. 5), and on two double-bowl pots (Plate XXV, figs. 1 and 2), the latter from Ferrenafe. A barrel-shaped pot (Plate XV, fig. 13) has a rather effective textile design in buff and brown.

There are a number of other pots of varied ware and design in which paint is used in the decoration either with or without modeling. All of these are shown on the accompanying plates.

Of the "arybals" or pots of the so-called Inca-type there are six specimens (Plate XV, figs. 1-6). These have a high neck with flaring rim, a bowl with a pointed base, two handles low down and a knob or puma head on the shoulder. Of these, two (Figs. 4 and 6) are of red ware, the latter from Cuzco; three (Figs. 1, 2 and 3) are black, and one (Fig. 5) is of a rich reddish-brown coloring with a decoration very similar to that figured by Uhle, from Pachacamac.[1] One of the double pots (Plate XXV, fig. 5), from Pachacamac, also has bowls of this Inca type with pointed base and low handles.

In addition to the pottery which has been so briefly described, the Ficke collection in Davenport contains a number of textiles showing the skill of the Peruvians, both in workmanship and design (Plate XXVI, figs. 29 to 38). These pieces of brilliantly colored cloth are of unusual interest, not only on account of their own artistic merit, but for comparison with similar designs on the pottery. There are also various articles of wood, stone, shell and gourds, as well as of copper and silver, all shown on the same plate.

These textile, metal and other objects together with the well made and beautiful pottery of so many types, show the degree of civilization that had been attained by the early inhabitants of different parts of Peru. The modern high estimate

[1] Uhle: Pachacamac, Plate XVIII, fig. 1.

of that complex civilization has been still further strengthened by the discovery of the remarkable many-colored pottery of Nazca, of which the Davenport museum is fortunate enough to possess such a large collection.

Davenport, Iowa,
February, 1914.

BIBLIOGRAPHICAL NOTE.—Without any attempt at being complete, attention may be called to the following illustrated published material dealing with the Nazca pottery of Peru:

Uhle, Max: Über die Frühkulturen in der Umgebung von Lima. XVI International Congress of Americanists (Vienna, 1908) pp. 347-370.

Berthon, P.: Étude sur le Précolombien du Bas-Pérou. Nouvelles Archives des Missions Scientifiques et Littéraires, Nouvelle Série, Fascicule 4 (pages 53-126) Paris, 1911.

Joyce, T. A.: South American Archæology, London and New York, 1912.

Joyce, T. A.: "On an Early Type of Pottery from the Nazca Valley" in Burlington Magazine, Vol. 22, pages 249 ff. (Feb., 1913).

Forbes, Henry O.: "A New Type of Pottery from Peru" in London Illustrated News, Vol. 143, pp. 930, 954-956. (Dec. 6, 1913).

Uhle, Max: The Nazca Pottery of Ancient Peru. Proceedings Davenport Academy of Sciences, Vol. XIII, pp. 1-16, Davenport, 1914.

LIST OF PLATES

Figure Pot from Nazca, Peru

1

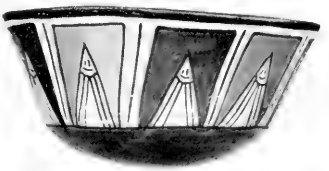
2

3

4

Pottery from Nazca, Peru

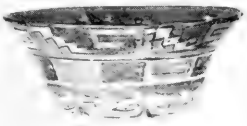
1



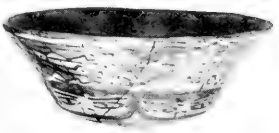
2

3

4



5



6

7

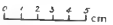
8

9

10

11

12



Pottery from Nazca, Peru

Pottery from Nazca, Peru

1

2

3

4

5

6

7

8

9

Pottery from Nazca, Peru

Pottery from Nazca, Peru

1

2

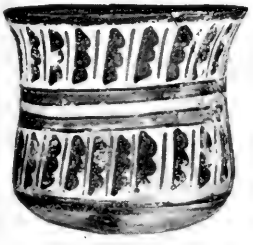
3

4

5

6

7



8

9

0 1 2 3 4 5 cm

10

Pottery from Nazca, Peru

1

2

3

4

5

6

7

0 1 2 3 4 5 cm

8

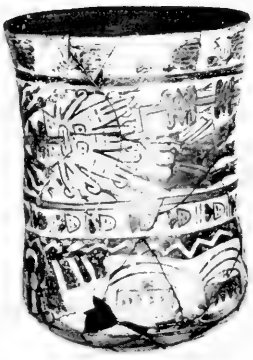
Pottery from Nazca, Peru

1

2

3

4



5

6

7

8

9

10

Pottery from Nazca, Peru

Pottery from Nazca, Peru

1

2

3

4

5

0 1 2 3 4 5 cm

Pottery from Nazca, Peru

1

2

3

4

5

0 1 2 3 4 5 cm

Pottery from Nazca, Peru

1

2

3

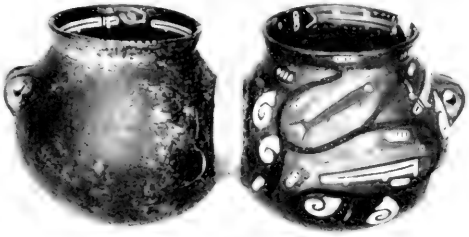
4

5

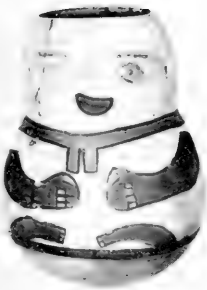
6

0 1 2 3 4 5 cm

Pottery from Nazca, Peru



1

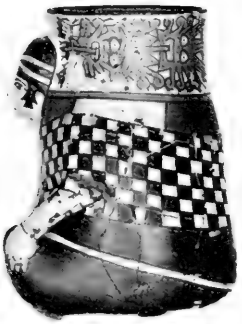


2

3

4

5



6

Pottery from Nazca, Peru

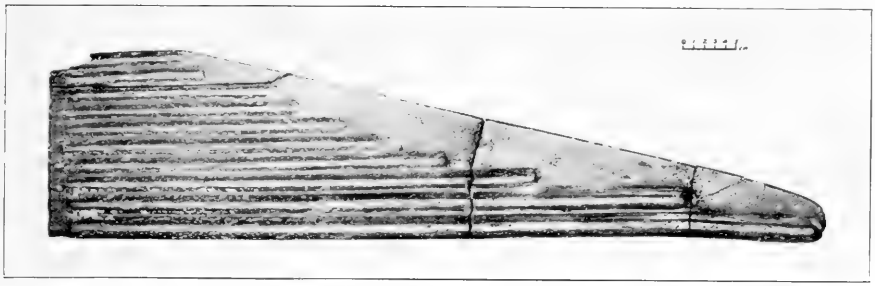


Fig. 1

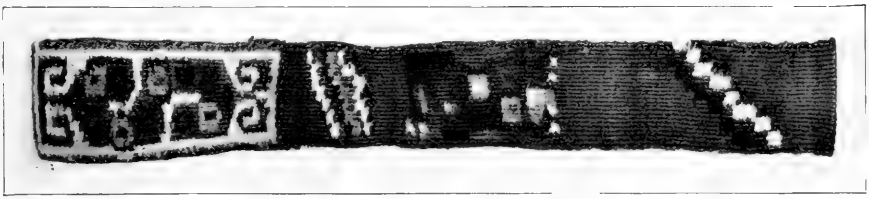


Fig. 2

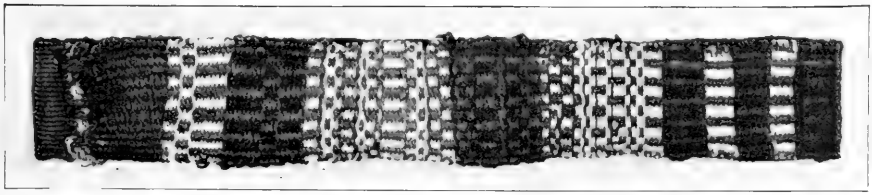
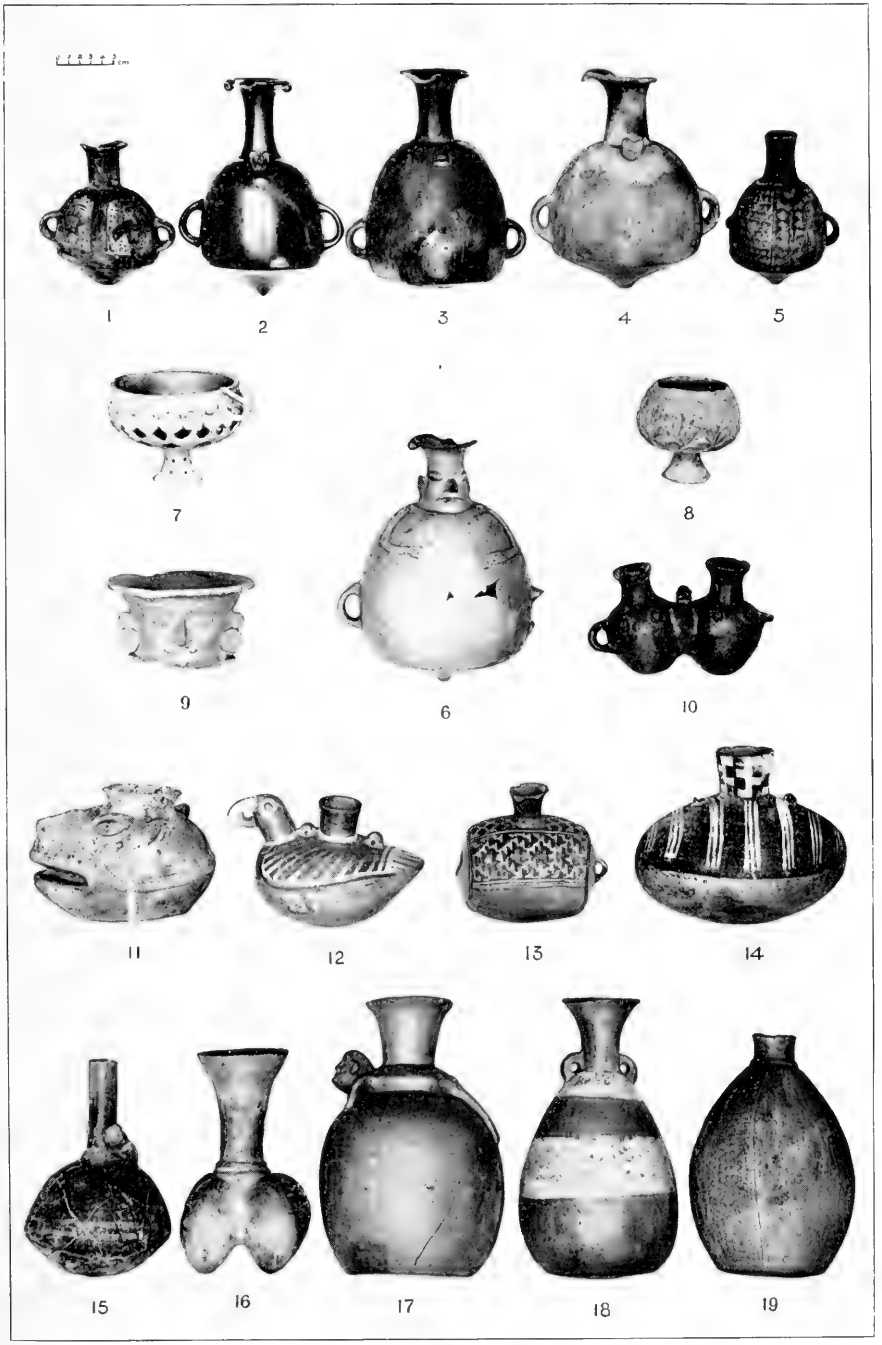


Fig. 3

Objects from Nazca, Peru

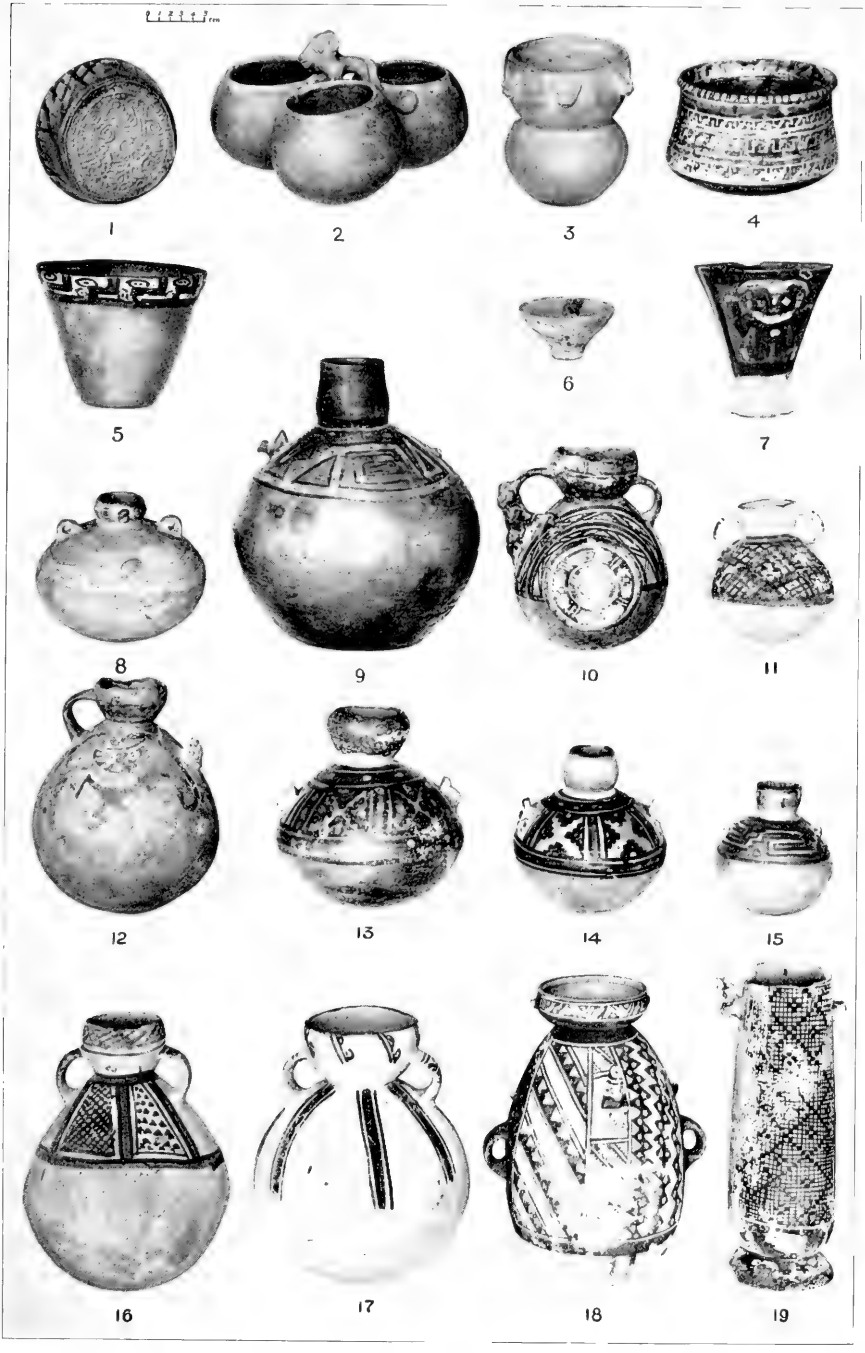
Fig. 1.—Syrinx, or pan-pipe, terra cotta.

Figs 2 and 3.—Cloth band, two sides.



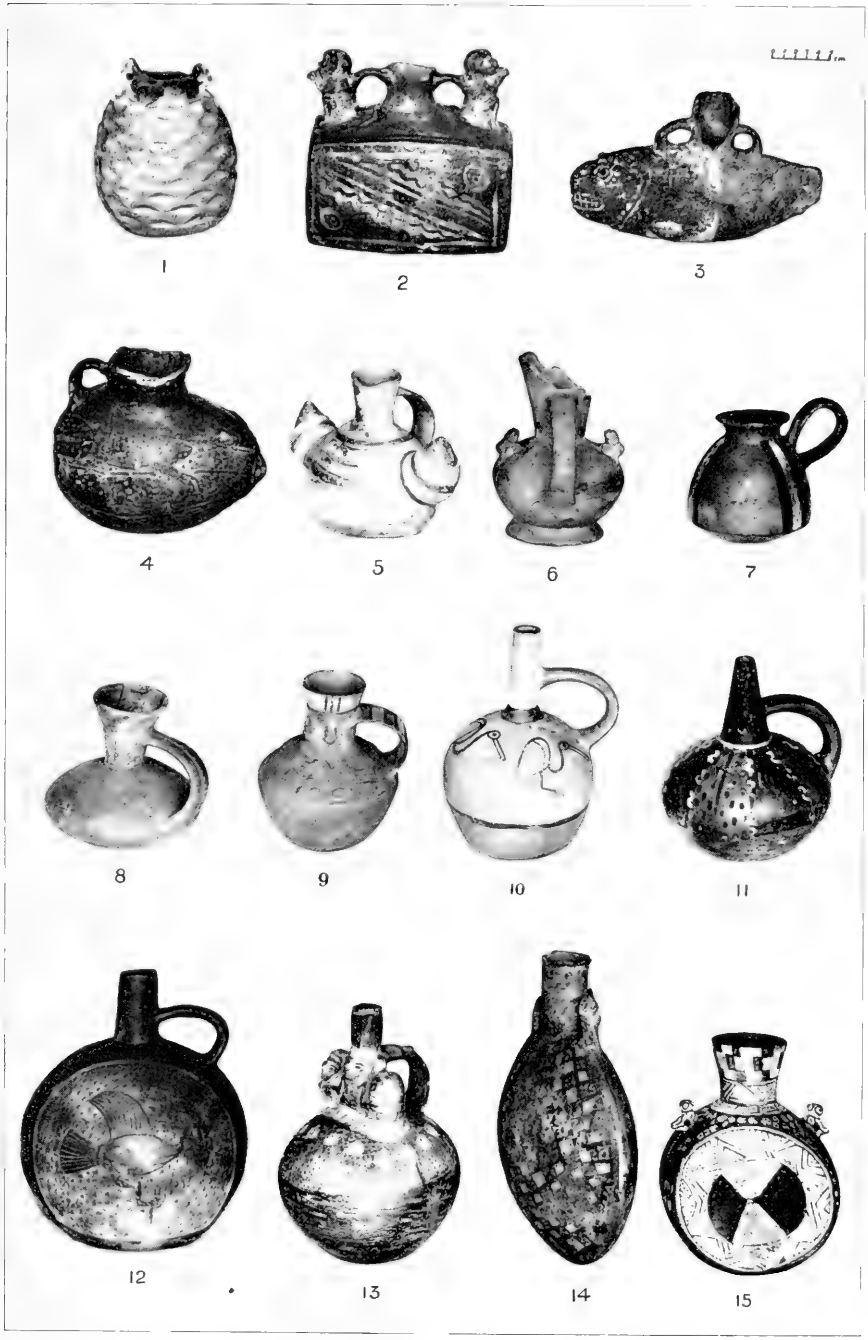
Pottery from Peru

Chiclayo, 3; Cuzco, 6, 14; Ferrenafe, 4, 11; Huacho, 7; Jauja, 10; Undetermined, 1, 2, 5, 8, 9, 12, 13, 15, 16, 17, 18, 19



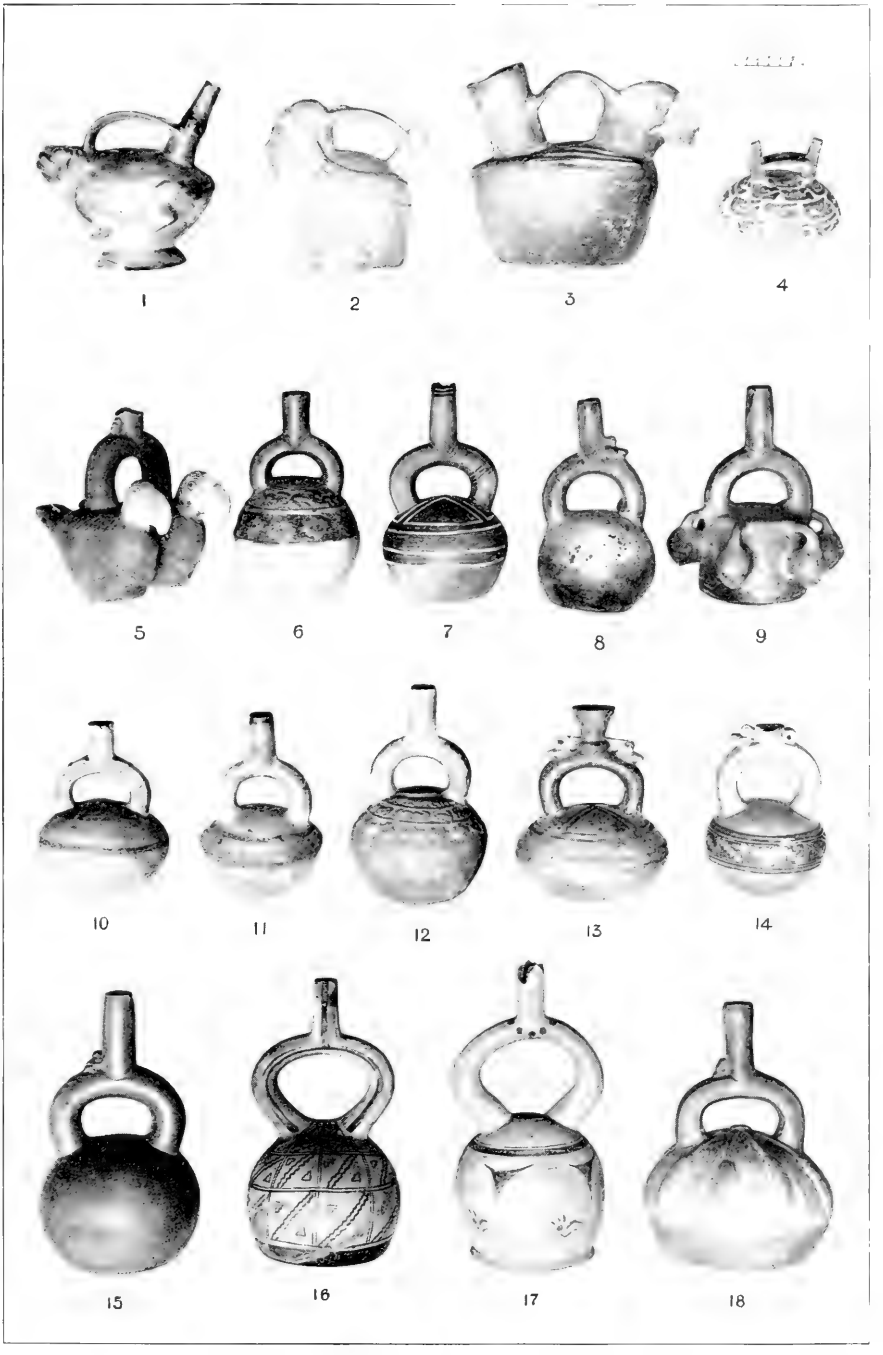
Pottery from Peru

Chancay, 18; Cuzco, 8; Ferrenafe, 1, 2, 3; Huacho, 5, 13, 19; Ica, 10; Pachacamac, 14; Supe, 9; Undetermined, 4, 6, 7, 11, 12, 15, 16, 17



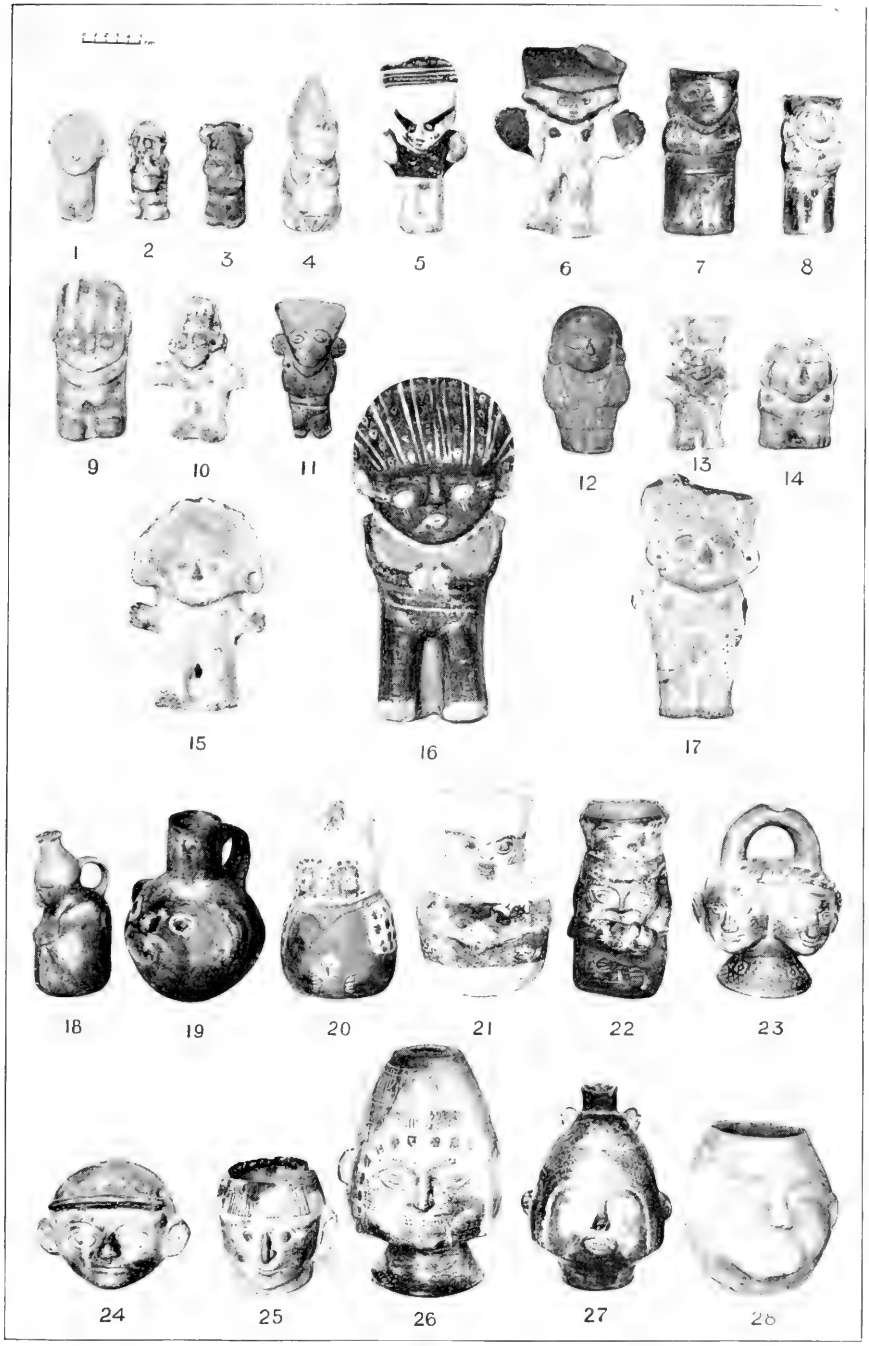
Pottery from Peru

Ayacucho, 2; Chiclayo, 7; Ferrenafe, 6, 12, 13; Pachacamac, 11; Undetermined, 1, 3, 4, 5, 8, 9, 10, 14, 15



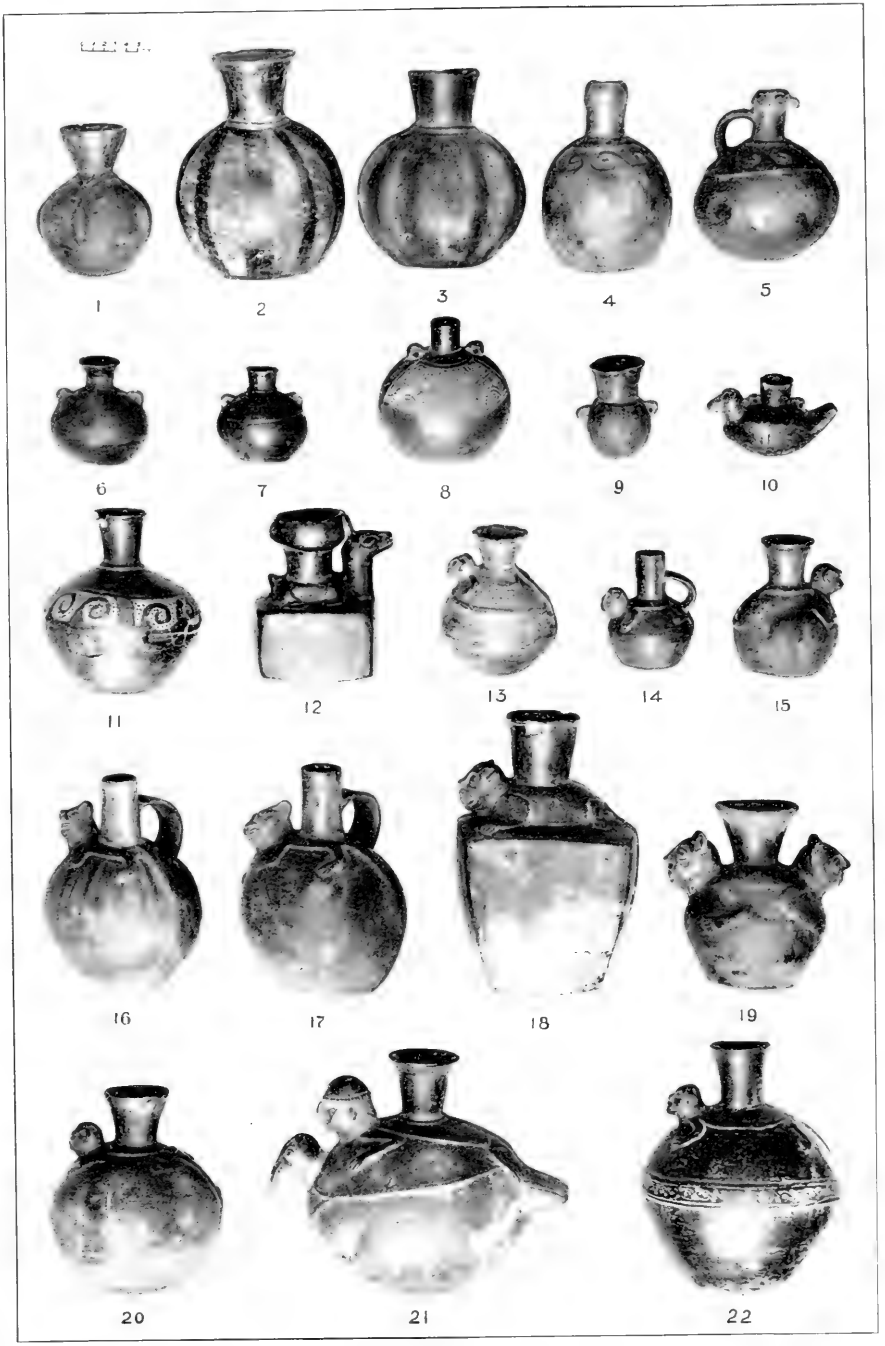
Pottery from Peru

Chiclayo, 8, 11, 12; Ferrenafe, 5, 6, 9, 13, 14, 15, 18; Pachacamac, 10; Trujillo, 1, 2; Undetermined, 3, 4, 7, 16, 17



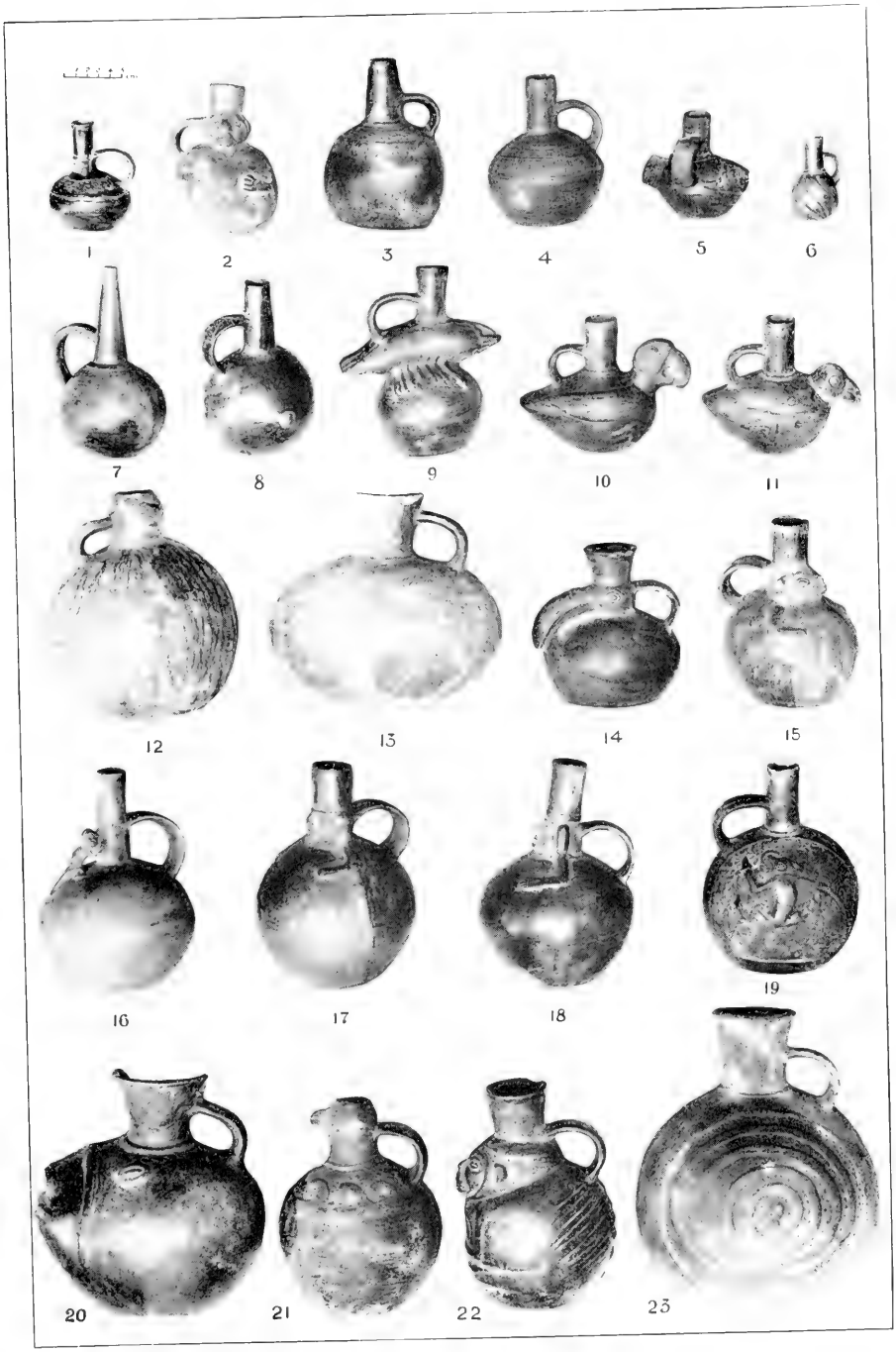
Pottery from Peru

Chiclayo, 21; Ferrenafe, 7, 8, 12, 23, 24, 25, 26; Huacho, 15, 16, 17, 22; Undetermined, 1, 2, 3, 4, 5, 6, 9, 10, 11, 13, 14, 18, 19, 20, 27, 28



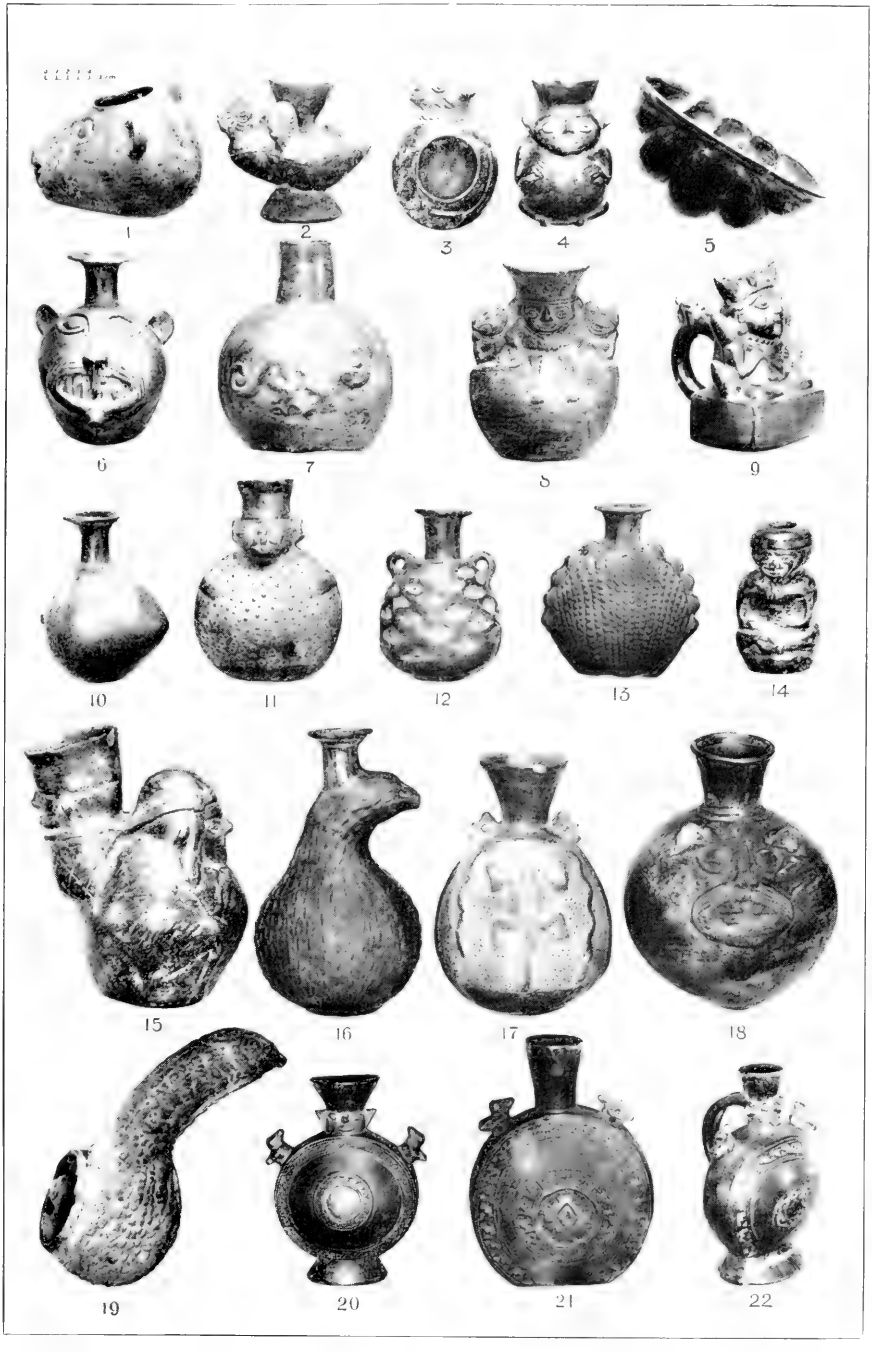
Pottery from Peru

Chiclayo, 2, 3, 4, 5, 6, 7, 13, 15, 17, 18, 20; Chimbote, 22; Ferrenafe, 1, 10, 14; Huacho, 12; Undetermined, 8, 9, 11, 16, 19, 21



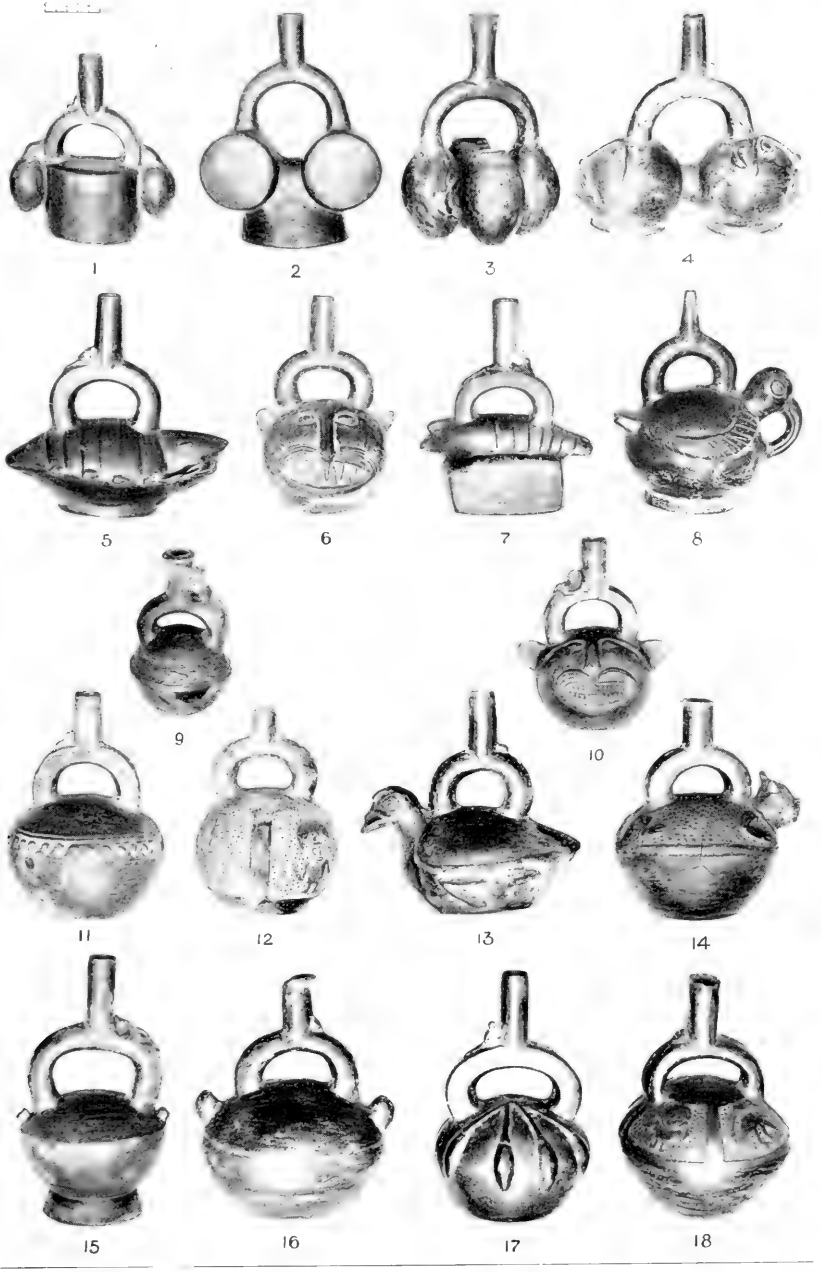
Pottery from Peru

Chiclayo, 3, 7, 8, 11, 12, 13, 15, 16, 21; Ferrenafe, 1, 5, 6, 9, 10, 14, 19; Undetermined, 2, 4, 17, 18, 20, 22, 23



Pottery from Peru

Ayacucho, 18; Chiclayo, 7, 10; Ferrenafe, 1, 3, 6, 16, 19; Huacho, 15; Undetermined, 2, 4, 5, 8, 9, 11, 12, 13, 14, 17, 20, 21, 22



Pottery from Peru

Ancachs, 2; Chiclayo, 14, 16; Ferrenafe, 3, 4, 6, 7, 10, 11, 13, 15; Undetermined, 1, 5, 8, 9, 12, 17, 18

Pottery from Peru

Chiclayo, 7; Ferrenafe, 4, 6, 9, 10, 12, 13, 14, 15; Pachacamac, 11; Undetermined, 1, 2, 3, 5, 8, 16, 17

Pottery from Peru

Callao, 3; Ferrenafe, 2, 6, 8, 12; Pachacamac, 5; Undetermined, 1, 4, 7, 9, 10, 11, 13

Pottery from Peru

Wood, 1-7, 27; Gourds, 8, 9; Copper and Silver, 10-15; Shell, 16; Stone, 17-26, 39; Twine, 28; Fabric, 29-38. (Figures 2, 3, 11, 31, 33 and 35, from Huacho; 26 from Pachacamac; balance undetermined).

Sketch Map of Peru