The bowfin group.

To illustrate the nesting habits of the bowfin, or mudfish. At the left the male and female fishes are seen on a nest; at the right a male standing guard over the eggs.

Detail of the bowfin group.

This photograph of a portion of the group shows the male bowfin poised over the nest guarding the eggs against intruders. [The eggs appear as white dots in the picture.]

The Life Habits of Fishes*

Exhibits in the American Museum

By Bashford Dean

It is an open question to what degree the life-habits of fishes should be pictured in an elaborate way in the Museum's present gallery of fishes, for space is limited and such "habitat groups" occupy many cubic feet. It is clear, too, that they are subsidiary to other types of exhibits, thus, the principal kinds of fishes must be shown as casts, alcoholic specimens or stuffed, and there must be models and preparations to illustrate how fishes move, breathe, and have their being generally, how they reproduce their kind, how they may be curiously adapted to living in shallows, surf, the depths of the sea, on land, and even flying in the air, how they change colors when they sleep, or when, chameleon-like, they adjust themselves to their surroundings. All exhibits of the latter types may be developed attractively on a fairly small scale, and will interest and teach the

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average visitor to the Museum, and will satisfy as well a need of the serious reader of zoology.

Great habitat groups, on the other hand, are elaborate exhibits with painted backgrounds, artificial plants and rocks and "effects" which entail much time to construct, great expense, and infinite pains to supervise and execute. The results, it is true, are apt to give an impressive and accurate picture of certain phases in the life of fishes, and are certainly a definite and æsthetic means of attracting the visitor to a more careful study of neighboring exhibits, whetting his appetite for a more serious zoological diet, so to speak. Still, even at the best, the habitat groups of fishes are not to be compared with those of mammals, birds or reptiles, for fishes are least suited structurally to the art of the taxidermist or of the modeler. Scales and fins shrink, colors fade, and the mounted fish, no matter what its pose, appears only too often as a dead fish, opaque and leaden. It follows, therefore, that with our technical methods, extensive fish groups can hardly be expected to rival the tanks of an aquarium.

In our present gallery, accordingly, it has been the

Thus, the lowly lampreys are represented in a group which shows such details as swimming, excavating their nest and depositing their eggs. And the ganoids are now pictured in four large groups. For the ganoids are the few survivors of one of the great divisions of fishes in early geological times, and formed the evolutionary bridge which connected the primitive sharks on the one hand with lungfishes, and on the other with the bony fishes, which form perhaps over ninety-nine per cent of all living fishes. In these four habitat groups, the first pictures the shovel-nosed sturgeon, which still occurs in the Mississippi and its tributaries, and is to be regarded as the least modified of all living ganoids. The second shows the spoonbill sturgeon, which, on the contrary, is the most highly modified member of the ancient stock. This eccentric sturgeon has survived only in this country and in China, and is here verging perceptibly toward extinction, for its immature spawn is used as caviar and our fishermen have devised means of well-nigh exterminating it. The third group exhibits the spawning habits of the gar pike, whose close-set armor of enamel plates suggests at once the bony- and

Portion of the transparent background of the bowfin group to show the painting of the male bowfin with the swarm of newly-hatched young.

The Gar pike group.

A party of gar (*Lepisosteus osseus*) just after spawning. At the right are seen the "weeds," among which the eggs (shown as white dots in the picture) were deposited. The studies for the group were made at Lake Nemabbin, Wisconsin, in June, 1912, by Messrs. Dwight Franklin and A. E. Butler of the department of preparation. The fishes were mounted and colored in the field from living specimens, by Mr. Franklin.

aim to show larger habitat groups only in those instances where the fishes form important links in the chain of the backboneed animals, and touch the broader phases of natural history, especially from the viewpoints of structure and descent. In such cases, too, the effort has been to demonstrate essential habits or interesting facts concerning their breeding or development.

glossy-scaled fossil fishes which one finds abundant from the age of the Old Red Sandstone onward. The fourth group shows a ganoid which has nearly attained the appearance and structure of a modern bony fish. This is the dogfish or bowfin, *Amia*, which though known fossil from many parts of the world, is practically restricted to-day to the waters of the Middle West.

The last three groups mentioned have lately been placed on exhibition. They are the work of Mr. Dwight Franklin, of the Museum's department of preparation, who collected the material and carried out its preparation with the greatest care. The plant-life accessories in the *Amia* group were executed by Mr. A. E. Butler,

also of the Museum's staff, who had the advantage of visiting Mr. Franklin in the field.

It may be said that the department of ichthyology of the American Museum hopes to prepare at some time in the near future a similar habitat group to show the important division of fishes represented by the living

sharks and rays, still another group to picture the life of the lungfishes, and several groups to represent the bony fishes—one showing the life habits of pelagic forms, another, which is now well in hand, will picture the "phosphorescent" fishes of the deep sea, and still another the fishes of rocks and surf and corals.

Plan of windbreaks on a 160-acre farm in Oklahoma. Osage orange, honey locust, green ash, or red cedar should be used.

Model of plan for location of windbreaks on a 160-acre farm in the northern prairies.

Trees as Windbreaks for Land Under Cultivation

Models Prepared by the Department of Agriculture

THE two windbreak models shown on the accompanying photographs give the proper locations of windbreaks on a 160-acre farm in the northern prairies, including eastern Montana, the Dakotas, and southern Minnesota, and in Oklahoma, western Texas, and adjacent regions. Windbreaks are valuable in three ways: first, they lessen evaporation; second, they protect crops from mechanical destruction wrought by the wind; and third, they protect livestock, houses, and barns from the hot winds of summer and the chilling winds of winter, thus rendering homesteads more habitable, and the livestock more comfortable. Livestock protected by windbreaks needs less food in winter to keep up body warmth, and are more comfortable and remain in better condition during the summer. Evaporation may be lessened not only by keeping the mulch cover of the ground well pulverized, but by lessening the force of the wind. The latter may be accomplished by placing forest windbreaks at frequent intervals throughout the farm, at right angles to winds prevailing during the growing season. The Forest Service has made careful and extensive study of the needs and value of windbreaks throughout the Middle West. It has determined the species best suited for windbreaks in the various regions, has carefully and accurately worked out both the harm done to crops by windbreaks, through sapping and shading, and the beneficent protection which accrues from their use, and has drawn a balance greatly favoring their establishment and maintenance. The published results of these investigations point out the manner in which trees should be placed in windbreaks, the width which the windbreaks need to have for best efficiency, the area over which windbreaks of given heights are effective, and other details valuable to the farmer who wishes to take advantage of them.

The windbreaks shown on the model of the Oklahoma farm run east and west, with a grove windbreak running north and south on the west edge of the farm. These windbreaks are placed in this way because the prevailing injurious winds during the growing season in this section of the country are mostly from the south. The windbreak on the southern edge of the farm is about ten rods through and protects a field about sixty rods in width. The other windbreaks are single row hedges, carrying their protection over to narrow fields becoming narrower as they are at greater distances from the grove windbreak on the southern edge of the farm. The north and west row on the west side of the farm is to help give protection from the southwest winds. While severe winds come from the north in this region, these winds are usually of short duration and do not occur frequently during the growing season. Such drought resistant hardwoods as Osage orange, green ash and honey locust, supplemented by Scotch and Austrian pine and red cedar, will make the best windbreaks for this region. Where hardwood trees which lose their leaves in winter are used, they should be supplemented by evergreens in order to furnish protection in winter as well as in summer.

The prevailing injurious winds in the northern prairies are the cold and dry winter winds from the northwest, and, secondarily, the occasionally dry westerly winds of summer. The warm chinook winds occurring in the early spring may have damaging consequences. To meet these, windbreaks of both orientations must be used, with about two of the north-south to one of the east-west. Conifers should be used for windbreaks in this region exclusively. There should be a belt of about seventy-five feet containing twelve rows of pines, and three rows of spruces on either side running along the north and west borders of a 160-acre farm, and two such rows extending north and south through the farm at intervals of about sixty rods. This will make about thirty-six acres of timber for the farm, will increase the productivity of the crops, and will allow at the end a large amount of material suitable for fence posts and other farm uses, and even for box boards for commercial purposes. On poor situations, the belts should be only 60 feet wide, but there should be an extra one running east and west on the farm.

Whales in the Mediterranean

THE sea-monster (popularly supposed to have been a whale) cast ashore last September at Beaulieu, has been identified as the *Ziphius cavirostris*, a cetaceous mammal. Although not a "true" whale, like the Greenland right whale (*Balaena mysticetus*), or the Nordkaper or Biscayan variety (*Balaena biscayensis*) of the same species, the *Ziphius* can certainly claim, in common with the narwhal, grampus, porpoise, etc., a relationship with the whale family.

The carcass of this animal has been secured by the authorities of the Museum of Oceanography at Monaco, where the skeleton, when mounted, will be added to the collection.

This is not the first *Ziphius* which has strayed into Nice waters. The skeleton of one, washed ashore at Villefranche in 1866, is in the museum at Jena. Another, captured by some fishermen off Beaulieu in 1878, measuring 5.60 meters (18 feet 4 inches) in length and 3.70 meters (12 feet) in girth, is in the Natural Museum at Florence. Another, captured at St. Jean, is at Brussels, and other specimens are to be seen in the museums at Turin, Monaco, etc.

Little is known concerning the habits of this creature, which takes its name, *cavirostris*, from the deep cavity on the underside of the snout. Its color is a bluish black, with patches of a darker shade on the back. The belly is white. It inhabits the Pacific Ocean, where it feeds principally on small fish, cephalopods and many other forms of marine invertebrates.

The Commandant Caziot, president of the Association des Naturalistes des Alpes-Maritimes, and curator of the Natural History Museum at Nice, has published an interesting memoir on the Cetaceans found on this coast, entitled "Liste des Cétacés observés dans la mer de Nice." In this he affirms positively that no "true" whale has been found in the Mediterranean Sea. In this work a list of no fewer than sixteen different species of Cetaceans that have been seen or captured in these waters is given. Of this number the museum at Nice, unfortunately, only possesses three specimens, viz., the *Tursiops tursi*, *Delphinus delphis* and the *Grampus Rissoanus*. The four members of the *Ziphius* tribe, viz.,

the *Ziphius cavirostris*, *Hyperood rostratum*, *Meropteron Sowerbyi* and the *Catodon macrocephalus*, or cachalot or sperm whale, sometimes found in the Mediterranean, are included in this list.

Among others which have been captured in these waters may be mentioned the finner whale (*Balaenoptera musculus*) and two others of the same genus, the *B. physalus*, one of which, 20 meters (65 feet 6 inches) in length, was harpooned by the crew of the yacht "Princess Alice," belonging to the Prince of Monaco, in the waters of the principality a few years ago. The other, the *Balaenoptera rostratus*, is not infrequently met with in the Mediterranean also. The *Phocaena communis*, the common porpoise frequently met with on this coast, figures in this list, which includes the bottle-nosed whale (*Balaenoptera hyperoodon*), as well as several varieties of the dolphin tribe, such as the *Sterno rostratus*, *Globiceps melas*, *Orca gladiator*, *Grampus griseus* and the *Prodelphinus tethyos*.—*Journal of the Royal Society of Arts*.

The Origin of a Borax Mineral

It is generally recognized that boric acid in considerable quantities is an original constituent in the waters and gases given off with volcanic emanations. In fact, the Tuscan fumaroles in Italy have been an important commercial source of boric acid for a long time, and in the past, possibly even to the present time, almost all the boric acid brought into the European market has been derived from this source. There is abundant evidence of the presence of boric acid in volcanic emanations in many parts of the world. On the other hand, boron is so rare a constituent of rock-forming minerals that it forms an almost inappreciable small percentage of the earth's rock mass as a whole.

A short study of the borate deposits in Ventura County, Cal., supplemented by more cursory examinations of similar deposits in the vicinity of Death Valley, has been made by Hoyt S. Gale, of the United States Geological Survey, and a new theory of the origin of the deposits of colemanite, or borate of lime, in these regions has been advanced by Mr. Gale in Professional Paper 85, Part A, recently published by the Survey. While this theory has not yet been entirely proved, there is much in its favor, and it affords suggestions and a working basis for further observation.

The supposition of a desiccated saline lake to explain the origin of the colemanite has little to support it beyond rather general assumptions. The character of the deposits themselves indicates rather a vein type of formation. Other salines which would naturally be expected in desiccation deposits resulting from natural saline solutions are not found in association with the colemanite. Those who have supported the desiccation theory have offered no explanation of the cause which might produce colemanite in such massive deposits as a product of water evaporation while, on the contrary, its formation from limestone in veins by replacement of carbonic acid with boric acid is a natural hypothesis that deserves further investigation. The relations of the deposits to basalt lava flows indicate the probable origin of the boric acid at the time of the extrusion of these lavas, although it may be assumed that this acid continued to find its way into solution of the circulating ground waters long after the period of the extrusions.—*The Chemical Engineer*.