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THE FOSSIL FISH OF SALENTO: A HISTORY OF THEIR DISCOVERY AND THEIR STUDY

RIASSUNTO

L'autore tratteggia le principali tappe attraverso le quali si è determinata la conoscenza delle due principali ittiofaune fossili del Salento: quella estratta dalle biomicriti mioceniche dette "Pietra leccese" e quella contenuta nei calcari cretacei. L'analisi approfondita delle principali fonti storiche ha permesso di dimostrare che le prime notizie riguardano esclusivamente i pesci fossili di epoca cretacea; esse risalgono alla fine del XVIII secolo e sono dovute all'attività dell'abate padovano Alberto Fortis, attraverso il quale le prime informazioni si diffusero anche in Europa. All'inizio dell'800 fu l'abate Giuseppe Maria Giovene a descrivere chiaramente sia i fossili cretacei che quelli miocenici. Durante tutto l'800 l'interesse dei ricercatori fu esclusivamente concentrato sui fossili delle biomicriti mioceniche e le principali scoperte furono dovute all'attività di Oronzo Gabriele Costa e di suo figlio Giuseppe, cui seguì l'attività di Giovanni Capellini; lo studio sistematico di questi fossili, tuttavia, fu poi condotto da Francesco Bassani solo all'inizio del '900. Alcuni appassionati locali, come Ulderigo Botti, ebbero ugualmente un ruolo importante nella raccolta di questi fossili. Solo con l'inizio del '900 furono riprese le attività di ricerca sui pesci fossili del Cretaceo, sia grazie all'attività di professionisti, come Geremia D'Erasmo, che di dilettanti, come Cosimo De Giorgi e Francesco Capasso. Negli anni '70 del secolo scorso si ebbe uno straordinario sviluppo delle conoscenze sui pesci fossili cretacei grazie alle attività di scavo condotte sul posto da Lorenzo Sorbini ed a quelle di studio condotte in laboratorio specialmente da Louis Paul Taverne. Infine, a seguito dell'attività del "Gruppo Naturalisti Salentini" (costituitosi nel 1982), è aumentata e si è resa più efficace la sorveglianza sulle attività estrattive locali, con il risultato di costituire una ingente ed importante collezione di pesci fossili, tanto cretacei quanto miocenici, presso il Museo dell'Ambiente dell'Università del Salento, sotto la direzione di Genuario Belmonte.

SUMMARY

The main stages through which knowledge has been gained of the two main fossil fish faunas of Salento are initially outlined here. This includes the fossils contained in the Cretaceous limestone, and those extracted from the Miocene biomicrite known as 'Lecce stone'. The in-depth analysis of the main historical sources has shown that the first information only related to the fossil fish of the Cretaceous era. This information dates from the end of the eighteenth century, and is the result of the activities of the Paduan Abbot Alberto Fortis, through whom the information also spread throughout Europe. At the beginning of the nineteenth century, the Abbot Giuseppe Maria Giovene clearly described both the Cretaceous fossils and those of the Miocene. Throughout the nineteenth century, the interest of researchers was concentrated exclusively on the fossils of the Miocene biomicrite. The main findings were due to the activities of Oronzo Gabriele Costa and his son Giuseppe, and this was followed by the activities of Giovanni Capellini. However, the systematic study of these fossils was then led by Francesco Bassani only at the beginning of the twentieth century. Some local enthusiasts, such as Ulderigo Botti, also had important roles in the collection of these fossils. Only at the beginning of the twentieth century did research on the fossil fish from the Cretaceous period resume, due to the work of both professionals, such as Geremia D'Erasmo, and amateurs, such as Cosimo De Giorgi and Francesco Capasso. In the 1970's, there were extraordinary developments in the knowledge of the fossil fish from the Cretaceous through the excavations conducted on site by Lorenzo Sorbini and studies performed in the laboratory, especially by Louis Paul Taverne. Finally, as a result of the activities of the Salento Naturalist Group (*Gruppo Naturalisti Salentini*; formed in 1982), the surveillance of the quarrying on site was increased and became more effective, with the result that a large and important collection of fossil fish from both the Cretaceous and the Miocene has been built up at the Museum of the Environment of the University of Salento, under the direction of Genuario Belmonte.

INTRODUCTION

Salento is today one of the most important regions for fossil fish, both nationally and internationally. These include both of the fossil fish faunas of Salento: those of the Cretaceous limestone, and those specific to the Miocene biomicrite.

There is widespread emergence of the Cretaceous limestone with fossil fish around Lecce and in the southern part of the Bari Province (southern Italy).

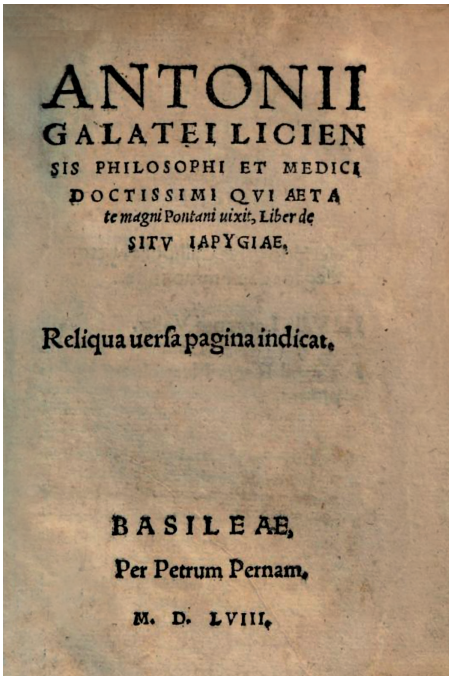
The fossil-rich localities known to date are numerous, among which there are in particular Alessano del Capo, Nardò (Porto Cesareo, Donna Donata and Cava Marra at Castello di Agnano) and Manduria. This limestone dates to the Upper Campanian–Lower Maastrichtian age and contains one of the richest and best-preserved fossil fish faunas of the Upper Cretaceous that are known to us today (Belmonte, 2014). The Miocene biomicrite represents the so-called 'Lecce stone', which has been quarried for centuries in Salento for building purposes. The most important quarries are located immediately south-west of the city of Lecce (e.g., *Cavallino* quarry), and those along the road between the villages of Melpignano and Cursi. The fossil content of this soft and friable rock is relatively low, although the intense quarrying activity has led to the exposure of enormous areas, which has made it possible to carry out particularly detailed analyses of the rock that has been quarried and cut down to building blocks. Hence, among the vast amount of marine fossils contained in this rock, certainly the component linked to the fish stands out, which is mainly represented by the selachian teeth that for centuries have attracted even popular attention (as seen by the popular name of 'tongues of thunder'). The estimated sedimentation period was during the Upper Miocene.

The present article considers the overall history of these discoveries and of the knowledge available concerning both of these fish faunas of Salento. The aim is to show that as well as being absolutely unique from a scientific point of view, they have been well known since ancient times, and thus represent a fixed aspect of the historical and cultural heritage of this region.

The first reports: the cases of Antonio De Ferrariis, Abbot Alberto Fortis, Barthélemy Faujas de Saint-Fond, and the French Naturalist School

Some studies have recently hypothesised that the first report of the presence of fossil fish in Salento can be placed as far back as the sixteenth century. Indeed, Landini *et al*. (2005) reported that, "The earliest studies on the geology and palaeontology of this area date back to 1552, when the Lecce scholar De Ferrariis published his "*Situ Japigiae*", in which the fossils that had been found in the calcarenites of the surroundings of Lecce were described, and generically indicated as *Lusus naturae* [freaks of nature]."

The original Latin text "*Liber de Situ Iapygiæ*" (Figure 1) was written by the Salento doctor Antonio de Ferrariis, known as 'Galateo' (*ca*. 1444-1517), and was published in 1558 (not in 1552) by Petrum Pernam in Basel. The detailed analysis of this text shows that De Ferrariis actually described the geological and petrographic characteristics of the Miocene biomicrite known as 'Lecce stone', and indeed he cites phenomena that he calls *Lusus naturae* (freaks of nature), although reference is never made to fossils.


ANTONII
GALATEI LICIEN
SIS PHILOSOPHI ET MEDICI
DOCTISSIMI QVI AETA
te magni Pontani uixit, Liber de
SITV IAPYGIAE,

Reliqua uersa pagina indicat.

BASILEAE,
Per Petrum Pernam,
M. D. LVIII.

Figure 1. Title page of the '*Liber de Situ Iapygiæ*' by Antonio de Ferrariis, known as Galateo.

In particular, we can note that Galateo gave the first, perfect description of the Lecce stone, writing that it is a soft stone that is well suited to being shaped for building, although the houses constructed with this stone require particular maintenance. Galateo focussed on the fragility of this stone when exposed to erosion from wind and water, such that the buildings require maintenance from one generation to the next. At the same time, he wondered at and highlighted the strength of this same stone when exposed to heat and fire. Indeed, on page 73 of the original text we read: "*Sed in hac regione non monstrantur (ut erant) grandia, atque immensa urbium vestigia: causa est: quo niam lapides et rosi fere ubique molles, ac fragiles, quos ventus, et imbres facile exedunt, et comminuunt. Hydruntini et Roccæ oppidi lapides cretæ compactæ, non igne costæ, sed sole duratæ similes sunt, ita ut domus, quam pater ædificavit, a filio reficienda fit: cum per tot sæcula durer materies, mirum est, qui ventum, et imbre non patiuntur: contra ignem uim habent indomitam, incolæ pyromachos vocat, quibus ad fornaces, et furnos, et caminos utuntur. Ego non alia causam assignaverim, nisi eam qua cocti lateres, vetos, et imbres, non cocti vero ignes melius patiuntur.*"

Moreover, in two distinct points in the text, Galateo refers to the expression *Lusus naturae*, when describing the port of Brindisi, and when referring to the optical illusions that frequently occurred near Nardò. The port of Brindisi is described as a perfect landing spot (Zacchino, 2014), where the morphology is naturally shaped like a cove that is perfectly suited as a port

(original text, page 63): "*Interior portus turribus et catena clauditur: exteriore hinc atque hinc scopuli et insulatu obiectus pterit. Videtur ludetis ac puide naturæ sagaci industria factus.*"

The passage that most probably has led to confusion, however, is that of page 119 of the original text. Here Galateo actually mentions the term *Lusus naturae*, which is used to refer to a series of optical illusions, which have also been referred to as "Fairies" by later authors. These are here described in detail and are reported as being frequently observed in the area surrounding the town of Nardò: "*Quando ratio apparentibus attestatur, et apparentia rationi, cum hæc duo sibi invicem non consentiunt omni falsa, omnia erronea sunt. Sed nos ad eade Phantasinata revertamur. Videbis quandoque urbes, et castella, et turres, quandoque pecudes et boves versicolores, et aliarum rerum species, sevidola, ubi nulla est urbs, nullum pecus ne dumi quide. Mihi voluptati interdum fuit videre hæc ludicra, hos lusus naturæ.*" (Figure 2).

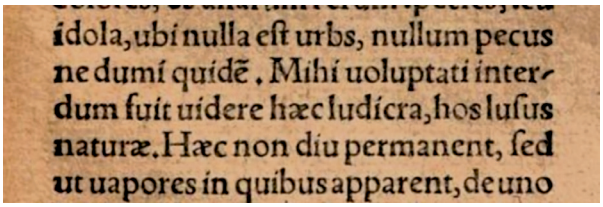

idola,ubi nulla eſt urbs, nullum pecus
ne dumi quidē. Mihi uoluptati inter-
dum fuit uidere hæc ludicra,hos luſus
naturæ.Hæc non diu permanent, ſed
ut uapores in quibus apparent,de uno

Figure 2. Detail of page 119 of the text by De Ferrariis where the term *lusus naturae* is explicitly mentioned.

There is no doubt, therefore, that the oldest text with a naturalist description of Salento, i.e., that published in 1558 by Antonio de Ferrariis, does not contain any descriptions of fossils, let alone the fossilised remains of fish. On the other hand, the term *Lusus naturae* was clearly used by De Ferrariis to describe curiosities and natural phenomena that were not considered within the terms of palaeontology, and that was only much later applied to the description of fossils; i.e., at the time of the publication of the famous study of Bartolomeo Beringer (1667-1770) entitled "*Lithographia Wirceburgensis*", which was printed in 1726 (Accordi, 1984).

Therefore, to find the first clear trace in print relating to the fossil fish of Salento we must wait until the end of the eighteenth century. The crucial character here was that of Abbot Alberto Fortis (born Giovanni Battista; 1741-1803), who is considered one of the founding fathers of the Natural Sciences in Italy and Europe. He was born in Padua, and was initially a hermit Abbot of the Order of St. Augustine. He was a restless spirit who found his reasons for life only in geology and political commitment (Figure 3). He was a formidable walker, and he visited and described a huge number of places, natural phenomena, geological structures, and palaeontological sites. However, he was also a polemic spirit and a free-thinker, so much so that he would laugh at most of his contemporaries, whom he called, "learned men who remain in their studies and devise systems".

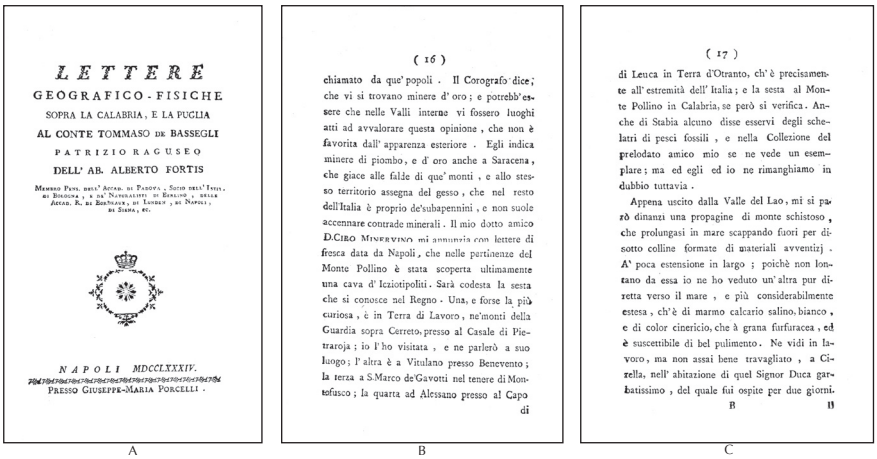
Figure 3. Abbot Alberto Fortis' tombstone (1741-1803) in the monumental cemetery in Bologne.

Alberto Fortis travelled extensively in Croatia between 1771 and 1776, where among his many other observations, he also identified the fossil fish sites of the Island of Lesina (Hvar), which was afterwards described by Kramberger-Gorjanovich in the middle of the nineteenth century. He then undertook a "Geological journey in the Kingdom of the two Sicilies" in 1780, under the auspices of His Excellency General John Francis Edward Acton, the then Minister of War of the Bourbon government. During this trip, Alberto Fortis reached Sicily and Calabria, and in the autumn of 1783, he crossed Apulia on the way back. However, here he had to stop at Barletta, between the end of October and the beginning of November. The story of this trip was pieced together by Zangari on the basis of many unpublished documents, and as he said "[He] had crossed almost all of the Provinces, taking notes both on the geological formation of the mountains and ridges of the sub-Apennines, and on the resources of the country and the nature of the land in terms of its various cultivation. And during his pause before publishing his report, in 1783 a terrible earthquake struck the region..... In November 1783, Fortis was in Barletta, and to distract himself from his melancholy - he said - forced as he was into a temporary stay in a quarantined hospital, he reported on the results of his research to Count De Bassegli, nephew of Senator Michele di Sorgo, in Ragusa in Dalmatia" (Zangari, 1954-55).

Thus, in the autumn of 1783, when Abbot Alberto Fortis was on the way back from his trip to the Kingdom of the two Sicilies, he was forced to stop

in the hospital of Barletta. The reason for this was linked to the epidemic of plague that had just broken out in the summer of that same year on the islands of Linosa, Pantelleria and Lampedusa. Consequently, they "put our guard against people coming from Sicily and the smaller islands, ..., opened the quarantine hospital, called for *in-absentia* judgements....." (Corradi, 1865-94, vol 5, p. 412). Evidently, this epidemic also interfered with the journey of Abbot Alberto Fortis in southern Italy, and he was forced to stop in Barletta because he was coming back from the south. He took advantage of this enforced idleness to write an initial report on the trip that he had just concluded. Fortis thus explained that, "This idleness in the hospital made me think of acquiring more ideas on the buildings of the country that had recently been battered by earthquakes, as much as it is possible to do this without returning there in person. You know that already in 1780 I had made a quick trip through Calabria while going from Naples to Sicily, preferring the hardships of naturalist wandering to the delights of Ragusa society." (this quotation can be found in the 'Second Letter' of the German edition only of the 'Letters', which corresponds to the 'First Letter' of the Italian edition: see below) (Capasso, 2007).

During his forced stay in the Barletta hospital, therefore, Fortis wrote a series of eight signed letters, which he then had published in 1784 with Porcelli Printing of Naples. These were brought together in a single volume of the eight, with the title of 'Geographical-physical letters regarding Calabria and Puglia to Count Tommaso De Bassegli, patrician in Ragusa". The book was printed in only 40 copies, "for his friends". Today only one copy of it survives, and this belongs to the so-called *Miscellanea Cuomo*, and it is kept in the Library of the Neapolitan Society of National History at Maschio Angioino (Figure 4A).



LETTERE
GEOGRAFICO-FISICHE
SOPRA LA CALABRIA, E LA PUGLIA
AL CONTE TOMMASO DE BASSEGLI
PATRIZIO RAGUSEO
DELL' AB. ALBERTO FORTIS
NAPOLI MDCCLXXXIV.
PRESSO GIUSEPPE-MARIA PORCELLI.

(16)

chiamato da que' popoli . Il Corografo dice; che vi si trovano minere d' oro ; e potrebb' essere che nelle Valli interne vi fossero luoghi atti ad avvalorare questa opinione , che non è favorita dall' apparenza esteriore . Egli indica miniere di piombo , e d' oro anche a Saracena , che giace alle falde di que' monti , e allo stesso territorio assegna del gesso , che nel resto dell'Italia è proprio de'subapennini , e non suole accennare contrade minerali . Il mio dotto amico D.Ciro Minervino mi annunzia con lettere di fresca data da Napoli , che nelle pertinenze del Monte Pollino è stata scoperta ultimamente una cava d' Icziotipoliti . Sarà codesta la sesta che si conosce nel Regno . Una, e forse la più curiosa , è in Terra di Lavoro , ne'monti della Guardia sopra Cerreto, presso al Casale di Pietraroja ; io l'ho visitata , e ne parlerò a suo luogo ; l' altra è a Vitulano presso Benevento ; la terza a S.Marco de'Gavotti nel tenere di Montefusco ; la quarta ad Alessano presso al Capo di

(17)

di Leuca in Terra d'Otranto, ch' è precisamente all' estremità dell' Italia ; e la sesta al Monte Pollino in Calabria, se però si verifica . Anche di Stabia alcuno disse esservi degli scheletri di pesci fossili , e nella Collezione del prelodato amico mio se ne vede un esemplare ; ma ed egli ed io ne rimaniamo in dubbio tuttavia .

Appena uscito dalla Valle del Lao , mi si parò dinanzi una propagine di monte schistoso , che prolungasi in mare scappando fuori per disotto colline formate di materiali avventizj . A' poca estensione in largo ; poichè non lontano da essa io ne ho veduto un' altra pur diretta verso il mare , e più considerabilmente estesa , ch'è di marmo calcario salino, bianco , e di color cinericio, che à grana furfuracea , ed è suscettibile di bel pulimento . Ne vidi in lavoro , ma non assai bene travagliato , a Cirella, nell' abitazione di quel Signor Duca garbatissimo , del quale fui ospite per due giorni.

B 11

A B C

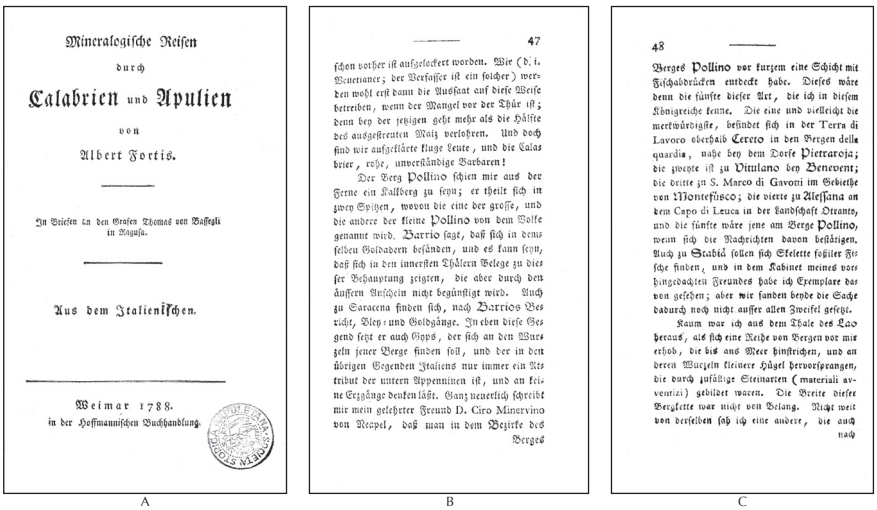
Figure 4. "Letters" by Alberto Fortis, as the Italian edition of 1784. **(A)** Title page. **(B, C)** Pages 16 and 17, which contain the first report of the fossil fish of Alessano.

The passage that interests us is contained in the "First Letter," dated from Barletta as 1 November, 1783. This states verbatim on pages 16 and 17 (Figure 4B, C): "My learned friend D. Ciro Minervino tells me in recent letters from Naples that in the surroundings of Mount Pollino a quarry of ichthyol stones (*Icziotipoliti*) was discovered recently. This would be the sixth one that we know about in the Kingdom. One, and perhaps the most interesting, is in Terra di Lavoro, in the mountains of La Guardia, above Cerreto, near the Casale Pietraroja; I have visited it and I'll talk about it in due course; another one is in Vitulano near Benevento; the third one is at San Marco de Gavotti in the territory of Montefusco; the fourth one is in Alessano at the Cape of Leuca in the Land of Otranto, which is precisely the extreme point of Italy; and the sixth one [*sic*] at Mount Pollino in Calabria, providing that this is verified. Also at Stabia there have been reports of the presence of skeletons of fossil fish, and in the collection of my above-mentioned friend, a specimen can be seen; but both he and I remain in doubt, however."

Hence, Alberto Fortis provides us with the first scientific list of places with fossil fish of the Kingdom of the Two Sicilies, and in this list, Alessano in the Land of Otranto appears for the first time. From the text it appears possible to infer that Abbot Fortis did not personally visit the site of Alessano, in particular because when he described the site of Pietraroja, he specifically stated that he had personally visited it. This leads us to believe that Fortis had collected on-the-spot information on the presence of fossil fish in Alessano, but without inspecting the site himself. As we will see later, there is a clue that leads us to believe that this information was passed on to Abbot Fortis by Abbot Giuseppe Maria Giovene.

These same "Letters" of Abbot Fortis were translated into German and printed in Weinheim in 1788, thus serving to spread the first geological and palaeontological knowledge of the Kingdom of the Two Sicilies throughout Europe. In particular, the first list of locations that had provided fossil fish in southern Italy was also made known in this way, and also spread in the German language throughout the European scientific community, with remarkable speed and efficacy (Figure 5A). The news that interests us in this German version is contained in the "Second Letter" (corresponding to the "First Letter" of the Italian edition), on pages 47 and 48 (Figure 5B, C).

Immediately following the publication by John Playfair of the first geological theory on Earth by James Hutton in 1802, as "Illustrations of the Huttonian Theory of the Earth", in France in 1803, the Director of the Museum of Natural History in Paris, Barthélemy Faujas de Saint-Fond, published the first volume of his "Essays in Geology, or Memoires of the Natural History of the World" ("*Essai de Gèologie, ou Mémoires pour servire a l'Histoire Naturelle du Globe*"; Figure 6A). In this volume, which can be considered a real milestone in European geology, an entire chapter (Chapter 5) is devoted to fossil



Mineralogische Reisen
durch
Calabrien und Apulien
von
Albert Fortis.

In Briefen an den Grafen Thomas von Bassegli in Ragusa.

Aus dem Italienischen.

Weimar 1788.
in der Hoffmannischen Buchhandlung.

A

47

schon vorher ist aufgelockert worden. Wie (d. i. Venetianer; der Verfasser ist ein solcher) werden wohl erst dann die Ausstaat auf diese Weise betreiben, wenn der Mangel vor der Thür ist; denn bey der jetzigen geht mehr als die Hälfte des ausgestreuten Mais verlohren. Und doch sind wir aufgeklärte kluge Leute, und die Calabrier, rohe, unverständige Barbaren!

Der Berg Pollino schien mir aus der Ferne ein Kalkberg zu seyn; er theilt sich in zwey Spitzen, wovon die eine der grosse, und die andere der kleine Pollino von dem Volke genannt wird. Barrio sagt, daß sich in demselben Soldadern befänden, und es kann seyn, daß sich in den innersten Thälern Belege zu dieser Behauptung zeigten, die aber durch den äussern Anschein nicht begünstigt wird. Auch zu Saracena finden sich, nach Barrios Bericht, Bley- und Goldgänge. In eben diese Gegend setzt er auch Gyps, der sich an den Wurzeln jener Berge finden soll, und der in den übrigen Gegenden Italiens nur immer ein Attribut der untern Appenninen ist, und an keine Erzgänge denken läßt. Ganz neuerlich schreibt mir mein gelehrter Freund D. Ciro Minervino von Neapel, daß man in dem Bezirke des Berges

B

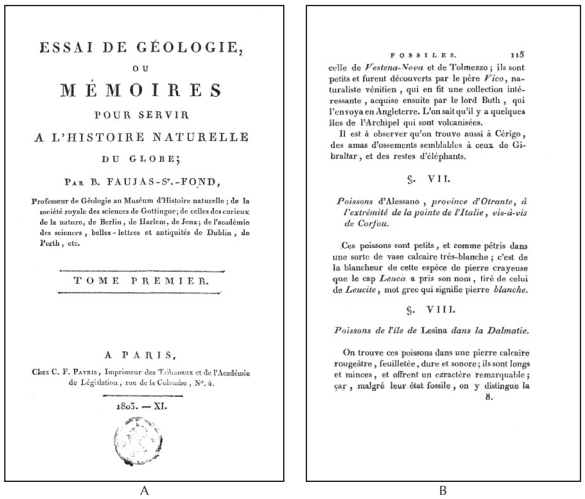
48

Berges Pollino vor kurzem eine Schicht mit Fischabdrücken entdeckt habe. Dieses wäre denn die fünfte dieser Art, die ich in diesem Königreiche kenne. Die eine und vielleicht die merkwürdigste, befindet sich in der Terra di Lavoro oberhalb Cereto in den Bergen della quardia, nahe bey dem Dorfe Pietrarojsa; die zweyte ist zu Vitulano bey Benevent; die dritte zu S. Marco di Cavotti im Gebiethe von Montefusco; die vierte zu Alessana an dem Capo di Leuca in der Landschaft Otrante, und die fünfte wäre jene am Berge Pollino, wenn sich die Nachrichten davon bestätigen. Auch zu Stabiä sollen sich Skelette fossiler Fische finden, und in dem Kabinet meines vorhingedachten Freundes habe ich Exemplare davon gesehen; aber wir fanden beyde die Sache dadurch noch nicht ausser allen Zweifel gesetzt.

Kaum war ich aus dem Thale des Lao heraus, als sich eine Reihe von Bergen vor mir erhob, die bis ans Meer hinstrichen, und an deren Wurzeln kleinere Hügel hervorsprangen, die durch zufällige Steinarten (materiali avventizi) gebildet waren. Die Breite dieser Bergkette war nicht von Belang. Nicht weit von derselben sah ich eine andere, die auch nach

C

Figure 5. "Letters" by Alberto Fortis, as the German edition of 1788. **(A)** Title page. **(B, C)** Pages 47 and 48, which contain the news of the presence of fossil fish in Alessano, in the Land of Otranto.



ESSAI DE GÉOLOGIE,
OU
MÉMOIRES
POUR SERVIR
A L'HISTOIRE NATURELLE
DU GLOBE;
PAR B. FAUJAS-S^T.-FOND,
Professeur de Géologie au Muséum d'Histoire naturelle; de la société royale des sciences de Gottingue; de celles des curieux de la nature, de Berlin, de Harlem, de Jena; de l'académie des sciences, belles-lettres et antiquités de Dublin, de Perth, etc.

TOME PREMIER.

A PARIS,
Chez C. F. PATRIS, Imprimeur des Tribunaux et de l'Académie de Législation, rue de la Colombe, N°. 4.
1803. — XI.

A

FOSSILES. 115

celle de *Festena-Nova* et de Tolmezzo; ils sont petits et furent découverts par le père *Feo*, naturaliste vénitien, qui en fit une collection intéressante, acquise ensuite par le lord Buth, qui l'envoya en Angleterre. L'on sait qu'il y a quelques îles de l'Archipel qui sont volcanisées.

Il est à observer qu'on trouve aussi à Cérigo, des amas d'ossements semblables à ceux de Gibraltar, et des restes d'éléphants.

§. VII.

Poissons d'Alessano, *province d'Otrante, à l'extrémité de la pointe de l'Italie, vis-à-vis de Corfou.*

Ces poissons sont petits, et comme pétris dans une sorte de vase calcaire très-blanche; c'est de la blancheur de cette espèce de pierre crayeuse que le cap *Leuca* a pris son nom, tiré de celui de *Leucite*, mot grec qui signifie pierre *blanche*.

§. VIII.

Poissons de l'île de Lesina *dans la Dalmatie.*

On trouve ces poissons dans une pierre calcaire rougeâtre, feuilletée, dure et sonore; ils sont longs et minces, et offrent un caractère remarquable; car, malgré leur état fossile, on y distingue la

8.

B

Figure 6. The first volume of the Essays in Geology of Barthelemy Faujas de Saint-Fond, published in Paris in 1803. **(A)** Title page. **(B)** Page 115, on which the presence of fossil fish in Alessano, in the Lecce Province, is reported.

fish. In addition to a general description, the author presents and describes all of the places in which fossil fish had been found and reported at that time. This included 23 locations, with 22 in Europe and one in Asia (Mount Lebanon). The seventh location, which can be found on page 115, is Alessano, in the Land of Otranto (Figure 6B).

It is of interest to report here the full list of these fossil fish locations as indicated by Faujas de Saint-Fond, because these represent and summarise the state of knowledge at the time in this specialised field:

I. Fish of Vestena-Nova in the Veronese.
II. Fish of Schio in Vicenza.
III. Fish of Monteviale, one and a half hours from Vicenza.
IV. Fish of Salzeo in Vicenza.
V. Fish of Tolmezzo, in the Region of Friuli.
VI. Fish of Cérigo in the Archipelago, the ancient island of Kythira.
VII. Fish of Alessano, Province of Otranto, at the extremity of the point of Italy, *vis-à-vis* Corfu.
VIII. Fish of the island of Lesina (Hvar) in Dalmatia.
IX. Fish of Scappezzano and of Mount Alto, in the Duchy of Urbino.
X. Fish of the promontory of Focara, in the Duchy of Urbino.
XI. Fish of Pietra-Roya, in Campagnia.
XII. Fossil fish of Stabia, in the place called the Tower of Roland, west of Castellammare.
XIII. Fish of Gifon, in the Kingdom of Naples.
XIV. Fish of Mount Liban.
XV. Fish of Eisleben, in the county of Mansfeld.
XVI. Fish of Eichstadt, in Bavaria.
XVII. Fish of Oéningen, near Lake Constance.
XVIII. Fish of Pappenheim.
XIX. Fish of carriers of Aix en Provence.
XX. Fish of Grandmont, four leagues from Beaune in Burgundy.
XXI. Fish of Montmartre near Paris.
XXII. Fish of Nanterre near Paris.
XXIII. Fossil fish near the hamlet of Devey-Lou-Ranc, a league from Privas, Département of Ardèche.

It can be noted here that of the 23 locations that are listed, as many as 11 are Italian, and four of these are within the Kingdom of Two Sicilies: Alessano, Pietraroja, Giffoni Valle Piana, and Castellammare di Stabia.

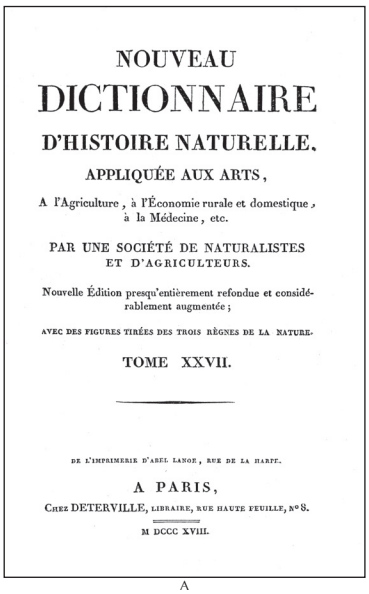
Therefore the issue that actually arises is whether Faujas de Saint-Fond drew up his list of fossil fish locations in southern Italy on the basis of his own direct experience. This issue is based on the fact that the Parisian geologist indeed described in detail the Vesuvius volcanic phenomena, and especially the rock of the Flegrea area (*pozzolana*). Indeed, right from their beginnings, the geological sciences showed crucial interest in volcanism, and in Vesuvius, as a clear example of an easily accessible and active volcano that is situated within sight of one of the largest European capitals, and was a favourite and very visited destination. However, we do not have direct evidence to demonstrate that he actually carried out this trip. Therefore, the most likely hypothesis is that Faujas de Saint-Fond only reported in his "*Essai de Géologie*" what he had read and heard about the matter. Thus the "Letters" that were published in Italian and in German by Abbot Fortis remain of crucial

importance, as the means of spreading the knowledge of the sites of the fossil fish that were both in southern Italy and in Croatia. In this regard, it also appears significant, in my opinion, to note that the list of the fossil fish localities reported by Faujas de Saint-Fond also includes the island of Lesina (Hvar), a site that was discovered around 1770 by Abbot Alberto Fortis himself.

Moreover, in substance, the description that Faujas de Saint-Fond gives of the Alessano site is dry and succinct, and denotes very superficial knowledge of both the place and its fossils. This can be read verbatim in particular: "These fish are small, and they appear petrified as if in a kind of very white limestone vase; it is from the whiteness of this type of chalky stone that Leuca Cape took its name, derived from that of Leucite, the Greek word for white stone" ("*Ces poissons sont petits, et comme pétris dans une sorte de vase calcaire trés-blanche; c'est de la blancheur de cette espèce de pierre crayeuse que le cap Leuca a pris son nom, tiré de celui de Leucite, mot grec qui signifie pierre blanche*"). This is a very superficial description indeed, which is based on only two pieces of data, the white colour of the matrix, and the reduced size of the ichthyolites. It seems likely, therefore, that this is actually second-hand information, whereby the primary origin can only be sought in the writings of Abbot Fortis. Indeed, the information on the fossil fish reported by Faujas de Saint-Fond will remain for a long time the only source for all of European palaeontological and geological research.

Towards the end of the eighteenth century, the European naturalist scene was dominated by the publications of Georges-Louis Leclerc de Buffon, in a long series of volumes in close sequence that ended up in providing a substantial core of scientific data that influenced naturalist research for a long time. Although Buffon lingered on fossil fish, in particular describing the extraordinary ones around Verona, none of his publications indicated the discovery of fossil fish in Alessano, also because his entire section on geology (i.e., the five volumes on minerals and rocks) was published belatedly, from 1783 to 1788, so before the diffusion in Europe of the first information on the presence of fossil fish in Alessano. Nevertheless, this was integrated into many of the subsequent editions, which were also translated into Italian. These major additions, which were due to the Earl of Lagépède, tended to introduce many updates in the original publication of Buffon. One of these was indeed the addition of the list of the fossil fish sites that had been put together by Faujas de Saint-Fond.

In the early nineteenth century the "Dictionary of Natural History" ("*Dictionnaire d'Histoire Naturelle*") entered the French naturalist scene. This was a colossal and innovative publication, which was organised as a real dictionary and was intended for all applications of naturalist knowledge, from the arts to agriculture, from the rural and domestic economy, to medicine. In the edition that was called the "New Dictionary", the term "Fossil fish" was also



NOUVEAU

DICTIONNAIRE

D'HISTOIRE NATURELLE.

APPLIQUÉE AUX ARTS,

A l'Agriculture, à l'Économie rurale et domestique, à la Médecine, etc.

PAR UNE SOCIÉTÉ DE NATURALISTES ET D'AGRICULTEURS.

Nouvelle Édition presqu'entièrement refondue et considérablement augmentée;

AVEC DES FIGURES TIRÉES DES TROIS RÈGNES DE LA NATURE.

TOME XXVII.

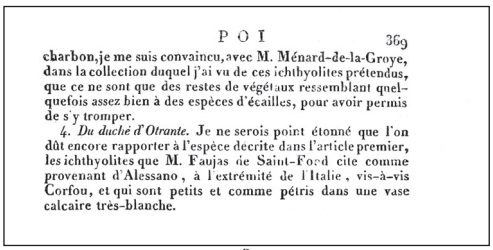
DE L'IMPRIMERIE D'ABEL LANOE, RUE DE LA HARPE.

A PARIS,

CHEZ DETERVILLE, LIBRAIRE, RUE HAUTE FEUILLE, N° 8.

M DCCC XVIII.

A



P O I 369

charbon, je me suis convaincu, avec M. Ménard-de-la-Groye, dans la collection duquel j'ai vu de ces ichthyolites prétendus, que ce ne sont que des restes de végétaux ressemblant quelquefois assez bien à des espèces d'écailles, pour avoir permis de s'y tromper.

4. *Du duché d'Otrante.* Je ne serois point étonné que l'on dût encore rapporter à l'espèce decrite dans l'article premier, les ichthyolites que M. Faujas de Saint-Fond cite comme provenant d'Alessano, à l'extrémité de l'Italie, vis-à-vis Corfou, et qui sont petits et comme pétris dans une vase calcaire très-blanche.

B

Figure 7. The New Dictionary of Natural History ("*Nouveau Dictionnaire d'Histoire Naturelle*"), Paris 1818. **(A)** Title page. **(B)** The particular section on page 369 of Volume XXVII.

included, which was then again included in volume XXVII of the "*Dictionnaire*", published "*chez Deterville*" in Paris in 1818. This entry was entrusted to the famous zoologist and anatomist Henri Marie Ducrotay de Blainville (1777-1850), who produced his real first small treatise on the subject, with an addition of as many as 86 printed pages (310-395) (Figure 7A). This treatise on the fossil fish by De Blaiville was organised in the following three chapters:

A. The marine formations of the Ichthyolites, or *Thalassieus*.
B. The fresh water formations of the Ichthyolites, or *Potamiens*.
C. The Ichthyolites for which their nature is not known.

In the whole of this treatise, fossil fish are cited for 13 Italian locations: nine "of marine origin" (Pietraroja, Castellamare di Stabia, Monte Bolca, Schio, Monteviale, Salzéo, Friuli, Murazzo-Struziano, Val di Noto) and four considered to be of "lake origin" (Scapezzano at Senigallia, Promontory of Focara, Punta degli Schiavi and Otranto Duchy).

The description concerning the Otranto district is no more than an almost literal quotation of the one made by Faujas de Saint-Fond (on page 369): "The Duchy of Otranto. I am not surprised that we had to still relate to the species described in the first article of the ichthyolites that Mr. Faujas de Saint-Fond cites as from Alessano at the extremity of Italy, *vis-à-vis* Corfu, which are small and are petrified as if in a kind of very white limestone vase" "*Du duché d'Otrante. Je ne serois point étonné que l'on dût encore rapporter à l'espèce decrite dans l'article premier, les ichthyolites que M. Faujas de*

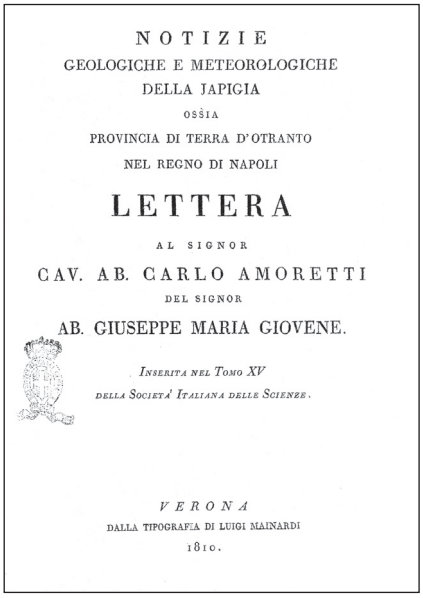
Saint-Fond cite comme provenant d'Alessano, à l'extrémité de l'Italie, vis-à-vis Corfou, et qui sont petit et comme pétris dans une vase calcaire très-blanche" (Figure 7B).

So we can say that the aforementioned famous list lasted for at least a third of a century, not only in France, but also in England and Italy, and resisted until the beginning of the spread of the monumental publication of Louis Agassiz, as his "Research on Fossil Fish" ("*Recherches sur le Poissons Fossiles*"), the first volume of which was published in Neuchâtel in 1833. Unfortunately, although this publication still today represents a cornerstone of the palaeontology of fish, it does not describe any findings from Salento. Indeed, it even completely omits the previous descriptions, and almost caused the loss of the memory of these, at least at the international level. This sort of European oblivion has its reasons, in that Agassiz found the financing and support for his research particularly in Paris and London, which was above all, for the preparation (i.e., engraved plates were very expensive, and very time-consuming to prepare) and printing (in five volumes) of his monumental publication. It seems to me significant that this same Louis Agassiz, the protagonist of the largest project on the study and documentation of fossil fish that had ever been made at that time, addressed a letter to Italian scientists who were gathered in their second national congress (held in Turin in July 1840) where he defined the Italian fossil fish that were known at the time. Here he declared that they originated from just three fossil sites: Monte Bolca, Senigallia and Castellammare!

The first description: the "letter" of Abbot Giuseppe Maria Giovene

In 1810, a booklet was printed at Luigi Mainardi printing in Verona that was to be of crucial importance in the history of the knowledge of the fossil fish of Salento: "Geological and meteorological news of Japigia, as the Province of the Land of Otranto in the Kingdom of Naples". This booklet was in the form of "A letter to Mr. Cav. Ab. Carlo Amoretti from Mr. Ab. Giuseppe Maria Giovene" (Figure 8).

Abbot Giuseppe Maria Giovene (1753-1857) was a central figure in the development of the geological and palaeontological studies of Salento. He was born in Molfetta and studied law in Naples, but he was initiated into his naturalist passion by his friend Giuseppe Saverio Poli. In 1806, Giuseppe Maria Giovene returned to Puglia as Pope's Emissary to the Diocese of Lecce, before moving to Molfetta in 1816. Here, he taught natural history at the local seminary, and he established a Natural History Museum that brought together the many archaeological finds that he had collected in the karst valley of Pulo. He also set-up a physics laboratory with optical and electrical in-



NOTIZIE
GEOLOGICHE E METEOROLOGICHE
DELLA JAPIGIA
OSSIA
PROVINCIA DI TERRA D'OTRANTO
NEL REGNO DI NAPOLI

LETTERA

AL SIGNOR
CAV. AB. CARLO AMORETTI
DEL SIGNOR
AB. GIUSEPPE MARIA GIOVENE.

Inserita nel Tomo XV
della Societa' Italiana delle Scienze.

VERONA
DALLA TIPOGRAFIA DI LUIGI MAINARDI
1810.

Figure 8. The title page of the booklet printed in Verona in 1810, entitled "Geological and meteorological news of Japigia, as the Province of the Land of Otranto in the Kingdom of Naples: Letter to Mr. Cav. Ab. Carlo Amoretti from Mr. Ab. Giuseppe Maria Giovene ".

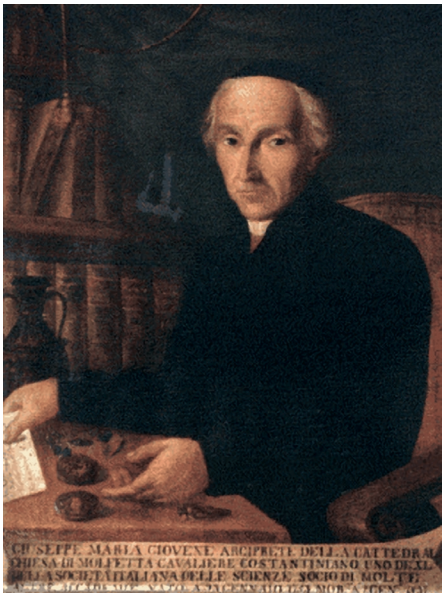


Figure 9. Abbot Giuseppe Maria Giovene (1753-1837).

struments. The name of Giuseppe Maria Giovene (Figure 9) has always been associated with the history of Pulo, in which he discovered the formation of nitro, for the production of gunpowder.

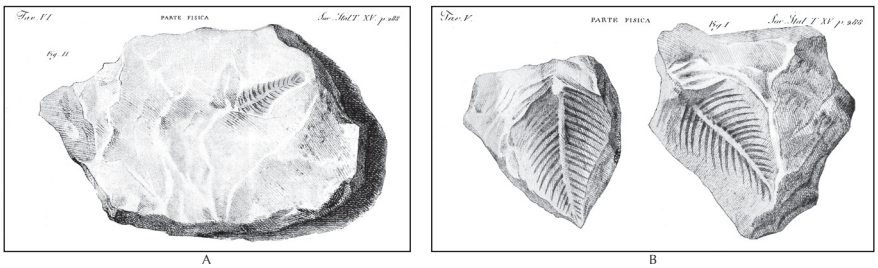
The aforementioned booklet printed by Giovene in Verona was also dedicated to the description of the rock that makes up the territory of Japigia, in practice the current Salento. The text was very clear and was organised into eight parts, as: a general overview of the soil of the region; followed by the separate and detailed descriptions of the two main types of rock that are typically found in this region (it was in these two paragraphs where the fossil content of the rock was also described); followed by the description of the "other overlying materials", the sulphurous springs, some caves, the springs of Manduria; and finally, a series of meteorological information concerning the local weather. The two main rock types that characterise the Salento soil are here clearly identified as the Cretaceous white limestone, which Giovene called "hard Apennine limestone rock" ("*Pietra Forte Calcareo-Appenninica*"), and the soft Miocene biomicrite, or Lecce stone, which Giovene called

"soft limestone rock" ("*Pietra Calcarea tenera*"). In his text, which is crucially important to our story, Giovene makes it known that both of these rock types that are typical of Salento contained fossils, and especially those of fish.

For the "hard rock", Giovene distinguished two varieties: one that breaks "with a powdery and soft fracture", and the other "with an almost silicaceous fracture". Marine fossils, and especially fish, were present in both of these rock types. This first description of the Cretaceous fossil fish of Salento is so detailed and interesting that is worth reporting it in full, as translated here from the original text: "In one, as well as in the other towards the last Promontory, there are some ichthyolites, or rather I should call them better ichthyol stones (*Icziotipoliti*). I accompany with this letter of mine the drawings of two such ichthyol stones (*Icziotipoliti*) that were found near Barbarano. The one marked with number 1 is in the second variety of rock, the other one marked with number 2 is in the first. Our celebrated friend the late Abbot Fortis, to whom I showed these pieces that were given to me many years ago when I made a short trip in this Province, mentioned them in some place in his Memoirs, although where at present I do not recall. The one marked with number 1, which appears to be the impression of a bream, is not entirely preserved in the stone, with only the concave impression of the backbone, which is, however, still intact in some parts. No trace can be found of scales, or of other parts that might be of the fish. Thus, it is a pity that the piece is not whole, and that it lacks in particular the part of the head. The piece marked with number 2 has the impression of a small fish, for which there are no characteristics that can be made out such that it can be identified. Here again, there is no trace of scales or fins, but only the concave impression of the small fish. Who knows, however, whether the continuation of my investigations, which have so far been fruitless for me but which I will regretlessly continue, will provide specimens that are both better preserved and more instructive. However, and as also agreed on by our late learned friend, there is no doubt that such ichthyolites have characteristics such as to be distinct from similar rock specimens that are known in other countries."

Abbot Giovene attached to his Memoirs the indicated two original drawings (Figure 10), which are therefore the first representations of the fossil fish from the Cretaceous era of Salento.

The reading of the above extract tells us that "many years before" (with respect to 1810), the same Giovene who received the gift of these two specimens of fossil fish that he described, showed them to his friend Abbot Alberto Fortis, who - he recalled - mentioned them in some of his writings. Here, then, is the indication of the source of that first mention of the presence of fossil fish in Salento that was reported in the "Letters" published by Fortis in 1784. This was probably just the result of the information that Giovene passed on to Fortis during the journey that Fortis made in Puglia in the au-



A B

Figure 10. Plates 1 **(A)** and 2 **(B)** of the 1810 publication of Abbot Giuseppe Maria Giovene. These represent the first images of the fossil fish of Salento. Note how the specimen in Plate 2 is preserved as the impression and the counter-impression.

tumn of 1873. Of course, the only known specimens were the two fish that had been described and reproduced in the original drawings published in 1810 by Abbot Giovene. However, it must be noted in this regard that while Abbot Giovene reports that the two specimens of fossil fish were collected in the vicinity of the town of Barbarano, Fortis reports the location of the fossils as Alessano; namely, the larger town located immediately north of Barbarano. Then already by the last part of the 1700's, this approximation was spread throughout Europe, with the name of the town of Alessano associated with the ichthyofossiliferous site of Salento.

With regards to the Miocene biomicrite, Abbot Giovene gave a detailed description, focusing on the softness that makes this rock suitable for processing, such that he described precisely the raw material used for the architectural decoration of the towns of Salento. The description of the fossils that this rock contained is also well detailed, and deserves to be reported here, as translated here from the original text: "You can well imagine that this rock contains many marine products mixed in with it. And in this way it is such that the beautiful shells sometimes even seem fresh, and are intact, with abundant corals, and Millepora, and Halcyonium, and other such marine trifles". Of course, he also described the fossils of the fish in detail: "...Similar to the Maltese rock, also for the Leccese rock, the glossopetre [fossilised shark teeth] are very abundant, which are called *linguæ melitenses* by some naturalists, and "tongues of thunder" by the Lecce people. This is an important observation for those who want to advance their geological theories." And he continued again: "The second thing to be noted is that it is never that entire skeletons of fish, or impressions of them, are found. It is really true, however, that there are frequent pieces, and pieces of big fish can be found."

In addition to the perfect and precise descriptions of the two distinct and characteristic ichthyofauna of Salento, as one from the Cretaceous and the other from the Miocene, Abbot Giovene concluded his pages of palaeontology by giving a particularly modern interpretation of the presence of the

marine fossils in these two main carbonatic formations of Salento (as translated here from the original text): "I do not want to provide reflections, nor do I want to abandon myself to endless theories, but rather I take pleasure in keeping solely to the facts, that the true natural science is for us mere mortals nothing more than the story of the facts." However, he did not resist the temptation to make his own judgments, and indeed, he added in a footnote to the page: "Who does not want to see a sea flood, which has carried these Tertiary materials, bearing them to the Apennines chain? Our theory-makers cannot believe in anything different from a permanent seabed; I see a seabed that has been transported from God knows what partial catastrophe."

In 1818, the famous geologist and palaeontologist Giovan Battista Brocchi also travelled to the Land of Otranto, and he analysed the Miocene biomicrites of the surroundings of Lecce on the spot, with the only stated purpose of seeking unlikely traces of volcanic rock that, of course, he did not find. Nevertheless Brocchi had to have noticed the presence of the fossils, such as to entice the same Oronzo Gabriele Costa, whom he had met in Lecce on the same occasion, to carry out his own research into these (Ruggiero, 2015).

Figure 11. Oronzo Gabriele Costa (1787-1867).

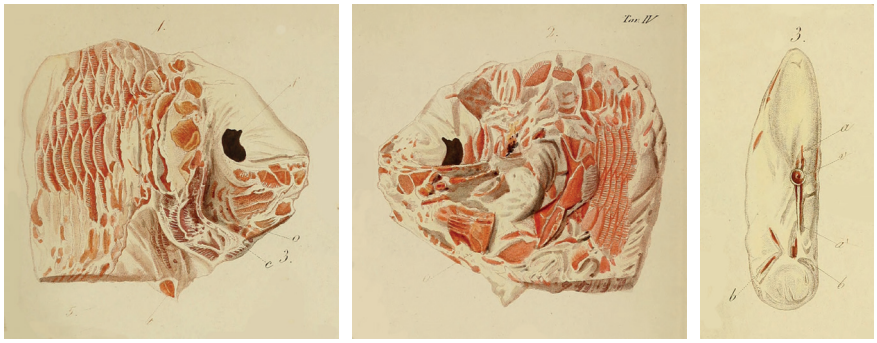


Figure 12. Plate IV of Part I of "Palaeontology of the Kingdom of Naples" by Oronzo Gabriele Costa, published in Naples in 1850. The fossil fish that is reproduced in Figures 1 to 5 is a *Beryx radians* Agassiz, which was fossilised in three-dimensions and collected from the Miocene biomicrites that surround Lecce.

The studies and discoveries of Oronzo Gabriele Costa, and the activities of Giovanni Capellini

In the mid-1800's, the Salento doctor Oronzo Gabriele Costa (1787-1867; Figure 11) started his naturalist and palaeontological research throughout the Kingdom of Naples. His studies on the fossil fish were mainly concentrated in Pietraroja and in Giffoni Valle Piana, but Costa also collected, studied and published on a large number of ichthyolites from Salento, his Region of origin. Although Oronzo Gabriele Costa was born in Alessano, which we know was quoted as a place where fossil fish had been collected since the end of the 1700's, he was never involved with these findings. Indeed, all of the Salento fossil fish collected and described by Costa came from the Miocene biomicrites, or Lecce stone, while this distinguished scientist did not describe any samples from Cretaceous limestone.

Already in Part I of his monumental "Palaeontology of the Kingdom of Naples", which was printed in 1850 at the Tramater printer in Naples, we find the description of two specimens of bony fossil fish of Lecce stone, as well as a large number of Selachii teeth. The first specimen described by Costa was actually collected by his son Giuseppe, who regularly frequented the Lecce stone quarries, buying the various local specimens on behalf of his father. The same Giuseppe Costa had made a brief mention of the discovery of this important piece of fossil fish in one of his reports that was read at the Academy of the Aspirant Naturalists in Naples in the meeting of 16 January, 1848. This was the head and the first half of the trunk of a fish of medium size (the fragment is 86 mm in length), which was preserved through three dimensions and almost completely free from the biomicrite matrix (Figure 12). I leave the description of this specimen and the circumstances of its discovery to the

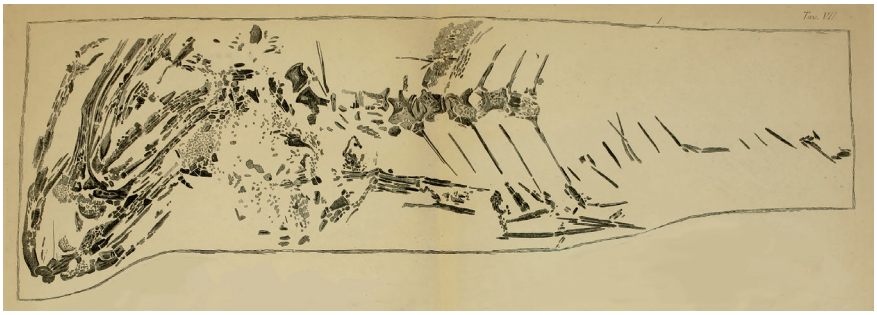


Figure 13. Detail of Plate VII of Part I of "Palaeontology of the Kingdom of Naples" by Oronzo Gabriele Costa (1850), with a reproduction (Figure 1) of the *Cheirolepis* sp., collected in the Miocene biomicrite in the surroundings of Lecce.

same Oronzo Gabriele Costa (page 53), as translated here from the original text: "The way in which the outer form of this fish is preserved is particular, with intact scales that are ordered almost normally, while the flesh has been replaced by the same limestone material in which it was enclosed. And in the inner part, the skeleton is still preserved, which is easily seen in the middle of the rock on the side of its fracture [see Figure 12]. This is the most beautiful example of an ichthyolite obtained by Mr G. Costa from the Lecce limestone, both for the preservation of its external form, and for the way it is petrified. It was taken from a depth of 80 palms from ground level, which lies about 300 palms above the current sea level". Costa attributed this fossil fish to the species *Beryx radians* Agassiz, and described it in detail on pages 51-54 of Part I of his "Palaeontology of the Kingdom of Naples", illustrating it in Figures 1 to 5 of the beautiful drawings of Plate IV of the same volume (Figure 12).

The second fossil fish that was described by Oronzo Gabriele Costa in the same Part I of his "Palaeontology of the Kingdom of Naples" also came from the Miocene biomicrites. This was classified as *Cheirolepis* sp., and described on pages 131-135 and illustrated in Figure 1 of Plate VII of the same volume (Figure 13). Again, I leave the significant description of the specimen to the same Costa (page 131), as translated here from the original text: "The several times mentioned tufaceous, fine-grained and tender Lecce limestone often reveals parts of fish, and impressions of them. However, so far there has been no better specimen than the *Beryx radians* that has been mentioned on page 51 of this publication. The characteristics of this rock seem unsuitable to ensure the preservation of such animals. Therefore, the specimens that it encloses are generally broken, disjointed, and also with altered and very brittle skeletal parts. What is represented in Plate VII, Figure 1, is one of the least spoiled, such that a fish can be recognized, which one would say to be a *Merlucius*, or other similar Gadino. The various parts of it not only lie out of position, and are in some disarray, but they are also on different planes, with some more superficial, oth-

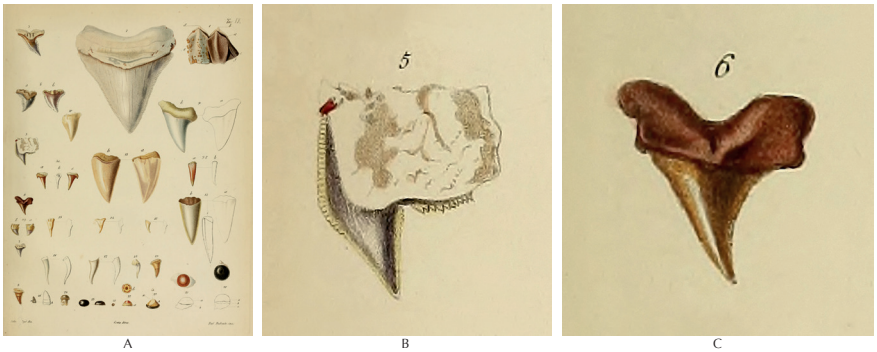


Figure 14. The first iconographic reference to the fossil shark teeth of the Miocene biomicrite of Salento is in this Plate IX **(A)** of Part I of "Palaeontology of the Kingdom of Naples", published in 1850. Indeed, the Plate contains the drawings of selachian teeth obtained by Giuseppe Costa (Oronzo's son) from the biomicrite around Lecce. These particular specimens are those of Figures 2-9, 10-12, 17 and 18. The specimens from his Figure 5 (*Galeocerdus rectus* Costa) **(B)** and Figure 6 (*Otodus salentinus* Costa) **(C)** belonged to new species, which therefore also represented the first new species of fossil fish described from this Salento site.

ers more deeply embedded. Hence the former crumbles while the latter is still deeply embedded, such that they cannot be stripped of the stone material that hides them without destroying the material of the bones themselves. Hence, they are very sensitive to handling. Only the cephalic bones and the jaw have remained together, inasmuch that the shape of the head can be recognized, as seen from the bottom or from the throat. The two mandibular arches are narrow and long and joined between themselves. A large bony piece stands out from the mandibular symphysis, which is wider than long, or as if it was placed sideways. This might be the remains of the hyoid bone."

Of course, most of the fossil fish specimens that were described by Oronzo Gabriele Costa are shark teeth that his son Giuseppe used to buy directly from the quarrymen of the surroundings of Lecce. What Costa himself wrote regarding these is interesting, as translated here from the original text: "The giant family of *Plagiostomi* left many remains of itself on the ancient sea bottoms. Nature was lavish in arming them with their numerous teeth, relevant and solid; of these there is a great abundance in land once covered by the sea, and now made arid. Nothing else is left of such fish, but few and not characteristic vertebrae. These teeth are abundant throughout the Tertiary soils of the entire Italian peninsula: and particularly in our territories, there are plenty in the limestone tufa of Lecce and the nearby Calabria. It has already been mentioned that they have been given different names at different times and by different peoples, and also by the common people; but those that most often dropped into our hands are of the *Carcharias* and *Oxyrhina*

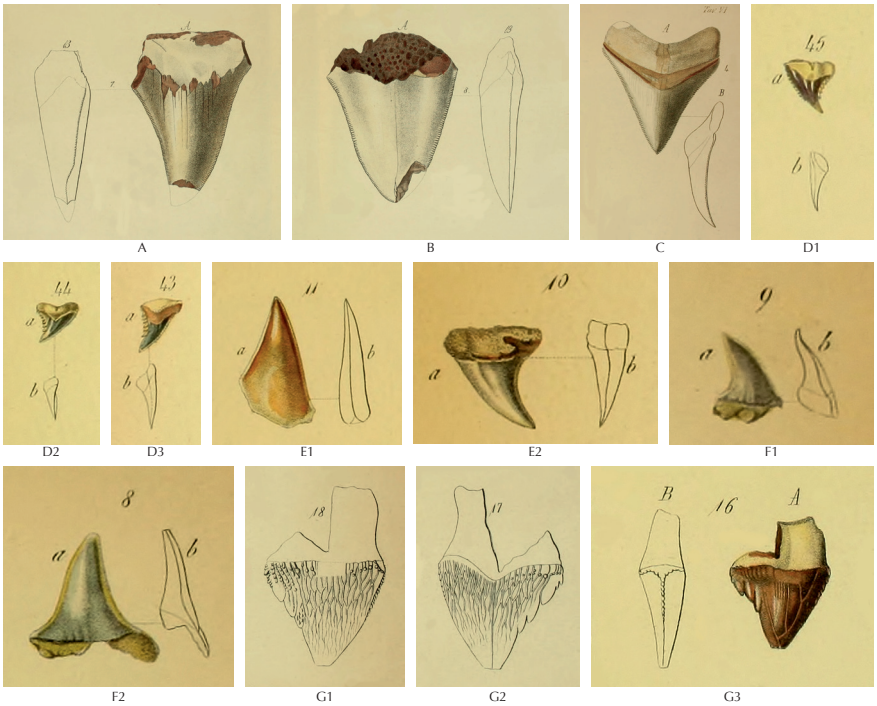


Figure 15. The seven new species defined by Oronzo Gabriele Costa in Part II of "Palaeontology of the Kingdom of Naples" (1856): *Carcharodon tumidissimus* Costa (Plate V, Fig. 7) **(A)**, *Carcharodon latissimus* Costa (Plate V, Fig. 8) **(B)**, *Carcharodon arcuatus* Costa (Plate VI, Fig. 4) **(C)**, *Hemipristis minutus* Costa (Plate VII, Figs. 43-45) **(D)**, *Oxyrhina tumidula* Costa (Plate VII, Figs. 10, 11) **(E)**, *Oxyrhina brevis* Costa (Plate VII, Figs. 8, 9) **(F)**, and *Rhytiosodon tuberculatus* Costa (Plate VI, Figs. 16-18) **(G)**.

species, which were still interpreted in various ways. The most common and general opinion was that they are tongues of snakes and birds, and they are indicated by this name. Thus scholars applied the glossary of approximate ideas taken from the native language and called them *glossopetrae*, equivalent to petrified tongues. Their arrowhead shape, and that they sometimes were found in the walls of buildings struck by lightning, promoted the concept in the inhabitants of Lecce that they were indeed the cause of the cracks in the buildings; and so they were called tongues of thunder; confusing also in this way the cause and effect."(pages 107-108).

In this same Part I of "Palaeontology of the Kingdom of Naples", Oronzo Gabriele Costa described salachian teeth from the Miocene biomicrites of the surroundings of Lecce that belonged to nine species, all illustrated in Plate IX of this volume (Figure 14): *Galeocerdus rectus* Costa (Plate IX, Fig. 5), *Sphyrna prisca* Ag. (Plate IX, Fig. 7), *Hemipristis serra* Ag. (Plate IX, Figs.

3, 4), *Otodus salentinus* Costa (Plate IX, Fig. 6), *Carcharodon megalodon* Ag. (Plate IX, Fig. 2), *Oxyrhina xiphodon* Ag. (Plate IX, Fig. 9), *Oxyrhina hastalis* Ag. (Plate IX, Figs. 10, 12), *Lamna contortidens* Ag. (Plate IX, Fig. 18), *Lamna* (*Spherodus*) *longidens* Ag (Plate IX, Fig. 17).

With this publication, therefore, we can record his description of the first two new taxa for science from the Miocene biomicrites of Lecce: *Galeocerdo rectus* Costa (which he described on pages 111-112), and *Otodus salentinus* Costa (which he described on pages 115-116).

In 1856, Oronzo Gabriele Costa published Part II of his "Palaeontology of the Kingdom of Naples", in the preface of which he summarised the efforts he had made over the previous two-and-a-half years to increase the excavations, to enrich the collections, and to increase knowledge. In terms of what was done in Salento, the same Costa wrote in this preface (page 6): "Inviting as well the oldest of my sons, Giuseppe, to also redouble his efforts to search for those tufa limestone outcrops known as Lecce stone, we have obtained many other remains of *Plagiostomi*, of which this rock is full."

This intense activity led to the collection of hundreds of specimens of fossils of selachian teeth, which formed the subject of a substantial part of Part II of "Palaeontology of the Kingdom of Naples". In this, Oronzo Gabriele Costa described the following species, all from the area around Lecce: *Carcharodon auriculatus* Ag., *Carcharodon rectidens* Ag., *Carcharodon productus* Ag., *Galeocerdus rectus Costa* (already described in Part I), *Galeocerdus denticulatus* Ag., *Galeocerdus aduncus* Ag., *Galeocerdus minor* Ag., *Corax egertonii* Ag., *Corax appendiculatus* Ag., *Hemipristis paucidens* Ag., *Hemipristis serra* Ag., *Notidanus recurvus* Ag., *Lamna elegans* Ag., *Otodus appendiculatus* Ag., *Oxyrhina desorii* Ag., *Oxyrhina mantellii* Ag., *Oxyrhina subinflata* Ag., and *Oxyrhina basiculata* Sismonda.

In addition, in the same Part II of this publication, as well as the species that were well known and had already been described by previous authors, Costa added some species that were new to science; namely (Figure 15): *Carcharodon tumidissimus* Costa (Plate V, Fig. 7), *Carcharodon latissimus* Costa (Plate V, Fig. 8), *Carcharodon arcuatus* Costa (Plate VI, Fig. 4), *Hemipristis minutus* Costa (Plate VII, Figs. 43-45), *Oxyrhina tumidula* Costa (Plate VII, Figs. 10, 11), *Oxyrhina brevis* Costa (Plate VII, Figs. 8, 9). Finally, he also describes a new genus: *Rhytiosodon tuberculatus* (Plate VI, Figs. 16-18).

So, at the end of the description of the fossil fish of Salento collected from the Lecce stone, in his Part II (page 92), Costa took stock of the situation and prepared a synoptic scheme in which he claimed to have identified and described as many as 35 species of fossil fish from this site near Lecce, of which nine were species new to science. Costa also had to describe the exact places in which these specimens were collected: "From the Lecce limestone, where they were found in the quarries to the southwest of the city, and at about half a mile from its walls." (Page 64).

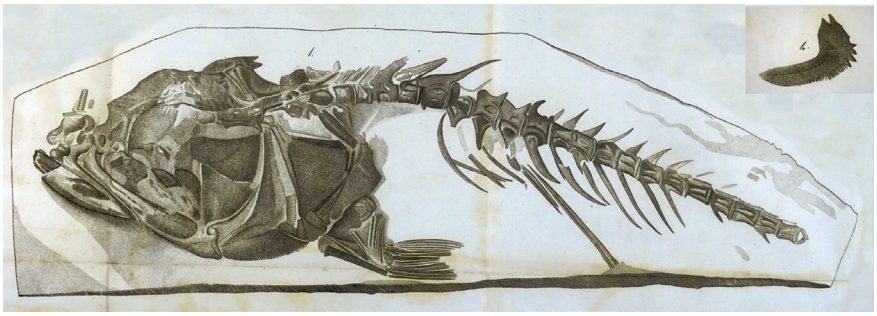


Fig. 16. *Luspia casotti* Costa, the ichthyolite illustrated in Plate XII, Figures 1 and 4, of Part III of "Palaeontology of the Kingdom of Naples", published in 1864 by Oronzo Gabriele Costa.

Some species were said to be very abundant, like *Galeocerdus minor*, and above all, *Corax appendiculatus*, which, as Costa wrote: "We have over 120 specimens of these small teeth, all of which were collected from the Lecce limestone, among which others were just defined as *Galeocerdo*, with many varieties." (page 66).

In 1860, Oronzo Gabriele Costa published a special volume entitled "Italian Fossil Ichthyology" ("*Ittiologia Fossile Italiana*"), with the intent – as he had already stated as the subtitle - to serve as a "Supplement to the research into the fossil fish of L. Agassiz". In this, Costa described and illustrated an example of an ichthyolite preserved with its anatomical connections partially intact, which included the head and the front of the trunk, with the remains of the axial skeleton and the body covering. For this specimen, Costa established a new genus and a new species, *Ferrarius caputi* (pages 20, 21; Plate 2, Figs. 5, 6), dedicating the genus name to the memory of the first Salento naturalist, the Antonio de Ferrariis to whom I devoted my attention in the first part of this report (this specimen in particular was then described more fully and illustrated in better detail in Part III). In the same publication Costa also described the presence in the Lecce stone of the teeth of *Sphaenodus irregularis* Ag. (page 53).

In 1864, Oronzo Gabriele Costa published Part III of his "Palaeontology of the Kingdom of Naples", which again contains the descriptions and illustrations of new significant ichthyolites from the Lecce stone. The most interesting finding is an ichthyolite that is anatomically connected and relatively well preserved, with a total length of about 27 cm, which Costa described as a new genus and a new species: *Luspia casotti* (pages 87-93; Plate XII, Figs. 1-4). The description of where this specimen was found is also interesting, and this also gives us the name of one of the people in Lecce who greatly helped in the collection of the fossil samples from the biomicrite quarries around the city, and gave them to Giuseppe Costa; as the senior Costa wrote,

as translated here from the original text: "This ichthyolite was taken from the depth of 100 Neapolitan palms (equal to 26.45503 m) below the ground level; and from those quarries to the southwest of the city of Lecce, at a quarter of a mile from its walls. These quarries are precisely those that you meet on the road that goes to S. Cesario: obtained through the efforts of Mr. Barone Francesco Casotti."(page 92). Baron Francesco Casotti was a friend of Oronzo Gabriele Costa, and he operated his own quarries on the outskirts of Lecce, where he promoted the search for fossils in the Lecce stone. He then passed these specimens on to his naturalist friend. This activity continued even after 1824, when Costa left Lecce and moved to Naples, where Baron Casotti then sent his Lecce specimens (Ruggiero, 2015).

Luspia casotti (Figure 16) is the last of the series of four ichthyolites that Costa, as father and son, collected and described from the Lecce stone in terms of their specimens of bony fish that are anatomically preserved. This was preservation condition had been excluded by Abbot Giuseppe Maria Giovene. This was such that specifically this difference between those first descriptions at the beginning of the 1800's and the evidence demonstrated on site by the detailed work of collecting by these two Salento naturalists in the mid-1800's, prompted him to write to Oronzo Gabriele Costa the following interesting account: "In connection with this, it should be mentioned here that in the limestone tufa of Lecce, or the Lecce stone, whole skeletons of fish are never found, or in truth, impressions of them; but they are frequently instead bits and pieces of large fish. This assertion, true at the time when the said Giovine [*sic*] wrote, has now been shown to be false, as shown by the two specimens indicated in the first part of this publication, to which can now be added the document provided here, which is the best example of them all."(pages 92-93).

In the same publication, Costa returned to describe the specimen that he had defined in his "Italian Fossil Ichthyology " as *Ferrarius caputi* Costa, giving it a more precise and detailed anatomical description and illustrating it in more detail in his Plate IX, Figs. 5 and 6 (Figure 17).

In the same Part III, Costa also describes some selachian specimens: teeth of *Sphaerodus gigas* Ag., and some indeterminate vertebrae of sharks (page 124 Plate XII, Fig. 15) (Figure 18). He also noted, although without any iconographic sources, a "bone" of a fish which he compared to ichthyodorulite ("*Ittiodoruliti*") described by Agassiz, and to which he gave the name of *Rudianus* (page 136).

Finally, it should be remembered that in this Part III of his "Palaeontology of the Kingdom of Naples" Costa also hinted at a second Salento fossiliferous area that had for the first time provided specimens of the remains of fossil fish. This was in the area around Lugugnano, where scales were collected of unidentified fish in the clay that was believed to be of the Pliocene era. As Costa wrote: "The figuline clay of Lugugnano (Province of the Land of Ot-

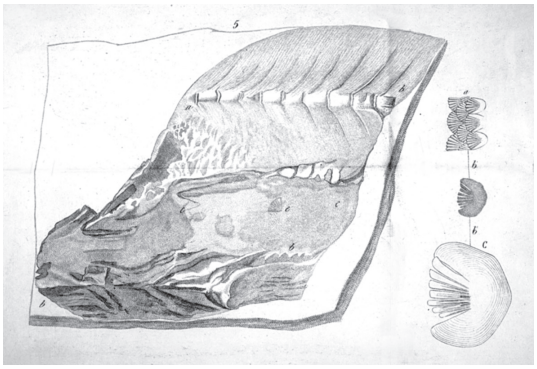


Fig. 17. *Ferrarius caputi* Costa, ichthyolite illustrated in Plate IX, Figs. 5 and 6 of Part III of "Palaeontology of the Kingdom of Naples", published by Oronzo Gabriele Costa in 1864, and found in the Miocene calcarenites in the area around Lecce.

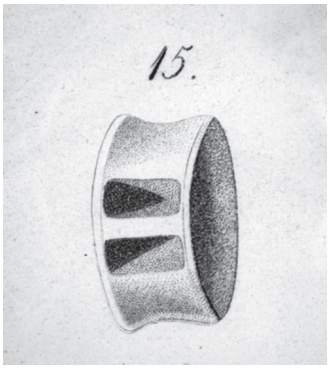


Fig. 18. Vertebra of an unidentified shark, as illustrated in Fig. 15 of Plate XII of Part III of "Palaeontology of the Kingdom of Naples" (1864) by Oronzo Gabriele Costa, collected in the Miocene biomicrites of Lecce.

ranto) provided us with some scales, which seem to me to have come from *Percoideo* of the *Mugini* family". (pages 135-136).

The last publication of Oronzo Gabriele Costa was the "Appendix to the Palaeontology of the Kingdom of Naples", printed in 1864, in the month of December, at the Printing House of Antonio Cons in Naples. In this, Costa summarises the knowledge about the fossil fish of the Lecce stone, although he also considered with uncanny clarity that the site of Lecce would never cease to be studied from the point of view of its inexhaustible fossils. Indeed, he wrote that "The soft limestone of Lecce frequently contains the teeth of *Squalidei*, and pieces of boney fish. So these will always be collected to increase our knowledge of the ancient ichthyological fauna."(Page 88).

In a brief schematic summary (which was inserted between pages 102 and 103), Costa proposed a comparison between the species of fossil sharks of the United States (as described by the palaeontologist Gibbes) and those typical of the Neapolitan Provinces. From the diagram shown, it can be seen that there were 33 species of fossil sharks found in the Lecce stone.

Not only has there been remarkable variety in the Salento Miocene biomicrite ichthyofauna fossils, but also there have been a great number of specimens found, such that the spread of these fossils has been possible also outside of the Kingdom of Naples, through exchanges with other collectors and enthusiasts. The same Costa commented significantly about this: "As far as the specimens are concerned, just my private collection contains hundreds of them now, inasmuch as more other palaeontological laborato-

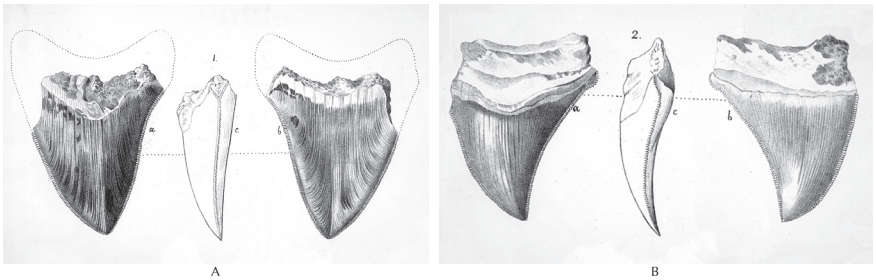


Fig. 19. *Carcharodon crassus* Costa **(A)** and *Carcharodon auriculatus* Ag. **(B)** variety *falciformis* Costa, the final two new forms that Costa described as coming from the Miocene biomicrite of Lecce (1864).

ries can be supplied with them, as has already been done for certain ones. Nevertheless, with the collection of these teeth growing daily in number, new species will be found if it is true that certain differences in shape and size depend on the species. But as this is a question that is difficult to answer, I will note here two others forms that have gained my attention "(page 101).

And indeed, also in this Appendix, Costa describes two new forms: *Carcharodon crassus* Costa (pages 102-103; Plate VI, Fig. 1) and *Carcharodon auriculatus* Ag. variety *falciformis* Costa (page 104; Plate VI, Fig. 2) (Figure 19).

This thus concluded the involvemment of Giuseppe and Oronzo Gabriele Costa in the collection and description of the fossil fish of Salento. It remains difficult to explain the reason why both of these active naturalists who had an efficient and dense network of local contacts did not manage – over the 20 years of their activities – to also collect fossil fish from the Cretaceous limestone around Alessano. This was despite it being the birthplace of Oronzo Gabriele (born in 1789), and despite information about the existence of these findings having been present in the literature since 1784.

From 1868, another distinguished scientist began to work systematically on the fossils of Lecce stone: Giovanni Capellini (1833-1922), who was a distinguished geologist and palaeontologist at the University of Bologne. On the invitation of *Cavalier* Ulderigo Botti, an earnest local enthusiast, Capellini made three trips to the Land of Otranto between 1868 and 1877, all to visit the quarrying activities in the area and to collect palaeontological specimens. At the end of these field trips, Capellini published a special monograph that he dedicated to the geological classification of the Lecce biomicrites and in which he described the palaeontological content with particular emphasis on the marine mammals. Of special interest, from our point of view, there was the description of a speciman that represented the first fossil swordfish found in this area, which Capellini described as *Brachyrhyncus teretirostris* Capellini. This precious speciman was lost, but as more recently established by Carnevale et al. (2002), it represented a fragment of the skull of *Makaira* cf. *M. nigricans* Lacepede.

Fig. 20. *Pristis lyceensis* Vigliarolo, a holotype of the Miocene biomicrite of Lecce, described in 1890.

In the late nineteenth century, the great spread of both printed scientific news and the scientific material itself (the latter that was promoted, at least in part, as we have seen, by the same Oronzo Gabriele Costa) necessarily led to a proliferation of interest and of studies on these fossil fish of Lecce stone. There were both studies aimed at the definition of the individual aspects of these fossil ichthyofauna of Lecce stone, as well as studies in which this same ichthyofauna was not the main object of attention, but instead served as a comparison in the description of other ichthyofauna.

Among the first of these, we can certainly note the study of U. Botti, resulting from which there was the description in 1868 of an ichthyolite that was anatomically connected and identified as *Luspia casotti* Costa.There was also the study of G. Vigliarolo, who in 1891 – on the basis of some rostral sections – described a new species of the genus *Pristis*, found indeed in the Lecce stone: *Pristis lyceensis* Vigliarolo (Figure 20) (moreover, Costa had already described these same findings as the teeth of dolphin).

Among the further studies, we can recall the beautiful monograph published in 1881 by Dr. Roberto Lawley, with a comparative description of the teeth of the *Carcharodon*, *Oxyrhina* and *Galeocerdo* genuses, both living and fossilised. Among those fossilised, he even included Miocene biomicrite species from the surroundings of Lecce.

Following the great cultural movement that was promoted primarily by the activities carried out on the spot by the Costas before and Capellini later, initiatives were also launched in Lecce for the collection and exploitation of these Miocene fossils of Lecce stone. These initiatives were certainly encouraged by the interest of nationally and internationally renown scholars who visited the stone quarries, as had done Giovan Battista Brocchi in the early 1800's, and then Giovanni Capellini in the second half of the same century. Indeed, following his third trip to Lecce, Capellini himself wrote about it: "In the spring of last year, 1877, I saw again the Land of Otranto, for the third time, and my satisfaction was great when I found in Lecce a provincial mu-

seum of geology and palaeontology, founded by *Cavalier* Botti, and a private collection of fossils of *Cavalier* De Giorgi, with numerous objects that, at least in part, would have provided a good show in a national museum, as it contained not only rare specimens, but certain fossils that are precious to geology and so far are unique in our country."(Capellini, 1878).

Thus, we know for certain that men like *Cavalier* Ulderigo Botti and *Cavalier* Cosimo De Giorgi were passionate palaeontologists who had important local collections of fossils that had been found through their continuous and constant monitoring activities in the areas around Lecce where these biomicrites were extracted. Also, these collections had become so well known and rich in significant specimens as to have formed in Lecce a real palaeontological Museum at the end of the nineteenth century.

Fig. 21. Tablet with two fossil teeth of shark from Lecce today preserved at the Museum of Paleontology of University of Florence (from Monechi & Rook, 2010).

Some specimens of fossil shark teeth collected in the surroundings of Lecce were also acquired at the Paleontological Museum of the University of Florence in the second half of the nineteenth century, under the direction of Professor Igino Cocchi (Figure 21).

The modern discoveries: Francesco Bassani and Geremia d'Erasmo

In 1873, the heirs of Professor Oronzo Gabriele Costa sold their ancestor's collection to the University of Naples. We have the written testimony through a report in an anonymous pamphlet that was printed at the presentation that the University of Naples held for the Vienna World Exposition of 1873. In particular, we read: "Of the Neapolitan Provinces, we must continue to increase the existing collections. These have seen large increases since the Ministry of Education was generous enough to provided 6,000 lire to the Museum, with which a part of the palaeontological collection of the meritorious Prof. Costa senior was bought. In this way, the ichthyolites of Pietraroja and

Fig. 22. Francesco Bassani (1853-1916).

Giffoni - two places that became famous among geologists for their fossils, as is Bolca – attract great interest of the scholars who visit our Museum of Geology. With approximately 4,000 lire, the Museum has so far purchased other parts of the collection of Costa, in which sediments of other Neapolitan provinces are well enough represented in terms of their organisms. Today, the number of specimens in this collection stands at 6,350. These ichthyolites of Pietraroja, Giffoni and Castellammare excel among the Neapolitan treasures, and those of the first two places in particular, which are rare and particular of this collection. The collections of bones of mammals of the caves of Cassino and Campagna are also outstanding - the remains of a crocodile, of *Pristis*, a beautiful set of teeth from sharks from the Province of Lecce, a shell of a *Chelonia*."(Anonymous, 1873: pages 70-71).

Thus, we know through this written document that already in 1873 the palaeontological collection accumulated by Costa that consisted of 6,350 specimens of fossils passed to the Museum of the Department of Geology of the University of Naples. The considerable sum (at the time) paid to the heirs of Costa was 10,000 lire, and we know too that this collection also included "a beautiful set of teeth from sharks from the Province of Lecce."

In the autumn of 1887, Professor Francesco Bassani (1853-1916; Figure 22) was awarded the chair of Geology at the University of Naples, who was a specialist in fossil fish. In the Museum annex of the Department of Geology he found this vast and interesting collection put together by Costa, which included, of course, also the fossil fish of Lecce stone.

Professor Bassani entrusted to one of his first Neapolitan students, M. Pas-

quale, the task of carrying out a systematic review of the fossil *Selacei* of southern Italy. This task resulted in a first publication in 1903, in which, however, Pasquale had not systematically faced the subject of the taxonomic redetermination of the dozens of species described by Costa for the Lecce stone. So it was the same Francesco Bassani who engaged in this research in the last part of his working life, which led to only two publications, in 1911 and 1915.

The first of these concerns the revision of the *Beryciformes* that Giuseppe Costa had collected in 1847 in the biomicrite quarries southwest of Lecce, along the road to San Cesareo. These had been included in the publication of Part I of "Palaeontology of the Kingdom of Naples" by Oronzo Gabriele Costa (see Figure 11), and were described as *Beryx radians* Agassiz. Bassani reclassified this specimen as *Myripristis melitensis* Woodward, and showed that the sample from Lecce was identical to contemporary individuals of the same species collected at Rosignano Piedmont and in Malta.

In his second study, published in 1915 (the year before his death), Francesco Bassani examined the fossil fish fauna of the Lecce stone in its entirety. This is a large, detailed monograph that is well illustrated and is dedicated - as might be suspected - mainly to the analysis and description of the shark teeth, as the characteristic fossils of Miocene biomicrites of the Lecce area. To compile this monograph, Francesco Bassani performed a full and complete census of the fossil fish of Lecce stone in the Italian public and private collections at the beginning of the twentieth century. It is thus through this catalogue that we know what fossil specimens of these fish were present at the time, on top of those in the Museum of Geology of the University of Naples (as a result of the acquisition by the University of the collection of Prof. Oronzo Gabriele Costa). This included the rich collection that Prof. Cosimo De Giorgi had put together at the end of the 1800's in Lecce. Further single exemplary specimens were held at the Universities of Pavia, Bologne (linked to the activities of Giovanni Capellini), and Palermo, as well as in the Institute of Higher Studies of Florence, in the Geological Office of Italy in Rome, in the Civic Museum of Natural History in Milan, and in the Laboratory of Natural History of the Technical Institute of Reggio Calabria.

From the detailed examination of all of this material, Francesco Bassani described the presence of 32 species, as the following: *Myliobatis crassus* Gervais, *Myliobatis microrhinus* Delfortrie, *Aetobatis arcuatus* Agassiz, *Pristis lyceensis* Vigliarolo, *Squatina* sp., *Carcharodon megalodon* Agassiz, *Carcharodon rondeleti* Müller & Henle, *Odontaspis acutissima* Agassiz, *Odontaspis cuspidata* (Agassiz), *Oxyrhina desori* Agassiz, *Oxyrhina hastalis* Agassiz, *Oxyrhina crassa* Agassiz, *Oxyrhina* sp., *Hemipristis serra* Agassiz, *Carcharias (Prionodon) egertoni* (Agassiz), *Carcharias (Aprionodon) basisulcatus* (Sismonda), *Carcharias* sp., *Galeocerdo aduncus* Agassiz, *Sphyrna prisca* Agassiz, *Notidanus primigenius* Agassiz, *Myripristis melitensis* (Wood-

Fig. 23. Geremia D'Erasmo (1887-1962).

ward), *Cybium bottii* (Capellini), *Cybium* sp., *Lepidopus lovisatoi* (Bassani), *Lepidopus* sp., *Histiophorus* sp., *Serranus casotti* (Costa), *Crysophrys* sp., *Dentex* sp., *Diodon scillai* Agassiz, *Diodon vetus* Leidy, *Trigloides dejardini* von Beneden.

We can note that, of the nine new species Oronzo Gabriele Costa had established for the fossil specimens of Lecce stone, after this revision by Francesco Bassani, only one remained valid, which was also attributed to a different genus from that originally specified: *Serranus casotti* (Costa).

A turning point in the research on the fossil fish of Salento came about with the arrival on the scene of Geremia D'Erasmo (1887-1962). He started as a research assistant, and then became Professor of Palaeontology (figure 23), only later to move to occupy the Chair of Geology, to succeed his mentor Francesco Bassani. D'Erasmo was a native of the Province of Bari, and

Fig. 24. *Halec bassani* D'Erasmo: the first ichthyolite from the Cretaceous limestone of Salento to be described scientifically (specimens no. 680 and specimen no. 681 of the Museo di Paleontologica of the University of Naples, Federico II; curtesy of the Dr. Maria Carmela Del Re).

he was an expert on the geology and palaeontology of his native region. He had also cultivated numerous and effective local relationships that kept him updated on the palaeontological discoveries also of Salento (Capasso, 2000).

Thanks to this favorable combination of circumstances, it was Geremia D'Erasmo who started the scientific interest in the fossil fish of the Cretaceous limestone of Salento, abandoning - so to speak - his research activities and studies of the specimens of Miocene biomicrite. Indeed, already in 1911, D'Erasmo described four fossil fish specimens that were from different parts of Salento, although all were found in the "compact limestone, sometimes white, but more often tending to grey, layered, sound, with irregular fractures, which constitutes the whole backbone of the mountain system of the Land of Otranto." (page 1). The first specimen (preserved in part and counterpart: Figure 24) was a complete and well preserved ichthyolite with a total length of 125 mm, and it was described by D'Erasmo as a new and characteristic species, which he dedicated to his mentor: *Halec bassani* D'Erasmo. He acquired this for the collection of the Palaeontological Museum of the University of Naples, having bought it in 1908 from a stone mason in Acquarica: "This fossil comes from Acquarica del Capo, near Presicce; it was found there in 1897 by the master stone mason Gabriele Panese, between the stones that he had dug out from beneath the topsoil, at 30 cm or so in depth, during preparation for the cutting."(page 5).

The second specimen was described by Geremia D'Erasmo as *Scombroclupea macrophtalma* (Heckel), and it is a partial ichthyolite that has lost the end of the trunk, the tail pedicel area, and the tail (Today not findable at the Museum of Paleontology of the University of Naples). It was acquired in

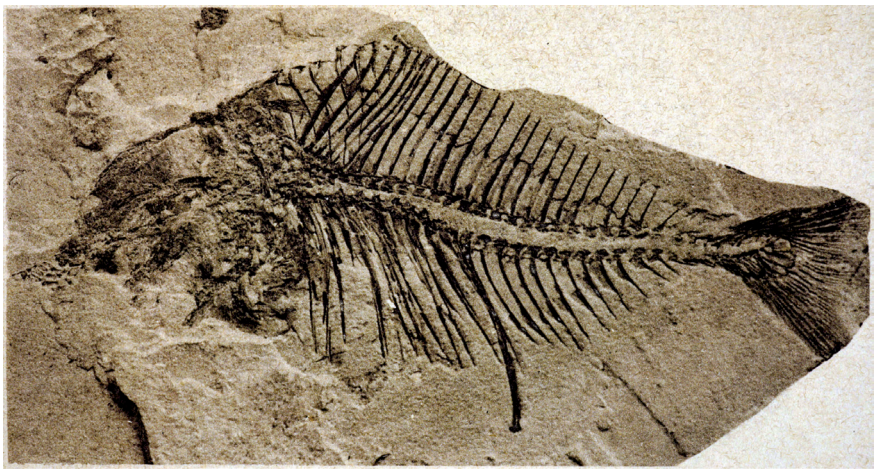


Fig. 25. *Coelodus costai* Hackel, collected in 1911 in the Cretaceous limestone of Alessano del Capo, and published by D'Erasmo in 1922 (Plate 1, Fig. 1).

the early years of the last century for the palaeontological collection of the Geological Office of Rome. "It comes from Nardò limestone, which is very similar to that of Hakel (Mount Libano). There was also another example found, missing the end of the trunk." (Page 6).

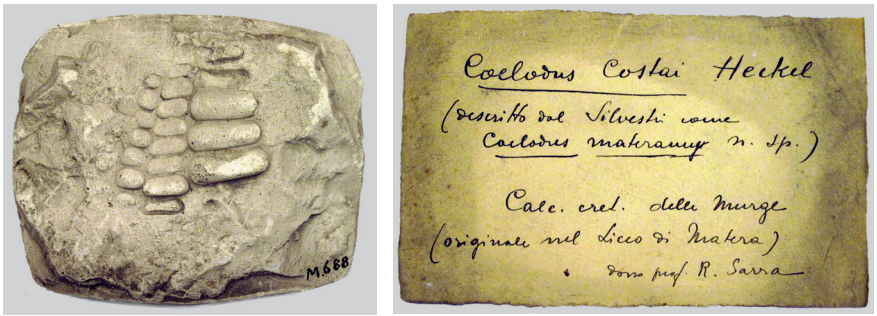
The last two specimens are fragments of Picnodont, described by the same D'Erasmo as *Coelodus* sp.. One came from the Cretaceous limestone that outcrops between Monteroni and Copertino, the other from Campi, from the outskirts of the village. One of these two specimens was part of the collection of Prof. Cosimo De Giorgi, who was one of the most active collectors and acquirers of fossils of Salento in the period between 1800 and 1900.

In this way, at 101 years from the first report of the presence of fossil fish in the Cretaceous limestone of Salento of Abbot Giusepe Maria Giovene, Geremia D'Erasmo was the first to return to this subject and to identify that which we can certainly define as the first real collection of scientific palaeoichthyological testimonies. The presence of this characteristic ichthyofauna and comparisons with other Italian and foreign Cretaceous ichthyofauna, confirmed to D'Erasmo that the limestone with fish of Salento can be considered as of the Cenomanian era.

In the same year, in 1911, and a few months after having published these descriptions, Geremia D'Erasmo acquired a complete specimen with a length of about 11 cm from Dr. Liborio Salomi of Lecce. This Picnodont had been collected northwest of Alessano, in the area called Cornola (Fig. 25). However, this beautiful and complete ichthyolite was described scientifically by D'Erasmo only in 1922, as part of a larger publication that was a sort of miscellany of palaeoicthyology of southern Italy, indicating it as *Coelodus costai* Heckel (D'Erasmo, 1922).

In the early years of the last century, there was also a donation by a certain Lucia Guida to the Museum of Palaeontology at the University of Naples, of a fragment of an ichthyolite found in "Murge, Lecce" that was certainly from the Cretaceous limestone of Salento (Inventory N° M.689).

It is also worth mentioning here that in 1923, Dr Alfredo Silvestri described a large-sized Picnodont left splenial tooth fragment that was found in a calcareous piece of rock. This rock had been used as an ornament in the garden of a private house in Matera (that of Mr. Tommaso Viziello), and it was from the part of the Murge known as "*Gravina Materana*". The rock characteristics leave no doubt that also this specimen is part of the fish fauna of the Cretaceous limestone of Salento, although from that part that surfaces in Basilicata. Moreover, Silvestri described a new species based on this fragment, *Coelodus materanus*. From this specimen, which should still be kept at the Technical Institute of Matera, a mold was made that was deposited at the Museum of Paleontology of the 'Federico II' University of Naples (Figure 26). However, when this was analysed by D'Erasmo (in 1924), he denied that this is a new species, and in-



A B

Fig. 26**.** Plaster-cast of the so-called *Coelodus materanus* Silvestri **(A)**, with the corresponding label signed by Geremia D'Erasmo **(B)**, originally from the Cretaceous limestone that outcrops in Matera Murgia. In 1924, D'Erasmo described this species as synonymous with *Coelodus costai* Hackel. This specimen is kept at the Museum of Paleontology of the 'Federico II' University of Naples (Inventory N° M.688).

stead also attributed it to *Coelodus costai* Heckel, which he had described as a typical species of the Cretaceous limestone of Salento.

All these findings that were concentrated in the first decades of the last century spread the news of the presence of specimens of fossil fish in Cretaceous limestone that outcrops in Salento, especially in the areas of Nardò and Alessano. This is also confirmed as these fossil fish were already held in various collections by the beginning of the last century. They were known to be held in Rome (in the Geological Office), Naples (in the Palaeontological Museum of the University), and in Lecce (in the Natural History Laboratory of the Technical Institute, and in the private collection of Prof. Cosimo De Giorgi). This is also confirmed because in the Capasso Public Collection there are some ichthyolites from Alessano del Capo that still bear their original label with the date of their acquisition as 1915-1916 (Capasso, 2000) (Figure 27).

Current events

Two excavation campaigns have identified ichthyofossiliferous-rich layers within the Cretaceous limestone of Salento. These are specifically conducted in the area around Nardò (in the district of Canale, and in the locality of Porto Selvaggio) by the Civic Museum of Natural History of Verona, under the direction of Dr Lorenzo Sorbini. With these focussed palaeontological excavations, it has been shown that this limestone contains one of the richest, most-varied, plentiful and best-preserved Cretaceous ichthyofauna known today. The material acquired is remarkable and the preliminary news of the discoveries was reported by Dr Sorbini in a brief publication in 1978.

These palaeontological materials have been acquired by the Museum of Natural History of Verona, where these specimens form the largest collection (which consists of about 1,500 exhibits of fossil fish). Through successive campaigns, smaller collections have even been established in the University Museums of Lecce (which has 800 specimens of fossil fish) and Pisa (with a group of seven fossil fish), and in the city of Nardò (which holds a collection of about 50 fossil fish) (Belmonte *et al.*, 2015). These new collections can be added to the old ones, which mainly derive from the activities of Geremia D'Erasmo, who formed a small collection at the University of Naples, Francesco Capasso, who at the beginning of the last century had collected some fossil fish, the extant author, who amassed a collection of 55 fossil fish in Montefalcone (today at Chieti), and Cosimo De Giorgi, who had a similar collection in Lecce.

At the same time Dr Giuseppe Leuci in 1970 donated to the Museum of Paleontology at the University of Naples his private collection of fish fossils collected in the vicinity of Nardò; this collection, consisting of 26 specimens, represent the majority of the Salento Cretaceous fossil fish still preserved in the Museum of Naples.

A large number of studies have been carried out for the description of the ichthyofauna, which was immediately shown to be composed predominantly of species new to science. The systematic study of these ichthyolites was entrusted by Lorenzo Sorbini to Prof Lois Paul Taverne, of the Royal Istitute of the Natural Sciences of Belgium, in Brussels, who only at a later time decided to request the collaboration of the present author. This intense scientific activity has to date produced a series of 38 monographs on this subject, which represents a monumental amount of knowledge of the Cretaceous fossil ichthyofauna of Salento.

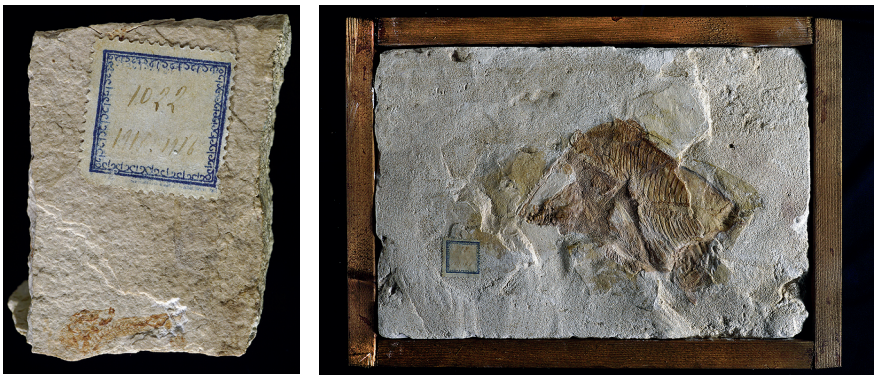


Fig. 27. Two ichthyolites collected in 1915-1916 (as can be seen in the lower part of their labels) acquired by yhe Capasso Public Collection, that are from the Cretaceous limestone of Alessano del Capo.

Finally, in 1982, the establishment of the association called the "Salento Naturalists Group" made it possible to coordinate the monitoring of the quarry activities of the Lecce stone as well as for the quarries around Nardò, so as to allow the Museum of the Environment of the University of Salento in Lecce to acquire a palaeontological collection that every year becomes more relevant and consistent. They have recently held two monograph exhibitions, one on the theme of the Cretaceous ichthyofauna (in 2014), and the other on that of the Miocene fauna of the Lecce biomicrite (in 2015), both of which were curated by the Director of the Museum, Prof Genuario Belmonte. Similarly, Prof Belmonte has also started the worthwhile and colossal census of the fossil fish contained in the museums and the Italian and foreign collections, which has already led to substantial preliminary results (Belmonte *et al.*, 2015).

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