

DESCRIPTION OF MIOCENE FISHES FROM
SOUTHERN CALIFORNIA

BY DAVID STARR JORDAN

In a recent visit to the noted diatom beds at Lompoc, Santa Barbara County, California, by Mr. Eric Knight Jordan, three new species of fishes were discovered, in addition to the fifty or more already secured from the same locality. In obtaining these, the collector is especially indebted to Mr. Edward B. Starr, director of the Celite Products Company. "Celite" is the trade name for these masses of pure diatoms used as blankets for hot pipes and, when crushed, as filtering substance.

Family CLUPEIDÆ

DIRADIAS Jordan, new genus

Type *Diradias aratus* Jordan.

This genus is not remote from *Clupea*, differing mainly in the very deep grooving of the opercle, the stronger serrations of the belly, agreeing in the number of vertebrae (deipas, a ridge).

1. *Diradias aratus* Jordan, new species.

Type No. 600, Stanford University, one specimen 14½ inches long, with caudal; cotypes 600A, counterpart of No. 600; and No. 601, 11 inches long, all these from the Miocene Diatom deposits at Lompoc, California. Collector, Eric Knight Jordan. The specimens are imprints, in fair condition, the type specimen having lost the ventral fins, and all of them with the head much injured.

Head 3 in length to base of caudal; depth 3¾; dorsal rays about 12, the longest 2 2/3 in head, pectoral rays about 10, the fin 2 2/3 in head; anal mostly lost, its rays probably 20 or more; ventrals 3¾ in head; caudal rays 15+15=30, the lobes 1 1/10 in head; vertebrae 52 (apparently only 46 in No. 601).

Body moderately elongate, herring-shaped; head large and deep, the mouth-bones displaced, its cleft apparently very oblique, the jaws not long, the mandibular joint being below eye; no teeth preserved; eye moderate, well forward; cheek region apparently deep, as in *Alosa*. Opercular bones very deeply and coarsely ridged and grooved, the furrows most distinct on anterior part of opercle where there are about 10 short ridges, those before and behind less prominent; the main ridges vertical, stronger, diverging below, some sharp striæ on other bones of head, those on upper next to opercle branching.

Vertebrae deeper than long, rather weak, each with 2 or 3 deep furrows. Ribs numerous, very slender, many of them branched. Neural and hæmal spines short and slender; interneurals and interhæmals very feeble, mostly obliterated.

Pectoral fin placed low, of very slender rays, apparently not elongate; ventrals inserted under last rays of dorsal, obliterated in the type, a few weak rays shown in No. 601, its insertion at a distance behind gill opening about 4/5 length of head.

Dorsal fin short and rather low, the rays broken, its insertion at a distance behind head equal to 2/3 length of head, the fin probably a little higher than long, its interneurals short and slender; anal of slender rays, mostly obliterated. Caudal nearly as long as head, deeply forked, its outer rays about twice the inner.

Scales rather large, smooth, cycloid, some with the surface faintly striate. Edge of belly with strong serrations in the type, these largely obliterated in the others.

From other herrings of the Miocene, this species is well separated by the very strongly ridged opercle.



Diradias aratus, Jordan
(Type) Lompoc.

Family HIPPOGLOSSIDÆ

HIPPOGLOSSUS Cuvier

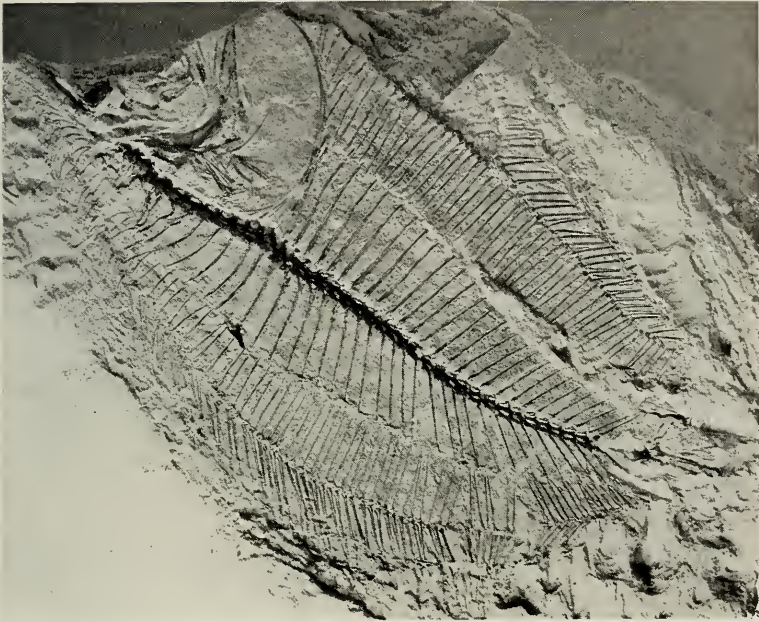
2. *Hippoglossus antiquus* Jordan, new species.

Type No. 603, a large fish, $21\frac{1}{2}$ inches long from the Miocene Diatom deposits at Lompoc. Collector, Eric Knight Jordan. The type has the body well preserved, but lacks the most of the head, and the posterior part with the caudal fin.

Head about $3\frac{1}{3}$ in length; depth $2\frac{3}{8}$; ninety dorsal rays evident, probably about 3 others making 93 in all. Anal rays $49+5=$ about 54; vertebrae about 50, with rudiments of 8 to 10 more along top of head. Body broad, elliptical (whether dextral or sinistral cannot be ascertained). Head probably large, with large mouth (only the opercular region and top of head preserved). Abdomen short and deep, the ribs very feeble, about 8 preserved, the last bounding rib very strong, without spine at the lower end. Shoulder girdle broad, with prominent ridges; a rounded obtuse angle at base of pectoral. Pectoral short, of about 15 slender rays; ventral obliterated. Dorsal fin beginning well forward on head, probably over eye, its first rays low and slender, these progressively longer to behind middle of body, where the longest is about one third greatest depth of body. Anal similar, beginning well forward, 90 dorsal rays counted, perhaps 3 more obliterated posteriorly; 50 anal rays counted with perhaps 75 more ($=55$) lost; hypural bone rather strong; caudal fin entirely lost.

Vertebrae deeper than long, each with about 4 deep furrows. Two interspinal bones, each with one ray for each neural or hæmal process, these strong, straight, except under anterior rays of dorsal, where the neurals and interneurals are slender and curved; hæmal bones longer and stronger than neurals; interneurals and interhæmals corresponding to increased height of rays.

This fish is evidently allied to the halibut, *Hippoglossus hippoglossus* and no character appears by which it can be separated from that genus. The numbers of vertebrae and fin rays would seem to separate it from *Paralichthys*. Until we can find out whether the fish was dextral or sinistral, what is the character of the mouth parts, where the dorsal fin begins and whether the caudal fin was lunate or convex, we may refer the species to *Hippoglossus*.



Hippoglossus antiquus, Jordan
(Type) Lompoc.

Family SPARIDÆ

ERIQUEIUS Jordan, new genus

Type *Eriquius plectrodes* Jordan.

This genus seems closely allied to *Stenotomus*, *Lagodon* and other genera having an antrorse dorsal spine; it differs from these mainly in the form of the short and deep body and increased number of vertebrae (larger than in any living Sparoid fish), the teeth being unknown.

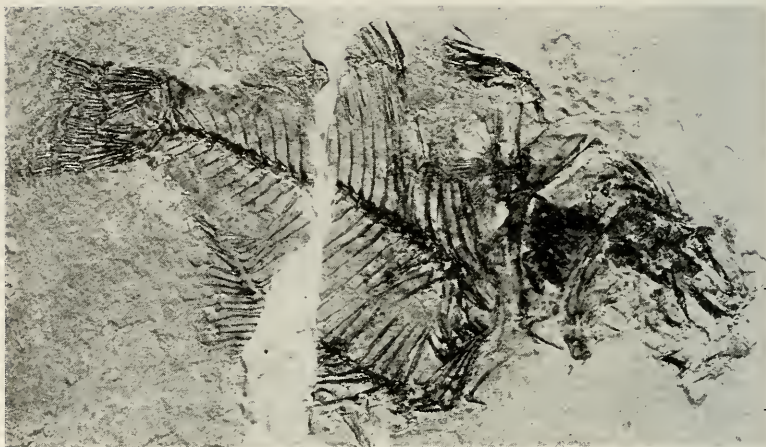
ERIQUEIUS PLECTRODES Jordan, new species

Type No. 602, 12 inches long, in fair condition except for the crushed head and damaged fins. Diatom beds at Lompoc, Eric Knight Jordan collector.

Head $2\frac{2}{5}$ in length to base of caudal; depth 2; dorsal rays apparently XII, 14; anal rays about III, 10. Pectoral 15; ventrals I, 5; caudal $10+10=20$. Vertebrae about $8+18=26$.

Body very short, deep, compressed, the back elevated anteriorly. Head large, badly broken; preopercle high, slightly curved; one displaced premaxillary rather short, with a few short, marginal teeth.

Vertebrae rather weak, deeper than long, more numerous than in living Sparidæ, each with two deep grooves; ribs rather strong, about



Eriquius plectrodes, Jordan
(Type) Lompoc.

10 in number; neural spines strong, bearing long interneurals under the dorsal spines, these not winged; interneurals of the soft rays growing shorter and very slender backward; first interneural large, bearing a strong procumbent spine, as in *Stenotomus* and *Plectrites*.

Dorsal fin with rather strong spines anteriorly, these not greatly elevated, the number apparently 12; fin not notched, longest spines about half head. Anal inserted under last dorsal spines, the anterior interhæmals strong, the others rapidly shorter and more slender; the soft rays also slender. Anal spines short, subequal, the second a trifle longest, not enlarged. Caudal lunate, the lobes $1\frac{1}{2}$ in head the inner rays $\frac{3}{4}$ the outer.

Pectoral fin of slender rays, little more than half head; ventrals inserted just below pectorals nearly half head.

Some scattered scales of moderate size, nearly smooth; some of them with the inner margin crenate, but these may belong to some other fish.

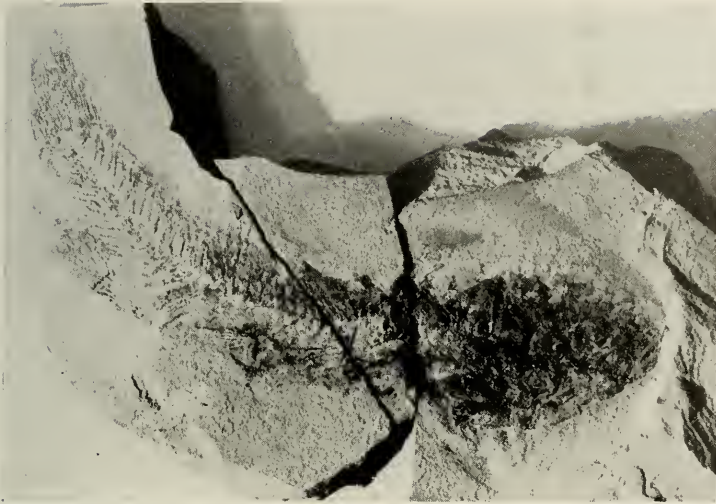
Family CYPRINODONTIDÆ

PARAFUNDULUS Eastman

4. *Parafundulus erdisi* Jordan, new species.

Type No. 605, Stanford University, from confluence of Liebre and Piru Creeks, Section 3, Township 6 N. R. 18 W. in the Santa Barbara National Forest, in the northern part of Los Angeles County, California; elevation 2,200 feet. Collector, Ellwood C. Erdis, of El Paso, Texas. Cotypes (606: 607) same locality.

Head $4\frac{1}{4}$ in length to base of caudal; depth $4\frac{2}{3}$. Dorsal rays 10 (12) anal rays 10 (12 in 607); caudal rays about 16 (20 in No. 606); ventrals apparently wanting, present in No. 606; pectoral rays 10; vertebrae $14+20=34$, (length, with caudal, 3 inches, No. 606, $4\frac{2}{3}$ inches).



Parafundulus erdisi, Jordan
(Type) Libre Creek, Los Angeles, County

The larger example, No. 606, is evidently the same, but the parts are more obscure. 20 caudal rays may be counted. Ventrals present, fairly large, the rays 5 or 6. A third example (607) shows a vertebral column with the anal fin of 12 rays.

General form of *Fundulus*, moderately elongate, and somewhat compressed. Head entirely crushed; no bones clearly to be made out, the mouth appearing rather small. Pectoral moderate, inserted low. No trace of ventral fins in the type example, evident however in No. 606; dorsal and anal each rather short, not elevated, about equal, the insertion of the dorsal a little in advance of that of the anal, the anal extending a little farther back; caudal not produced, its outline rounded, its middle ray longest. Vertebrae deeper than long, each with three ridges and grooves; the ribs and spinal bones fairly developed, the interspinals slender, a few scattering scales of moderate size traceable.

The three specimens were obtained by Mr. Erdis in a black, slaty rock supposed to be relatively recent formation. As usual when the head is all intact, the bones are obliterated, a fact which may be due to fats or other substances within the brain, as when detached from the brain and jaw bones, opercles and the like are very often well preserved.

I am indebted for this material to Mr. George F. Eaton, Secretary of the Connecticut Academy of Arts and Sciences. From a letter of Mr. Erdis transmitting the specimens to New Haven, I quote:

"The specimens are from the junction of La Liebre (Jack-Rabbit) Creek, with Piru Creek. The geologic maps call the locality "Dry Lake." The shale formation is about 10 miles north and south and (I think) half that in width. The whole country has been heaved, folded, bent and broken, and all other descriptive terms of severe physical contortions of Mother Earth. I have seen two different cliffs



Parafundulus erdisi, Jordan

half a mile apart which show the strata bent at right angles, with the fracture from six inches to two feet wide. Some of the meanest oak brush and chapparral you ever saw. . . . Geologically it is recent, for the cliffs and hills are sharp, and entire mountain sides will have only two to six inches of broken shale on the surface not enough to support a growth."

The type specimen may have lost its ventral fins, or it may never have had them. In some of the living desert species of *Cyprinodon* (*C. baileyi*, *C. browni*) the ventral fins are often much reduced or in *C. baileyi* entirely absent. It may be so with other desert *Cyprinodonts*.

The species agrees in essential respects with *Parafundulus nevadensis* Eastman, lately described from Lahontan beds near Hazen, Nevada. *P. erdisi* has the dorsal fin less advanced, and it is probably of later age, though this is not certain. *Empetrichthys merriami* Gilbert, from the Amargosa-Death Valley region, has no ventral fins, but is otherwise quite unlike *Parafundulus*. It has probably no relation to *Orestias*, a South American genus lacking ventrals with which it has been compared.

Family SCIÆNIDÆ

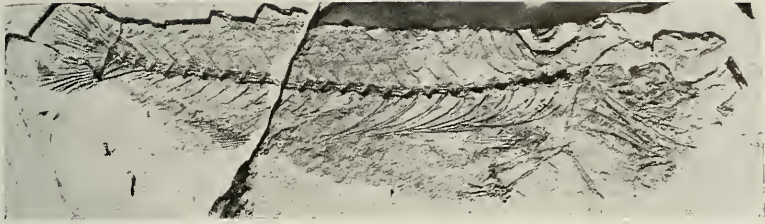
LOMPOQUIA Jordan and Gilbert

5. *Lompoquia retropes* Jordan and Gilbert.

Lompoquia retropes Jordan and Gilbert, (J. Z.) Fossil Fishes S. Cal., 49. Pl. XXIV Fig. 1, 1919 (Lompoc); Jordan, Fish Fauna Cal. Tertiary, 281. Plate 47 (restoration) same specimen.

Of this species, heretofore known from an imperfect example, we have received a fine specimen from Miocene shales at Covina, California, from Mr. Morris Goodwin of the Featherstone Insulation Company, through the courtesy of Dr. James Z. Gilbert.

PLATE K.



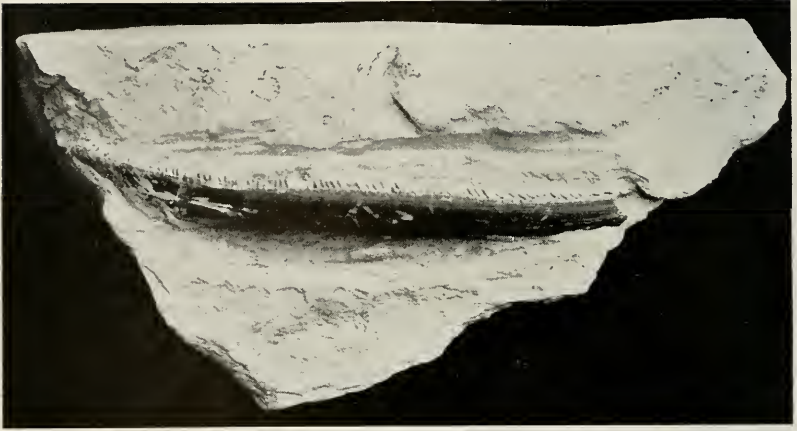
Lompoquia retropes, Jordan and Gilbert
Covina

Length $8\frac{3}{4}$ inches. Head crushed, first dorsal obliterated; otherwise in fair condition, in a rather hard sand-shale.

Body oblong, compressed, the dorsal outline nearly straight, the ventral more curved. Head large, about 4 in length; its bones entire; mouth and teeth. Vertebrae $10+14=24$, besides the small hypural, the segments rather strong, longer than deep throughout, slightly constricted, each with two strong ridges and grooves; neurals rather slender, rather largest mesially; hæmals quite similar. Interneurals short and slender, not winged nor dagger-shaped, not expanded at base, about as long as the neurals, decreasing rapidly backward; interneurals of the soft dorsal much weaker than the neurals and set more obliquely; one for each pair of neurals under the spinous dorsal; two under the soft dorsal. Interhæmals small and weak, shorter than the hæmals, that supporting the second anal spine, slender but longer and stronger than the others; two interneurals to each pair of hæmals. Ribs rather long, slender, curved backwards. Opercles convex.

Spinous dorsal lost, represented by 12 interneurals, the spines probably weak. Soft rays slender, not to be exactly counted, the fin apparently XII-1, 12; no traces of any more, either as rays or interneurals; 10 vertebrae below spinous dorsal, 5 below soft dorsal. Anal rays apparently II, 16, the rays slender; the fin longer than the soft dorsal, and beginning under its middle; its spine (1 or 2) relatively weak and broken, inserted under middle of the soft dorsal; the soft rays low, crowded; (both dorsal and anal may have had more rays in life). With the anal are obscure traces of more interneurals indicating 20 soft rays. Caudal probably lunate, the subtruncate hæmals divided, three strong rays on either side supported by stout elements from the last three vertebrae. Ventrals (1, 5) inserted well behind the pectorals, the pelvic bone unusually long, the insertion near middle of the pectoral length. Pectoral unsymmetrical, of moderate length. Small scales seen at intervals, these entire or slightly crenate.

This fish is evidently identical with the type of *Lompoquia retropes*, the backward ventrals, the weak fin rays and the form of the vertebrae leaving no doubt. Its number of vertebrae indicates a typical member of the *Sciænidae* (not an ally of *Otolithes*, as at first supposed). With the living California genus, *Seriphus*, it has some-



Deprandus lestes, Jordan and Gilbert
Alhambra

thing in common, the anal being apparently longer than the soft dorsal. This relation does not appear in our restoration of *Lompoquia retropes*, the original type lacking the posterior region of the body. But *Seriphus* has the vertebrae 14+10, as in *Cynoscion* and *Otolithes*. *Lompoquia* is certainly 10 or 11+14 or 13=24 in all.

Family DEPRANDIDÆ

DEPRANDUS Jordan and Gilbert

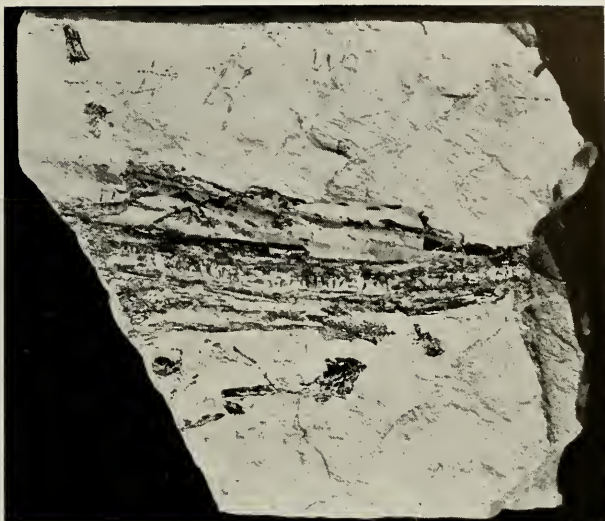
6. *Deprandus lestes* Jordan and Gilbert.

Deprandus lestes Jordan, Fish Fauna of the California Tertiary, 1919, 252. 1921. Plates 9b; 30b; El Modena; Alhambra.

This species was originally based on two examples from El Modena. These are quoted in the paper above named as having been described in the Proceedings of the Natural History of Southern California, but the account prepared by Dr. Gilbert referred to still remains in Manuscript.

The specimens from Alhambra referred to above differ slightly from the types from El Modena. They agree with two jaws from Alhambra since loaned to us by Dr. A. J. Tiejé of Los Angeles. These we (Jordan and Gilbert) describe as follows:

The first is a fragment of skull, upper and lower jaws, mouth closed. Length 2 inches, slender, feebly curved upward, closely set (25 to inch) with uniformly conical, sharp teeth at intervals slightly greater than the width of the tooth at base; the row double except in the very front where small teeth seem set among teeth of twice



Deprandus lestes, Jordan and Gilbert

their size; those toward the middle and posteriorly feebly stouter; curved inward and feebly forward. In addition to this regular outer row of about 50 teeth is another of slightly smaller teeth alternating with those of the outer row.

Length of second fragment 3 inches, straight except at the anterior fourth where it is curved slightly upward; set with a double row of teeth, sharp pointed, strong, conical curved inward and all directed strongly forward. The teeth of the outer row (judged by the bases clearly seen) more numerous than in inner (30 to the inch, inner 22 to inch) about 55 in all; along the middle larger, at posterior part shorter and more slanting, anterior teeth very small. No elongate canines.

We are not quite sure that these belong to *Deprandus lestes*. The extraordinary length and slenderness of the jaw in *Deprandus* justifies the recognition of a distinct family, *Deprandidae*, which may prove to be related to the *Muraenesocidae* rather than to the *Muraenidae*. Stanford University, February 9, 1924.

