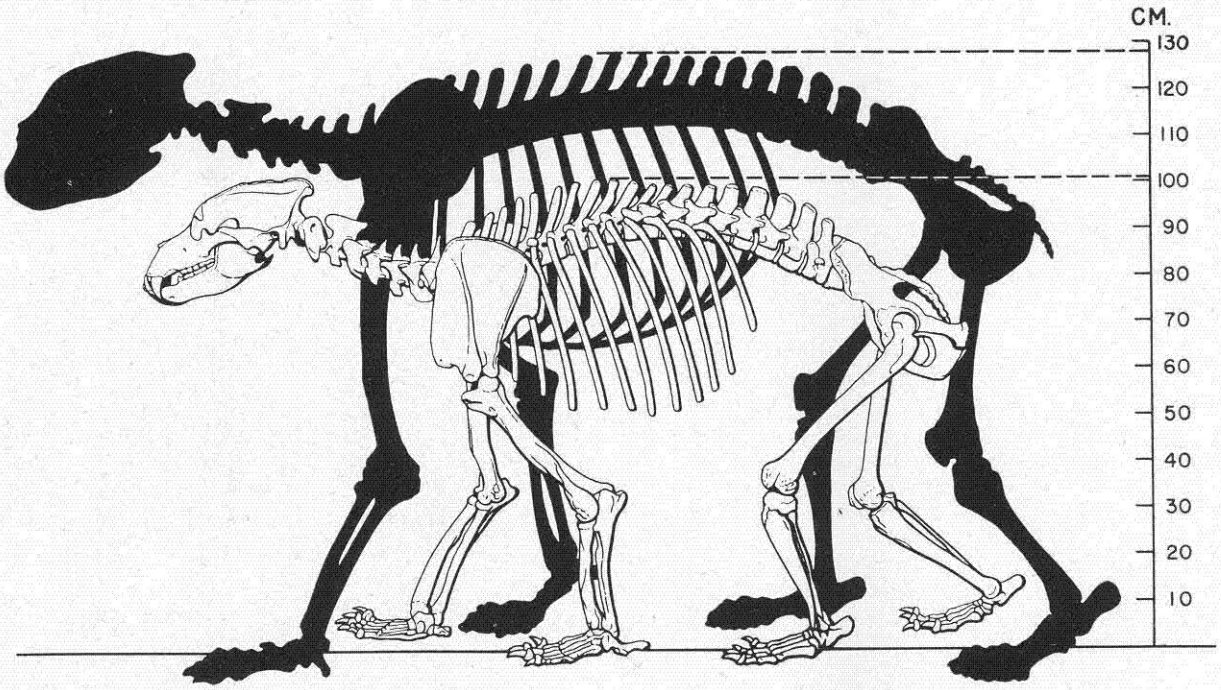


FIG. 1. Skeleton of recently extinct Californian grizzly (Ursus horribilis) in outline and of the Pleistocene short-faced bear (Tremarctotherium californicus) in silhouette, showing difference in size. Outline of the grizzly specimen after a photograph by Gardet, an illustration of a mounted skeleton rarely seen. Outline of the tremarctothere based on a specimen from Rancho La Brea.

CALIFORNIA BEARS

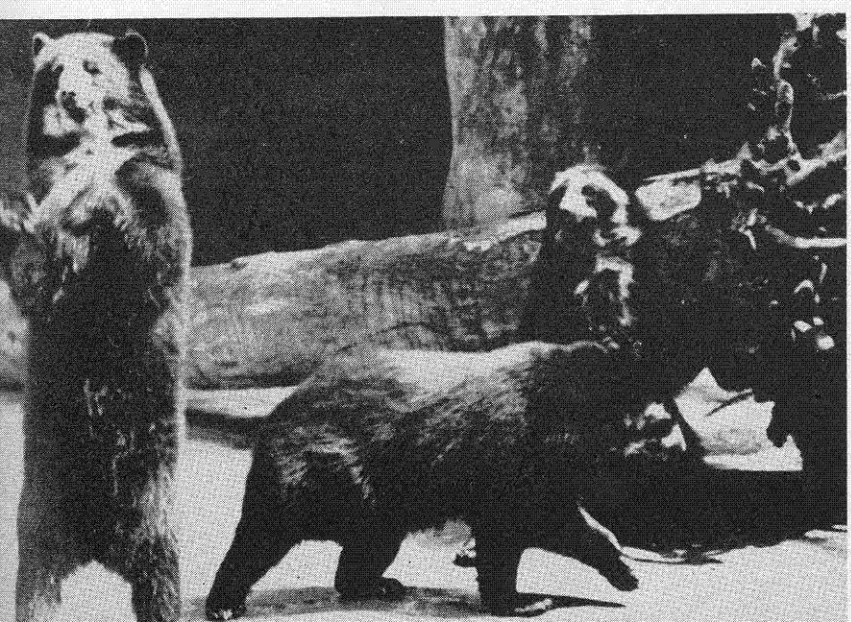
PRESENT AND PAST

By CHESTER STOCK

BEARS are among the most interesting animals of the wildlife of California. Today, most people know the black bear, its characteristic appearance and some of its habits, since it is commonly seen in frequented places like Yosemite and Sequoia National Parks. While it is the largest of our fur-bearing mammals, overestimates of its weight and size are commonly made. An individual of average size weighs between 200 and 300 pounds although instances are known where a black bear of large size weighs almost 500 pounds. These animals stand from 30 to 36 inches at the shoulder. The black bears at present and during the historic past are known to have ranged in the northern coast ranges, north of San Francisco, into Siskiyou County, and southward throughout the length of the Sierra Nevada. The southern end of their distribution extended from the Tehachapi Mountains into the eastern portions of Ventura and Santa Barbara Counties.

CALIFORNIAN GRIZZLY

In contrast to the black bear, the Californian grizzly is less well known, and apparently became extinct in the



AT LEFT:

FIG. 2. Three individuals of the spectacle bear (Tremarctos ornatus) from Guayaquil, Ecuador. Note small size of animals. Courtesy of the Zoological Society of San Diego.

state some 20 years ago. The so-called Sunland bear, killed in the lower part of Tujunga Canyon in 1916, was the last grizzly on record to be found in southern California. The grizzly bears were the most striking wild animals in early California history. They were much more widely distributed over the state than the black bear, for their range extended from the Mexican border to Oregon. Almost the only areas not inhabited by them were the arid or desert sections along the eastern border and in the southeastern portion of the state. The Californian grizzly was a distinctly larger animal than the black bear. As in the instance of the latter, estimates of its weight were often on the liberal side. A grizzly in poor condition, shot in the vicinity of Pasadena in the winter of 1879-80, weighed about 500 pounds. It is probable that an average weight for these bears was 800 pounds, with some weighing distinctly more. When it died, Old Monarch, a grizzly kept in captivity for many years in Golden Gate Park, San Francisco, weighed, according to reports, 1127 pounds. It had a shoulder height of 48 inches.

Their wide range made them well known not only to the native Mexican occupants of the region when it still belonged to Mexico, but likewise to those Americans who came west as adventurers, explorers, miners and settlers in the days of '49 and before and after. The subsequent history of the grizzlies in the state is a sad one to relate. Relentlessly hunted and trapped by man, their numbers gradually became depleted until this group of bears reached the vanishing point about 1924. Curious though it may seem, little information of scientific value was recorded about the grizzly when it was still alive. Even in its heyday, authentic facts concerning the natural history of this animal were of the most meager sort, since the statements of trappers and hunters were principally concerned with its spoor, the formidable character of the bear, its ferocity, and the dangers of the hunt. Today, therefore, our knowledge of the Californian grizzly is gleaned from stray notes and accounts and from a relatively sparse collection of skulls and still fewer skins.*

To the paleontologist this episode in the wildlife history of California has special significance, for it demonstrates in striking manner how animals come to disappear from the living world in a relatively short span of time, due to the introduction of some new factor, even though the original life expectancy was considerable. The change in the mammalian life that has taken place in the Californian region with the passing of the Ice Age or Pleistocene epoch and the coming of Recent time is precisely of this sort, although the direct cause of extinction was apparently not always man, and on occasion may have been due to some physical rather than biological factor.

A comparison of the assemblages of mammals exhumed from the Pleistocene asphalt deposits of Rancho La Brea and McKittrick with that living in California today emphasizes the paucity of the present fauna. The difference displayed by our existing life results largely from the disappearance or extinction of many of the characteristic types of Pleistocene mammals. To less extent is this due to the appearance of new specific types. Thus, while black bears and grizzlies were present in the Californian region during the Ice Age, and the former at least is definitely known to be specifically different from the black bear of today, the most striking feature of an earlier history of the bear group is the existence in California during the Glacial Period of an extinct short-faced bear unrelated to the black bear and grizzly. In contrast to the disappearance of the grizzly in California, the extinction of the short-faced bear cannot, as yet, be ascribed to the advent of man in the late Ice Age or early Recent time.

*An excellent summary of the available information concerning the Californian grizzly is found in Grinnell, Dixon, and Linsdale: *Fur-Bearing Mammals of California,* University of California Press, 1937.

FIG. 3. Spectacle bear (Tremarctos ornatus) from Guayaquil, Ecuador. Note color pattern on face and chest. Courtesy of the Zoological Society of San Diego

SHORT-FACED BEAR

The *tremarctothere* or short-faced bear takes its common name from the fact that the snout is not long and slender as in the grizzly and black bear, but the face is blunter. The animal grew to very large size, and its stature exceeds that of the grizzly. In this respect, it resembles the giant brown or Kadiak bears that today inhabit Alaska. The difference in size between the *tremarctothere* and the Californian grizzly is well shown by a comparison of their skeletons *(Fig. 1)*. Male individuals of this bear must have weighed at least 1500 pounds and probably exceeded that figure.

When the remains of these creatures were first found in 1879 in Pleistocene cave deposits of northern California, the animal was called a cave bear, but short-faced bear is a more appropriate name. These animals are now known to have had a very wide distribution on the North American continent during the Ice Age, for their fossil remains are found from the Yukon to the Mexican plateau. They were unquestionably the most formidable carnivores of the American Ice Age, holding their own by size and strength. Close relatives occur also in the Pleistocene of South America. It is apparent from their structural characteristics that they were more carnivorous mammals than either the black bear or the grizzly.

Perhaps the most interesting fact concerns their relationship to living bears. It is now apparent that the short-faced bears are not nearly related to the living bears of North America, but have closest kinship with the diminutive spectacle bear of South America. The latter animal is found in the Andes from Colombia south to Chile. It is not often seen in zoological gardens in North America, although several living animals are the property of the Zoological Society of San Diego *(Fig. 2)*. The spectacle bear takes its name from the color pattern on the face, more particularly the marking about the eyes *(Fig. 3)*. In contrast to the black bear, the spectacle bear is a smaller animal, standing about 22 inches tall at the shoulders and weighing less than 100 pounds. Thus, in the lineage of the *tremarctothere* it may be said that not only did the occupants of what was once a great estate give way to a smaller breed, but also their territory became much more restricted in area.

The history of the short-faced bears can be traced back still farther in geologic time. Some of the evidence of their more ancient existence is furnished by fossil teeth and jaw fragments that have been collected in the Mt. Eden formation, Riverside County. These strata accumulated during the Pliocene, or the epoch immediately preceding the Pleistocene. The earliest record of the group leads back into the Miocene epoch, for in the famous Barstow deposits of the Mojave Desert are found curious animals showing relationship to the *tremarctothere* and to the dogs. *Hemicyon*, or half dog, as this carnivore is appropriately called, is a connecting link suggesting the derivation of this group of bears from one branch of the great and diversified family of dogs during the middle of the Age of Mammals.

Hydraulics Laboratory

(Continued from Page 3)

a thorough understanding of the advantages and limitations of the Laboratory solution.

PRESENT ACTIVITIES

Because of the war, work on basic research projects has been reduced in order to concentrate on problems of more immediate assistance to the war effort. Wind erosion studies have been discontinued and density current and sediment transportation studies retarded.

During 1943, hydraulic model studies of six large spillways were made by the Laboratory. The first four studies were for existing structures which had proved unsatisfactory and unsafe in operation because their designs were based on faulty hydraulic assumptions. One of these structures is in Oklahoma, one in Louisiana, and two in Texas. By means of the model studies, simple and economical methods of reconstruction were developed for these Southern structures, which will provide them with adequate hydraulic design for the spillways and their stilling basins. Incidentally, the damage loss, plus the cost of reconstructing these four large structures, will exceed the cost of operating this Laboratory for several decades. The other two spillway studies were for structures to be located in Utah and California. In both of these cases the designs were submitted in advance of actual construction, thus giving the Laboratory an opportunity to make constructive suggestions.

During 1943, a standard design for baffle type energy dissipators for pipe outlets was developed as a sequel to the standardized drop structure design. The development of such standardized designs is an effective Laboratory activity because the results apply to innumerable structures instead of to one. Another recent development in this category is a flow meter for pipe line irrigation outlets.

An interesting new density current development arose through the Southern California Edison Company. The company observed that in the spring at their Shaver Lake reservoir the cold heavy snow water entering from the stream would flow underneath the warmer, light water of the lake without mixing with it. Valuable field measurements have already been secured and the investigation is being continued this spring.

The sediment transportation studies have been accelerated by the addition of *H. A. Einstein* to the staff. He has been studying this particular problem for several years at one of the Soil Conservation Service research stations in the East.

At the request of the Navy, this Laboratory and the Hydraulics Structures Laboratory are studying an important problem of the Los Angeles Harbor. Although this project consumes most of the energies of both staffs, the effort seems justified since it appears that the study is assisting the Navy in more satisfactory operation of this important base.

Sediment Transportation

(Continued from Page 7)

on a straight line must not be taken as evidence that the theory is in complete agreement with experiment since as mentioned previously, the exponent z was determined so that the curve would fit the experimental data.

Fig. 8 shows velocity profile curves on the center of the flume for two flows of the same depth, one with clear water and the other with a suspended load of 0.15 per cent by weight, distributed according to the curve at the right of the figure. The shaded area between the velocity curves represents the increase in velocity due to the presence of the sediment. It will be seen that this increase is almost 10 per cent. The effect of the sediment is to reduce the apparent friction resistance of the channel. This results from a modification of the turbulence by the suspended sediment. The turbulence must support the sediment against the action of gravity which causes it to settle. This requires energy which must be supplied by the turbulence thus reducing its intensity. Since the turbulence also transmits the resistance of the channel to the entire cross section of the flow, when its intensity is reduced it is less effective in transferring this resistance and a higher velocity is necessary to establish equilibrium conditions.

The action of sediment in increasing the velocity of flow was observed in all laboratory tests; however, the concentrations used in the laboratory were rather low so there is no evidence available on the variation of this effect with extremely high sediment loads. The action of sediment in reducing the intensity of turbulence indicates that the maximum load that a stream can carry is determined by some kind of equilibrium between the supporting power of the turbulence and the settling tendency of the sediment.

SUMMARY

The experimental work on the transportation of suspended sediment described briefly in this paper has shown that the theoretical relationships which were based on analysis of turbulent flow give approximate results for the distribution of sediment. They have also clarified the inter-action of the sediment and the turbulence and suggested the mechanism by which the maximum load that a stream can carry is determined. Further experimental work and research on the subject is needed and promises to yield results that are necessary to enable engineers to handle sediment-laden flows.