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Note on the Probable Occurrence *of* Siwalik Strata *in* China *and* Japan. *By* R. Lydekker, B.A., F.G.S., F.Z.S.

I have lately received from Herr L. v. Loczy, of the Royal Geological Survey of Hungary, a letter in which I am informed that during a recent expedition to China he observed extensive tertiary formations on the Upper Hwangho (Hoang-ho) river, in which he collected fresh-water shells and numerous bones of Proboscidia and Rodentia[1] (*sic*). In Western Kansu[2] he acquired from a native dispensary other large fossil bones, and the lower molar of an elephant which he considered very similar to the teeth of the Siwalik *Stegodon clifti;* this molar

[1] ? Ruminantia.

[2] A province on the Upper Hwangho, due north of Burma.

is described as being brown and highly mineralized, and apparently in very similar condition to the Siwalik fossils.

I am promised an opportunity of examining a cast of the molar, but the description given leaves little doubt that the strata whence the fossil was obtained correspond to the Siwaliks. It will be remembered that Professor Owen has described [1] the milk-molar of a *Stegodon*, said to have been obtained from "marly beds near Shanghai," which he referred to a new species under the name of *S. sinensis*, but which I have seen [2] no reason to separate from the Siwalik *S. clifti*. The mineralization of this specimen (now in the British Museum) is precisely similar to that of the Siwalik fossils, and leads me to conclude that the beds from which it was obtained, together with the Hwangho beds, almost certainly correspond, at least in part, to the Siwaliks. The geographical position of the Hwangho beds, due north of Burma, lends a strong support to this conclusion, as it is well known that the Siwaliks of that country, whence Crawfurd's original specimens were brought, extend far up the valley of the Irawadi, and thus are only separated by Yunan and Sechuen from the Kansu district.

In the same paper Professor Owen also described various other Chinese fossil mammals, belonging to the genera *Chalicotherium*, *Rhinoceros*, *Tapirus*, *Stegodon*, and *Hyæna*, and said to have been obtained from a cave in the province of Sechuen (Sze-chuen), or between Kansu and Yunan and Burma. The mineralization of these specimens is much less complete than that of the Shanghai and Siwalik fossils, but the difference in the manner of the entombment of the specimens is probably quite sufficient to account for this. The genera are all characteristic of the Siwaliks, and although Professor Owen has assigned all the specimens to distinct species, yet it has appeared to me [3] to be highly probable that the *Stegodon* is the same as one of the Siwalik forms; while work on which I am now engaged leads to the conclusion that the Sechuen hyæna is identical with, or very closely allied to, one of the Siwalik hyænas. Whether or no the species be the same, it appears to be most probable that the Sechuen mammals belong to the same period as those of the Siwaliks, and connect those of Burma with those of Kansu.

Turning to Japan, it may be observed that in 1881 Dr. Edmund Naumann figured and described [4] various remains of fossil elephants from that country, which he referred to the following species, *viz.*, *Stegodon clifti*, *S. insignis*, *Elephas namadicus*, and *E. primigenius;* the two first being Siwalik species, the second (or the allied *S. ganesa*) also ranging up into the Narbada beds, and the third being characteristic of the latter. These fossils indicate pretty conclusively that representatives of the mammaliferous beds of India, which probably correspond both to the Siwaliks and the Narbadas, exist in Japan, and are probably the continuation of the Chinese deposits.

[1] "Quar. Jour. Geol. Soc," Vol. XXVI, p. 417.

[2] "Palæontologia Indica." Ser. X, Vol. I, "Siwalik and Narbada Proboscidia."

[3] *Ibid.*

[4] "Ueber japanische Elephanten der Vorzeit." 'Paläontographica,' Vol. XXVIII, pt. 1, pls. I—VII.

Since the publication of Dr. Naumann's memoir, another paper on the same subject has appeared by Herr D. Brauns,[1] which is certainly a very remarkable paper indeed. In that paper it is first of all attempted to prove that the Siwaliks are entirely of miocene, and the Narbadas of pliocene age, while the Japanese (and presumably the Chinese) mammaliferous deposits are all referred to the pleistocene. Now it is not my intention on the present occasion to go again into the question of the age of the Siwaliks and Narbadas, but there are two points in relation to Herr Brauns' treatment of this question, to which it is almost impossible to omit referring. It happens to be inconvenient to his line of argument that any of the Siwalik species should occur in the overlying Narbadas, and therefore, when such is stated to take place he adopts the very easy, but scarcely scientific, method of doubting the evidence. Thus in the case of the occurrence of *Stegodon insignis* (or the allied *S. ganesa*) in the Narbadas, it is stated[2] that the two specimens of broken teeth figured in the "Fauna Antiqua Sivalensis[3]" from those deposits are not sufficiently perfect for determination, and therefore that *S. insignis* does not exist in the Narbadas. Even if those specimens are insufficient evidence, if the author had but taken the trouble to refer to page 117 of the first volume of the "Palæontological Memoirs," he would have seen a very perfect specimen of the lower jaw of *S. insignis* (No. 1) from the Narbada described by Dr. Falconer; this specimen, which is now in the Indian Museum, where there are others from the same beds, leaves not the slightest doubt that *Stegodon insignis* (or *S. ganesa*, which, as far as teeth are concerned, is the same) occurs in the Narbadas. From this may be gathered the value of the following dogmatic statement of Herr Brauns, *viz.*,—

Elephas namadicus	solely pliocene,
Stegodon insignis	„ miocene.
„ clifti	„ „

In the case of the occurrence of the Narbada *Bubalus palæindicus* in the topmost Siwaliks, it is argued that the specimens are not properly determined. It happens, however, that they are unquestionably the same as the Narbada species. I have not figured them because there are so many other specimens of more importance. Similarly doubt is thrown upon the authenticity of the stone implements from the Narbadas. If this sort of reasoning be allowed, of course anything can be proved.

Leaving now the Narbadas and Siwaliks which Herr Brauns has proved to his own satisfaction are respectively pliocene and miocene and contain no species in common, attention may be re-directed to the Japanese fossils. Considering, as Herr Brauns does, that the beds from which these fossils were obtained are entirely pleistocene, and therefore altogether newer than the Siwaliks and the Narbadas, it would never do that any of the fossils from them should

[1] "Ueber japanische diluviale Säugethiere," Zeits. d. Deutsch. Geol. Gesell., 1883, pp. 1—83.

[2] *Ibid*, p. 9.

[3] Pl. 56, figs. 10, 11.

be the same as those of either of the latter. Accordingly the fossils described and figured by Dr. Naumann are re-named as follows, *viz.*—

Elephas meridionalis, Nesti, = *Stegodon insignis*, Naumann, pls. 3-5.
Elephas antiquus, Falc. = *Elephas namadicus*, Naumann, pls. 6-7.
Stegodon sinensis, Owen = *Stegodon clifti*, Naumann pls. 1-2.

Now there is not the slightest shadow of a doubt that the specimens figured by Dr. Naumann under the name of *S. insignis* are true Stegodons, and belong either to the Siwalik *Stegodon insignis* or *S. bombifrons;* they have nothing whatever to do with a *Loxodon* like *E. meridionalis*. The molars of *E. antiquus*[1] and *E. namadicus* are so alike that it is difficult or impossible to distinguish them, and there is therefore at least a probability that Dr. Naumann's determination may be correct. The specimen figured by Dr. Naumann as *Stegodon clifti* is a typical specimen of the last lower molar of that species, like many in the Indian Museum. I can see not the slightest reason why this tooth should be associated with the Shanghai milk-molar of the so-called *Stegodon sinensis* and so separated specifically from *S. clifti* of the Siwaliks.

There accordingly seems not the slightest doubt but that Dr. Naumann is perfectly correct in referring two of the fossil Japanese elephants to Indian Siwalik species; while it is not impossible that a third is a Narbada form; a fourth species is, however, referred to the European and North American *Elephas primigenius*, and to this Herr Brauns adds the European *Bison priscus*, Bojanus.

These determinations lead to the conclusion that the mammaliferous beds of Japan in all probability correspond both with the Siwaliks and Narbadas of India (which may there be in normal sequence), with the former of which they are connected by the Shanghai, Kansu, Sechuen, and Burmese deposits; and that they also contain an admixture of European palæarctic forms, which have probably reached Japan through northern America. In place of the fauna of the Japanese beds being distinct from that of the mammaliferous beds of India and affording any argument for the latter being pliocene and miocene in place of pleistocene and pliocene, all the evidence points very strongly to the equivalency of the two, and to the confirmation of the latter view of their age.

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Note on the Occurrence of Mastodon angustidens *in* India. *By* R. LYDEKKER, B.A. *&c., &c.*

Several specimens of the "intermediate molars" of a trilophodont mastodon collected by Mr. W. T. Blanford in the lower Manchhars (Siwaliks) of the Dera Bhugti country (Eastern Baluchistan), are absolutely indistinguishable from the corresponding teeth in the British Museum of *Mastodon angustidens*, Cuvier, of the upper miocene of Europe.

The occurrence of a European species of mastodon on the extreme western

[1] I am indebted to Herr Brauns for pointing out that in "Siwalik and Narbada Proboscidia" I have inadvertently given the age of *Elephas antiquus* as pliocene instead of pleistocene.

limits of India is a fact of great importance, indicating that we may look for a commingling of the faunas of the Siwaliks, and of the European upper miocene and lower pliocene in Persia and Asia Minor.

These important and interesting specimens will be figured in the "Palæontologia Indica" at no very distant date.