

From all the above, it is evident that navigation in coast-waters must be slow and gradual, although it has always been attended with the greatest advantages. Inshore navigation is not without its hinderances, however, and especially is this the case where the water near the coast is very shallow; and this could be remedied only by a light-draught vessel, which has the disadvantage that such a vessel cannot conform to the build already indicated. This is especially the case on the polar shores of the mainland of America, Asia, and most of Europe, while in the channels and waters north of them the land rises higher, the navigable waters approach more closely to the shore, and progress forward becomes more easily assured. Also in coast-water cruising, a vessel forced upon the shore by the incoming pack, backed by a heavy gale, is in a more precarious state than one simply grounded or lifted upon an ice-field.

A ship once fairly beset, and strongly held during a gale, is completely beyond control; and no real good can be accomplished by the severe tasks of warping and continual shifting of ice-anchors, which only exhaust the crew, and render them more or less unable to take a thorough advantage of a favorable situation, should one occur. Parry, however, under these circumstances, did not hesitate to employ his crews to their utmost at the hawsers and sails, plainly acknowledging that "the exertions made by heaving at hawsers, or otherwise, are of little more service than in the occupation they furnished to the men's minds under such circumstances of difficulty; for, when the ice is fairly acting against the ship, ten times the strength and ingenuity could in reality avail nothing." But the greater majority of ice-navigators are now decidedly of the opinion that it is best to yield to fate, and reserve the men's strength for palpable efforts. Still, in these besetments the mind of the commander must be ever active; for new events follow each other so rapidly, that a favorable chance for rescue is passed, before it can be fairly weighed in all its aspects.

FREDERICK SCHWATKA.

NOTES ON HIBERNATING MAMMALS.

A VERY prevalent impression exists, that hibernation among mammals is so fixed a habit that it may be defined in a few words, that it occurs with all the regularity of sleep, and is as necessary to the creature's welfare as food or drink. So far as these hard and fast

lines are drawn, so far is our understanding of the subject warped and imperfect.

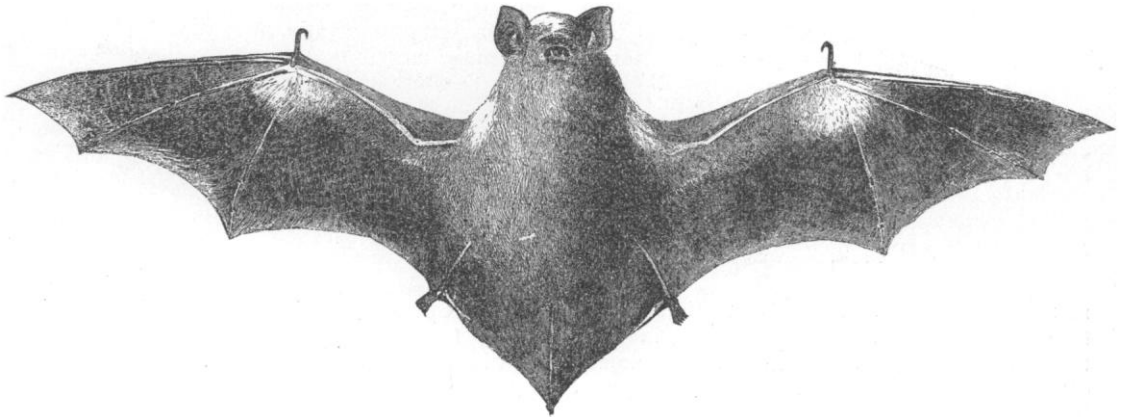
In the ninth edition of the *Encyclopaedia Britannica*, hibernation is defined as that "peculiar state of torpor in which many animals which inhabit cold or temperate climates pass the winter." Here we have the characteristic feature of the habit clearly expressed; but, when we come to consider the minor details, we do not find that any two animals, however closely allied, hibernate in precisely the same manner, nor do individuals of the same species always hibernate alike. Further, we do not find that it is so common an occurrence as usually supposed; and no animal appears to hibernate merely because winter has 'set in,' regardless of the temperature then prevailing. My own studies of the animal life in this neighborhood (central New Jersey) lead me to conclude, rather, that it is a happy faculty, which certain animals possess, but do not willingly exercise. If the prevailing temperature forces them, in self-defence, to hibernate, they can; but so long as they are able to withstand a low temperature, and food is accessible, they resist. Other causes than cold may induce an animal to hibernate; as when deprived of the supply of food gathered during the preceding autumn. In such a case, squirrels will pass the winter in a state of torpor, however mild the weather; while, with an abundant food-supply, they will simply sleep through the colder days, and awake to feast whenever the sun shines brightly.

Of the thirty or more mammals found here, thirteen species are supposed to be hibernating animals. These are four species of bats, two of moles, three squirrels, one ground squirrel, one marmot, one jumping-mouse, and one *Hesperomys*. Of these, probably the bats are the most sensitive to cold, and avoid exposure to it with the greatest care; and yet I find that the little red bat (*Atalapha novaeboracensis*) is very late in retiring for the season, and reappears with great regularity early in February. Their actions at this time indicate that considerable food is to be had,—that flying insects are abundant. While this bat's ordinary habits do not differ noticeably from those of the other species, it is apparently less sensitive to low temperature, and needs but the least encouragement to arouse from its hibernating sleep. It is also less crepuscular in habit than the others; but I do not know that this fact has any bearing upon the irregularity of its hibernation.

Bats disappear in November or December, immediately after the formation of ice, but do

not seem affected by a mere succession of hard frosts. As insect-life is not materially affected by the first few frosts, there does not seem any reason for their withdrawal from active life, and therefore it is not surprising that even up to Christmas, bats should be seen flying, at sunset, in considerable numbers. When the steady cold of an average winter fairly reaches us, bats hibernate in two ways. If they resort to the ordinary shelter of a hollow tree, or similar locality, that is considerably exposed to the wind, then many individuals cluster to-

flues which passed through it, and which were in constant use during the time. This bat could be taken down and hung up as readily as an inanimate object, yet clearly showed that it was conscious of the disturbance to which it was subjected. Once I brought it into a warm room, when it revived in thirty minutes, and flew about the apartment, but not with a very steady, well-directed flight. When taken again to the attic, it responded to the effects of the lower temperature by resuming its former position, after a steady to and fro flight from end



THE DUSKY BAT, *VESPERTILIO FUSCUS* (ONE-HALF NATURAL SIZE).

gether; and contact is mutually beneficial, for the torpor of hibernation is not rapidly, but rather gradually acquired. Such clusters of bats, if disturbed immediately after gathering together, are as resentful as when captured during midsummer; and not until three or four days have elapsed do they become insensible to disturbance. If this be very violent, and the creatures roused suddenly, a curious condition of aimless activity ensues, but lasts for a short time only, and often ends in death.

On the other hand, I have very frequently found solitary bats in curiously out of the way places, where they were so protected that they could not have suffered from the severity of the season, however intense. In such cases the torpor was never profound, the temperature of the body but little reduced, and the heart's action almost normal. For instance: a single dusky bat (*Vespertilio fuscus*) slept, or hibernated, as described, for thirteen weeks, in the attic of my house. It clung to a nail driven into the wall of the chimney, and was protected by a piece of woollen cloth hanging from a beam above it. The chimney retained a little of the warmth derived from the three smoke-

to end of the attic for nearly an hour. The bat seemed to be wholly aware of the position of the nail in the chimney, and, when wearied of its flight, turned to it directly, and, folding its wings about it, seized the nail with a tighter grip, and hung, head down, as it had been doing. In two hours I went to it again, and found it as indifferent to handling as before.

The two species of moles so common with us hibernate in quite different ways, the habit varying as much with them as does the character of their respective habitats.

The common mole (*Scalops aquaticus*)—which, by the way, is in no sense aquatic—buries deeply into dry soils, keeping just beyond the frost-line; and there it remains, without a nest of any kind, until the warmth of the spring sunshine melts the frost, loosens the soil, and sets the subterranean prisoner free. If, as sometimes happens, the cold is unusually intense and sudden, the ground freezes below the resting-places of the hibernating moles, and then they are frozen to death. This, I judge, does not often occur; but the approaching frost rouses them sufficiently to place them

on their guard, and forthwith they burrow a little deeper.

It is very different with the meadow-haunting, star-nosed mole (*Condylura cristata*). This mammal has more complicated burrows than those of the preceding, and often one or

from forty-eight to seventy-two hours, the ordinary duration of the high water. If through any cause the period of submergence was prolonged, it is probable that it would prove fatal to the moles.

The short-tailed shrews (*Blarina brevica-*



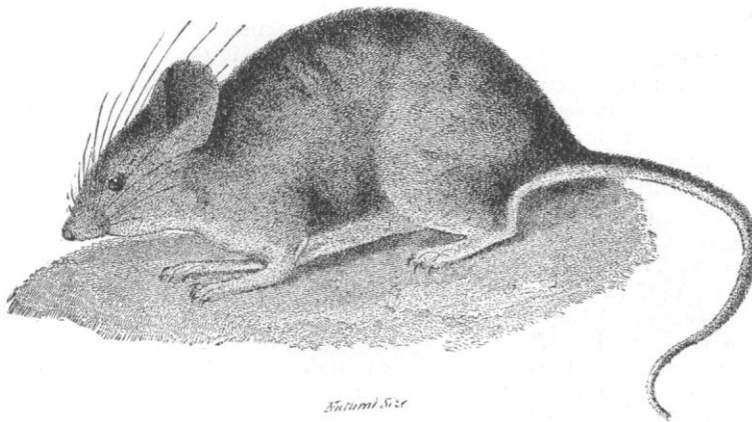
THE STAR-NOSED MOLE, *CONDYLURA CRISTATA* (FIVE-EIGHTHS NATURAL SIZE).

more openings to them are beneath the surface of the water. At some point in their tangled tunnellings, these moles form commodious nests, placing a good deal of fine grass in them. Here, indifferent to freshets, they remain all winter, and, as they can lay up no food, sleep, I suppose, through the entire sea-

son. The fact that these moles are unaffected by being submerged during the spring freshets is an interesting fact. So far as I have examined their nests, there was nothing to show that they were water-tight; and I think that the animals must have been thoroughly soaked for

da), on the other hand, which are closely akin to the foregoing, are full of life and activity all winter. No severity of the weather chills their ardor; but this is not to be wondered at. Their favorite food is grasshoppers, and these are to be had in abundance the season through. Every warm day brings hundreds of half-grown, wingless grasshoppers to the surface, where they move about very actively. Feb. 3 of this year I found literally millions of them hopping over the dead grass, in the meadows, as restlessly as though it were August. The ground was frozen, and the sunlight had merely dried and warmed the tangled mat of dead grass upon the surface. At various points I found the openings of tunnels, which I took to be the pathways of the crepuscular shrews, — shy little creatures, that towards sunset come to the surface, and forage during the twilight.

Omitting reference to the winter habits of the familiar squirrels and woodchuck, or marmot, let us consider briefly the two small rodents found here, that are also hibernating



THE WHITE-FOOTED MOUSE, *HESPEROMYS LEUCOPUS* (NATURAL SIZE).

son. The fact that these moles are unaffected by being submerged during the spring freshets is an interesting fact. So far as I have examined their nests, there was nothing to show that they were water-tight; and I think that the animals must have been thoroughly soaked for

animals,—the jumping-mouse (*Zapus hudsonius*) and the white-footed mouse (*Hesperomys leucopus*). These two mice, popularly so called, hibernate with great regularity in one sense, but differ *inter se* in another. The former, once torpid, remain so until spring, a few warm days in winter failing to rouse them; but the white-footed mouse seems simply to sleep soundly rather than grow torpid, and responds with considerable promptness to any disturbance. The jumping-mouse builds a nest of leaves and grass at a considerable depth from the surface of the ground (not a 'ball of mud,' as stated in the *Encyclopaedia Britannica*, art. 'Jerboa'), and, once fairly settled therein, is beyond the various sudden changes of our winters: the white-footed mouse, on the contrary, utilizes an old bird's-nest, or has a resting-place beneath a log or in a half-decayed stump. In such positions, of course, the occupant is more likely to be disturbed, and is also directly exposed to the varying temperature.

jumping-mouse, does not do. However this may be, the fact remains that both these rodents are quite sensitive to cold, and hibernate



FIG. 1.

as soon as winter sets in; yet how very differently is this faculty exercised! C. C. ABBOTT.

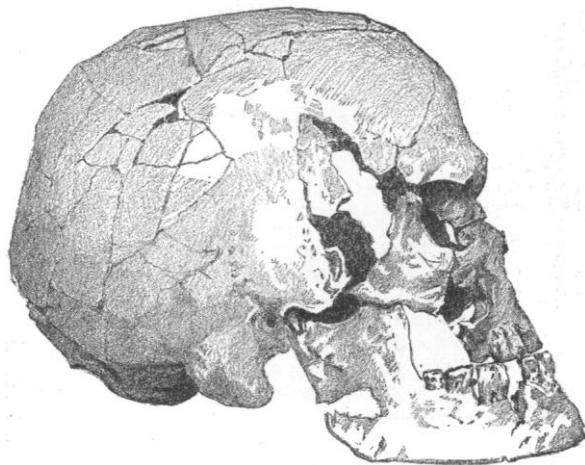


FIG. 2.

Is it to meet the requirements of this condition that this mouse lays up a goodly stock of food during autumn?—something the jerboa, or

ANOTHER ANCIENT HUMAN SKELETON FROM MENTONE, FRANCE.

WE owe to the favor of Prof. Spencer F. Baird, secretary of the Smithsonian institution, photographs of a human skull exhumed last month from one of the grottos at Mentone, France (next to that in which Rivière discovered a skeleton twelve years ago), together with a letter from Hon. Thomas Wilson, U. S. consul at Nice, under date of March 31, from which we extract the following statements:—

The skeleton to which the skull belongs was found in the 'fourth cavern,' at a depth of eight metres and a half, under well-defined strata; one, a metre and a half thick, composed of cinders, ashes, burnt earth, and charcoal. More or less worked flint chips were found with it, comparing well with those found with Rivière's skeleton.

The skeleton was complete; but, as the result of a quarrel over the ownership, the body was stolen, and its whereabouts are still unknown.