

## CARE OF OFFSPRING IN ANIMALS.

BY C. F. HOLDER.

The accompanying illustration shows one of the most interesting cases of maternal care among lower animals on record. It was observed by F. L. Harvey, Esq., of the Arkansas University, at Fayetteville, Arkansas, probably for the first time in America, though such occurrences have been several times chronicled in England.

Prof. Harvey was in the field gunning, and suddenly noticing a woodcock (*Philohela minor*) rise near him and fly off laboriously, he ran after it, and distinctly saw the young one clasped and held between her feet, and watched the transportation for one hundred rods, when the mother alighted and they both probably ran off together. This certainly shows a remarkable and unsuspected amount of intelligence in the woodcock, and places it in this respect above many other birds who are ranked higher.

The peculiarity of carrying the young in one form or another is seen in many families of animals. It has been recorded that the night-hawk will carry off its eggs in its mouth, an occurrence that, though doubted, would not be more remarkable than the case of the woodcock. The king penguin carries its eggs around in a sac; moving about with it with a hopping motion peculiar to this time. This is probably true of many of the penguins; also of the albatross, that builds a nest, even then holding its egg in the curious sac that is analogous to the pouch of marsupials. In the kangaroos, the appearance of the young clinging to a nipple has often caused curious errors, many observers believing the young to have grown there; and it was my privilege to read recently a pamphlet written by some observer (?) upholding this theory. The stomach of the kangaroo is of large size and very complex, its walls being puckered up by longitudinal muscular bands into a great number of sacculi, like those of the human colon. The alimentary canal is long, and the cæcum well developed. All the species have a marsupium, or pouch, formed by a fold of the skin of the abdomen, covering the mammary glands with their four nipples. In this pouch the young are placed as soon as they are born; there their growth and development proceeds; and to it they resort temporarily for the purpose of shelter, concealment, or transport, for some time after they are able to run and jump about the ground and feed upon the same herbage which forms the nourishment of the parent. During the early period of their sojourn in the pouch, the blind, naked, helpless young creatures (which in the great kangaroos scarcely exceed an inch in length) are attached by their mouths to the nipple of the mother, and are fed by milk injected into their stomach by the contraction of the muscle covering the mammary gland. In this stage of their existence, the respiratory organs are modified much as they are permanently in the *Cetacea*, the elongated upper of the larynx projecting into the posterior nares, and so maintaining a free communication between the lungs and the external surface, independently of the mouth and gullet, thus averting all danger of suffocation while the milk is passing down the latter passage.

The opossum not only rears its young in the pouch, but they cling to the mother's back, their tails entwined about her tail, presenting a curious appearance. Among the pipe fishes, the sea-horse, etc., the males receive the young into a pouch in a very similar manner. The female deposits the eggs unimpregnated, and they are caught in the pouch of the male, where they are impregnated, also drawing nourishment from the fat that lines the pouch, and are finally born the second time, over a thousand or more regular sea-colts. Dr. Lockwood thus describes the actions of his brood immediately after birth: "The scene that followed was one of singular and lively interest. I was nervous with delight, and wished that every naturalist could see it for himself. I am sure there is no student of nature but will excuse the enthusiasm which prompted me to write at once to a friend 'that he must not set the minister down as a horse jockey on being informed that he was now the proud possessor of the most numerous drove of colts ever owned by one man the whole wide world over.' Using my best judgment, for, owing to the mazy motion of this tiny throng, counting was out of the question, I set the number down as not far from a thousand. Each measured from five to six lines in length. Very minute creatures truly, when one considers how large a proportion is taken up by the tail, which organ was of but little more than thread-like dimensions. We might suppose that it would require a few days for young hippo to find out the remarkable monkey-like endowment of its tail. Not so. Only look at what my own eyes beheld many a time when a stampede of these little colts was going on, although they were but one day old. There came two little hippos, each swimming in a direction at right angles to that of the other. Just at the point of passing, one, lasso-like, whips his caudal extremity round that of his fellow, who, of course, in like manner returns the compliment, which, to speak technically, acts as a "double lock." Of course, both pull, and, by a natural law, the force is exerted in exactly opposite directions, and the right angle is resolved into a straight line. It is but poor headway they make, nor does it mend the matter much that a third little fellow comes giddily on, and switching his tail, takes a hitch in that precise point in space where the two others meet. Now a triple force is exerted, and the effect is, with two straight lines, to project three obtuse angles. And so the three toil on, obtusely laboring *in statu quo*. But a droller sight is that of yonder juvenile lophobranch, who seems to be of somewhat belligerent proclivities, as he is leading by the nose a weaker member of

his own species, having, with his caudal extremity, noosed him on the snout. These funny antics, though oft repeated, are of short duration, as the parties soon have to rest from sheer fatigue."

The lamented Agassiz discovered among the South American fishes some remarkable instances of affection for their young; they were in some cases endowed with certain modifications of structure that enable them to conceal their young or eggs about their bodies. Prof. Agassiz thus refers to his discovery in a letter to the Emperor of Brazil:

"TEFFÉ.

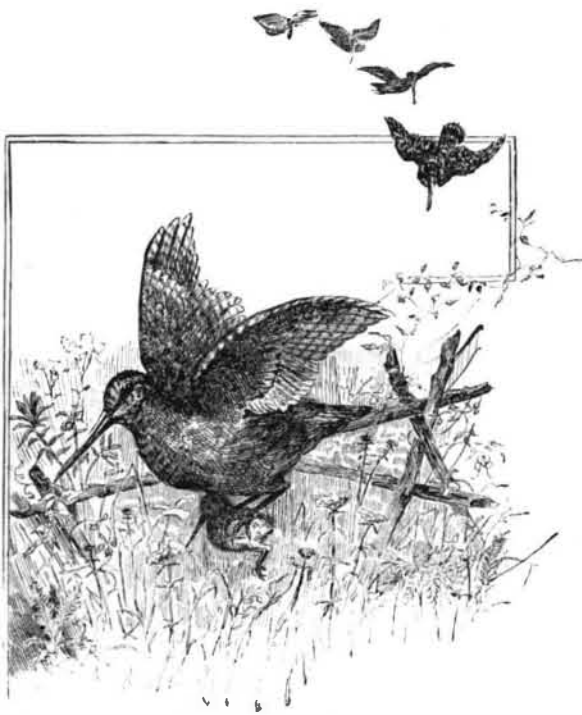
"Sire: On arriving here this morning, I had the most agreeable and unexpected surprise. The first fish brought to me was the acara, which your Majesty kindly permitted me to dedicate to you; and by an unlooked-for good fortune it was the breeding season, and it had its mouth full of little young ones in the process of development. Here, then, is the most incredible fact in embryology fully confirmed, and it remains for me only to study, in detail and at leisure, all the changes which the young undergo up to the moment when they leave their singular nest. . . ."

An Indian species of arius has a similar habit, while another of the same genus, found at Panama, has a fold in the skin in which the females carry their eggs. When hatched, they are received into the mouth of the male, and the remarkable sight is seen of young moving in and out of the capacious mouth, fleeing to it in time of danger.

Those familiar with the gigantic sturds of South America aver that it has a similar habit of protecting its young.

Perhaps the most remarkable instance among the catfishes is that of the aspredo. During the breeding season, curious horny stalked capsules appear upon the ventral surface and fins; to these the eggs become attached, and the fish moves off, her coming progeny dangling and swimming after her. When the young are hatched, these cradles disappear.

Some of the tree-toads—the hylodes of the island of Gua-



WOODCOCK CARRYING HER YOUNG.

deloupe—bear their young about clinging to their backs, and in Martinique the tadpoles (*Hylodes martinicensis*) are carried about in the same way. The female of *Notorema* has a sac upon the back in which the young are carried, and similar methods are seen in notodelphys. The most remarkable case, however, is that of the Surinam toad.

The ant eater carries her young upon her back, a sketch of which has been shown in a former number of the SCIENTIFIC AMERICAN, and this is equally true of a number of animals, not including the monkeys.

Among insects, love of offspring seems to be predominant, and the most elaborate structures are formed for their protection. Who has not watched the jealous care of the ants over their presumable offspring! If the nest is destroyed, each ant will be seen carrying off one or more of the curiously colored young to a place of safety.

Some spiders carry their young about with them; and the scorpions, some of which are a foot long, have been seen covered with their minute young, and a popular belief exists that the mother dies a victim to their hunger. Goss gives a curious account of the care a scolopendra shows over her young: "Under a stone by the roadside at Sabito Bottom I found a centipede performing the duties of a mother. It was a blue species, about three inches in length; it was lying in the form of a bow, the head and the tail curved forward toward each other, almost on its back, the curved body embracing some ten or fifteen eggs, which slightly cohered. The parent on being disturbed darted away among the stones, leaving the eggs, so that I did not capture her. I brought home the eggs, and, having taken out a few for preservation, placed the rest carefully on moist earth in a phial, hoping to rear them. They soon, however, became covered with mould, and decomposition destroyed them. The mother's care is perhaps indispensable, as in the case of ants, regulating the admission of heat and moisture to them according to circumstances.

## Antiseptic Properties of Carbonic Acid.

BY PROF. H. KOLBE.

Since 1874, when the author published his first experiments on the antiseptic action of salicylic acid, it has been his constant endeavor to find out a suitable method of its employment for preserving meat. Innumerable experiments, repeated under varied conditions, have convinced me that although meat impregnated with carbonic acid is, in fact, protected from decay, it acquires an unpleasant flavor after a few days, and when boiled or roasted it disseminates a disagreeable (but not putrid) odor. In spots where any decomposition was noticed, the meat no longer reacted acid, but alkaline.

This experience led to the conjecture that meat could be protected from spoiling by the acids in general, as well as by their gases, if it is thereby protected from the liberation of ammonia which accompanies decomposition, in the same manner as by putting it in vinegar.

The first experiment in this direction, made by putting a piece of beef on a plate under a glass bell jar of carbonic acid, was unsatisfactory. Before the end of the week, a putrid odor was perceptible, and the parts in contact with the plate, where no carbonic acid could reach them, showed an alkaline reaction.

The results were better when the meat was suspended so as to hang freely in a vessel filled with carbonic acid.

The experiment was repeated in apparatus of various sizes. The meat to be preserved was hung on a tinned iron hook that moved along a horizontal iron rod in a cylinder made of sheet tin. On the bottom of the cylinder was a porcelain dish to catch the dropping liquid from the meat, and in the side of the cylinder, just above the dish, a tubulus is soldered on air-tight, and through it passes a short glass tube connected with a rubber tube for introducing the carbonic acid gas. The rubber tube can be closed quickly and tightly by means of a pinch-cock. The cylinder also has a gutter around the top into which the lid sits, and which is half full of glycerine. A tubulus is also soldered into the top of the metallic cover, and provided with a glass tube like the lower one.

The glycerine acts like a water seal, and when the vessel is closed, carbonic acid from a Kipp's constant apparatus is passed in by the lower tubulus and expels the air through the upper one, which is left open. When nearly all the air may be supposed to have been displaced by carbonic acid, the two rubber tubes are securely clamped.

The first series of experiments were made in winter, the second in the hot months of summer. The cylinder containing the meat stood in the warmest room of my laboratory, which, being on the south side, was exposed to the sun's rays for the greater part of the day, and at noon the temperature rose to 32° C. (90° Fahr.). Pieces of freshly killed beef weighing from two to five kilos (4½ to 11 lb.), including bone and fat, were used.

A week after the beef had been put in the cylinder of carbonic acid, it could not be distinguished by appearance, color, or odor from fresh meat. It reacted slightly but distinctly acid everywhere.

After being carefully washed off it was boiled in water. The broth made from it smelled and tasted just like that from fresh meat, and the meat itself, if not boiled too long, was soft and tender, not stringy.

Meat suspended in carbonic acid for two weeks had the same qualities as the other, except that it looked grayer, but within it was red and juicy. The broth made from it, as well as the meat itself, had a pleasant flavor, and only a very sensitive palate could distinguish a slight difference in the taste of this broth and that from fresh meat. In a few cases the meat as well as the soup had a slightly acid taste, which was completely removed by putting in a very small quantity of carbonate of potash. Meat kept in carbonic acid for three weeks was as good as that left there for two weeks, but was softer than fresh meat, and required less time to cook it, or to obtain good broth.

After being kept in carbonic acid for four or five weeks, the meat was still free from putrid smells, but the broth made from it did not taste as good as fresh *bouillon*. The experiments were not continued any longer.

From this it will be seen that *carbonic acid is an excellent preservative for beef*, in which it will retain its flavor for several weeks.

It is worthy of note that mutton acts quite differently, and after being kept in carbonic acid gas for a week it begins to have a putrid smell.

Veal does not keep as long as beef. No experiments have been made with game or fowls.

Fish, oysters, and fruit only keep a short time.

This property of carbonic acid to preserve beef a long time will scarcely become of any great practical importance, but may find use where carbonic acid is given out in abundance from the earth. At the Naueim baths there are dry wells in which almost unlimited quantities of carbonic acid stream forth and are pumped out to be used for making soda water, and for other purposes. It would be worth while to try how long beef could be kept fresh by hanging it on a rope in such a well.

The experiments described give rise to many other queries, such as whether light has any effect on the preservative power of carbonic acid.

The author does not propose to extend his experiments any further, and leaves the field free for others who wish to study the chemical and physiological changes and reactions.

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