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C. R. Palevol 4 (2005) 375–384
COMPTES RENDUS PALEVOL
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Histoire des sciences

Early (18th century) discovery of Cretaceous fishes from Chapada do Araripe, Ceará, Brazil – Specimens kept at the 'Academia das Ciências de Lisboa' Museum

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Received 29 November 2004; accepted after revision 8 February 2005

Available online 25 March 2005

Presented by Philippe Taquet

Abstract

Portuguese meaningful contributions to the Natural History of territories under the rule or influence of Portugal since the 16th century have most often been despised or just ignored. This is the case of the discovery by a Portuguese naturalist of the remarkable Cretaceous fossil fish localities from Ceará. The collecting of such fossils could be ascribed to the end of 18th century. Fossiliferous nodules have indeed been received in Lisbon well before 1807. Some have been rediscovered among the old collections of the Lisbon Academy of Sciences. Their origin may certainly be ascribed to the Santana Formation in Ceará. Additional evidence consists of a letter/report by João da Sylva Feijoo, a Rio de Janeiro-born naturalist that got his degree at the Coimbra University. This letter is dated "Siara 11 de Dezembro de 1800". This document remained almost unknown, even if it has been published. Feijoo is better known as leader of a mission to Cape Verde archipelago, where he had been sent by the Portuguese government. He returned to Lisbon, where the Academy of Sciences published some memoirs by him. Sometime later, Feijoo returned to Brazil and settled down in Ceará, where he carried on prospecting work. Feijoo (ibid.) dealt with the saltpetre mine at Sítio Tatajuba and mentions that he sent samples from there to Lisbon for analyses. The corresponding samples have been sent to the Governor as well as fossil fishes. He also provides some discussion on the latter's occurrence conditions and expressed his wish to prepare a more detailed memoir on these fossil fishes. This is accordingly the origin of the nodules of the Lisbon Academy's Museum, where these specimens have probably been transferred from the Ajuda Royal Museum in Lisbon. As a concluding remark, let us say that, in our present state of knowledge, the first discovery of (and the first report on) the famous Cretaceous fishes from Ceará have indeed been that by the Portuguese citizen, the naturalist João da Sylva Feijoo, well before the supposedly, often claimed first discovery that has been related to the well-known expedition by Spix and Martius.
To cite this article: M. Telles Antunes, C. R. Palevol 4 (2005).

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doi:10.1016/j.crpv.2005.02.001

Résumé

Ancienne découverte (XVIII^e siècle) de poissons du Crétacé de Chapada do Araripe, Ceará, Brasil – Exemplaires du musée de l'*Academia das Ciências de Lisboa*. D'importantes contributions d'origine portugaise sur l'histoire naturelle de territoires sous la souveraineté ou l'influence du Portugal dès le XVI^e siècle ont été le plus souvent méprisées ou ignorées. C'est bien le cas de la découverte, par un naturaliste portugais, des remarquables gisements à poissons du Crétacé du Ceará. La récolte de tels fossiles a pu être rapportée à la fin du XVIII^e siècle. En effet, des nodules contenant des poissons, certainement reçus avant 1807, ont été retrouvés parmi les anciennes collections de l'Académie des sciences de Lisbonne. Ils proviennent, sans le moindre doute, de la formation Santana, représentée au Ceará. Une preuve additionnelle est une lettre/rapport par João da Sylva Feijoo, naturaliste né à Rio de Janeiro et diplômé de l'université de Coimbra. Ce document est daté « Siara 11 de Dezembro de 1800 ». Il resta presque totalement inconnu, malgré le fait qu'il ait été publié. Feijoo est plus connu par la mission à l'archipel du Cap-Vert dont il fut chargé par le gouvernement portugais. Il retourna à Lisbonne, où l'Académie des sciences a publié quelques mémoires dont il est l'auteur. Quelque temps plus tard, Feijoo regagna le Brésil et s'établit au Ceará, où il réalisa des travaux de prospection. Feijoo s'occupa de la mine de salpêtre au lieudit Sítio Tatajuba, dont il envoya à Lisbonne des échantillons pour analyse. Il mentionne en outre l'envoi à Lisbonne d'échantillons de fer et d'amiante. Il les expédia au gouverneur en même temps que des poissons fossiles, dont il indique les conditions de gisement. Il envisagea, si possible, la préparation d'un mémoire plus développé sur ces poissons, mais ne semble pas avoir mis ce projet à exécution. Le Sítio Tatajuba, remarquable par sa richesse paléontologique, étudié récemment, a livré bien d'autres fossiles, dont l'aspect est identique à celui des spécimens de l'ancienne collection de l'Académie des sciences de Lisbonne. Telle est, par conséquent, l'origine des nodules qui font partie des collections du musée de l'*Academia das Ciências de Lisboa*, lesquels y ont peut-être été transférés à partir du musée royal d'Ajuda (Lisbonne). En guise de conclusion, nous dirons que, dans l'état actuel des connaissances, la première découverte des fameux poissons fossiles du Crétacé du Ceará fut, en fait, l'oeuvre d'un naturaliste, João da Sylva Feijoo, né au Brésil, mais qui était alors de nationalité portugaise, bien avant celle qu'on a souvent prétendue comme telle, divulguée à la suite de l'expédition bien connue de Spix et Martius. ***Pour citer cet article : M. Telles Antunes, C. R. Palevol 4 (2005)***.

Keywords: Chapada do Araripe; Santana Formation; Cretaceous; Feijoo; 18th century; 'Academia das Ciências de Lisboa'; History of Sciences

Mots clés : Chapada do Araripe ; Formation Santana ; Crétacé ; Feijoo ; XVIII^e siècle ; 'Academia das Ciências de Lisboa' ; Histoire des sciences

Version française abrégée

Des contributions importantes d'origine portugaise sur l'histoire naturelle de territoires sous la souveraineté ou l'influence du Portugal dès le XVI^e siècle ont été le plus souvent méprisées ou ignorées. En fait, il y a eu des résultats importants, notamment ceux obtenus par des missions « philosophiques » qui ont eu lieu sous le patronage du gouvernement portugais et, plus particulièrement, du secrétaire d'État à la Marine et à l'Outremer, Martinho de Mello e Castro (1716–1795). Ces missions ont concerné le Brésil (la plus importante parmi toutes fut celle dont Alexandre Rodrigues Ferreira a été chargé entre 1783 et 1792), l'archipel du Cap-Vert, l'Angola, le Mozambique et l'Inde, toutes sous la direction de naturalistes formés à l'université de Coimbra.

En particulier, parmi d'autres anciennes références oubliées ou non divulguées depuis longtemps, il faut inclure la découverte, par un naturaliste portugais né à Rio de Janeiro, des remarquables gisements de poissons du Crétacé du Ceará.

On a vérifié que ces fossiles ne font pas partie des collections en provenance du musée royal d'Ajuda, à Lisbonne, réquisitionnés par Étienne Geoffroy Saint-Hilaire au profit du Muséum national d'histoire naturelle de Paris lors de la première invasion napoléonienne du Portugal (1807–1808) – Lisbonne avait alors été occupée par une armée commandée par le général Andoche Junot, qui fut expulsée peu après par des forces anglo-portugaises. Les spécimens prélevés ont été intégrés aux collections du Muséum national d'histoire naturelle de Paris. La récolte de ces fossiles pourrait remonter à la fin du XVIII^e siècle. Des nodules contenant des poissons, certainement reçus avant 1807, ont été retrouvés parmi les anciennes collections de l'Académie des sciences de Lisbonne. Leur origine peut être rapportée sans le moindre doute à la formation San-

tana, représentée au Ceará, comme l'un de nous (I. F.) a pu le constater.

Une preuve additionnelle est une lettre/rapport par João da Sylva Feijoo (Rio de Janeiro, 1760–Ceará, 1824), naturaliste diplômé de l'université de Coimbra. Ce document sans adresse est daté « Siara 11 de Dezembro de 1800 ». Il a sans doute été envoyé au secrétaire d'État à la Marine et à l'Outremer, le comte de Linhares, Rodrigo de Sousa Coutinho (Fig. 1), lequel, outre ses fonctions qu'il a très bien remplies, était très intéressé par le progrès scientifique, et celui de la philosophie naturelle en particulier. Néanmoins, ce document resta presque inconnu, malgré sa publication ultérieure. Feijoo est plus connu par la mission dans l'archipel du Cap-Vert dont il avait été chargé par le gouvernement portugais. Il est retourné à Lisbonne, où l'Académie des sciences a publié quelques-uns de ses mémoires. Quelque temps après, Feijoo a regagné le Brésil. Il s'est établi au Ceará, où il a accompli des travaux de prospection de mines de salpêtre (alors très recherché pour l'industrie de préparation de poudre), de fer, etc.

Feijoo (ibid.) s'occupe de la mine de salpêtre au lieudit Sítio Tatajuba, en faisant mention de l'envoi à Lisbonne d'échantillons à analyser. En plus, il mentionne des échantillons de fer et d'amiante à envoyer également à Lisbonne. Il les a expédiés au gouverneur en même temps que des poissons fossiles, dont il mentionne les conditions de gisement. Les nodules fossilifères (« pétrifications ») ont été récoltés sur la terre de Serra, entre Missão Velha et le site nommé Milagres, à l'Engenho da Gameleira. Tous les sites en cause concernent le bassin de l'Araripe (Fig. 2) et la formation Santana, datée du Crétacé inférieur (Aptien–Albien). Il a même considéré, si possible, la préparation d'un mémoire plus développé sur les poissons en question, mais ne semble pas avoir mis ce projet à exécution. Le Sítio Tatajuba, remarquable par sa richesse paléontologique, étudié récemment, a livré bien d'autres fossiles, dont l'aspect est identique à ceux de l'ancienne collection de l'Académie des sciences de Lisbonne.

Telle est, par conséquent, l'origine des nodules fossilifères qui font partie des collections du musée de l'Academia das Ciências de Lisboa, lesquels y ont peut-être été transférés à partir du musée royal d'Ajuda (Lisbonne). Ces nodules peuvent être rapportés à *Vinctifer comptoni* Agassiz, 1841, espèce très commune (Fig. 3). Aucune étiquette originelle n'est conservée. Ceci explique peut-être le manque d'attention vis-à-vis de ces objets, dont l'origine et la signification étaient alors inconnues.

En guise de conclusion, nous dirons que, dans l'état actuel des connaissances, les premières trouvailles des célèbres poissons fossiles crétacés du Ceará ont, en fait, été le fruit des explorations d'un naturaliste, João da Sylva Feijoo, alors de nationalité portugaise, né au Brésil, bien avant la prétendue première découverte divulguée à la suite de l'expédition (1817–1820) de Johann Baptist von Spix (1781–1826) et Carl Friedrich Philipp von Martius (1794–1868). Ayant été autorisés à voyager à travers le Brésil, ils ont reçu l'offre d'un lot de fossiles en provenance du Ceará, comprenant des poissons récoltés dans ce qui a été défini plus tard comme la formation Santana. Les poissons fossiles en question ont été mentionnés dans le troisième volume de leur œuvre *Reise in Brasilien,* publié à Munich en 1831 [16] (voir aussi [12 (p. 9),14].

1. Introduction

The general knowledge of the Brazilian Natural History was often based on descriptions from German, French and other foreign authors. Valuable Portuguese contributions which took place since late 16th century, well before the independence of Brazil in 1822, were most often overlooked or just ignored. This could lead to the grossly erroneous belief that nothing had been accomplished before foreign interventions after the Independence of Brazil. Once again, new data underscore meaningful Portuguese older contributions that had been long forgotten even if published. In this case, we deal not less than with the discovery much before what it is generally acknowledged of the famous localities of fossil fishes from Ceará. These fossils really deserve a world-wide interest.

Time is sometimes the best judge. Increasing interest arose in Brazil, Portugal, and elsewhere. High-quality editions have recently been produced on the magnificent work by Alexandre Rodrigues Ferreira, whose collections resulted from the expedition to Brazil (1783–1792) that he leaded. This expedition (among others) had been promoted by the remarkable Secretary of the Navy and Overseas from the Portuguese Government, Martinho de Mello e Castro (11 November 1716–24 March 1795).

However, this promising period when Portuguese missions were sent to Brazil, Cabo Verde, Angola, Mozambique, and Goa in India, to obtain data about Portuguese overseas and its Natural history was soon doomed. Situation in Portugal became dramatic. Internal difficulties at the Royal Museum of Ajuda, in Lisbon, and even more political turmoil in Portugal, which was invaded in 1807, 1809, and 1811 by Napoleon's armies, largely account for this. During the first invasion (1807–1808), the Ajuda Royal Museum was sacked of the best part of its collections, and not only of doubles as has diplomatically been stated [4 (p. 19),5 (p. 85)]. All were selected and sent to the Paris 'Muséum national d'histoire naturelle' by Étienne Geoffroy Saint-Hilaire according to an order issued by Napoleon that meant total disrespect for another country treated as an occupied territory. As an imperial deputy, Geoffroy was empowered to select without any restriction all that he wanted to be sent to the Paris Museum [10 (p. 9)]. This order, asked for by this institution, was fully and zealously carried on by the 'Muséum' and by Geoffroy himself.

This happened with the full support of general Andoche Junot, the commander of the French Army that arrived to Lisbon and French governor, who authorized the 'requisition' of all that Geoffroy wanted. This order is utmost abusive because the legitimate Portuguese authorities, the 'Conselho de Governadores', had been dismissed by Junot. The success of Geoffroy has also been made easier through the abject cooperation of the Ajuda Museum's extremely pro-French Director, Domingos Vandelli, who acted beyond all Saint-Hilaire's expectations [10 (p. 16)].

Among the 'requisitioned' specimens were fossils that recent research, carried out with the cooperation of our colleague Philippe Taquet, failed to find among the collections of the 'Muséum national d'histoire naturelle', Paris. An account is known about the nature of the fossils from the Ajuda Museum sent to Paris [10 (p. 66)]:

"18 coquilles,
2 Balanites.
2 Crabes.
3 Empreintes de Reptiles.
Dents de 4 espèces de Reptiles.
Portions d'épine.
Molaire de Mastodonte.
Fragment d'écailles, analogues à celles du Pangolin.
Fragment de vermisseaux.
Fait à Lisbonne, le 24 Juin 1808.

Signé : GEOFFROY ST-HILAIRE
D. VANDELLI

Pour copie conforme, envoyée à Son Excellence le ministre de l'Intérieur.
Paris, le 2 novembre 1808

GEOFFROY ST-HILAIRE".

No fossil fish or fossiliferous nodules were referred.

In Portugal, political instability continued long after, and resulted in a bloody civil war between absolutists and liberals. The latter ultimately won in 1834. Those times were of course terrible for research and for the preservation of the collections.

Meanwhile, the departure of the Portuguese Prince Regent and his Court to Brazil (1807) resulted in a development boom of Rio de Janeiro, the new capital, and of Brazil as a whole. The Regent was crowned in Rio de Janeiro (1816) as João VI, king of the United Kingdom of Portugal, Brazil and the Algarves, etc. A new Museum of Natural History was created (1818) in Rio de Janeiro, where it superseded the *Casa dos Pássaros* (House of the Birds).

Pedro, João VI's son and heir to the throne, married (1817) Princess Maria *Leopoldina* Josefa Carolina (1797–1826), daughter of Francis I, Emperor of Austria. Among her retinue were the Bavarians Johann Baptist von Spix (1781–1826), a zoologist, and Carl Friedrich Philipp von Martius (1794–1868), a botanist. They were allowed by the Government of the United Kingdom of Portugal, Brazil and Algarves to travel extensively in Brazil (1817–1820). They produced a book on their accomplishments [16] in three volumes. A lot of fossils including fishes collected in the State of Ceará were presented to Spix and Martius by Major-General Manoel Ignacio de Sampaio [12 (p. 9),14]. In the second volume (1828: 799), fossil fishes were mentioned, and in the last one (1831: pl. xxii, fig. 5) there is a figure that depicts a *Rhacolepis* in a limestone nodule from what was later defined as the Santana Formation [12 (p. 13)].

The political situation in Portugal led João VI to return to Europe (1822). This event was a part of a quite peaceful process that resulted in the independence of Brazil under the leadership of Pedro, who became the first Emperor of Brazil.

Direct collecting of fossil fishes at Chapada do Araripe was reported by George Gardner (1812–1848), a Scottish botanist who travelled through the northeast of Brazil between 1838 and 1839. These fossils were described by the well-known Swiss paleoichthyologist Louis Agassiz (1807–1873) in *On the fossil fishes found by Mr. Gardner in the province of Ceará, in the North of Brazil* [1]. The scientific study on the Santana Formation fossils had begun.

The fish fauna described by Agassiz in 1841 comprised the following, all new, taxa:

Calamopleurus cylindricus Agassiz, 1841
Cladocyclus gardneri Agassiz, 1841
Lepidotes temnurus Agassiz, 1841
Notelops brama Agassiz, 1841
Rhacolepsis buccalis Agassiz, 1841
Rhacolepsis latus Agassiz, 1841
Vinctifer comptoni Agassiz, 1841.

In 1844, Agassiz, [2] has published in France his paper entitled *Sur quelques poissons fossiles du Brésil.*

Some years elapsed until the first Brazilian expedition that has dealt with Santana Formation's localities. It has been carried on in 1859 by the Comissão Científica de Exploração, which was supported by Emperor Pedro II and comprised five sections including that of Geology and Mineralogy, whose leader was Guilherme Capanema.

Later research on fossil fishes is due to the Americans Edward Drinker Cope [8,9], David S. Jordan and J.C. Branner [11] and the British A. Smith Woodward, who published several papers between 1887 and 1908. New taxa were added to Agassiz's list:

Anaedopogon tenuidens Cope, 1871
Brannerion vestitum Jordan & Branner, 1908
Enneles audax Jordan & Branner, 1908
Tharrhias araripis Jordan & Branner, 1908
Tharrhias rochae Jordan & Branner, 1908.

Still later, there are studies by an Italian (Geremia d'Erasmo) and a Brazilian (Rubens da Silva Santos) palaeontologists. Finally, one must notice the large, excellently illustrated book edited by J.G. Maisey [12]. New studies are underway.

2. New data

After much loss, the Museum of the 'Academia das Ciências de Lisboa' includes what is left from:

- the Mayne Museum that had been installed at the 'Convento [monastery] de Nossa Senhora de Jesus' by Father José Mayne (1723–1792), superior of the 3rd Order of Saint Francis and great promoter of pedagogic activities. Shortly before his death, he placed the Natural History Cabinet under the administration of the Academy of Sciences;
- the old Academy's collections from before the bestowal (1834) by Queen Maria II of the monastery of Nossa Senhora de Jesus building to the same Academy, that occupied it in 1836;
- the collections from the 'Real Museu da Ajuda', which were transferred to the Academy of Sciences sometime after it was housed at the former Convento's building.

All made part of the so-called Museu Nacional, which was further enriched through the buying of new collections, by several gifts as those of King Pedro V and his brother, the future king Luís I, as well as by the incorporation of the mineralogical collections from the Casa da Moeda [6].

These collections were very much impoverished with the transfer in 1859 of nearly all the zoological and mineralogical material to the Escola Politécnica's Museum in Lisbon.

The Museum has been almost entirely deactivated since then. Recuperation begun with our (M.T.A.) antecessor, Rómulo de Carvalho, who did much to improve the situation, as far as the physics instruments collection and the 'jewel of the crown', Brazilian ethnographic materials collected by Alexandre Rodrigues Ferreira, are concerned [7].

Special attention has been paid by us to the Natural History Collection's remnants. Results are very important and promising. Some taxa, mostly from Brazil, have been identified, i.e. after a specimen from the rare Amazonian chelonian *Podocnemis erythrocephala* (by F. de Lapparent de Broin). Other specimens have been identified by us among other animal remnants in ethnographic implements [18] (Viagem ao Brasil... II, chapter *Relíquias da Academia das Ciências de Lisboa*).

A special reference must be made to fossil fish-containing nodules without any neither label nor inventory references found by M. Telles Antunes among the old collections of the Academia das Ciências. Anyway, the acquisition of these fossils was certainly old, especially since there is no hint at all of any contribution

from Brazil after the Regent Prince's settlement in Rio de Janeiro in 1807.

Their origin, even if not indicated, would certainly correspond to Santana Formation fishes. One of us [3 (pp. 66–67, figs. 28 & 29)] identified one of these specimens as *Vinctifer comptoni* (Agassiz). He recognized too that the origin of those fossils could be ascribed to the epoch of the renowned Portuguese naturalist Alexandre Rodrigues Ferreira and of the mission he led in Brazil.

According to the late Octávio da Veiga Ferreira, similar nodules were kept in the Geological Museum (IGM), also lodged inside the Academy of Sciences' building. This suggests that the whole initial set had been shared between Francisco Pereira da Costa and his former colleagues of the 2nd Commissão Geológica before its extinction in 1867, or that a part of it was taken by somebody after their angry split. This corroborates that the concerned fossils had been sent to Lisbon much before.

In order to get complementary data, M.T.A. and A. Balbino asked for the support from I. Freitas for his detailed knowledge of the area, its geology and palaeontological sites. In November 2003, Freitas observed the nodule specimens in Lisbon and searched back in Brazil for other data.

There are records of Portuguese people in Ceará since mid-18th century, according to oral traditions. We may thus speculate that somebody had found and collected fossils as they are exceedingly numerous in the Cariri valley. They could keep some as souvenirs and/or for offer, sending a few specimens away.

Happily, there is better evidence: a letter [16,18] by João da Sylva Feijoo [modern spelling, Feijó, pronounced with an open *o*] (Rio de Janeiro, 1760–Ceará, 1824). As far as we could ascertain, no portrait of him is known.

Feijoo was one of the Brazil-born naturalists who (as Alexandre Rodrigues Ferreira) studied at Coimbra University. Like other colleagues in a similar situation, Feijoo was sent overseas by the Portuguese government. His mission was directed to Cabo Verde, where he served as General Secretary and collected much Natural History material between 1783 and 1793 at least. He was a Corresponding Member of the 'Real Academia das Sciencias de Lisboa', and published some memoirs on Cape Verde and Brazil. However, data about his activities in Lisbon during these years are scant. His excellent herbariums were observed by the Count of Hoffmannsegg between 1797 and 1799 and became later (1808) a target of Étienne Geoffroy Saint-Hilaire's depredations in the Royal Ajuda Museum in Lisbon. Specimens from Cape Verde were sent to Paris.

Feijoo returned to Brazil. According to the terms of a Decree dated 1 February 1799 and signed by the Regent Prince João de Bragança, he was appointed as 'Sargento-Mor' (equivalent to major in rank) in the 'Milícias' of the 'Capitania do Ceará', where Feijoo was charged of several studies and exploration in the field of Natural sciences. He sailed from Lisbon (2 May 1799) to Recife along with his wife, Maria Joaquina, a son and a daughter, and a servant. From Recife, Feijoo gained by sea Baía Formosa–Paraíba, and from there he proceeded by land to Vila de Fortaleza, where he arrived on 24 October. In Brazil/Ceará, Feijoo was paid the same 400 000 reis he earned in Europe as a naturalist.

Is of special interest a letter that he sent without naming its address, but certainly to *Rodrigo* Domingos *de Souza Coutinho* Teixeira de Andrade Barbosa, later Count of Linhares (Fig. 1). The latter, a remarkable and very able Minister (Secretary of State) of the Marine and Overseas and successor in this position to Martinho de Mello e Castro after the death of the latter

Fig. 1. Rodrigo de Sousa Coutinho, Count of Linhares (Chaves, 4 August 1745–Rio de Janeiro, 26 January 1812).
Fig. 1. Rodrigo de Sousa Coutinho, comte de Linhares (Chaves, 4 August 1745–Rio de Janeiro, 26 Janvier 1812).

(1795), was a key Government member as far as the development of the concerned territories was concerned. Keeping a keen interest in Natural history, Souza Coutinho actively promoted scientific developments concerning Africa, India, and South America.

The main purpose of this letter is perhaps to report on his field observations on the ancient Mangabeira gold mines, where his work was impaired by lack of water. He then went further southwards in the Capitania's territory, where it was easier to get water. Meanwhile, he did not neglect to make additional observations, as those that allowed him to recognize in the later-named Araripe Basin (Fig. 2) the amazing occurrence of fish petrifications. In his opinion, this occurrence was the rarest and most curious that ever had been found in the whole World.

In his letter from 'Siara 11 de Dezembro de 1800' [13,17,19] he reports on the discovery of a saltpetre

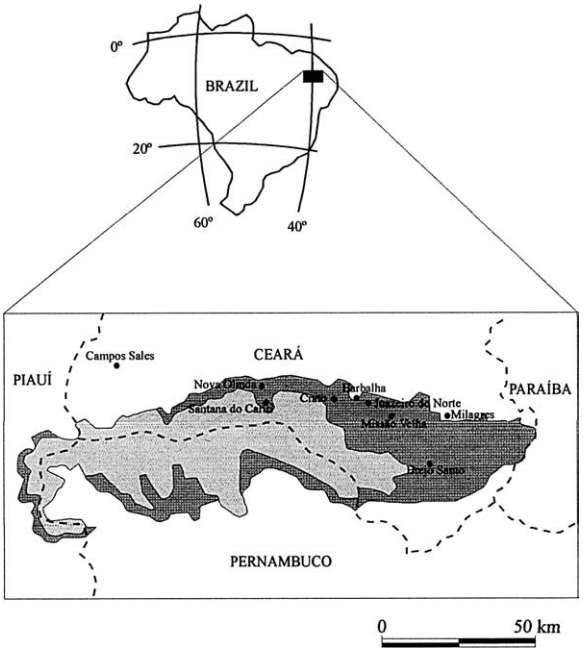

Fig. 2. Map of Brazil to show the concerned Araripe Basin in the State of Ceará. Dark grey: Lower Cretaceous, Aptian/ Albian (shale, carbonate, evaporite, including the Santana Formation) and Jurassic (sandstone, shale). Among the main localities, Santana do Cariri and Missão Velha are shown. Light grey: Lower Cretaceous, Albian (sandstone).

Fig. 2. Carte du Brésil montrant le Bassin d'Araripe, État du Ceará. Gris sombre : Crétacé inférieur, Aptien/Albien (pélites, carbonates, évaporites, y compris la formation Santana) et Jurassique (grès, pélites). Parmi les gisements principaux, on signale Santana do Cariri et Missão Velha. Gris clair : Crétacé inférieur, Albien (grès).

mine at Sítio Tatajuba and on samples he had sent to Lisbon for analysis. He further mentions iron and asbestos samples that he sent to the Governor together with fossil fishes to be shipped to Lisbon (sic; in not updated Portuguese):

"Tãobem com estas vai hua colleção de Petrificaçoens de Peixes, e Amphibios, as mais curiozas, e raras, que jámais, a meu vêr, se hão encontrado, e que por isso merecerão a attenção dos Amadores da Historia Natural, e talvez dos que se applicão a profundar o Systema geral da natureza deste Globo; de cuja cõtemplação talvez me aproveite para discorrer em Memoria particular, se a tanto chegarem os meus Limitados conhecimentos, pois sendo constante entre os Naturalistas que jámais se podem petrificar as partes molles, e musculares dos Animaes, nota-se aqui o contrario, vendo-se immensos Peixes inteiramente convertidos em cristal spatozo, e envolvidos em massas de pedra calcarea &.a: Tenho encontrado esta Petrificação espalhada por sima da terra da Serra, que demora entre a Missão velha, e o Lugar chamado os Milagres, no Engenho da Gamelleira: tãobem, consta-me havellas alem da Serra dos Carirız Novos, onde se diz o Jardim, cujas amostras, se não forem com aquellas, espero ter a satisfação de as remeter a V.Exc.a brevemente."

Translation: "Together with these [mineral samples] is being sent off a collection of fish and amphibian petrifications, the most curious, and rare, that have, in my opinion, ever been found, and for that very reason, will deserve the attention of the Natural history lovers, and maybe from those that are dealing with the development of Nature's general System of our World; from whose contemplation I perhaps will profit to talk over in a special memoir, if my restricted knowledge is enough, as it is a steadfast opinion among the naturalists that the soft and muscle parts from animals can never become petrified, the contrary happens here, as we can see numerous fishes that entirely have been converted into spathic crystal, and became enveloped in limestone, etc. I have found this petrification scattered over the soil of the Serra [mountain] between Missão Velha [Old Mission], and the locality named Milagres, at Engenho da Gamelleira: furthermore, I am told that there are petrifications that also occur beyond the Serra dos Carirız Novos, at the Jardim locality, whose samples, if not sent together with the former, I hope I will have the pleasure to send soon to your Excellency".

Feijoo reported on these fossils, which are plentiful and occur easily exposed in very large numbers. He furthermore recognized their great interest for the naturalists and produced some interesting viewpoints about fossilization. Feijoo also announces that he intended to send shortly specimens from Jardim, and states that he would perhaps produce a memoir on these fossils if his limited knowledge was enough to accomplish it. This does not seem to have been done.

Notwithstanding all difficulties Feijoo met in his life, and especially the deliberate, undeserved silence campaign that after his death was carried on against him, his works on the Natural history of Ceará are indeed gaining increasing recognition [15]. He really was the true pioneer on Natural sciences in the land of Ceará he loved and has served so much. Among his contributions, we can refer:

- inventory of natural resources;
- geological mapping;
- the first collecting of fossil fishes and the evaluation of their importance, as well as the sending of specimens, plants and animals to European museums;
- a catalogue of the Flora from Ceará;
- the installation of the first research laboratory;
- a general description of the 'Capitania', including economical, social and political aspects;
- several excursions to the interior of Ceará, namely at Mangabeira, Missão Velha, Milagres, Tatajuba, Tajaçuoca, Ipueiras, Serras dos Cocos, Carnaubal, Fortunas, Baturité, Canindé, and Ribeira do Choró.

3. A brief account on the 'Academia das Ciências de Lisboa' specimens

All the five nodules kept at the Academia das Ciências de Lisboa (Fig. 3) can be reported to a single taxon. Systematics are as follows.

Division: HALECOSTOMI

Subdivision: TELEOST incertae sedis

Family: ASPIDORHYNCHIDAE Nicholson & Lydekker, 1889

Genus: *Vinctifer* Jordan, 1919

Species: ***Vinctifer comptoni*** (Agassiz, 1841)

Type species: *Aspidorhynchus comptoni* Agassiz

1841 – *Aspidorynchus comptoni* Agassiz

1844 b – *Aspidorynchus comptoni* Ag.; Agassiz

1890 – *Belonostomus comptoni* (Ag.); Woodward

1895 – *Belonostomus comptoni* (Ag.); Woodward

1908 – *Belonostomus comptoni* (Ag.); Jordan & Branner

1919 – *Vinctifer* Jordan

1923 – *Vinctifer* (Ag.); Jordan

1938 – *Belonostomus comptoni* (Ag.); D'Erasmo

1945 – *Aspidorynchus comptoni* Ag. ; Silva Santos

1968 – *Aspidorynchus comptoni* Ag. ; Silva Santos & Valença

1985 b – *Vinctifer comptoni* (Ag.); Silva Santos

1988 – *Vinctifer comptoni* (Ag.); Brito

Lectotype: British Museum (Natural History), BM (NH) 47892; distorted head and most of body; Santana formation, Jardim, Chapada do Araripe, Ceará.

Fig. 3. Nodule containing a *Vinctifer comptoni* specimen. Museum of the 'Academia das Ciências de Lisboa', Santana Formation. Ceará, Brazil.
Fig. 3. Nodule avec *Vinctifer comptoni*. Musée de l'*Academia das Ciências de Lisboa*, formation Santana, Ceará, Brésil.

Vinctifer comptoni – a teleostean fish that could attain 1 meter in length. The body is long and subcylindrical, with the dorsal fin in a rear position near the caudal pedicle. Rostrum is acute and long.

4. Conclusions

Valuable Portuguese contributions since the 16th century were most often overlooked or ignored. Meaningful Portuguese old contributions as the discovery of the remarkable Cretaceous fishes from Ceará were long forgotten.

The collecting of these fossils could be ascribed to late 18th century times. Indeed fossil fish-containing nodules certainly received before 1807 were found among Academy's old collections.

There is no doubt that the concerned nodules are from the Santana Formation, Ceará.

As a further evidence, there is a letter dated "Siara 11 de Dezembro de 1800" hitherto nearly unknown even if it had already been published. It was written by the naturalist, João da Sylva Feijoo, who reports on a saltpetre mine at Sítio Tatajuba and mentions the samples he had sent to Lisbon for analysis. He further deals with iron and asbestos samples that he sent to the Governor *together with fossil fishes* to be shipped to Lisbon. This is the origin of the nodules from the Academia das Ciências de Lisboa Museum.

Hence (at our present status of knowledge) the first scientific collecting of the renowned Cretaceous fishes from Ceará has indeed been carried on by a Portuguese/Brazil-born naturalist much before the Spix & Martius mission.

Acknowledgements

Our colleague, Philippe Taquet ('Muséum national d'histoire naturelle', Paris) was most helpful in obtaining several data concerning the fossils from the Ajuda Royal Museum in Lisbon that were sent to Paris.

At the Évora University, Carlos Ribeiro prepared the map (Fig. 2).

Our work was supported by the Project POCTI 36531/ PAL/ 2000 – Studies on Portuguese Palaeontology (Post-Palaeozoic), granted by the 'Fundação para a Ciência e a Tecnologia' (Portugal).

We thank very much all the help granted to us.

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