Observations on the Neogene Sharks of California.*

by **Maurice Leriche**

In California the Neogene marine formations occupy a more or less wide strip of the Pacific coast.

These formations have yielded numerous shark teeth which were studied in 1856 by Louis Agassiz and, quite recently, by Mr. David Starr Jordan , President of "Leland Stanford Junior University" in Berkeley (California).

Most of these teeth were considered by L. Agassiz and Mr. D. S. Jordan as belonging to different species than those encountered in Neogene formations in Europe. According to Mr. D. S. Jordan's figures of the teeth, most of them do not seem to distinguish themselves specifically from the teeth of the Neogene of Europe. In these figures I have recognized the following European species:

L. Agassiz. "Notice of the Fossil Fishes found in California" by W.P. Blake. *American Journal of Science and Arts, 2nd series*. Vol. XXI. p. 272-275. This note by Agassiz was reproduced with minor modifications and an added plate in R. S. Williamson, *Report on Explorations in California*. U.S. Pacific Railroad Survey. 1853 Report, p. 313-316, pl. 1.

D. S. Jordan. "The Fossil Fishes of California with supplementary notes on other Species of extinct Fishes." University of California Publications. *Bulletin of the Department of Geology*. Vol. V, p. 101-120; 1907.

I place into synonymy the names, which were erected by L. Agassiz and Mr. D. S. Jordan.

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Notidanus primigenius L. Agassiz

1907.*Heptranchias andersoni* D. S. Jordan 1907. D. S. Jordan. The Fossil Fishes of California with supplementary notes on other Species of extinct Fishes. *University of California Publications*. *Bulletin of the Department of Geology*. Vol. V. p. 101, fig. 3 in the text.

Deposit and localities : Miocene: Barker Ranch (Kern County).

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Odontaspis cuspidatus L. Agassiz.

1856.*Lamna clavata* L. Agassiz. L. Agassiz. "Notice of the Fossil Fishes found in California" by W.P. Blake. *American Journal of Science and Arts, 2nd series*. Vol. XXI, p. 275.

1907.*Lamna clavata* D. S. Jordan. *Loc. cit*., p.106, fig. 8 in the text.

Agassiz has already noted the affinities presented by the teeth under the name of *Lamna clavata* to those of "*Lamna*" *cuspidata* of the Oligocene and Miocene of Europe.

As I will show in a future memoir , this species bore symphyseal teeth and consequently must be assigned to the genus *Odontaspis*.
Deposit and localities: Miocene: Kern County, Ocoya Creek.

Oxyrhina hastalis L. Agassiz.

1856.*Oxyrhina plana* L. Agassiz. L. Agassiz, *Loc. cit*., p. 274.
1856.*Oxyrhina tumula* L. Agassiz. L. Agassiz, *Loc. cit*., p. 275.
1907.*Isurus planus* D. S. Jordan, *Loc. cit*., p. 107, fig. 9 in the text.
1907.*Isurus tumulus* D. S. Jordan, *Loc. cit*., p. 109, fig. 10, 11 in the text.
1907.*Isurus smithii* D. S. Jordan, D. S. Jordan, *Loc. cit*., p. 111, fig. 12 in the text.

In California.
The Oligocene Fishes of Belgium (*Memoires du Musée royal d'Histoire naturelle de Belgique*. 5).

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The teeth to which Agassiz has given the names *Oxyrhina plana* and *O. tumula* are referable respectively to the teeth of the upper and lower jaw of *O. hastalis*. The teeth of the lower jaw of *O. hastalis*, in particular the anterior teeth, have a thicker root than in the upper jaw. It is with this character that L. Agassiz distinguished *O. tumula* from *O. plana*.

As for the teeth that Mr. D. S. Jordan proposed the name, *Isurus smithii*, they must be considered as lower anterior teeth of subadult individuals of *O. hastalis*.

Deposit and localities: 1. Miocene: Barker Ranch (Kern County), Carrizo Creek (San Diego County), Ocoya Creek, Oil City, Santa Ana; 2. Pliocene: around Coalinga (Fresno County).

Carcharodon megalodon L. Agassiz

1856.*Carcharodon rectus* L. Agassiz. L. Agassiz, *Loc. cit*., p. 274

1907. *Carcharodon riversi* D. S. Jordan. (*pars*). D. S. Jordan, *Loc. cit*., p. 115, fig. 14b (not fig. 14a)
1907. *Carcharodon branneri* D. S. Jordan. D. S. Jordan, *Loc. cit*., p. 116, fig. 15.

The teeth that Mr. D. S. Jordan described under the name *Carcharodon branneri* are teeth typical of *C. megalodon*. Those of the Miocene, which the same author called *C. branneri*, are the teeth of young individuals of the same species.

Deposit and localities: Miocene: Barker Ranch (Kern County), Bolinas Bay, Oil City, Santa Ana.

Carcharodon rondeleti Muller and Henle

1907. *Carcharodon arnoldi* D. S. Jordan. D. S. Jordan, *Loc. cit*., p. 113, fig. 13 (the two figures to the left).
1907. *Carcharodon riversi* D. S. Jordan (*pars*). D. S. Jordan, *Loc. cit*., p. 115, fig. 14a (not fig. 14b).

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Deposit and localities: 1. Pliocene: Pescadero (San Mateo County), Port Los Angeles, Santa Monica, Zapata Chino Creek (Fresno County); 2. Pleistocene: Rustic Canon (Santa Monica Range).

Hemipristis serra L. Agassiz.

1856 *Hemipristis heteropleurus* L. Agassiz. L. Agassiz, *Loc. cit*., p. 274.
1907. *Hemipristis heteropleurus* D. S. Jordan, *Loc. cit*., p. 104, fig. 6 in the text.

Mr. D. S. Jordan, himself, observes that "there is no obvious reason for regarding the California species as different from *Hemipristis serra*."

Deposit and localities: Miocene: Barker Ranch (Kern County), Ocoya Creek, Oil City.

Galeocerdo aduncus L. Agassiz

1856. *Galeocerdo productus* L. Agassiz. L. Agassiz, *Loc. cit*., p. 273.
1907. *Galeocerdo productus* D. S. Jordan, *Loc. cit*., p. 101, fig. 13 (the four figures to the right) (not fig. 4b, 4c, 4e).

Deposit and localities: Miocene: Barker Ranch and Oil City (Kern County).

Under the name *Galeocerdo productus* Mr. D. S. Jordan (*Loc. cit*., 4b, 4c, 4e) figures three small teeth from the Miocene of Kern County. As much as can be ascertained from the unclear figures provided, the teeth corresponding to figures 4b and 4c – teeth that Mr. D. S. Jordan, himself, reports only doubtfully as *Galeocerdo productus* – appear instead

to belong to *Aprionodon*. The tooth identified as No. 4e does not distinguish itself generically from the teeth of *Galeus*.

Finally, Mr. D. S. Jordan (*Loc. cit*., p. 119, fig. 4d) doubtfully attributes teeth from the Miocene of Barker Ranch to the genus *Chiloscyllium*. They appear to be the teeth of *Squatina*.

[page 306] [N.B. Page 305 actually ends between “of” and “Barker” in Line 2 of the previous paragraph.]

The preceding observations show once again the great geographic extent of some shark species, and consequently, the importance that the examples above have in the establishment of particular species living synchronously over great distances.