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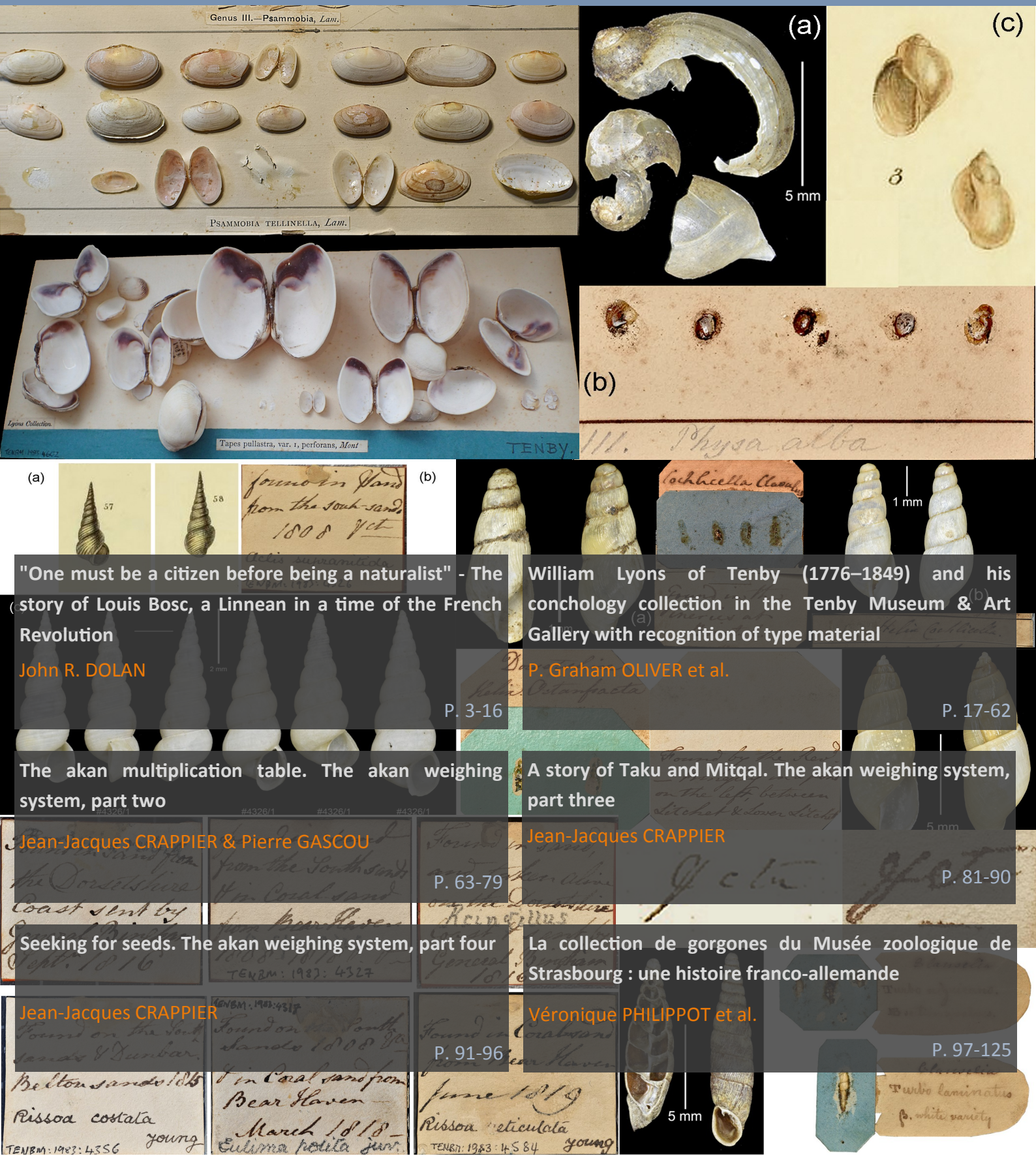

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"One must be a citizen before being a naturalist" - The story of Louis Bosc, a Linnean in a time of the French Revolution

“Il faut être un citoyen avant d’être un naturaliste” - L’histoire de Louis Bosc, un Linnéen au temps de la Révolution française

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Summary: Louis Bosc (1759-1828) was a naturalist, one of the very first "Linneans" of France, and among the founders of the first Linnean Society, the Société Linnéenne de Paris. The early part of his career as a naturalist coincided with the Revolutionary Period in France (1789-1799). During that chaotic period, he published over 30 articles with many species descriptions, 18 of which are currently recognized as valid. Here his complicated life, professional and personal, during the chaotic period of the French Revolution is described.

MOTS-CLÉS

Société linnéenne de Paris
zoologie
histoire naturelle
Révolution française
histoire des sciences

Résumé : Louis Bosc (1759-1828) était un naturaliste, un des premiers Linnéens de France et compte parmi les fondateurs de la première société linnéenne, la Société Linnéenne de Paris. Les débuts de sa carrière de naturaliste ont coïncidé avec la Période Révolutionnaire (1789-1799). Durant cette période, il a publié une trentaine d'articles et décrit un grand nombre d'espèces dont 18 sont aujourd'hui considérées comme valides. Sa vie compliquée à la fois sur le plan professionnel et personnel, pendant la période chaotique de la Révolution Française, est ici décrite.

Introduction

This is the story of an early French Linnaean, focusing on his life during the years of the French Revolution (1789-1799). A naturalist during a long ago tumultuous time may at first appear to be an odd topic. However, I believe his story to be of potential relevance today. Increasingly, scientists are urged to act in the public sphere. It may then be useful to look a back on a period in which acting in the public sphere was common for naturalists. In addition, the little-known tale of Louis Bosc with it surprising turns and twists merits telling.

Early years

Louis Bosc (**Fig. 1**) was born in 1759, as Louis Bosc d'Antic, into a relatively well to do protestant family. Both his grandfather and father were doctors. His father was a corresponding member of the Académie Royale des Sciences, writing on topics of both medicine and glass making. His mother, of a distinguished military family, died shortly after his birth and he spent his first 5 years in the care of a maternal aunt living in a small village and his second 5 years in with his re-married father in Servin, surrounded at the time by the forests of Bassigny which he explored from early on. From age 10 to 18 he attended a Jesuit college in Dijon and was destined for a military career in the artillery given his family connections. However, he showed little inclination to pursue that pathway and managed to obtain permission during his last 2 years to attend botany classes at the Academy of Sciences of Dijon. Louis Bosc's father, after 2 failed ventures in glass manufacture, returned to practicing medicine, but in

Paris, and with the distinction of being one of the Doctors to his Majesty the King. He brought his son Louis with him to Paris and through his connections, obtained in 1778 for the 19-year old, an administrative job in the Poste aux Lettres (Post Office) in Paris.

Fig 1. Louis Bosc d'Antic Likely sometime before 1792 when he consistently dropped the "d'Antic", with its noble connotations, from his name.

Young Louis Bosc in Paris

The young Bosc rose quickly through the ranks in the administration of the Poste aux Lettres to become secretary to one of the directors by 1782. During his early years in Paris he attended public classes in chemistry, mineralogy and notably those of Broussonet in Botany, his introduction to Linnaeus. However, it was attending botany classes given by Jussieu in the Jardin du Roy in 1780 that Louis Bosc came to know the newly-wed couple M. and Mme. Roland. The close relationship he developed with Rolands would play a very large role in the course of his life (Reynolds, 2012).

In 1780, Jean-Marie Roland was a mature, 46 year-old former inspector of manufactures married to the young (26 years old) and vivacious Marie-Jeanne Roland (**Fig. 2**). The Rolands were in Paris because Jean-Marie Roland had been summoned to help draft new manufacturing regulations. Task accomplished in early 1781, the Rolands left for the provinces, not to return to Paris until 1791, year 2 of the Revolution. However, Louis Bosc and the Rolands, especially Marie-Jeanne corresponded very frequently. In these early years, the Rolands had a daughter Eudora, born in 1781 and Louis Bosc, a son, also named Louis, born out of wedlock in 1782. Both Eudora Roland and Louis Bosc, the son, will figure in the story of the revolutionary years.

Fig 2. Marie-Jeanne (Manon) Roland and Jean Marie Roland (date unknown) from Plan (1909).

The naturalist Louis Bosc in pre-Revolutionary Paris

Unlike many eighteenth century naturalists, Louis Bosc had to work for a living. However, his work at La Poste aux Lettres, the lectures, and the field trips of courses at the Jardin du Roy did not keep Louis Bosc from working independently on diverse topics of natural history. He published his first description of a new species of insect, *Orthezia characias*, in 1784 at age 25, and it is still a valid species today. He also wrote on methods of preserving larval insects (1785). By May of 1785 he was well-enough known to be asked to join the French version of Captain Cook's voyages, the ill-fated La Pérouse Expedition as one of the expedition naturalists. Luckily for him, he followed the advice of Mme Roland and his superior at La Poste aux Lettres to decline the invitation (Perroud, 1902). Bosc remained in Paris working and writing on diverse topics such as caterpillar attacks on vineyards (1786), and the formation of ice (1788). He truly made his mark internationally as a naturalist in late 1787 as one of the founding members of apparently the very first Linnean Society, the Société Linnéenne de Paris, likely the most short-lived Linnean Society.

The Société Linnéenne de Paris existed only from December 1787 to December 1788. It was founded shortly after James Edward's Smith's second stay in Paris by Pierre-Marie-Auguste Broussonet, Guillaume-Antoine Olivier, and Louis-Auguste-Guillaume Bosc. Not long after the founding of the Paris society, both Bosc and Broussonet were among the first foreign members of the Linnean Society of London, named in March 1788 (Beale, 1991). In France though, the new society was viewed with outright hostility by some members of the Académie Royale des Sciences. Still today, it is unclear if the hostility was to the Linnean system of classification or simply to a self-proclaimed scientific society, that is one with no official sanction and therefor had no official existence (Hahn, 1971). In any event, it quickly became known that members of the Paris Society were not welcome in the Académie and were in fact unlikely to be nominated to it. Attendance at the weekly meetings declined and the last meeting was in late 1788 (Chappey, 2010), a few months before the fall of the Bastille.

Bosc during the Constitutional Monarchy (1789-1792)

The fall of the Bastille in 1789 is the symbolic beginning of the end of the absolute monarchy and that entailed major changes for naturalists. According to Hahn (1971) the end of the absolute monarchy corresponded with a new Freedom of Assembly, allowing formation of scientific societies, and the end of royal control over the press, allowing the creation of new serials. These changes together would eliminate the near monopoly of the sciences held by the Académie des Sciences under the absolute monarchy. Of all the scientific establishments existing at the time, only the Jardin du Roy, re-invented as the Muséum National d'Histoire Naturelle in 1793, would survive more or less intact due largely to the political dexterity of its naturalists (Spary, 2000).

Among 'new' scientific societies was the Société d'Histoire Naturelle, founded on Friday August 27th 1790, at 6:00 in the evening in the home of Louis Bosc. According to the minutes of the meeting "*The Linnean Society having ceased its meetings for over a year... A member proposed to drop the name Société Linnéenne and to adopt the name Société d'Histoire Naturelle*" (Chappey, 2010). The re-branded Linnean Society was devoted not only to investigations of natural history but also participation in society at large. Louis Bosc was quite clear with regard to role of a naturalist during the revolutionary period. About a month before the founding of the Société d'Histoire Naturelle de Paris, he sent a letter to James Smith thanking him for being named as a Foreign Member of the Linnean Society of London and publishing his first article in the *Transactions* (**Fig. 3**). Apologizing for his late response to the honor Smith did him, Bosc pointedly wrote "*One must be a citizen before being a naturalist. One must serve the country before satisfying desires.*" (Bosc, 1790).

Not surprisingly then, Bosc and Broussonet, another founding member of the Société Linnéenne de Paris, were early members of the Société des Jacobins. Bosc was also a member of the 'Friends of the Constitution' and a regular contributor to the newspaper "*La Patriote François*" (Perroud, 1902). An example of Bosc's mixing of politics and natural history was his

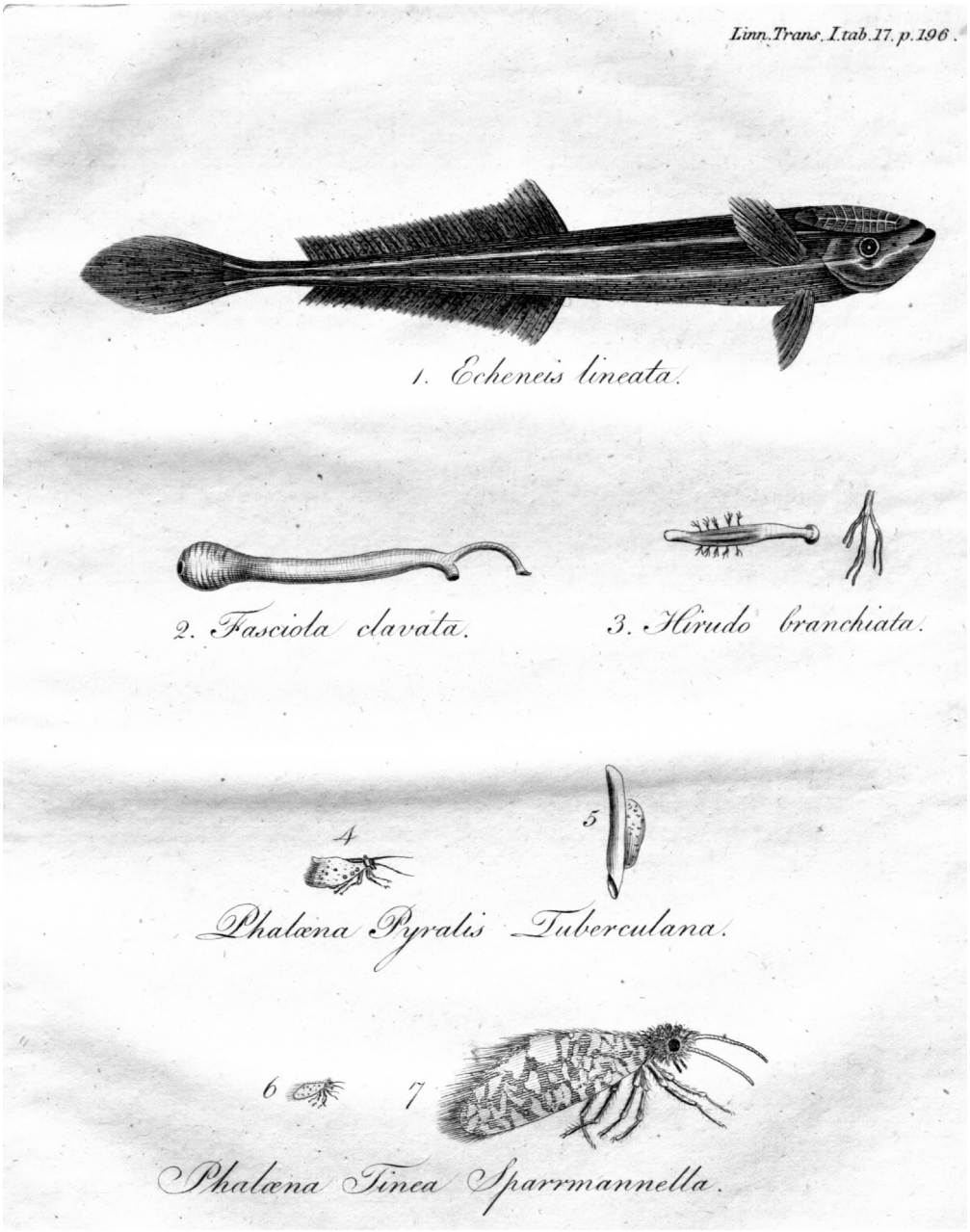

Fig 3. The plate illustrating Bosc's first publication in the *Transactions* in 1791. Descriptions of two new species of *Phalena*. *Transactions of the Linnean Society*, 1: 196-197 (Bosc, 1791a).

organisation of the inauguration of a bust of J. J. Rousseau in the forest of Montmorency (the site of botanical field trips of classes in the Jardin du Roy) as great elaborate civic festival reported on in the newspaper "*Révolutions de Paris*" (Anon., 1791) and by himself in "*Le Patriote François*" (Bosc, 1791e).

Evidence of the civil engagement of the Société d'Histoire Naturelle (and its political ambitions) was also evident in its petition (signed by Bosc and others) to the National Assembly in January 1791, asking for a naval expedition to follow the route of the La Pérouse Expedition and establish its fate. Other than perhaps finding any stranded survivors, the rescue operation was touted benefiting the nation as certain to bring back new useful plants to cultivate and establish new trading routes (Soc. Hist. Nat. Paris, 1791). Through the petition, the Société successfully placed itself in the role previously occupied solely by the Académie Royale, the original organizer of the La Pérouse Expedition, as both the Société and the Académie were consulted in organizing the new expedition (Hahn, 1971).

In 1792 the Société published the *Actes de la Société d'Histoire Naturelle*. Although short-lived, according to Hahn (1971), "*Here were the true beginnings of a specialized scientific press in France, which was at last independent of the Academy.*" Not surprisingly, Bosc published very extensively in the journal (**Table 1**) on a wide range of subjects even including descriptions of an octopus and a lizard (**Fig. 4**).

Year	Journal or Book Title	Subject	Reference
1791	*Transactions of the Linnean Society* (read 1790)	moth	Bosc 1791a
1791	*Bulletin des Sciences*	beetle	Bosc 1791b
1791	*Bulletin des Sciences*	beetle	Bosc 1791c
1791	*Bulletin des Sciences*	millipede	Bosc 1791d
1791	*Bulletin des Sciences*	rice	Bosc 1791e
1791	*Bulletin des Sciences*	plant	Bosc 1791f
1791	*Bulletin des Sciences*	beetle	Bosc 1791g
1791	*Le Patriote François*	Rousseau	Bosc 1791h
1791	*La Flore des Insectophiles*	cricket	Bosc 1791i
1792	*Bulletin des Sciences*	opilione, gall	Bosc 1792a
1792	*Actes de la Société d'Histoire Naturelle*	bird	Bosc 1792b
1792	*Actes de la Société d'Histoire Naturelle*	octopus	Bosc 1792c
1792	*Actes de la Société d'Histoire Naturelle*	lizard	Bosc 1792d
1792	*Actes de la Société d'Histoire Naturelle*	beetle	Bosc 1792e
1792	*Actes de la Société d'Histoire Naturelle*	fly	Bosc 1792f
1792	*Actes de la Société d'Histoire Naturelle*	grasshopper	Bosc 1792g
1792	*Actes de la Société d'Histoire Naturelle*	locust	Bosc 1792h
1792	*Actes de la Société d'Histoire Naturelle*	mushroom	Bosc 1792i
1792	*Actes de la Société d'Histoire Naturelle*	plant	Bosc 1792j
1792	*Journal d'Histoire Naturelle*	bird	Bosc 1792k
1792	*Journal d'Histoire Naturelle*	fly	Bosc 1792l
1792	*Journal d'Histoire Naturelle*	gall	Bosc 1792m
1792	*Journal d'Histoire Naturelle*	bird	Bosc 1792o
1792	*Journal d'Histoire Naturelle*	mineral	Bosc 1792p
1792	*Journal d'Histoire Naturelle*	plant	Bosc 1792q
1792	*Journal d'Histoire Naturelle*	beetle	Bosc 1792r
1792	*Journal d'Histoire Naturelle*	bird	Bosc 1792p
1794	*Transactions of the Linnean Society* (read 1791)	plant	Bosc 1794a
1794	*Bulletin des Sciences*	shrub	Bosc 1794b
1794	*Bulletin des Sciences*	bird + mite	Bosc 1794c
1796	*Magasin Encyclopédique* (re-publication of Bosc 1794c)	bird + mite	Bosc 1796
1797	*Bulletin des Sciences*	hydra, actinia, worm	Bosc 1797a
1797	*Bulletin des Sciences*	plant	Bosc 1797b
1797	*Bulletin des Sciences*	plant	Bosc 1797c
1799	*Bulletin des Sciences*	butterfly	Bosc 1799

Table 1. Bosc's publications during the revolutionary years.

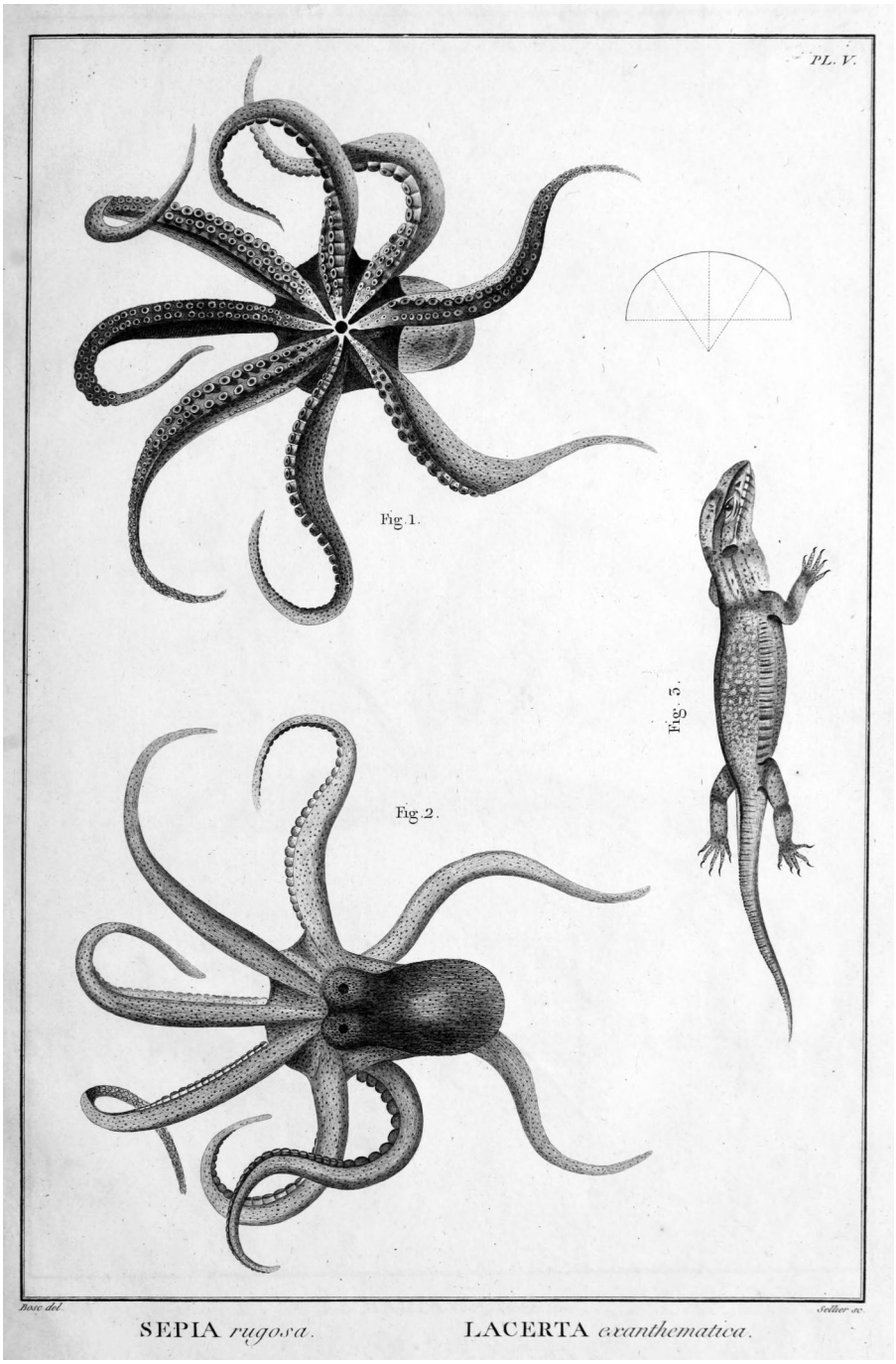

Fig 4. Illustrations from Bosc's 1792 description of a cephalopod (Bosc, 1792b) and a lizard (Bosc, 1792c) in the journal *Actes de la Société d'Histoire Naturelle*.

The Return of Bosc's friends, the Rolands

Meanwhile, in February of 1791, the Rolands returned to Paris so that M. Roland could lobby the National Assembly to aid the finances of the city of Lyon. It was in mid-year in 1791 when King Louis XVI attempted to flee France and was forcibly returned to Paris. Political divisions quickly appeared with regard to the role of the would-be refugee King, and the question of going to war as pre-emptive strike against foreign powers sympathetic to restoring the absolute monarchy. The divisions led to political instability and turnover among ministers in the government. In March of 1792 M. Roland, as an uncontroversial candidate as a former inspector of manufactures, was asked to serve as Minister of the Interior. His tenure was short lasting only until June 1791. The King sacked Roland for his insistence that laws, passed to raise a new army, and subjecting priests to oaths of obedience to the constitution, be enacted. M. and Mme. Roland had not the time to wrap up their affairs and return to the provinces before their fortunes changed again.

Events spiraled quickly with military defeats, the uprising of Paris, and culminated with imprisonment of the King. A constitutional monarchy without a monarch was put in place by August, soon to become the Convention, and Roland was recalled to again head the ministry of the Interior in September 1792. The second

tenure was also short, ending with the trial and execution of the King in January 1793. Roland resigned and plans were made to quietly retire. However short Roland's tenures as Minister were, Louis Bosc profited quite well at least temporarily. During Roland's first tenure changes were made in the direction of La Poste aux Lettres and Bosc was named one of the 4 "administrators" complete with official lodging. It was Mme. Roland who announced the happy news to Bosc (Perroud, 1902). Later, his high position in La Poste aux Lettres put Bosc in real danger but perhaps also saved him, allowing him to aid the Rolands.

On May 31st of 1793 Bosc was arrested and charged with tampering with the mail, allowing letters to be read. Later in the day he was released as keeping the La Poste aux Lettres functioning was judged to be vital by the Convention, requiring the service of the top administrators. That very same day, early in the evening, M. Roland was confronted by members of the "Insurrectional Committee" sent to arrest him in his home. He successfully argued that the charges needed to be re-written and then he fled to Bosc's lodgings. Late in the night of May 31st, officials returned to the Rolands and arrested Mme. Roland. Bosc heard of Mme. Roland's arrest and went to fetch Eudora Roland who was in the care of two housemaids. Bosc placed her with family friends who pretended Eudora was their own adopted daughter. With Mme. Roland in prison, it fell to Bosc to help M. Roland escape Paris and save himself as well.

Bosc took M. Roland to an old priory he had purchased few years earlier in the nearby countryside, near Saint-Prix and Montmorency, "Sainte-Radegonde", located about 20 km from Paris. Once there, Bosc took on the role of a country farmer. M. Roland remained hidden for about 3 weeks and then left for Rouen to stay with friends as Sainte-Radegonde was too close to Paris for safety. Bosc remained and stuck to the role of a simple farmer, staying until the end of "The Terror" in August 1794 when Robespierre himself was sent to the guillotine. During his time at Sainte-Radegonde, Bosc did not completely abandon his naturalist pursuits. An unpublished manuscript, dated September 1793, entitled "Spiders of the Forest of Montmorency described and drawn while I was hidden in Sainte-Radegonde during the Terror" is said to be in the library of the Muséum d'Histoire Naturelle de Paris (Leroy, 1970).

For the first few months of his exile in the countryside, he made regular trips to Paris, and disguised as a simple countryman, visited Mme. Roland in prison bringing her news, flowers from the Jardin du Roy, and smuggling out her writings as she spent her months in prison writing her memoires. Bosc hid the memoires of Mme. Roland in his house. She eventually asked Bosc to end his visits as too dangerous and facing the inevitable, asked him to look after her daughter Eudora (Perroud, 1902). Mme. Roland was sent to the guillotine on November 8, 1793. Two days later, M. Roland, on hearing of her fate, killed himself (Perroud, 1895). Roland use the cane-sword Bosc had given him, perhaps presciently, for self-defense when he entered the Ministry (Le Guin 1966). Today the remains of Mme Roland are likely with those of most of the victims of the guillotine; their final resting place is the catacombs of Paris (Reynolds, 2012).

By December 1794, Bosc had himself officially named as guardian of Eudora Roland and set about reclaiming her inheritance, the property of her parents. He also edited and published Mme. Roland's memoires and letters as both a tribute to her and to raise money for her daughter. The book of her memoires, "*Appel à l'impartiale postérité*" (*Appeal to the impartial posterity*) (Roland, 1795) sold over 12,000 copies. Bosc's edition would establish Mme. Roland as an iconic figure of the French Revolution (Outram, 1989). By 1798, an English translation was published in America (Roland, 1798). Her story inspired writers such as Mary Shelly (Morrison, 2004) and Stendhal (character Mathilde de la Mole in *Le Rouge et le Noir*).

Soon Louis Bosc, at age 37, developed feelings for his young ward, then 14 years old, only a year older than his son. They made plans to emigrate to America and start a new life. This complicated and controversial story (e.g., Did Bosc fall in love with a young version of Mme. Roland? Was young Eudora simply anxious to gain adult status?) was treated at length by Perroud as a romantic novella based on contemporary documents in "Le Roman d'un Girondin" (Perroud, 1914-1916), a historical account that was well regarded in the literary press (e.g. Lavivière 1924). Transcriptions of the poignant letters of Eudora Roland and Louis Bosc to each other and their mutual friends M. and Mme. Gosse, were published by Plan (1909). To be very brief, Bosc announced the engagement to his close friends who in-

sisted he renounce his plans, arguing not only that age differences between the two were great but also it was unethical to marry one's ward especially when fighting to regain her inheritance. While Bosc was undeterred, he agreed to a separation to test the feelings of Eudora. After a few months of separation with many letters and only a few visits, Eudora wrote to Bosc a "Let us remain friends" letter, ending the engagement. The reaction of the heart-broken Bosc was to leave for America as quickly as he could (Perroud, 1914-1915).

Bosc goes to America

The following account of Bosc's time in America is based largely on Beale 's well-documented "Bosc and the Exequatur" (1978). Before leaving, Louis Bosc first set about to obtain a Foreign Service appointment in America and got a vague promise of receiving the next available post. A friend from his days in botany classes at the Jardin du Roy, André Michaux, was in Charleston, in present day South Carolina. Since 1785, Michaux had a botanical station, "The French Garden" supported financially by the French government near Charleston. In August 1796, Louis Bosc with his son Louis, sailed to Charleston to join Michaux and perhaps do some exploring with him while awaiting a diplomatic appointment. Ever the naturalist, along the voyage to Charleston he made collections and observations of marine life (**Fig. 5**).

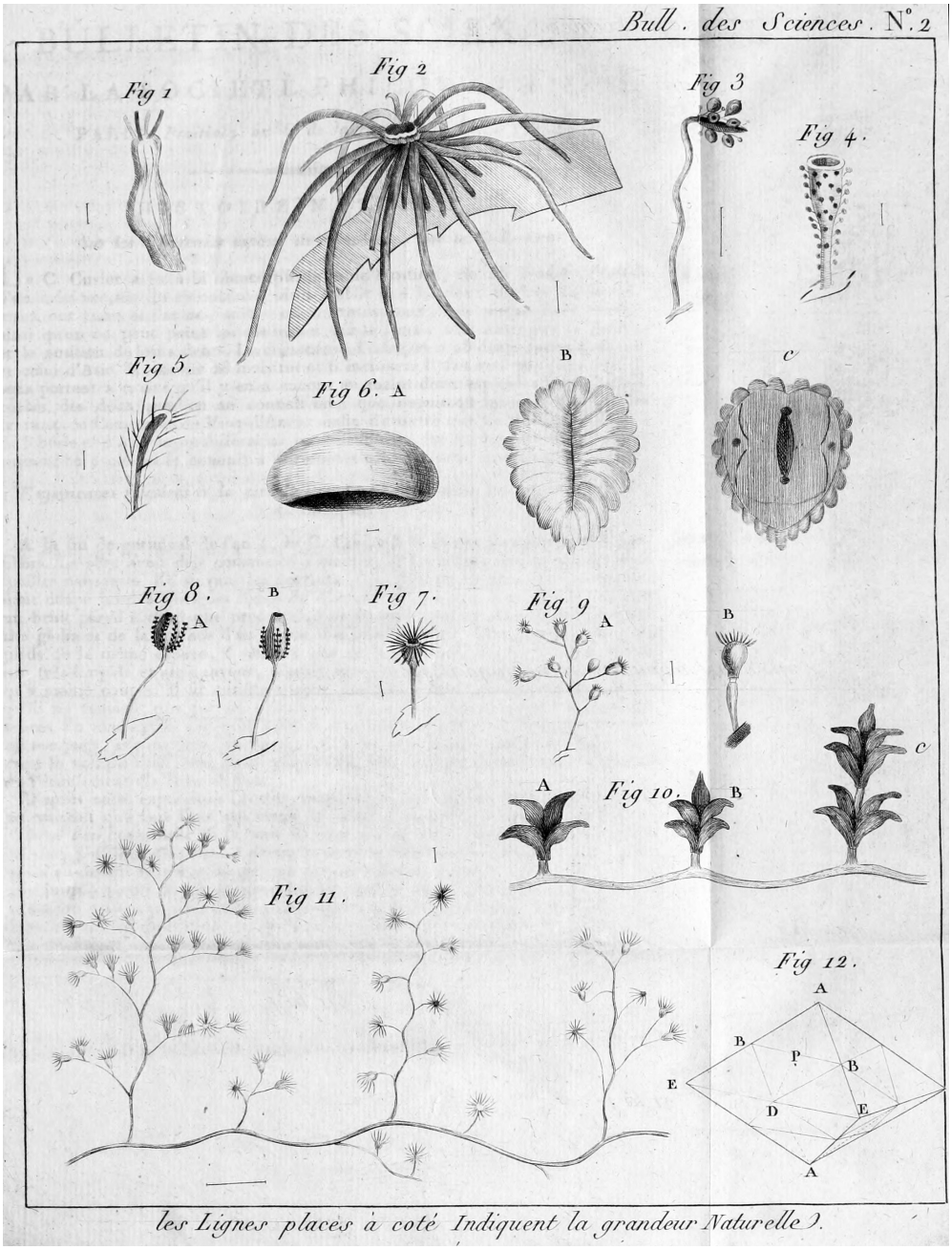

Fig 5. The plate illustrating the marine organisms from Bosc (1797a) that he studied during the 1796 voyage from Bordeaux to Charleston.

Unfortunately for Bosc, his friend Michaux left Charleston, on nearly the same day Bosc left Bordeaux, bound for Paris to attempt to get his unpaid salary (Michaux & Sargent, 1888). Bosc and his son found themselves in Charleston at loose ends with only a small capital and speaking little English. They lodged in a boarding house and spent a good of deal time exploring, documenting, and collecting specimens to be sent back to France. Bosc would later formally describe many new species from his time in Charleston such a polychaete worm from the Bay of Charleston now known as *Diopatra cuprea* (**Fig. 6**), in a series of multi-volume monographs on "coquilles", "vers" and "crustacés" (Bosc, 1801a, b, c). Also, his specimens, manuscript descriptions and drawings of a variety of organisms from his time in Charleston later would be used by others, such as Latreille and Daudin, to describe many new species (Harper, 1940).

Communications with France were very poor and the first letter he got was not until May 1797. It was from Michaux in Paris, and contained no news of a consular job nor of Eudora. However, at long last he got word that he was to be vice-consul of Wilmington. Alas, it was not to be. By the time the proper documents arrived in May 1798, relations between the United States and France had soured and US President Monroe refused to accept any exequaturs, documents attesting to recognition of diplomatic status. Soon after, the French consular corps was told to sell all properties, issue passports to all French citizens who asked, do their best to secure archives, and prepare for any eventuality. The Charleston consul closed in July. In August of 1798 Bosc and his son along with the consul and his family as well as crates of specimens, descriptions, and drawings, left Charleston to return to France via Corruna, Spain. Thus, Louis Bosc left the United States the same year that an American edition of his letters of Mme. Roland was published.

Bosc back in France

Bosc and his son landed in Corruna, Spain and made their way back to Paris on foot. All along their march across Northwest Spain, their baggage including many specimens in a horse-drawn cart, of 21 days, Bosc made copious notes, eventually publishing his observations on everything from the construction of the cart, to a new anthozoan, and mountain farmhouses (**Fig.** 7) in "*Voyage en Espagne, à travers les royaumes de Galice, Léon, Castille-Vieille, et Biscaye*" (Bosc, 1800). They finally arrived back in Paris in November 1798. Bosc

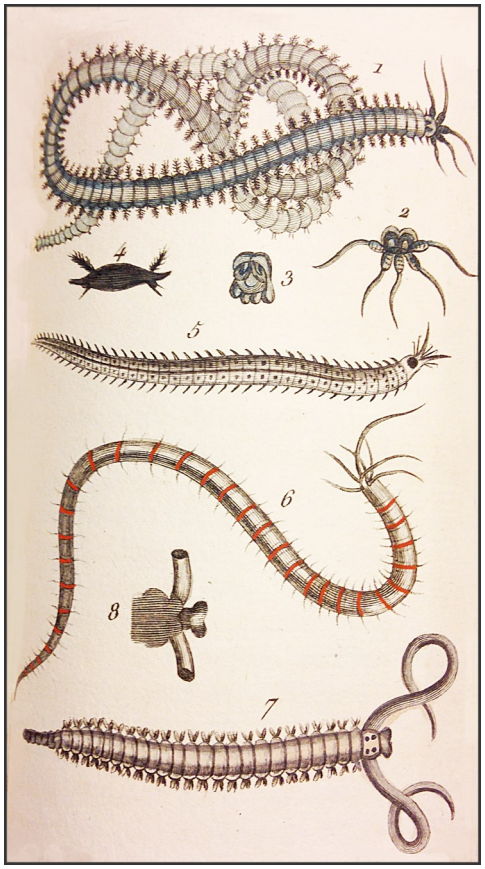

Fig 6. Plate 5 from Bosc 1802b showing the polychaete (1) now known as *Diopatra cuprea* (Bosc, 1802) he found in the Bay of Charleston.

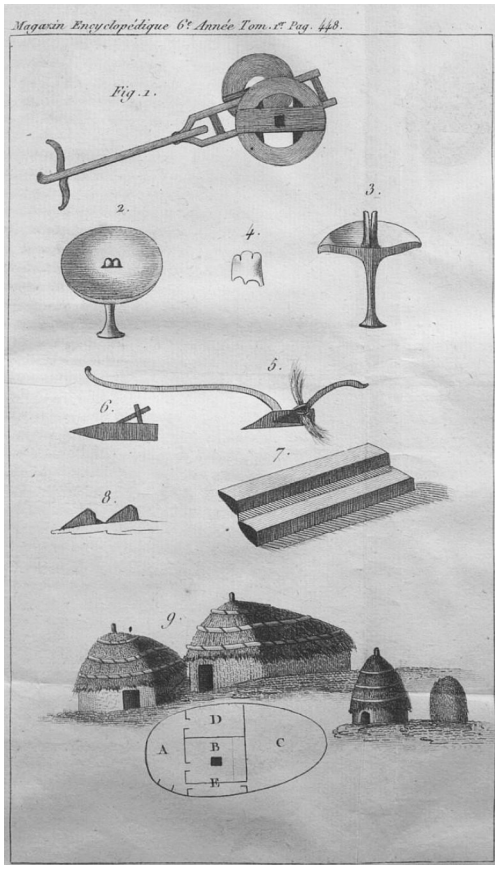

Fig 7. Plate from Bosc's account of his travels across Northwest Spain in late 1798 (Bosc, 1800).

still had friends in high places and was named an administrator of hospitals and prisons. However, he would soon return to scientific activities. In fact, Louis Bosc eventually finished his career as Professor where this story began, in Paris at the Jardin du Roy. In his last letter to James Smith, dated July 24 1826, exactly 36 years after his first letter, he respectfully informed Smith of his new positions as Member of the Institut (the Académie des Sciences) and Professor au Jardin des Plantes (Bosc, 1826). Louis Bosc then was, at that time, one of very few professional naturalists, that holding an academic position. Unfortunately, he died but 2 years later of a respiratory infection.

Bosc's legacy

The contemporary eulogies on Bosc all underlined, not only his scientific contributions, but also his outstanding loyalty to his friends, regardless of circumstances (Cuvier, 1829; Dutrouilh, 1829; Silvestre, 1829). Later entries on Bosc in collections of scientific biographies, less personal but not less admiring, end with pointing out his devotion to popularising science (Lemercier, 1843), and naming him as a pioneer in practical natural history (Leroy, 1970). However, beyond this later rather brief entry by Leroy in the Dictionary of Scientific Biography, the only substantial English language text on Bosc is by Damkaer in his "*The Copepodologist's Cabinet*" (Damkaer, 2002). It appears that Bosc is likely better known to historians for his role with regard to the Rolands during the French Revolution than to biologists for his work as an early Linnean. Ironically perhaps, today his name is probably more closely associated with a pear, the Bosc pear, named in his honor but not characterized by him (Van Mons, 1819), than either the history of the French Revolution or natural history. Although today not well known, Louis Bosc can be said to have been a model Linnean Naturalist.

Bosc's collections

Many of specimens Bosc collected still reside in the Muséum National d'Histoire Naturelle de Paris. His insect collection was bought by the Muséum from his widow in 1828. The collection was noted as precious by Silberman (1835) because it contained rare specimens not found in any other collection. However, today, his specimens appear to be scattered among other collections. For example, Milne-Edwards *et al.* (1850) catalogue of coleopterids mentions Bosc's specimens for many species but makes no mention of a specific Bosc collection. Likewise the hymenopterids specimens from his insect collection, likely the largest of his collections, are scattered among others in the Muséum, with his specimens only recognizable from the distinctive labels (Notton, 2007). It is likely that many of Bosc's specimens were lost or destroyed by insects as suggested by the report by Cambefort (2006), noting that all the coleopterans specimens attributable to Bosc were contained in a single small box of 8x10".

Bosc's species descriptions

The species first described by Louis Bosc (currently recognized) number 69 and of these 20 were published during the Revolutionary Period (1789-1799). The descriptions of Bosc represent a very diverse set of organisms from a very wide range of habitats. He described large numbers of insects, mollusks, crustaceans, and polychaete worms but he is also credited with describing mushrooms, birds and even a salp from the marine plankton.

The species descriptions were published by Bosc over the period of 1784 to 1830. As mentioned above, many of the descriptions were based on collections made during his extended stay (1796-1798) in what is now South Carolina (Beale 1978) during the Revolutionary Period. Most of these descriptions appeared in his monographs of 1801. The last of his descriptions, of a lizard (Bosc 1830), published after his death, is credited to Bosc as the description was based on his notes, drawings, and specimens; this was the case for several vertebrate species descriptions now credited to Bosc (Harper 1940). The complete list of species currently attributed to Bosc, with bibliographic details, is given the Appendix.

Conclusion

Here was shown the complicated personal and professional life of Louis Bosc during the Revolutionary Period. The considerable scientific output of Louis Bosc during the period is remarkable. Furthermore, it was also a period of Bosc's engagement in political and scientific societies. Louis Bosc deserves recognition as pioneer naturalist who made significant contributions to natural history during difficult times.

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BOSC L., 1792d. *Lacerta exanthematica*. *Actes de la Société d'Histoire Naturelle*, 1: 25.

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BOSC L., 1792f. *Keroplatus*. *Actes de la Société d'Histoire Naturelle*, 1: 42-43.

BOSC L., 1792g. *Acheta sylvestris*. *Actes de la Société d'Histoire Naturelle*, 1: 44.

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BOSC L., 1792i. *Lycoperdon axatum*. *Actes de la Société d'Histoire Naturelle*, 1:47.

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BOSC L., 1792r. *Coturnix ypsilophorus*. *Journal d'Histoire Naturelle*, 2: 297-298.

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Appendix

Species Described by Louis Bosc, Currently Valid, in Chronological Order of Description with References to the Original Descriptions

#1 *Orthezia characias* Bosc 1784. *Obs. Phys. Hist. Nat. Arts*, 24(1): 171.

#2 *Celama tuberculana* (Bosc 1791). *Trans. Linn. Soc.*, 1: 196.

#3 *Eriocrania sparrmannella* (Bosc 1791). *Trans. Linn. Soc.*, 1: 197.

#4 *Helophorus rufipes* (Bosc 1791). *Bull. Sci.*, 1: 8.

#5 *Blaniulus guttulatus* (Bosc 1791). *Bull. Sci.*, 1: 10.

#6 *Odiellus spinosus* (Bosc 1792). *Bull. Sci.*, 2: 18.

#7 *Egretta gularis* (Bosc 1792). *Actes Soc. His. Nat.*, 1: 4.

#8 *Varanus exanthematicus* (Bosc 1792). *Actes Soc. His. Nat.*, 1: 25.

#9 *Marolia variegata* (Bosc 1792). *Actes Soc. His. Nat.*, 1: 40.

#10 *Keroplatus tipuloides* (Bosc 1792). *Actes Soc. His. Nat.*, 1: 42.

#11 *Nemobius sylvestris* (Bosc 1792). *Actes Soc. His. Nat.*, 1: 44.

#12 *Leptophyes punctatissima* (Bosc 1792). *Actes Soc. His. Nat.*, 1: 45.

#13 *Podaxis axatus* (Bosc 1792). *Actes Soc. His. Nat.*, 1: 47.

#14 *Topaza pella subsp. smaragdulus* (Bosc, 1792). *Journ. His. Nat.*, 2: 385.

#15 *Andricus quercustozae* (Bosc 1792). *Journ. His. Nat.*, 2: 156.

#16 *Ammodramus humeralis* (Bosc 1792). *Journ. His. Nat.*, 2: 179.

#17 *Ripiphorus subdipterus* (Bosc 1792). *Journ. His. Nat.*, 2: 293.

#18 *Coturnix ypsilophora* (Bosc 1792). *Journ. His. Nat.*, 2: 297.

#19 *Aphelocoma coerulescens* (Bosc 1796). *Mag. Encycl.*, 2: 26.

#20 *Renia adspergillus* (Bosc 1799). *Bull. Sci.*, 2(39): 114.

#21 *Clydonopteron sacculana* (Bosc 1799). *Bull. Sci.*, 2 (39): 115.

#22 *Nosopsyllus fasciatus* (Bosc 1800). *Bull. Sci.*, 2(44): 156.

#23 *Raja eglanteria* (Bosc 1800). *His. Nat. Poissons*, 2: 109.

#24 *Chasmodes bosquianus* (Bosc 1800). *His. Nat. Poissons*, 2: 493.

#25 *Hyla squirella* (Bosc 1800). *His. Nat. Quad. Ovipares*: 23.

#26 *Hyla femoralis* (Bosc 1800). *His. Nat. Quad. Ovipares*: 24.

#27 *Megatrema madreporarum* (Bosc 1801). *Bull. Sci.*, 3 (57): 66.

#28 *Clio cuspidata* (Bosc 1801). *His. Nat. Coquilles*, 2: 241.

#29 *Erodona mactroides* (Bosc 1801). *His. Nat. Coquilles*, 2: 329.

#30 *Tagelus adansonii* (Bosc 1801). *His. Nat. Coquilles*, 3: 12.

#31 *Polymesoda caroliniana* (Bosc 1801). *His. Nat. Coquilles*, 3: 37.

#32 *Uniomerus carolinianus* (Bosc 1801). *His. Nat. Coquilles*, 3: 142.

#33 *Hypoturrilites tuberculatus* (Bosc 1801). *His. Nat. Coquilles*, 3: 189.

#34 *Leptuca pugilator* (Bosc 1801). *His. Nat. Crustacés*, 1: 197.

#35 *Armases cinereum* (Bosc 1801). *His. Nat. Crustacés*, 1: 204.

#36 *Petrolisthes galathinus* (Bosc 1801). *His. Nat. Crustacés*, 1: 233.

#37 *Clibanarius vittatus* (Bosc 1801). *His. Nat. Crustacés*, 2: 78.

#38 *Speziorchestia grillus* (Bosc 1801). *His. Nat. Crustacés*, 2: 152.

#39 *Triops cancriformis* (Bosc 1801). *His. Nat. Crustacés*, 2: 244.

#40 *Hyaloteuthis pelagica* (Bosc 1801). *His. Nat. Vers*, 1: 52.

#41 *Philomycus carolinianus* (Bosc 1801). *His. Nat. Vers*, 1: 80.

#42 *Diopatra cuprea* (Bosc 1801). *His. Nat. Vers*, 1: 142.

#43 *Nereis frontalis* (Bosc 1801). *His. Nat. Vers*, 1: 143.

#44 *Proceraea fasciata* (Bosc 1801). *His. Nat. Vers*, 1: 144.

#45 *Polydora cornuta* (Bosc 1801). *His. Nat. Vers*, 1: 151.

#46 *Amphitrite ventricosa* (Bosc 1801). *His. Nat. Vers*, 1: 168.

#47 *Hydroides hexagona* (Bosc 1801). *His. Nat. Vers*, 1: 176.

#48 *Spirorbis communis* (Bosc 1801). *His. Nat. Vers*, 1: 184.

#49 *Acerotisa notulata* (Bosc 1801). *His. Nat. Vers*, 1: 254.

#50 *Phyllobothrium delphini* (Bosc 1801). *His. Nat. Vers*, 1: 324.

#51 *Tentacularia coryphaenae* (Bosc 1801). *His. Nat. Vers*, 2: 13.

#52 *Hemipholis cordifera* (Bosc 1801). *His. Nat. Vers*, 2: 113.

#53 *Idotea metallica* (Bosc 1801). *His. Nat. Vers*, 2: 179.

#54 *Pegea socia* (Bosc 1801). *His. Nat. Vers*, 2: 180.

#55 *Actinia reclinata* (Bosc 1801). *His. Nat. Vers*, 2: 221.

#56 *Bunodosoma cavernatum* (Bosc 1801). *His. Nat. Vers*, 2: 221.

#57 *Glossiphonia swampina* (Bosc 1801). *His. Nat. Vers*, 2: 247.

#58 *Dynamena disticha* (Bosc 1801). *His. Nat. Vers*, 3: 101.

#59 *Jellyella tuberculata* (Bosc 1801). *His. Nat. Vers*, 3: 118.

#60 *Pseudacris ocularis* (Bosc & Daudin 1802). *His. Nat. Rainettes, Grenouilles et Crapauds*: 39.

#61 *Keroplatus carbonarius* (Bosc 1803). *Nouv. Dict. His. Nat.*, 4: 542.

#62 *Sabella negate* (Bosc 1803). *Nouv. Dict. His. Nat.*, 20: 1.

#63 *Indusia tubulosa* (Bosc 1805). *Journ. Mines*, 17: 397.

#64 *Capsala martinieri* (Bosc 1811). *Nouv. Bull. Sci.*, 2: 384.

#65 *Clathrus columnatus* (Bosc 1811). *Ges. Naturfor. Freunde Berl.*, 5: 85.

#66 *Discina caroliniana* (Bosc 1811). *Ges. Naturfor. Freunde Berl.*, 5: 86.

#67 *Phallus rubicundus* (Bosc 1811). *Ges. Naturfor. Freunde Berl.*, 5: 86.

#68 *Rhopalogaster transversarius* (Bosc 1811). *Ges. Naturfor. Freunde Berl.*, 5: 87.

#69 *Sceloporus undulatus* (Bosc 1830). *His. Nat. Reptiles*, 2: 40.

William Lyons of Tenby (1776–1849) and his conchology collection in the Tenby Museum & Art Gallery with recognition of type material

William Lyons de Tenby (1776–1849) et sa collection conchyliologique au Tenby Museum & Art Gallery avec reconnaissance du matériel type

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Summary: The William Lyons (1776-1849) conchological collection in the Tenby Museum and Art Gallery is one of the few from the early 19th century to survive intact and is the oldest natural history collection in Wales. Lyons was recognised in three eponyms, the molluscan genus *Lyonsia* and the molluscan species *Trochus lyonsii*, and the barnacle *Conia lyonsii*. His collection was extensively cited in the works of Forbes and Hanley, J.G. Jeffreys and Captain T. Brown. Lyons corresponded and received shells from his contemporaries who include Colonel G. Montagu; W. Turton; J.S. Miller; Lieutenant General R. Bingham; Reverend W. Bingley; T. Walcott; Miss Puxley; Miss Pocock and T. Rackett; brief biographies of each are given. Examples of the labels and handwriting of the collectors are illustrated. Type and possible type material is recognized for the following species: *Acanthochitona discrepans* Brown, 1827; *Turritella* (now *Aclis*) *minor* Brown, 1827; *Pyramis crystallina* Brown, 1827 (now *Hyala vitrea*); *Helix goodalli* Miller, 1822 (now *Opeas hannense*); *Helix* (now *Zenobiella*) *subrufescens* J.S. Miller, 1822; *Physa alba* Turton, 1825 (now *Physa hypnorum*); *Helix scarburgensis* Alder, 1830 (now *Spermodea lamellata*) and *Voluta catenata* Montagu, 1803 (now *Gibberula catenata* (Montagu, 1803). A manuscript in the hand of William Lyons entitled "A list of shells found on the sea shore at Tenby and Pembrokeshire" is presented and analysed. A brief family history of William Lyons is included.

Key-Words

historical collection
Molluscs
Tenby
type specimens
Capt. T. Brown
J.S. Miller
W. Turton
J. Alder
Col. G. Montagu

Résumé : La collection conchyliologique de William Lyons (1776-1849) au Tenby Museum and Art Gallery est l'une des rares du début du XIX[e] siècle à avoir survécu intacte et est la plus ancienne collection d'histoire naturelle du pays de Galles. Lyons est reconnu dans trois éponymes, les mollusques *Lyonsia*, *Trochus lyonsii* et le balane *Conia lyonsii*. Sa collection a été largement citée dans les ouvrages de Forbes et Hanley, J.G. Jeffreys et Capt. Brown. Lyons correspondait et recevait des coquilles de ses contemporains dont le colonel G. Montagu, W. Turton, J.S. Miller, le Lieutenant-Général R. Bingham, le Révérend W. Bingley, T. Walcott, M[lle] Puxley, M[lle] Pocock et T. Rackett ; de brèves biographies de chacun sont fournies. Les différentes étiquettes et écritures des collectionneurs sont illustrées. Les types et le matériel possiblement typique sont reconnus pour les espèces suivantes : *Acanthochitona discrepans* Brown, 1827 ; *Turritella* (act. *Aclis*) *minor* Brown, 1827; *Pyramis crystallina* Brown, 1827 (act. *Hyala vitrea*) ; *Helix goodalli* Miller, 1822 (act. *Opeas hannense*) ; *Helix* (act. *Zenobiella*) *subrufescens* Miller, 1822 ; *Physa alba* Turton, 1825 (act. *Physa hypnorum*) ; *Helix scarburgensis* Alder, 1830 (act. *Spermodea lamellata*) et *Voluta catenata* Montagu, 1803 (act. *Gibberula catenata* (Montagu, 1803). Un manuscrit de William Lyons intitulé "Une liste des coquilles trouvées au bord de la mer à Tenby et Pembrokeshire" est présentée et analysée. Une brève histoire familiale de William Lyons est incluse.

MOTS-CLÉS

collection historique
Mollusques
Tenby
spécimens types
Cne T. Brown
J.S. Miller
W. Turton
J. Alder
Coll. G. Montagu

Introduction

During the first decades of the 19[th] century William Lyons (1776-1849) amassed a collection of British shells, mainly from around his home town of Tenby in south-west Wales. Although he did not contribute to the scientific literature, his collection was well known to his contemporaries with whom he corresponded and exchanged shells (Dean, 1936; Kennard, 1944). A portion, containing most of the land and freshwater shells, was reviewed by Kennard (1944) in which he recognized a number of secondary collectors such as Bingham, Bingley, Bean, Goodall and Miller and two lots of paratypes. Kennard's statement (1944: 75), *"It is of the greatest importance to ascertain what the pioneers meant by the names they used"* still holds true today and as was exemplified in the recent review of the Montagu collection (1803-1816) in the Exeter Museum by Oliver, Morgenroth & Salvador (2018). Since the review by Kennard the Lyons collection has received little attention and the marine portion has never been revised. A preliminary review indicated that the collection was no longer accessible physically nor were the associated data available in a useable format. A project was then put in place to research the collection, bring the data up to modern standards and to place the collection in modern storage. This paper summarises the contents of the collection, reports on specimens of taxonomic significance, on the secondary collectors and presents a brief biography of William Lyons. Also included in this paper is an assessment of a manuscript found in the Tenby Museum labelled "Shells of Tenby" not dated but in the handwriting of William Lyons. This item will be referred to as "Lyons mss" throughout this paper.

Acquisition history

The collection was made, according to dates on the labels, between 1808 and 1831. William Lyons died in 1849 and the collection remained in the family home, at 5 Market Street, until 1878. In March 1869 in a "Proposal for a public museum" [1] Frederick Dyster (1800?-1893) describes *"...the conchological collection of Miss Lyons as forming, if it could be transferred to this museum, a valuable nucleus for a really scientific collection..."* In 1878 the Tenby Museum **(Fig. 1)** was created and was given a lease for a property on Castle Hill, overlooking St Catherine's Island. In a letter, dated 1st April 1878 [2], Dr Dyster reported that it was being offered to the museum by Miss Lyons presumed to be Miss Jane Sarah Lyons (1805-1879) the eldest daughter or perhaps Sarah Alicia Lyons (1806-1885); and this was duly accepted. In 1885 conchological books belonging to Wil-

1. Proposal for a public museum in the Tenby Observer 18 March 1869.

2. Minutes of the Trustees meeting of 1st April, 1878, Tenby Museum Archive.

liam Lyons but carrying the signature of C.A. Lyons (Catherine Ann Lyons (1798-1873) were donated to the Tenby Museum by a Miss Janet Lyons [3] (presumed to be a grand-daughter and child of Cdr William Lyons (1797-1878), the eldest son). It is interesting to note that a condition of the bequest was that "*the original nomenclature be preserved*" something that was sadly not adhered to in the following years. There is no record of the size of the collection at that time and no register of its contents was made and no formal acquisition documentation was kept. Rather quickly it was decided to rearrange the shells and minutes of the Museum indicate that central to this was the Reverend C.M. Phelps. The Minutes indicate that the re-arrangement had begun by 1882 but in 1890 it was reported that Phelps still had museum specimens in his possession and these were returned in 1891 [4]. Phelps died in 1907 [5] and we have no record of him completing the re-arrangement. He made his own collection which was acquired by Y.H. Mills of Haverfordwest and subsequently donated by him to the National Museum of Wales (NMW) in 1916. One lot in that collection contained a typical pale blue Lyons mount suggesting that Phelps had confused his collection with some of Lyons. Another local conchologist, a Mr Bartlet Span, and one-time trustee of the Tenby Museum, was also enlisted [6] to help with the rearrangement. The Bartlet Span collection of some 5000 specimens was also donated to the NMW in 1915. Then in 1925 staff of the Zoology Department of the National Museum of Wales, including the conchologist J. Davy Dean, were requested to advise on the arrangement and display of the shells [7]. Exactly what was done is unclear but correspondence with the NMW continued through to 1976. Alarmingly F.G. North , then Keeper of Geology in the NMW, in 1939 suggested "*it would certainly be better to turn out some of the shells (displayed in Tenby museum) in order to accommodate fossils*" [8]; what actually was done is not known. Throughout this period only J. Davy Dean and A.S. Kennard emphasised the historical importance of the Lyons collection. Despite all the correspondence about re-arrangement, no-one suggested cataloguing the collection or applying basic curatorial management practices to it. In 1980 the collection was removed from display and a team of volunteers was tasked with data basing the specimens, using the collection management system Modes. The lack of conchological experience during this process did nothing to highlight the historic nature of the collection, and nor was the physical conservation improved. **Figures 2–4** show the natural history gallery as it was in 1939 and the Lyons shells can be seen arranged on wooden slats in the cases.

3. Minutes of the Trustees meeting of 4th October, 1885, Tenby Museum Archive.

4. Minutes of the Trustees meeting of 27th April, 1882; 25th July, 1883; 6th May 1885: 27 November 1890: 25th April 1891, Tenby Museum Archive.

5. Death of Rev C.M. Phelps, The Pembroke County Guardian and Cardigan Reporter for 1st November 1907. Available on-line at the National Library of Wales- https://newspapers.library.wales/view/4251134/4251139/45/Phelps.

6. Minutes of the Trustees meeting of ?th October, 1890, Tenby Museum Archive.

7. Minutes of the Trustees meeting of 8th May, 1925, Tenby Museum Archive.

8. Letter from F.G. North to J.E. Arnett dated 8th March 1939 in Tenby Museum Archive.

Figs 1–4.
Fig. 1, Tenby Museum as it is today overlooking St Catherine's Island.
Figs 2–4, The natural history gallery in 1939, the Lyons shells can be seen attached to wooden slats in the display cases; **1**, with Mr Phelps (treasurer); **2**, with Joseph Arnett, honorary curator, retired 1939; **3**, with Arthur Leach, honorary curator (1940-1955).

Summary of the collection

Today the collection consists of 340 lots of dry molluscan shells representing 216 species. The number of lots of the main categories are given in Table 1 along with the number of species represented. The Lyons list (Lyons mss) of Tenby shells gives 245 species but the disassociation of data has been such that only about one third of the lots now carries locality data. For the majority of specimens it can only be assumed that they came from Tenby. Seventy-four lots did not come from Tenby and among these 21 came from Bear Haven, Bantry Bay in Ireland, 21 from the south coast of England, 12 from Scarborough and 15 from Somerset.

The marine shells in particular have been extensively used for exhibition and many have no direct attribution to Lyons in that they carry no original labels or mounts. Their provenance is only indicated by the addition of "Lyons coll.", either in hand writing or as typed labels, by subsequent curators. The land and freshwater Mollusca examined by Kennard (1944) appear never to have been put on display or rearranged by Phelps. They retain the bulk of their original mounts and labels and include shells gifted to Lyons from other collectors and locations other than Tenby. It is likely that the origins of these shells outside of Tenby excluded them from the attention of Phelps and others who were focussed on displaying only shells from Tenby. The marine shells have been subjected to greater disturbance and a smaller proportion remain with their original mounts.

	number of lots	number of species
Marine bivalves	83	64
Marine gastropods	171	85
Land & freshwater bivalves	10	5
Land and freshwater gastropods	58	54
Polyplacophora	8	6
Scaphopoda	2	1
Cephalopoda	1	1
Mixed	7	

Table 1. Higher taxon summary of the current Lyons Collection in Tenby Museum.

The original Lyons mounts among the marine shells consist of small rectangular blocks covered on their upper surfaces by coloured paper of various shades (**Fig. 5**). At one time these blocks were attached to wooden slats for display and these slats contained the identifications (**Fig. 5**). The reverse is plain and carries the locality data in Lyons' hand but no identifications (**Fig. 6**), these have been added at a later date by subsequent researchers or curators. Remnants of adhesive remain on the reverse sides and often obscure the data. Larger shells

Fig. 5. A reconstructed slat with Lyons block mounts in place.

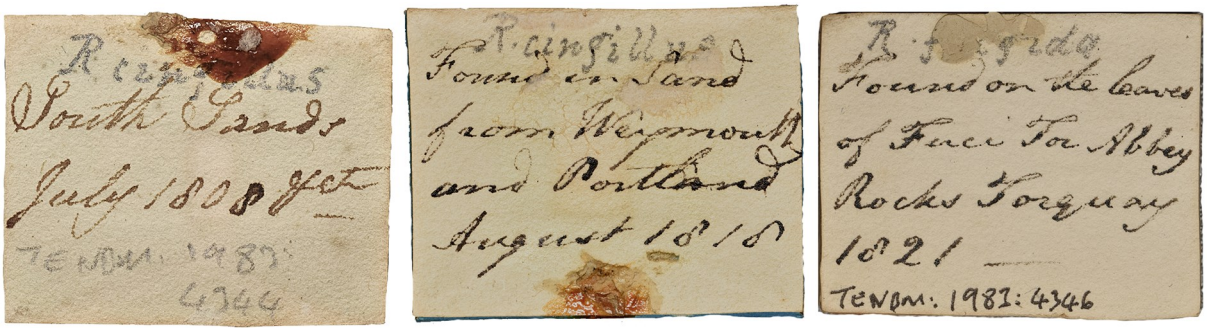

Fig. 6. Reverse of Lyons blocks showing locality and dates in Lyons hand writing, Identifications and museum numbers added later.

Fig. 7. Wooden display slats with Lyons shells fixed directly.

were completely removed from their original mounts and fixed directly onto wooden slats (**Fig. 7**). Their provenance may be a printed label or hand-written stating "Lyons Collection" on the front of the slat or this information may be written on the reverse.

Much of the material examined by Kennard (1944) was gifted to Lyons by his contemporaries and some retain the label styles of these collectors or have been remounted by Lyons himself.

These appear not to have been on display and these will be considered separately under each secondary collector.

Eponyms

Lyonsia W. Turton, 1822 (Bivalvia, Pandoroidea) (**Fig. 8**). Type species *Mya striata* Montagu, 1816.
Turton (1822: 34) wrote "*We have dedicated it to our worthy correspondent, Mr Lyons of Tenby, who first presented it to the notice of the British naturalist*."

The type species was described by Montagu (1816: 188) who also acknowledged Lyons by writing. "*This new and interesting species, it appears, was discovered by Mr Lyons in Tenby-bay on the south coast of Wales, from whence specimens were sent to Mr Norris who obligingly favoured me with that form from which the above description is taken; and I have been reassured by the Rev Mr Bingley that several more have been taken recently by the same gentleman after a storm, which were all alive.*" For Norris see Appendix 3 and the Rev Mr Bingley is dealt with below.

Fig. 8. *Lyonsia* shells in Lyons Coll. Tenby. TENBM 1983.4740 (32 mm).

Lyonsiella G.O. Sars, 1872.
This name is not directly linked to William Lyons but is simply a diminutive of *Lyonsia*.

Trochus lyonsii Fleming, 1828 (**Fig. 9**)
The name *Trochus lyonsii* has a varied attribution but nowhere was it formally described always being referred to as a white variety of *Trochus zizyphinum* first noticed by Leach. The name first appears in Leach's manuscript of his *Molluscorum Britanniae Synopsis* of 1816. Gray (1847) argued that Leach's names should be validated with the date 1818 but this was never accepted and Sherborn (1932) gave the date as 1847, which is the date of Gray's paper. MolluscaBase attributes the name to Leach in Gray, 1852 but this name does not appear in that publication. The name appears in McAndrew & Forbes (1847) and is referred to as *Calliostoma zizyphinum* var. *lyonsii* in Forbes & Hanley, 1850 [1853]. However Fleming (1828: 323) mentions Leach's white variety of *Trochus zizyphinum* as *T. lyonsii* Leach and we argue that this predates all other publications and therefore Fleming takes priority.

Fig. 9. *Calliostoma zizyphinum* var *lyonsii* in Lyons Coll. Tenby. TENBM 1983.4536 (17 mm).

Conia lyonsii G. B.Sowerby I, 1823 (**Fig. 10**)
Lyons included barnacles, worm tubes and larger foraminifera in his list but only mollusc shells are present in his extant collection. This species is cited in Lyons mss and was collected from the hull of a ship in Tenby and presumably sent to W.E. Leach for identification. It is now regarded as a junior synonym of the Caribbean *Newmanella radiata* (Bruguière, 1789).

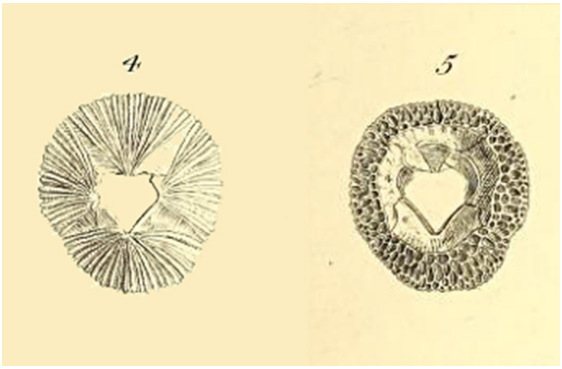

Fig. 10. *Conia lyonsii* reproduced from original figure of G.B. Sowerby I, 1823.

The previous two eponyms were originally given by W.E. Leach (Harrison & Smith, 2008) who during the period of 1815-1822 was the Keeper of Zoology in the Natural History Museum, London. Leach left his position following a nervous breakdown in 1822 and we have no direct archival evidence of correspondence between the two men. Neither publication mention William Lyons directly but Leach mss (in library of NMW) does cite material first collected by Lyons.

The marine molluscs not examined by Kennard (1944)

An indication of the value of the Lyons collection to his contemporaries can be gleaned from the citations in some standard works of the era, primarily Forbes & Hanley (1848-1853) (**Table 2**) and Jeffreys (1862-1869) (**Table 3**). Lyons is cited 32 times in Forbes and Hanley and 18 times in Jeffreys. Both authors describe visiting the Lyons collection; (Forbes & Hanley, vol. 1: 214) and (John Gwyn Jeffreys, vol. 4: 104). Lyons is also cited in Turton, 1822 and in Brown, 1827.

Table 2. List of citations of Lyons in Forbes & Hanley (1848-1853). 1ere partie.

Volume	Page	Citation	Name in citation	Current name	Museum number
Vol. 1	p. 167	"Tenby (Lyons)"	*Mya truncata*	*Mya truncata*	*83/4736*
Vol. 1	p. 214	"having examined Mr Lyons's own specimens"	*Lyonsia norvegica*	*Lyonsia norvegica*	*83/4740*
Vol. 1	p. 234	"by Mr Lyons at Tenby"	*Thracia distorta*	*Thracia distorta*	*83/4735*
Vol. 1	p. 273	"Tenby (Lyons), near Milford Haven (Lyons)"	*Psammobia vespertina*	*Gari depressa*	*83/4719*

Volume	Page	Citation	Name in citation	Current name	Museum number
Vol. 1	p. 276	"Tenby (Lyons)"	*Psammobia fervensis*	*Gari fervensis*	*83/4720*
Vol. 1	p. 286	"sandy beach about two miles from Tenby (Lyons)"	*Tellina fragilis*	*Gastrana fragilis*	*83/4702*
Vol. 1	p. 289	"Tenby (Lyons)"	*Tellina crassa*	*Arcopagia crassa*	*83/4706*
Vol. 1	p. 294	"Tenby (Lyons)"	*Tellina donacina*	*Moerella donacina*	*83/4708*
Vol. 1	p. 299	"Tenby (Lyons + SH)"	*Tellina incarnata*	*Bosemprella incarnata*	*83/4709*
Vol. 1	p. 376	"Fishguard and Caldy Island in Pembrokeshire (Lyons)"	*Lutraria oblonga*	*Lutraria oblonga*	*missing*
Vol. 1	p. 382	"Caldy Island near Tenby (Lyons)"	*Tapes perforans*	*Venerupis corrugata*	*83/4602*
Vol. 1	p. 391	"Tenby (Lyons)"	*Tapes virginea*	*Polititapes rhomboides*	*83/4705*
Vol. 1	p. 394	"Tenby (Lyons)"	*Tapes aurea*	*Polititapes aureus*	*83/4706*
Vol. 2	p. 32	"Tenby (Lyons)"	*Cardium pygmaeum*	*Parvicardium exiguum*	*missing*
Vol. 2	p. 68	"Tenby (Lyons)"	*Diplodonta rotundata*	*Diplodonta rotundata*	missing
Vol. 2	p. 76	"Tenby (Lyons + SH)"	*Montacuta bidentata*	*Kurtiella bidentata*	*missing*
Vol. 2	p. 80	"to the west of Manorbeer, in Pembrokeshire (Lyons)"	*Montacuta substriata*	*Montacuta substriata*	*missing*
Vol. 2	p. 83	"Tenby (Lyons)"	*Turtonia minuta*	*Turtonia minuta*	*missing*
Vol. 2	p. 93	"Mr Lyons (of Tenby) acquired his specimens from the coral-sand of Bantry Bay"	*Kellia nitida*	*Hemilepton nitidum*	*missing*
Vol. 2	p. 241	"Tenby and Milford Haven (Lyons)"	*Arca lactea*	*Striarca lactea*	*missing*
Vol. 2	p. 258	"Milford Haven (Lyons)"	*Pinna pectinata*	*Atrina pectinata*	*missing*
Vol. 2	p. 397	"Found at Tenby, by Mr Lyons, according to Brown"	*Chiton discrepans*	*Acanthochitona discrepans*	*83/4588*
Vol. 2	p. 534	"Tenby (Lyons)"	*Trochus helicinus*	*Margaritus helicinus*	*missing*
Vol. 3	p. 75	"Tenby (Lyons)"	*Rissoa striatula*	*Alvania carinata*	*83/4559*
Vol. 3	p. 122	"Tenby (Lyons)"	*Rissoa rubra*	*Barleeia unifasciata*	*missing*
Vol. 3	p. 129	"Tenby (Lyons)"	*Rissoa fulgida*	*Eatonina fulgida*	*missing*
Vol. 3	p. 140	"Laugharne (Lyons)	*Rissoa ventrosa*	*Ecrobia ventrosa*	*missing*
Vol. 3	p. 220	"we are indebted to the late Mr Lyons of Tenby for the gift of some examples of this remarkable species"	*Aclis supranitida*	*Aclis minor*	*83/4325-6*
Vol. 3	p. 357	"Tenby (Lyons)"	*Lamellaria perspicua*	*Lamellaria perspicua*	*83/4454*
Vol. 3	p. 561	"Milford Haven (Lyons)"	*Pleurobranchus plumula*	*Berthella plumula*	*missing*
Vol. 4	p. 271	"as found at Tenby by Mr Lyons"	*Turritella minor*	*Aclis minor*	*83/4324*
Vol. 4	p. 469	"Tenby (Lyons)"	*Astarte triangularis*	*Goodallia triangularis*	*missing*

Table 2. List of citations of Lyons in Forbes & Hanley (1848-1853). 2eme partie.

Volume	Page	citation	name in citation	current name	museum number
Vol. 2	p. 195	"found by Lyons and Hanley at Tenby	*Lepton squamosum*	*Lepton squamosum*	*missing*
Vol. 2	p. 255	"by Lyons at Tenby"	*Diplodonta rotundata*	*Diplodonta rotundata*	*missing*
Vol. 2	p. 333	"Mr Lyons told me that he had found it at Milford Haven"	*Venus chione*	*Callista chione*	*83/4614*
Vol. 2	p. 350	"Tenby (Lyons)"	*Tapes aureus*	*Polititapes aureus*	*83/4706*
Vol. 2	p. 368	"near Tenby (Lyons)	*Gastrana fragilis*	*Gastrana fragilis*	*83/4702*
Vol. 2	p. 431	"it is said that the late Mr Lyons found it in Pembrokeshire	*Lutraria oblonga*	*Lutraria oblonga*	*missing*
Vol. 3	p. 28	"named after the late Mr W. Lyons, an active British conchologist"	*Lyonsia norvegica*	*Lyonsia norvegica*	*83/4740*
Vol. 4	p. 6	"Tenby (Lyons)"	*Rissoa striatula*	*Alvania carinata*	*83/4559*
Vol. 4	p. 44	"Mr Lyons noticed it at Tenby"	*Rissoa fulgida*	*Eatonina fulgida*	*missing*
Vol. 4	p.57	"Tenby (Lyons)"	*Barleeia rubra*	*Barleeia unifasciata*	*missing*
Vol. 4	p. 95	"Tenby (Lyons)"	*Scalaria trevelayana*	*Epitonium trevelaya-num*	*missing*
Vol. 4	p. 104	"Tenby (Lyons and J.G.J)" "This shell the type of which I examined in the collection of the late Mr Lyons, Tenby"	*Aclis supranitida*	*Aclis minor*	*83/4325-6*
Vol. 4	p. 161	"Tenby (Lyons)"	*Odostomia scalaris*	*Brachystomia scalaris*	*83/4304*
Vol. 4	p. 163	"Tenby (Lyons)"	*Odostomia rufa*	*Pyrgiscus crenata*	*83/4350-1*
Vol. 4	p. 232	"Dover (Lyons fide Montagu)"	*Aedorbus subcarinatus*	*Aedorbus subcarinatus*	missing
Vol. 4	p. 317	"Tenby (Lyons)"	*Trophon muricatus*	*Trophonopsis murica-tus*	*83/4444*
Vol. 4	p. 320	"Tenby (Lyons)"	*Trophon truncatus*	*Boreotrophon truncatus*	*83/4445*
Vol. 4	p. 448	"Tenby (Lyons)"	*Philine scabra*	*Philine scabra*	*missing*

Table 3. List of citations of Lyons in Jeffreys (1862-1869).

The collection was visited by two persons who gave identifications by writing these on the reverse of the wooden blocks (**Fig. 11**). These identifications are often partly obscured by glue and were thus made before the collection was attached to the wooden slats as seen in the display cases and in **Figure 5**. The identifications written in a primitive style in pencil (top row) are by a person unknown to us but the handwriting on the bottom row is that of J.T. Marshall (1842-1922). Marshall (1893-1912) compiled a series of papers entitled "*Additions to British Conchology*" and one suspects that he was using the Lyons collection to verify records. We have no direct evidence from Tenby Museum archives of his visit.

Fig. 11. Lyons blocks. Top row annotated with identifications in pencil in an unknown hand. Lower row annotated with identifications in the hand of J.T. Marshall.

Capt. T. Brown

Thomas Brown (1785-1862) was a Scottish naturalist and conchologist. He is best remembered for his *Illustrations of British Conchology* (1827 and reprinted and expanded in 1844) in which he introduced many new genera and species, very few of which gained acceptance. He became curator of the Manchester Museum in 1840 but very little of his shell collection has been recognised (Jackson, 1944; McGhie, 2008).

Brown is not mentioned in the labels of the Lyons collection but Brown does refer to shells in Lyons collection and having examined some, from which he described new species. For one species a lectotype has been chosen (Kaas, 1985) but for others, type material has not been located although the species are represented in the collection. In Brown (1827, 1844) he refers to Lyons as George Lyons of Tenby, but this must be an error as there was no George Lyons living in Tenby at that time and none with a collection of shells from Tenby.

Chiton discrepans Brown, 1827
now *Acanthochitona discrepans* (Brown, 1827)
(Fig. 12)

Lectotype designation: Kaas (1985: 598–602).
Type material: 7 shells as *Chiton discrepans* formerly attached to a wooden slat but no original labelling. TENBM 1983.4588, det. Anon. Lectotype and 6 paralectotypes as illustrated by Kaas (1985). Kaas's figure numbers are linked to catalogue numbers as follows: fig. 62 (lectotype) is #4588/1; fig. 61 is #4588/2; fig. 60 is #4588/3; fig. 59 is #4588/4; fig. 65 is #4588/5; fig. 66 is #4588/6; fig. 67 is #4588/7. The undersides of these shells have remnants of the typical duck-egg blue card used by Lyons.
Type locality: Tenby, Pembrokeshire, Wales, U.K.
Type references: As ***Chiton discrepans*** Brown, 1827, pl. 35, fig. 20. As ***Chiton discrepans*** Brown, 1827, In Brown T. 1844: 65, pl. 21, fig. 20.

Fig. 12. Type series of *Chiton discrepans* Brown 1827, TENBM: 1983.4588/1–7, with the figure numbers from Kaas, 1985, no 62 is Lectotype, 21.0 mm. Insert: a copy of the original illustration in Brown, 1827.

1827 Description

Several specimens of this new shell, as a British species, were sent to me by George Lyons, Esq. of Tenby Wales as the *C. fascicularis*, which shell, it would appear, is not known on that coast.

1844 Description

Shell much elongated, narrow, acutely carinated; valves shield-shaped, and acutely pointed beneath; along the centre of the valves is a lance-shaped elevation, which is striated longitudinally; valves covered with strong, round, elevated regularly set papillae, except at the edges, which are plain; at the junction of each valve is a tuft of strong, straight, stiff bristles; whole margin beset with rather distant, very minute, grey hairs; valves generally of an orange-yellow; margin deep umber-brown. This species differs from the preceding in being much more carinated, in the valves being a third narrower, in the fasciculi of bristles being shorter and more stunted, in the papillae being round instead of oval, and the whole shells being narrower in proportion to its length. Several specimens of this shell, new to the British Conchologist, were sent to me from George Lyons, Esq, of Tenby, Wales, where it is common and where it was mistaken for the *C. fascicularis*.

Turritella minor Brown, 1827 now *Aclis minor* (Brown, 1827) (**Fig. 13**)

Type material: Syntypes: 4 shells as *Aclis supranitida* S.V. Wood, 1842 Found in sand from the South Sands, 1808. TENB 1983.4325, det. J.T. Marshall.

Type locality: South Sands, Tenby, Pembrokeshire, Wales, UK approx. 51.66°N 4.71°W

Type references: As ***Turritella minor*** Brown, 1827: pl. 51, figs 57, 58. As ***Turritella minor*** Brown In Brown T. 1844: 9, pl. 8, figs 57, 58.

1827 Description

Turritella minor – A new species. Found at Tenby by George Lyons Esq – In his cabinet

1844 Description

Shell acute; with fifteen well defined, rounded, somewhat short volutions, tapering to a sharp point, covered with very fine, regular, spiral striae; aperture subrotund; outer lip thin. Length three-eighths of an inch, breadth not an inch. Found on the coast of Tenby, Wales, by George Lyons, Esq., Tenby and in his cabinet.

Fig. 13. *Aclis minor* (Brown, 1827). **(a)** Original figures nos 57 and 58 from Brown, 1827. **(b)** Reverse of Lyons block with type locality, *Aclis supranitida* det. by J.T. Marshall. **(c)** Syntype series of *Turritella minor* Brown, 1827, TENBM 1983.4326/1-4.

No formal description was given in 1827, only illustrations. A brief description was given in 1844 but was not regarded as sufficient by Forbes and Hanley (1853: 271) to distinguish it. They correctly point out the error in Brown's dimensions. *Aclis minor* is included in Forbes and Hanley (1850) but under *Aclis supranitida* SV Wood where they acknowledge a gift of this species from Lyons. If these shells exist they may be regarded as part of the syntype series.

Pyramis crystallinus Brown, 1827 now *Hyala vitrea* (Montagu, 1803) (**Fig. 14**)

Type material: Possible syntypes, 8 shells attached to a brick-red wooden block. “Found on the South Sands, June 1809” in Lyons hand. TENBM 1983.4329/1-5. As *Rissoa vitrea* det. Anon. 4 separated off as 1983.4329/1–4, 4 damaged shells attached to wood block as 1983.4329/5.

Type locality: South Sands, Tenby, Pembrokeshire, Wales, UK approx. 51.66°N 4.71°W

Type references: As ***Pyramis crystallinus*** Brown, T. (1827: pl. 50, fig. 76). As ***Pyramis crystallinus*** In Brown T. 1844: 13, pl. 9 fig. 76.

This taxon is absent from modern databases but was considered to be a junior synonym of *Rissoa vitrea* (now *Hyala vitrea*) by both Forbes and Hanley (1853) and Jeffreys (1867). No specimens labelled as *Pyramis crystallinus* or *crystallinus* are present but shells of *Hyala vitrea* are, under TENBM 1983.4329.

1827 Description

A new species. Found by George Lyons Esq. - In his cabinet.

1844 Description

Shell blueish white, with 5 glossy, very smooth, somewhat ventricose volutions; ending in a rather obtuse apex; body more than one and a half the length of the spire, and a little cylindrical; aperture nearly orbicular; outer lip thin, smooth; pillar lip very slightly reflected on the columella. Length an eighth of an inch; breadth not half its length. Found at Tenby, by George Lyons, Esq., and in his Cabinet.

Myatella montagui Brown, 1844

Brown (1844) introduced the generic names Magdala and Myatella and the new species *Myatella montagui* but all are compounded around Montagu's *Mya striata* and *Lyonsia* of Turton. *Myatella montagui* is credited to shells discovered in Tenby by Lyons but it is clear that these are the same shells described by Montagu as *Mya striata*. All the names here have been placed into the synonymy of *Lyonsia norvegica* in MolluscaBase (2020).

Fig. 14. *Pyramis crystallina* Brown 1827 now *Hyala vitrea*, **(a)** 4 potential syntypes TENBM 1983.4329/1-4. **(b, c)** 8 potential syntypes as originally attached to wood block with locality data on reverse, TENBM 1983.4329/5 **(d)** original illustration from Brown, 1827.

Col. G. Montagu

We already know that Lyons was acquainted with Col. George Montagu through the description of *Mya (Lyonsia) striata*. From annotations on the Lyons blocks (**Fig. 15**) we also know that Lyons received shells from Montagu and that Montagu identified shells for Lyons. The Lyons collection contains other shells that may have come from Montagu and may have some taxonomic significance. It is however unfortunate that the disassociation of data from the shells within the Lyons collection has left this a matter of conjecture.

Voluta catenata Montagu, 1803 now *Gibberula catenata* (Montagu, 1803) (Fig. 16)

Type material: Possible syntypes: 3 shells as *Gibberula miliaris*. TENB 1983.4515, det. Anon.

Type locality: Cornwall (as given in Montagu, 1803)

Type references: As ***Voluta catenata*** Montagu, 1803: 236, pl. 6, figs 2. Montagu described this species believing that his shells came from Cornwall (Oliver *et al.*, 2017: 377). This is a Caribbean species and is one of the numerous erroneous additions made by Montagu to the British fauna (Oliver & Morgenroth, 2018). Three shells agreeing entirely with those described by Montagu are present in the Lyons collection and one cannot but surmise that these came from Montagu. As no type material was found in Exeter or London (Oliver *et al.*, 2017) we suggest that the shells in the Lyons collection are possible syntypes and are treated here as such.

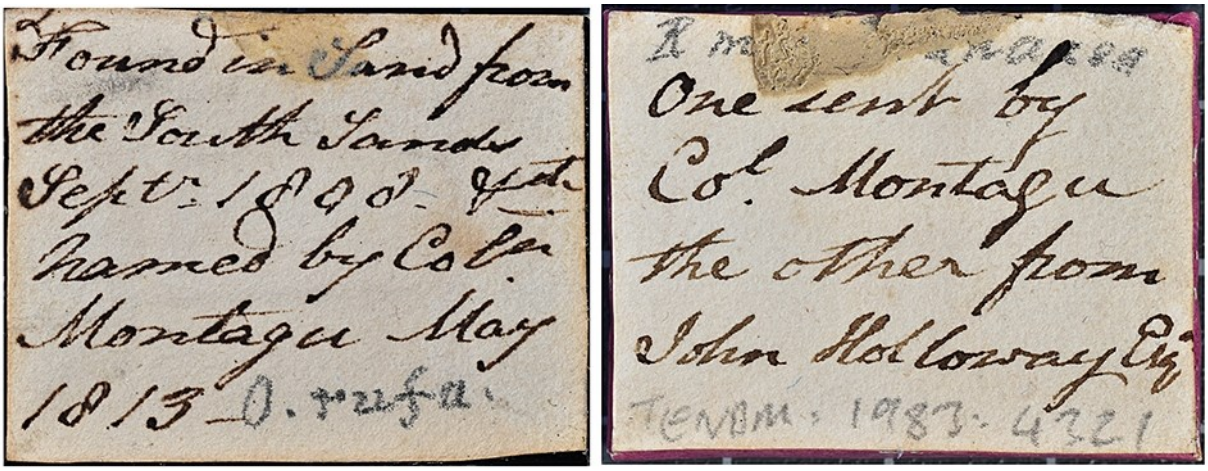

Fig. 15. Reverse of Lyons mounts indicating provenance of Col. George Montagu. TENBM 1983.4321 and TENBM 1983.4351.

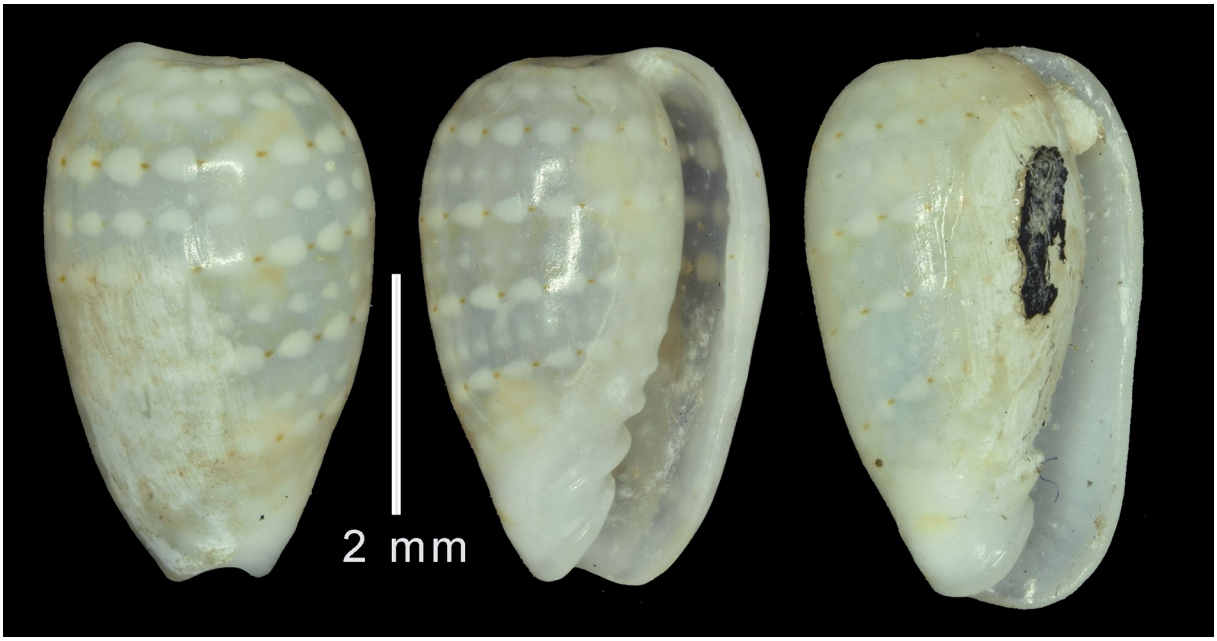

Fig. 16. *Gibberula catenata* (Montagu) from the Lyons collection. TENBM.1983.4515.

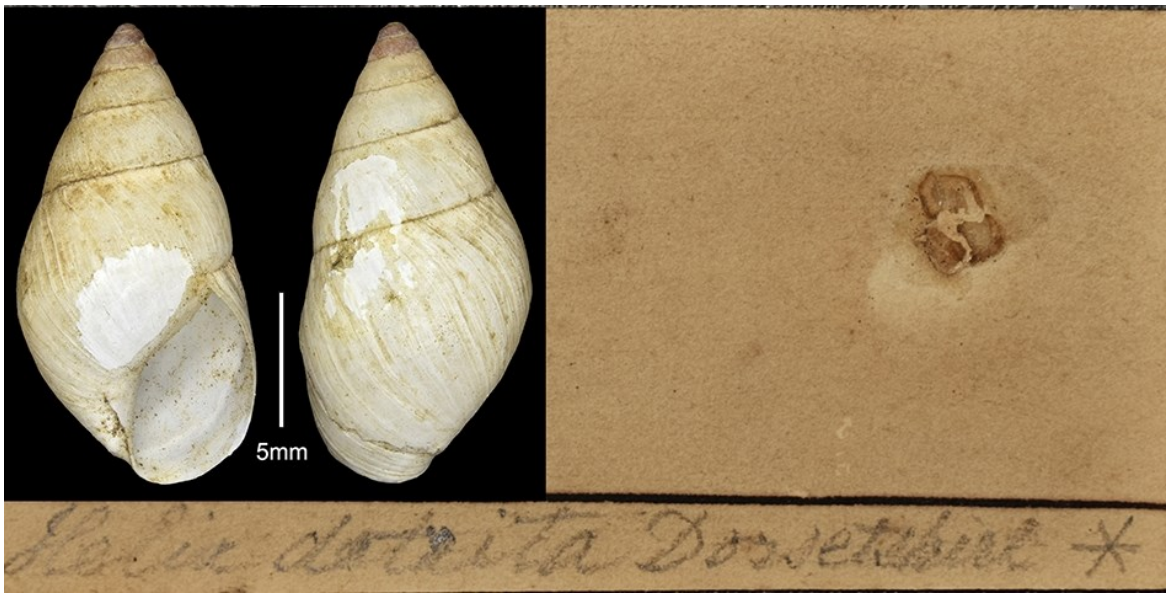

Fig. 17. *Helix detrita* Montagu from Dorsetshire in the Lyons collection. TENBM. 2001.192.2.

Helix detrita Montagu, 1803 now *Drymaeus elongatus* (Röding, 1798) TENBM 2001.192.02 (**Fig. 17**).

This is another neotropical shell described by Montagu as British (Oliver *et al*., 2017) and was given to Montagu by Mr Bryer who found it at Weymouth and Dorchester. The two shells in the Lyons collection match exactly and are labelled as coming from Dorsetshire, it seems plausible that Lyons's shells are part of the same lot seen by Montagu but from whom Lyons got them is not known. Dorsetshire localities in Montagu (1803; 1808) are frequently linked to a Mr Bryer and to a lesser extent a Miss Pocock who is more fully acknowledged by Donovan (1802: pl. 125).

Miss Elizabeth Pocock

Donovan (1802) says of Miss Pocock when describing *Mactra glauca* "*the conchologist is indebted to Miss Pocock for the discovery of it on our shore. The attention with which this lady has honoured the science has not been rewarded by this new species only: we have been favoured with several others, besides many rare kinds that have been found by her on different parts of the sea-coast.*"

A Miss Elizabeth Pocock is mentioned in J. Sowerby (1812: 14; 1818: 22) as donating shells from Marazion in Cornwall and therefore probably the same person. Turk (1979) suggested that this Miss Pocock may have been part of the family of Nicholas Pocock (artist, b. 1741) and brother of Nicholas Pocock (marine captain out of Cornwall from 1804-1811), but this is supposition. Unfortunately, we have been unable to find any confirmatory biographical data for this lady but record here that she also sent shells to Lyons (**Fig. 18**), lots #2017.08, #1983.4741 and #2001.129.04.

Fig. 18. *Turbo truncatus* Montagu collected by Miss Pocock from the "regectamenta of the River Itchin at Southampton".

Bear Haven and the Puxleys

There are 21 lots present bearing the locality "Bear Haven" a location in Bantry Bay, SW Ireland. There is a single label linking their provenance to a Miss Puxley (**Fig. 19**). However, Lieut.-General Bingham is also implicated as Leach in Gray (1852) notes that a J.L. Puxley sent a shell to Gen. Bingham that Leach subsequently described as *Buccinum puxleianum* (now *Buccinum humphreysianum* Bennett, 1824). Brown (1827, 1844) describes his *Brochus arcuatus* as "Found in sand, at Bear Haven ---- by General Bingham, in his cabinet".

As Lyons received shells from Bingham, both Bingham and Puxley are possible sources. A Mrs Puxley is cited five times by Forbes & Hanley (1853) and four times by Jeffreys (1862-68). The JL Puxley mentioned by Leach in Gray (1852) can be traced to a John Lavellin Puxley formerly of Cork and listed as a landowner in the parish of Bear Haven. He and his family subsequently appear in the 1841 census of Laugharne (Pembrokeshire) and again in 1851 now in Tenby. In this last census they have a visitor, one Jane Lyons (1805-1879) eldest daughter of William Lyons. This is the daughter who donated some of the conchological books belonging to William Lyons to Tenby Museum in 1885.

Bantry Bay is a frequent locality in shell collections probably because of the diverse species to be found in the coral (maerl) sands. The locality appears in the biological literature first in 1809 (Lyne, 1983) when Lewis Weston Dillwyn, William Elford Leach and Joseph Woods make a collecting trip and visit the famous Irish Botanist Ellen Hutchins at her home in Ballylickey, Bantry Bay. (Harrison & Smith, 2008). Although most well known as a botanist Ellen Hutchins also collected shells and Leach named *Persiphona hutchinsiana* [now *Alvania cimex* (L. 1758)] for her after a shell she sent to him (Harrison and Smith, 2008; 99). William Turton and his daughter acknowledge the hospitality of the 1st Earl and Countess of Bantry (Viscount Beerhaven) at their "noble house" Bantry House and note some shells collected there (Turton,1819: 260).

Fig. 19. Spirula peronii from Miss Puxley collected at Bear Haven, Bantry Bay, TENBM 2017.06.

The non-marine molluscs examined by Kennard (1944)

J.S. Miller

J.S. Miller (?-1830) was Curator of the museum in Bristol during the early part of the 19th century. He was primarily interested in palaeontology, particularly crinoids. He wrote a single paper (Miller, 1822) on the land and freshwater molluscs of the Bristol district. In this paper he describes *Turbo everetti*, *Helix allaria*, *Helix subrufescens* and *Helix goodalli*. The presence of trade cards in the Lyons collection suggests that Miller was a serious collector and probably had a formal arrangement for exchanging shells. A biography of Miller can be found in the *Philosophical Magazine* (Anonymous, 1831).

Kennard (1944) attributed 8 lots to JS Miller the most important taxonomically being two lots attributable to new species described by Miller. Their significance was noted by Kennard (1944) who suggested they may represent paratypes but the loss of the Miller collection in Bristol due to bombing of the museum during the Second World War raises their status to syntype.

Helix goodalli J.S. Miller, 1822, now *Opeas hannense* (Rang, 1831).

Type locality: The pineries at Bristol (**Fig. 20a**).
Type material: Possible syntypes, 4 shells, Found in the pineries at Bristol. Leg. J.S. Miller. As *Cochlicella clavulus*. TENBM 2001.129.12
Type locality: Pineries (pineapple cultivation beds) Bristol, England.
Type reference: Miller, J.S. 1822: 381 not figured.
These shells are from the type locality as given by Miller (1822) and with the absence of type material in the Bristol Museum can be regarded as possible syntypes. The pineries mentioned were beds for raising pineapples and were kept at a raised temperature ideally suited for this hot-house alien. There are currently only 12 recorded occurrences of this species in the UK (NBN Gateway, 2019) but is fairly common as a hothouse alien (pers.

Fig. 20. (a) syntype of *Helix goodalli* J.S. Miller, 1822 with label in the Lyons collection, TENBM 2001.129.12.
(b) second lot of *Helix goodalli* as *Helix cochlicella*, TENBM.2001.129.42.

comm. Ben Rowson).

A second lot that Kennard (1944) also attributed to J.S. Miller is present but carries no locality data and is not considered as type material. 4 shells, No locality. As *Helix cochlicella*. Leg. J.S. Miller. TENBM.2001.129.42 **(Fig. 20b)**.

Original description

A subperforated, turreted, pellucid, pale corneus, or almost white shell, having six to seven volutions, and an ovate aperture.

Helix subrufescens J.S. Miller, 1822, now *Zenobiella subrufescens* (J.S. Miller, 1822) (Fig. 21).

Fig. 21. Syntypes of *Helix subrufescens* J.S. Miller, 1822. TENBM.2001.129.44.

Type material: Possible syntypes, 2 fragmentary shells, No locality, As *Helix subrufescens*. Leg. J.S. Miller. TENBM 2001.129.44

Type locality: Environs of Bristol

Type reference: In. Miller, J.S. 1822: 379 not figured.

Original description

A subumbilicated, very slightly carinated, irregularly striated, slightly raised, diaphanous shells, with five volutions, and a somewhat round lunated aperture.

Kennard (1944) believed that these shells came from J.S. Miller and were therefore paratypes and that he knew of no specimens of this species in the Alder collection in Newcastle. Given that the Miller collection in Bristol has been lost we feel justified in suggesting that these shells can be considered as possible syntypes even though there is no locality data with them.

J.S. Miller Trade Cards

The trade cards **(Fig. 22)** give Miller's private address suggesting that his conchology was not part of his museum duties and that perhaps he ran a shell dealership from his home.

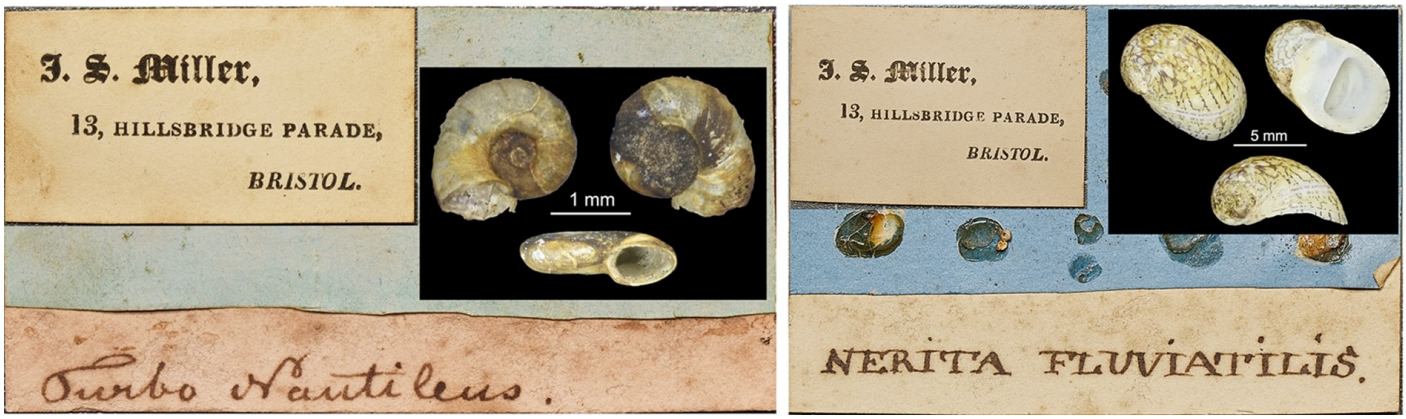

Fig 22. Trade cards of J.S. Miller in the Lyons Collection. Right, TENBM: 2001:129:40, Theodoxus fluviatilis;
Left, TENBM: 2001:129:39, Gyraulus crista. Reverse of card in left corner, shells cleaned and detached from card.

W. Bean

William Bean II (1787-1866) of Scarborough is well known for the extensive collections that he amassed and his generous nature through the exchange of specimens (McMillan & Greenwood, 1972). Kennard (1944) recognised 10 lots in the Lyons collection all attached to the distinctive mounts of Bean's collection. Of these one may have some taxonomic significance.

Helix scarburgensis Alder, 1830 now *Spermodea lamellata* (Jeffreys, 1830) (**Fig. 23**)

Type material: Possible syntypes. 3 shells and 1 fragment. No Locality. Leg. W. Bean. TENBM. 2001.129.37.
Type locality: Scarborough, Yorkshire, England.
Type references: Alder, J. 1830: 36. As ***Acanthinula lamellata*** Jeffreys, 1830: 333.
Helix scarburgensis is a manuscript name by William Bean of Scarborough. Bean distributed such specimens to other collectors including J.S. Miller of Bristol and J. Alder of Newcastle. The shells in the Lyons collection were attached to a typical Bean mount carrying his very distinctive writing style. Alder (1830) on the basis of Bean's material published his *Helix scarburgensis* but almost simultaneously Jeffreys described his *Acanthinula lamellata* (Jeffreys, 1830) on Bean material given to him by J.S. Miller. Authentic material from Bean can be regarded as potential type material and it is noted here that Jeffreys's types of *S. lamellata* are not itemised in the Jeffreys collection in the United States National Museum (USNM) and no material of Alder's *H. scarburgensis* has been found in Newcastle. The shells in the Lyons collection have the same provenance of both Alder's and Jeffreys' taxa and could act as potential type material. It is also known that Lyons's shells were sent to Bean. Oliver (2015) reported on shells of the alien bivalve *Mytilopsis leucophaeata* labelled "Lyons, Tenby" on a Bean label in the Doncaster Museum collection.

W. Turton

William Turton (1762- 1835) was as a physician and worked in Swansea for 15 years, moving to Dublin, Teignmouth, Torquay and finally settling in Bideford in 1831. He was a contemporary of Col. G. Montagu, Forbes and Jeffreys and wrote a number of seminal works, notably his *Conchylia Insularum Britannicarum* (published in 1822). Turton's collection came into the possession of Jeffreys and is now incorporated with the latter in the USNM. The genus *Turtonia* was dedicated to Dr Turton by Alder, 1848.

Physa alba Turton, 1826 now *Physa fontinalis* Linnaeus, 1758.

Type material: Possible syntypes as Fragments. Formerly attached to a beige card marked in pencil with "111. Physa alba". TENBM 2001.129.05. (**Fig. 24**).
Type locality: Towyn, North Wales, UK.
Type reference: Turton W. 1826: 363, pl. 13, fig. 3.
Type description
Testa sinistrorsa, ovata, ventricosa, albo-cornea, pellucida; anfractibus quatuor, tumidis, exsertis: apertura ovata.
Shell sinistral, oval, ventricose, white horn-colour, transparent: volutions four, tumid and produced. Length four tenths of an inch; breadth about three tenths.

Fig. 23. Possible syntype of *Helix scarburgensis* Alder and *Acanthinula lamellata* Jeffreys. TENBM.2001.129.37. Card mount ex W. Bean, his hand writing.

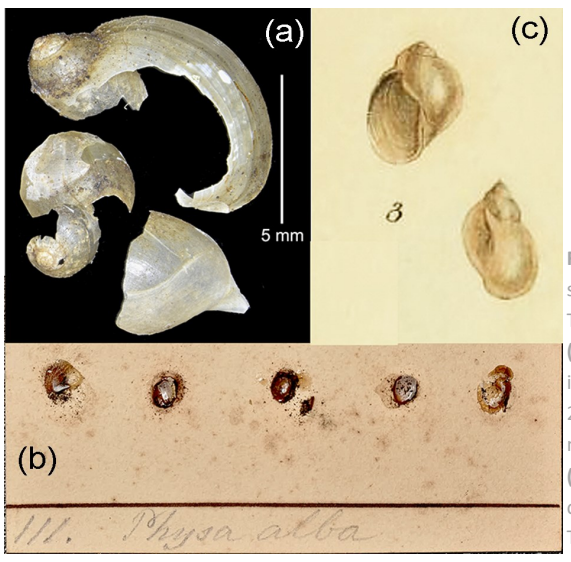

Fig. 24. Possible syntypes of *Physa alba* Turton, 1826. **(a)** remaining fragments in Lyons Coll. TENBM 2001.129.05. **(b)** Lyons's mounting card. **(c)** reproduction of original figure from Turton, 1826 (enlarged).

We know from the literature that William Turton corresponded with Lyons but there seems to have been very little exchanging of specimens. Kennard (1944) considered one lot to have come from Turton because of the reference to "111" on Lyons' card which is a direct reference to Turton's Manual of 1831. If so Kennard considered these to be paratypes of *Physa alba* Turton and considered that they match the original figures. On the Smithsonian catalogue we could find no reference to this species in its original name or current name of *Physa fontinalis* with the type locality of Towyn, Wales. If Kennard is correct then these shells could act as syntypes but they are now in fragments and scarcely recognisable.

General Bingham

Lieut.General Richard Bingham (1741- 1824?). Officer in the Dorset Militia. Resided Melcombe Horsey in the parish of Melcombe Bingham near Dorchester, Dorsetshire, England.

He carries the eponyms of *Sphenia binghami* Turton, 1819, *Pyramis binghami* Brown, 1827, *Binghami paradoxus* Brown, 1827 and *Sabanea binghamiana* Leach, 1852.

He was described variously as "*our diligent fellow-labourer among the rocks of Torbay*" (Turton, 1819); "*an assiduous collector of British shells*" (Jeffreys, 1864); "*indebted to the exertions of his friend General Richard Bingham*" (Brown, 1827). In contrast "*General Bingham was notorious for being imposed on as to indigenousness*" (Jeffreys' letter in Forbes & Hanley, 1853). This would imply that his locality data were not to be trusted and this might stem from the thirty-nine new species described by Brown (1827) from shells collected by Bingham, primarily from Dunbar and Belton Sands in East Lothian, Scotland. These localities are exactly those so often given by the mistrusted Captain Laskey (1811) in his "*Account of North British Testacea*" (Oliver *et al*., 2017; Oliver & Morgenroth, 2018). Regardless of Bingham's reputation he did gift shells to Lyons, some of the marine shells directly indicating their provenance but others probably indirectly (**Fig. 25**). Those lots carrying localities of Dunbar and or Belton Sands (**Fig. 25**) probably all came from Bingham.

Kennard (1944) also attributes a series of 15 terrestrial molluscs collected in north Somerset to General Bingham. These consist of a pale blue card to which the shells were attached; the identifications are on a paper attachment and the locality is on the reverse of the card. One lot (**Fig. 26**) carries the label "*Helix striatula* Bingham", a manuscript name suggesting that these lots came from Bingham. Kennard (1944) was not totally convinced of this provenance and we could not find any connection between the Bingham family and a property in the vicinity of Langford or Churchill Batch.

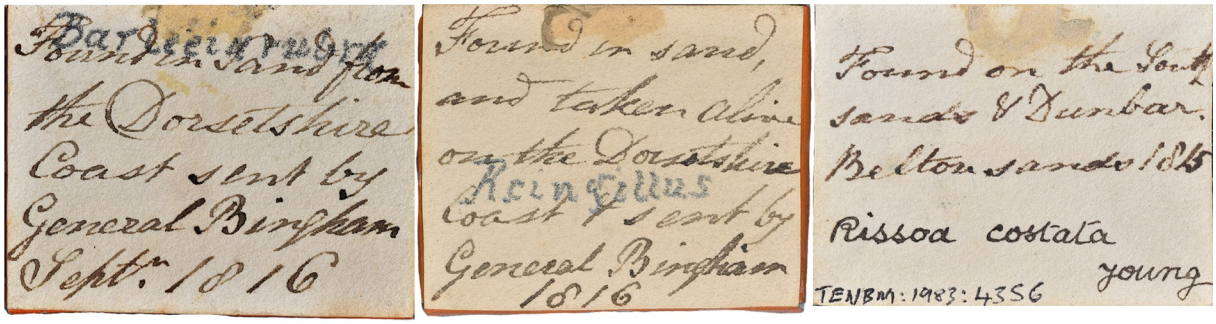

Fig. 25. Reverse of Lyons mounts indicating the provenance of General Bingham and the Scottish localities of Dunbar and Belton Sands. TENBM. 1983. 4310, TENBM. 1983.4343, TENBM. 1983.4356.

Fig. 26. One of 15 lots of land snail attributed to General Bingham. This labelled with the manuscript name *Helix striatula* Bingham. TENMB. 2001.129.25.

Fig. 27. Two lots attributed to the Rev. J. Goodall. *Turbo tridens*, Amersham are topotypes of *Azeca goodalli* Férussac. TENBM.2001.129.48. *Turbo 6-dentatus*, Eton is *Vertigo pygmaea* (Draparnaud). TENBM.2002.92.

J. Goodall

Dr Rev Joseph Goodall (1760-1840) was Provost of Eton and an ardent shell collector purchasing at auctions such as that of the Tankerville collection; his shells are mostly now in the Natural History Museum London (Dance, 1986). A number of eponyms were given including *Helix* (now *Azeca*) *goodalli* Férussac, 1821. Kennard (1944) recognised 3 lots that he attributed to Goodall (**Fig. 27**). Of these one is of interest as it consists of a topotype of *Azeca goodalli*. The single shell was attached to a pale blue-green hexagonal card with an attached paper label reading "*Turbo tridens*, Amersham". The syntypes of this species are in the Muséum National d'histoire Naturelle, Paris.

J. Walcott

John Walcott (1754-1831) was a naturalist who wrote on diverse subjects and was an early disciple of Linnaeus. He lived in various houses in and around Bath although he rather eccentrically rented country properties moving around frequently (Torrens, 2004). The Walcotts and Lyonses had their family roots in south-west Ireland and were to be connected by marriage when in 1783 John married William Lyons' sister, Dorothy Mary (1759-1832). Marriage between the two families continued when Mary Ellen the (sixth child of William Lyons) married Edmund Scopoli Walcott (third son of John Walcott) in Tenby in 1817. A further example of Walcott's eccentricity was the naming of his sons after famous naturalists Edmund Scopoli (b. 1785), John Lyons Ray (b. 1788) and William Henry Linnaeus (b. 1790). Only a single lot in the shell collection reflects the above link however Walcott was not a shell collector but was known for his fossils (Torrens, 1976). The shell is that of *Unio tumidus* Retzius, 1788 taken from the River Severn, in 1810 (**Fig. 28**).

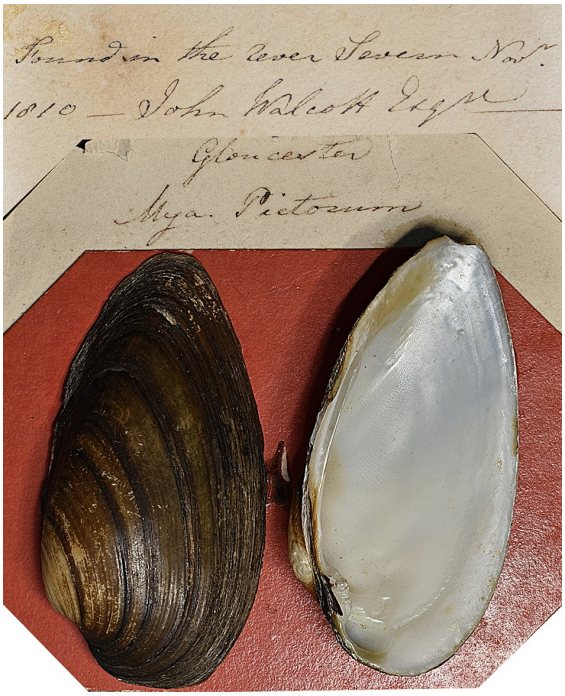

Fig. 28. *Unio tumidus* Retzius collected by John Walcott from the R. Severn. TENBM. 2001.129.15.

Rev. W. Bingley

William Bingley (1774-1821) was an English cleric, naturalist and writer (Courtney, 1886). He was a fellow of the Linnean Society and wrote on both botanical and zoological subjects. He is not recognised as a shell collector.

A single lot is attributable to Bingley as indicated on Lyons's label (**Fig. 29**). The two shells were identified as *Helix octanfracta* Montagu, 1803 and at that time was considered rare. The exact locality of 'a pond between Litchet and Lower Litchet' is to be found in Maton & Rackett (1807, p.212) who wrote "This is either a rare or very local species" -- We have procured it from a gravel pit between Litchet and Lower Litchet, Dorset. *Helix octanfracta* is now a syno-

Fig. 29. *Helix octanfracta* (*Omphiscola glabra*) collected by the Rev. Bingley from a pond near Litchet, Dorsetshire.

Fig. 30. Two lots attributed to Thomas Rackett by Kennard (1944). Shells and top mount as *Turbo nigricans* TENBM 2001.129.52. Bottom mount as *Turbo laminatus* white variety, TENBM 2001.129.55.

nym of the *Omphiscola glabra* (O.F. Müller, 1774) a widespread but very local species that is not well represented in large museum collections (pers. comm. Ben Rowson).

Rev. T. Rackett

Thomas Rackett (1755-1840) was an English cleric, antiquary and naturalist (Watkins and Davies, 2004). Working with William George Maton (1774-1835) he wrote a history of early conchologists (Maton & Rackett, 1804) and a catalogue of British shells (Maton & Rackett, 1807).

Kennard (1944) tentatively attributes 6 lots to Rackett but he gave no reasons for this assumption, he may have recognised the label style (**Fig. 30**) although there is no known depository for the Rackett collection.

Unidentified glass mounts

Among the Lyons collection are four glass mounts that were not reported upon by Kennard (1944). The shells are sandwiched between two glass plates and visible on both sides through a window cut in the inserted card mount. The script on the labels is not that of Lyons but despite being intricate and very distinctive we have been unable to verify their provenance. Both writing styles are however similar to those seen of the trade cards of J.S.

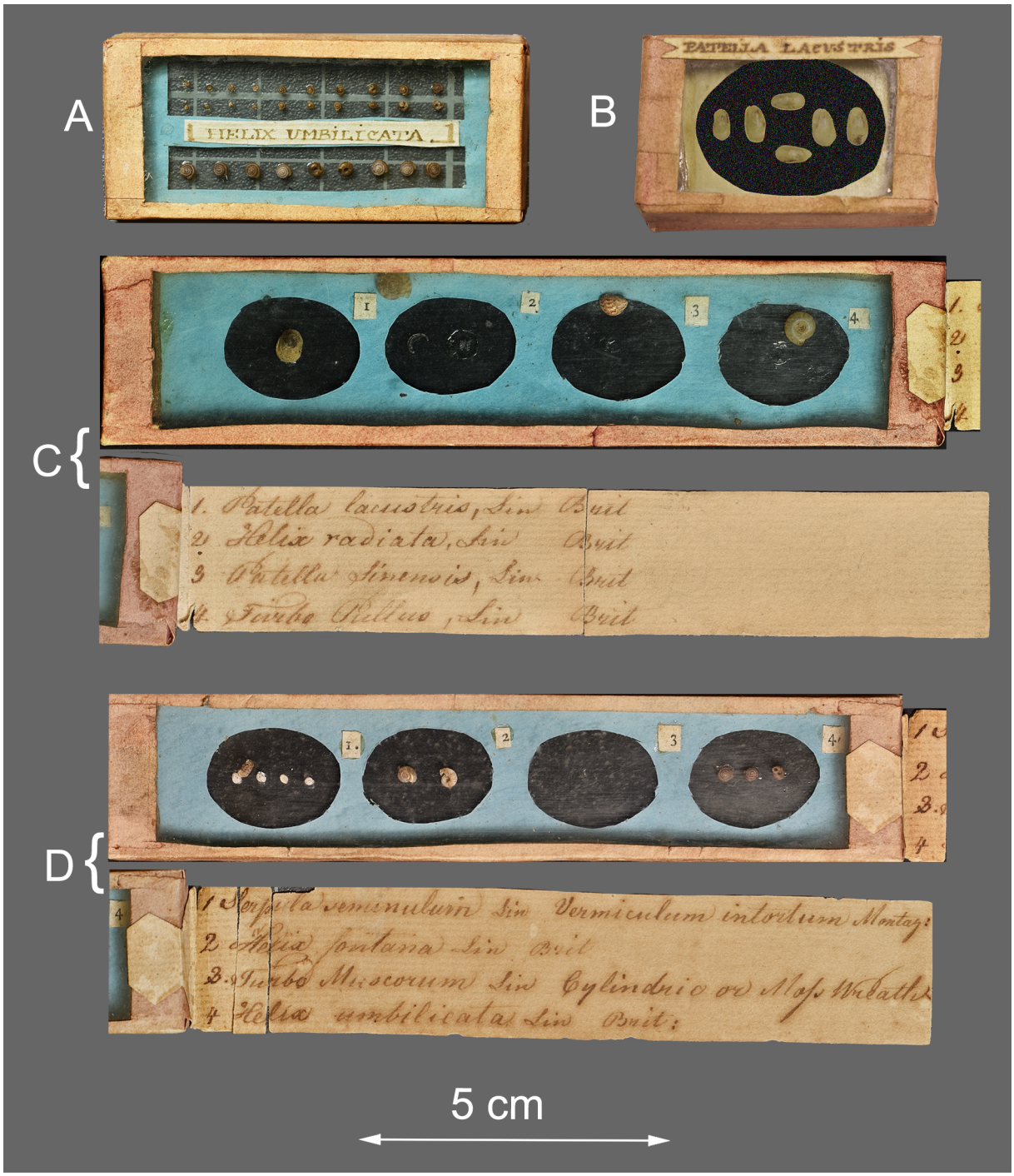

Fig. 31. Four glass mounts of uncertain provenance. **A**, TENBM 2001.129.13; **B**, TENBM 2001.129.10; **C**, TENBM 2017.02; **D**, TENBM 2017.01.

Miller (see **Fig. 31**). In *Turbo* for example the right tail of the T is extended and reflected over most of the word. The block printing in capitals are alike.

Brief family history

Prepared by Douglas Fraser for Tenby Historical Society reprinted from http://www.tenbyhistoricalsociety.org.uk/downloads/William_Lyons.pdf.

Figure 32a, b, family history charts prepared from data in Ancestry.com.

William Lyons of Tenby (1766-1849)

Origins

William Lyons was the descendent of an Irish family although the very early origins suggest they can be traced back to the Lords of Glamis of Glamis Castle in Scotland. At some point in the seventeenth century the family acquired estates in Ireland with the family seat at Lyons River, Kings County. His great grandfather, Major Henry Lyons served in the West Indies where he married Sarah Winthrop whose father was to become Governor of Antigua. In addition to the Antiguan estates that he thus

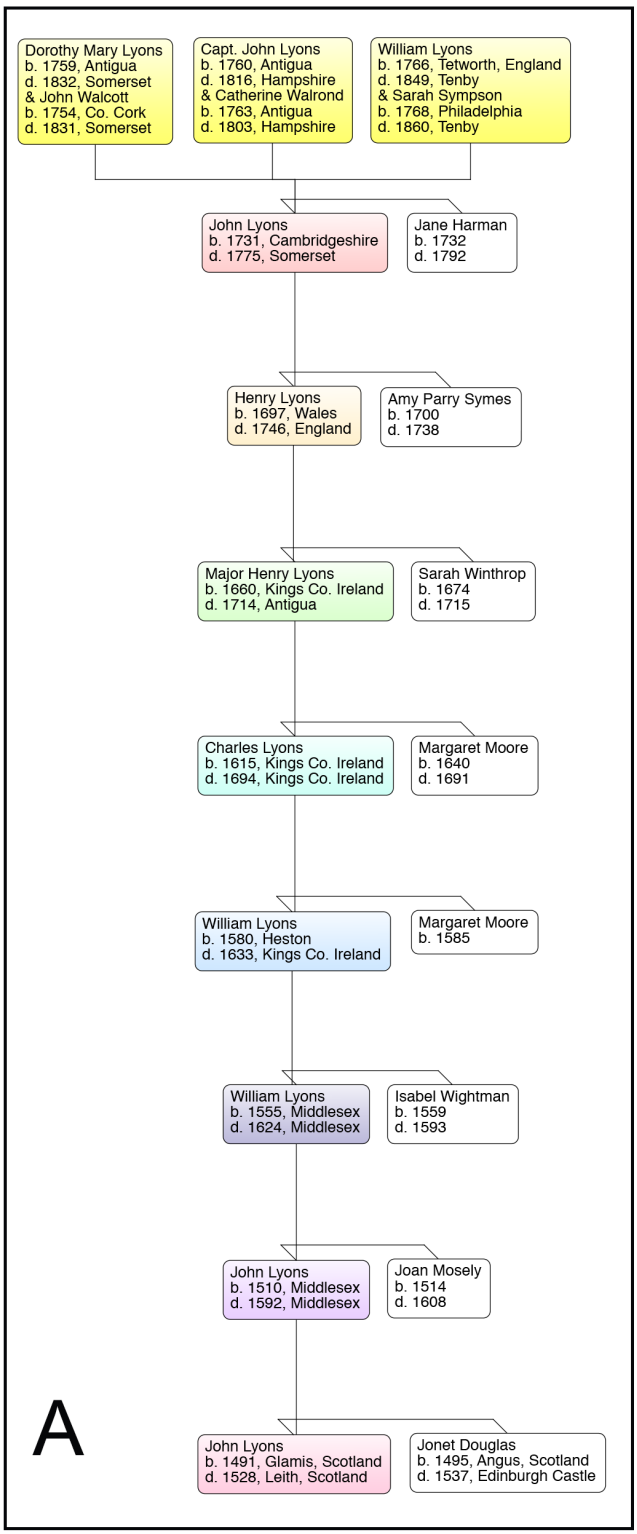

Fig. 32. Ancestry charts for the family of William Lyons (1766-1849) of Tenby. **A**, ancestors of William Lyons. **B**, descendants of William Lyons and two of his siblings, John and Dorothy who have relevance to this paper.

inherited, Major Lyons made considerable land purchases, building up a substantial property, which he left in the charge of his fourth son, Samuel when he returned to Ireland. Henry's son, William's father, John of Sturtlow House, Huntingdon and Antigua married Jane, the daughter of Colonel Samuel Harman of Harman's Antigua, in 1753. His estates were left primarily to his eldest son, John who was a member of the Council of Antigua in 1782.

Thus, the Lyons family acquired substantial sugar producing estates in Antigua, but it was also a large family and it is quite difficult to establish just how prosperous any individual member was. William himself was one of ten. His eldest brother, John, had eighteen children by two marriages; some joined the armed forces and some travelled extensively, one became very prominent (Edmund was an admiral and subsequently first Baron Lyons of Christchurch). We know from his will that William's marriage settlement provided him with £2000 from the Antiguan estates but his cir-

cumstances otherwise suggest that he was of independent means but not particularly wealthy. William's estate was left in its entirety for the benefit of his wife and unmarried daughters, his sons appear to have had to make their own way in life. The family also led a very retiring life; there is virtually nothing about them in the newspaper archives, just the occasional announcement of a marriage or a birth.

Life in Tenby

William's family lived in a town house in Market Street (now Tudor Square) Tenby where he and his wife Sarah (née Sympson) lived until her death in 1860. There is no record of them having owned the land, so we may assume that they rented. William himself was born in Tetworth, Huntingdonshire in 1766 and lived in Tenby from at least 1796 when their first child, Anthony, was born until the birth of his youngest in 1811. William and Sarah and their unmarried daughters: Jane, Sarah and Elizabeth, are recorded in the 1841 census for Tenby and William is known to have died there in 1849. The family is mentioned in the "gentry" section of Piggotts 1830 directory of Tenby but in 1844 the only reference is to a Miss Lyons - which may mean that William and Sarah were living somewhere else at the time (in 1837 they were in Bath but still describing themselves as being of Tenby). Sarah with Catherine and young Sarah are shown at no 5 Market Street in the 1851 census.

It is difficult to establish how well travelled William Lyons was, especially in the first 30 years of his life (given the occupations of his predecessors and descendants, it might be expected that he joined the armed forces but no record has been found). In addition to the Antiguan connection, his family could be found in all parts of the world including India and the United States as well as the West Indies. His wife, Sarah (Sympson) had been born in Philadelphia in 1768. However, as noted above, virtually every historic reference to William's whereabouts is to Tenby. But why did he settle in Tenby in the first place? One intriguing possibility is because it was the home of Catherine and William Routh. William Routh was a Bristol printer who, in 1790, commissioned the Regency architect John Nash to design a house in Tenby. His wife, Catherine Davies, was the grand-daughter of Thomas Howell who had made his fortune in Antigua before buying Prinknash Park in Gloucestershire in 1776. Was there a connection, by blood, marriage or merely friendship between the Howell and the Lyons families?

Children

William and Sarah had thirteen children: Anthony, William, Catherine, John, Edmund, Mary, Charles, Henry, Jane, Sarah, Elizabeth, Frances and James. It has proved quite difficult to trace the family, in part because unless the full name is used, names such as "John Lyons" are quite common, but mainly because the sons appear to have travelled extensively, either on business or in the armed forces. For that reason the following account relies heavily upon family internet sources which it has not always been possible to verify.

Two of the sons, **Charles** (1803-1803) and **James Hamilton William Lyons** (1811-1812) died in infancy. This may also have been the fate of **Frances Harriet** (1809-?) since she soon disappears from the records. Four of the girls lived and died unmarried in Tenby; **Catherine Ann** (1798-1873), **Jane Sarah** (1805- 1879), **Sarah Alicia** (1807-1885) and **Elizabeth William** (1808-1843). Was their failure to secure a husband because father could not afford a sufficient settlement?

The eldest son, **Anthony Munton Lyons**, born in 1796 joined the Royal Marines in 1812 but was put on half- pay in 1814. He does not appear to have returned to service but was still a 2nd lieutenant on half-pay in the 1842 Army Lists. He remained in Tenby and in the 1830 Piggott's Directory Anthony is described as "the master of the ceremonies"; Tenby had an assembly rooms by the harbour. Clearly, he had little income since in early versions of his will, William arranged to leave £500 to Anthony, but he revoked this in 1844 because his son had secured a position in Demerara, presumably a civilian appointment. Anthony had married Mary Ann Williams from Tenby in 1823. They had **Elinor** (1824), **Mary Elizabeth Williams** (1825), **Sarah Emma** (1826), **Caroline Jane Williams** (1828), **Antonia Emily Williams** (1830) and **William Williams** (1832). He died in Guiana in 1863. Of the children, we have not been able to trace young William, who does not appear to have returned to the UK although it is possible that one or more of the girls returned but is recorded under another name after marrying overseas.

William, born in 1797, is said (family internet

sources) to have been a Royal Navy Captain. It has been impossible to verify this and since the plain name William Lyons is not uncommon it is difficult to follow him through the records with any certainty. However, he is likely to have been the William Lyons who became a lieutenant in the Navy in 1825 but who did not receive subsequent promotion. Instead he was sent to run the coastguard station at Glenarm in County Antrim where he received the RNLI silver medal for gallantry in 1840. If this is the correct William Lyons, it helps to explain why he has not been traced in the UK census records, nor in marriage registrations, since most of the Irish records for the period have been lost. The title of captain may well have been acquired at a later stage in his career since a William Lyons served in the merchant marine from 1853 to 1857. He died in 1878 in Goole.

John William (1799-1846) does not appear under that name in any of the UK census and registration records which may suggest that he served overseas with the armed forces. The family internet sources suggest that he was a lieutenant and there is a possible entry in the Royal Marines lists showing a seniority of 1830. There is no record of **Edmund Walcott William** (1800) except his death in Headington, Oxfordshire, in 1864. Similarly, the census shows no record of **Henry Harcourt Lyons** (1804-1875) but it does include his wife, Anna Margaretta Griffies Williams. whom he married in 1833 in Marlborough, and his daughter Agnes Grace Sutton Lyons (1834-1911). It is interesting and may be significant that Anna is shown in the census as a "Landed Proprietor"; did she have her own income rather than depending upon that of her husband? The intriguing absence of the Lyons sons from the census suggests that they were frequently away from home, either with the armed services or acting as merchants in connection with the family business.

Mary Ellen William (1801-1870), married Edmund Scopoli Walcott of Limerick, probably her first cousin, in 1817. Not long after he added the name Sympson and the records are variously in the names of Walcott and Walcott-Sympson. Their children were: **John Minchin** (1818), **Edmund Lyons** (1819), **Mary Dorothy** (1821), **William Lyons Enraght** (1822), **Henry Sympson** (1826). They were all christened in Clifton or Bristol and William was christened at the age of four in 1826, which often happened when families went overseas for a spell. By 1861, Mary is a widow living in Bristol with her unmarried daughter, Mary. Most of the rest of the family, where it can be found, consists of people living modestly on private incomes. Henry lived for a while in The Norton, Tenby but by the time of the 1871 census he and his family lived in Laugharne. Edmund went to Australia in about 1850 and had eight children, one of which, Henry, himself had eighteen.

Williams brother John (1759-1832) also had many children and gave rise to a famous line of military figures in the Royal Navy and Army, including Admiral **Edmund Lyons** (1790-1858) and his nephew Admiral **Algernon McLennan Lyons** (1833-1908). We mention the latter because his wife **Lady Louisa Lyons** also made a shell collection that was donated to the National Museums Liverpool.

Conclusions

William Lyons and his family do not appear to have made a great mark. They lived quietly in Tenby, wealthy enough - for the most part - not to have to work but not sufficiently wealthy to live well. Possibly not sufficiently wealthy for the girls to make good marriages, with the exception of Mary who married a cousin when only sixteen. The males mostly joined the Armed Forces but do not appear to have made a great success of that, or they may have become involved with the family's West Indian trade. William Lyon's descendants all appear to have left Tenby by the end of the nineteenth century.

The memorial of this quiet man is to be found in his remarkable shell collection donated to Tenby Museum in 1878 by his daughters.

A second Lyons collection

It was reported in the *Transactions of the Cambridge Philosophical Society* (Donations to the Museum, 1827) that on the 14th April 1823 a collection of British shells had been donated to their museum by W. Lyons. In 1865 most of the collection of the Cambridge Philosophical Society was incorporated into the Cambridge University Museum of Zoology but the shells were retained by the Rev. L. Jenyns (1800-1893) and had been taken with him when he moved to Bath in 1849 (Preece & Sparks, 2012). Kennard (1944) reported that one lot that he saw in the Tenby Museum was labelled "Swaffam Prior Cambs" and therefore had likely come from the

Rev. L. Jenyns thus confirming the likely link. Unfortunately, the Tenby lot in question was not located in our revision, for more information on Jenyns see Preece & Sparks (2012). The shell collection of Jenyns in the Bath Royal Literary and Scientific Institution is currently inaccessible.

Lyons's "List of Shells found on the Sea Shore at Tenby and Pembrokeshire"

Present in the Tenby Museum archive is a handwritten list of the shells found at Tenby and Pembrokeshire (**Fig. 34**). On the cover,

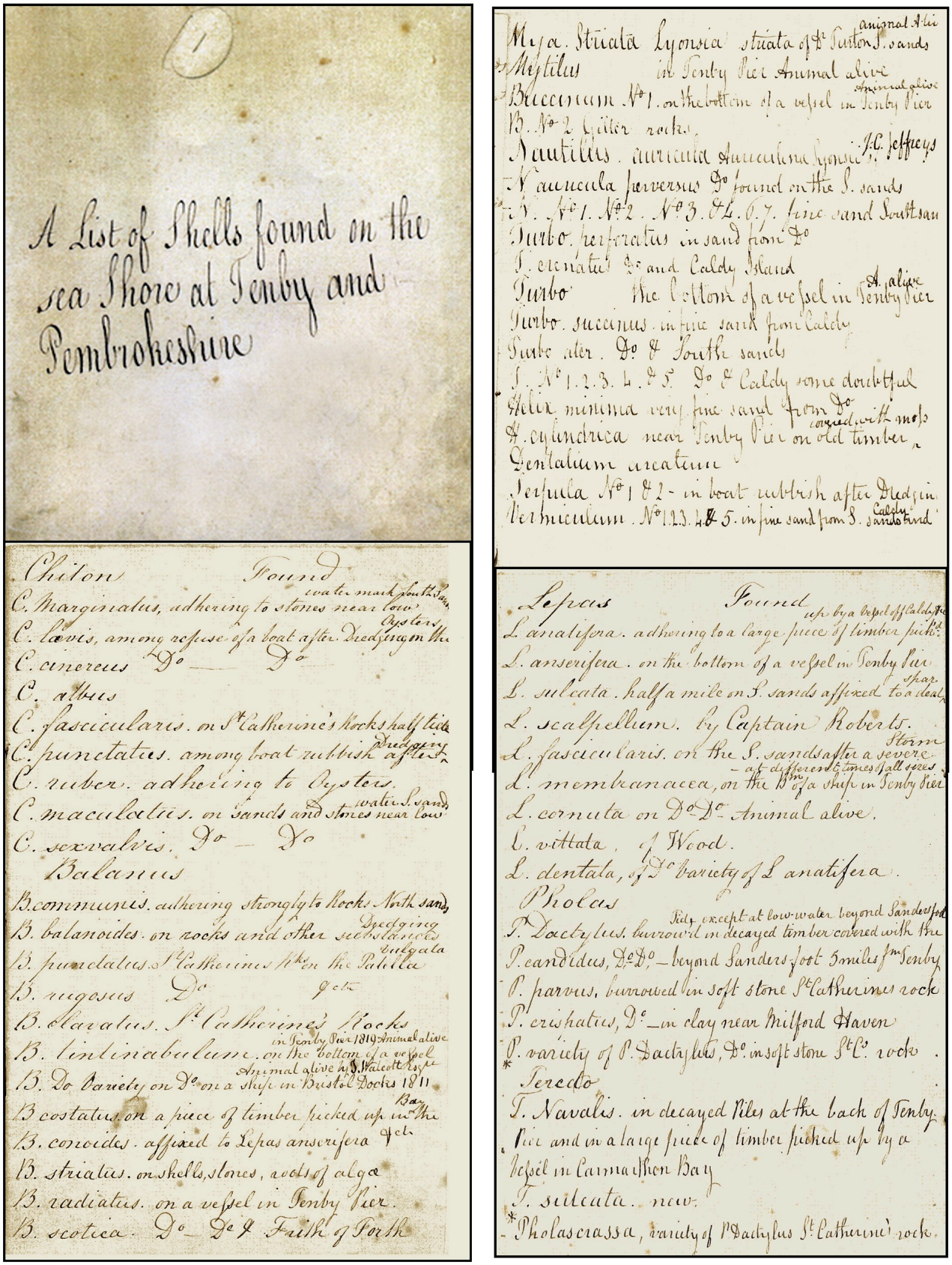

Fig. 34. Cover and three sample pages of Lyons list of the shells of Tenby.

written in biro (so relatively recently) is “by Capt. Roberts c. 1849”. There is no evidence for this provenance so perhaps a single reference to Roberts in the list prompted this conclusion. Other evidence suggests it is by Lyons himself. Firstly it is in the same handwriting that is found on the reverse of the Lyons mounts, most distinctive is his frequent use of the abbreviation “&ctr” (see **Fig. 33**).

Fig. 33. Distinctive use of the abbreviation for &ctr in the Lyons list (**left**) and on the Lyons mounts (**right**).

Secondly in Bourne's 1843 “*History of Tenby*” she gives a list of Tenby shells which is structured in a similar way and she credits on pages 76-77 “*The following list of shells may be relied on as correct, being a copy of one compiled by a gentleman of great research in conchology, and who has in his splendid and valuable collection all the specimens mentioned*”. Then on p. 79 she mentions Lyons by name and notes *Mya striata* which is *Lyonsia*.

The list consists of 22 pages giving the names of species and where each was found. The list includes 245 species of mollusc and in addition barnacle, polychaeta and foraminifera 'shells'. It is a valuable document allowing the comparison of the fauna of a defined region over a span of some 200 years. Environmental change is recognisable in the frequent quoting of shells from the trash of oyster dredging, as such oyster beds are long gone. It is also apparent that Lyons frequently examined the hulls of ships beached on shore in Tenby harbour (**Fig. 35**) and this may account for the number of alien molluscs and barnacles recorded. At that time Tenby was a busy harbour that traded with numerous countries including the Americas and the ships were beached to take on and offload cargo thus allowing Lyons to collect from the hulls at low tide (**Fig. 36**).

Fig. 35. Lithograph of Tenby harbour circa 1832 by G. P. Reinagle. From the collection of the National Library of Wales.

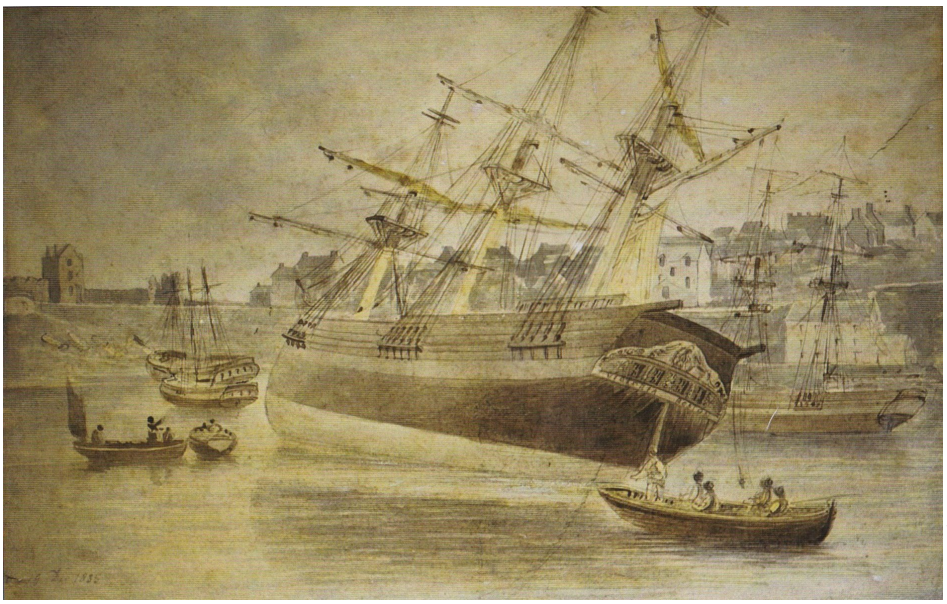

Fig. 36. Lithograph by Charles Norris (1835) showing the American registered "Victoria" of Boston beached in Tenby harbour.

Fig. 37. Aerial view of Tenby showing Lyons's favourite collecting sites. The current location of the Tenby Museum is also indicated.

The last page is titled "New shells found at Tenby by W.L." and here we find *Lyonsia* and *Conia lyonsii* (see above). We also note a *Balanus tenbiensis* and an *Auriculum lyonsii* of Jeffreys, along with a number of Turbo species that are all apparently unpublished manuscript names but unfortunately there are no specimens bearing any of these labels in the collection.

Most of the shells were collected from the beaches and rocks around Tenby although also from neighbouring beaches at Laugharne, Saundersfoot and MilfordHaven. Lyons's favourite locations are marked on **Fig. 37** and are South Sands, North Sands, St Catherine's Rock, the Harbour, Caldey Island and Giltar rocks. The various aspects of these sites give a large variety of shore types from sheltered to exposed, clean sand to muddy sand and with the aid of local fishing boats dredging was possible in the sublittoral.

Chiton

C. marginatus Pennant, 1777
Lepidochitona cinerea (Linnaeus, 1767)
adhering to stones near low water mark, South Sands

C. laevis Pennant, 1777
Callochiton septemvalvis (Montagu, 1803)
among refuse of a boat dredging oysters

C. cinereus Linnaeus, 1767
Lepidochitona cinerea (Linnaeus, 1767)
Dº *Dº*

C. albus Linnaeus, 1767
Ischnochiton albus (Linnaeus, 1767)

C. fascicularis Linnaeus, 1767
Acanthochitona fascicularis (Linnaeus, 1767)
on St Catherine's Rocks half tide

C. punctatus Turton, 1819
Lepidochitona cinerea (Linnaeus, 1767) ???
among boat rubbish after dredging

C. ruber Linnaeus, 1767
Boreochiton ruber (Linnaeus, 1767)
adhering to oysters

C. maculatus Gmelin, 1791
Not a British species
on sands and stones near low water, S. Sands

C. sexvalvis
manuscript name
Dº *Dº*

Balanus

B. communis Pulteney 1799
Perforatus perforatus (Bruguière, 1789)
adhering strongly to rocks, North Sands

B. balanoides Linnaeus, 1767
Semibalanus balanoides (Linnaeus, 1767)
on rocks and other dredging substances

B. punctatus Montagu, 1803
Chthamalus stellatus (Poli, 1791)
St Catherines Rocks on the Patella vulgata

B. rugosus Pulteney, 1799
Balanus crenatus Bruguière, 1789
Dº *&ctr*

B. clavatus Montagu, 1803
Semibalanus balanoides (Linnaeus, 1767)
St Catherine's Rocks

B. tintabulum
Megabalanus tintinnabulum (Linnaeus, 1758)
on the bottom of a vessel in Tenby Pier 1819 Animal alive

B. Dº variety

Note: The text in the calligraphy font is that from Lyons's list, i.e. the first name given and the locality data. We have added the authorities to the names given by Lyons and then we have offered the current accepted name (from Mollusca-Base) for each entry although we cannot confirm that all of Lyons's determination were accurate. We have not altered any of the spellings used by Lyons some of which are archaic, eg "muscle" rather than "mussel".

on Dº on a ship in Bristol Docks 1811. Animal alive by J. Walcott esq.

B. costatus Montagu, 1803
Balanus balanus (Linnaeus, 1758)
on a piece of timber picked up in the bay

B. conoides Montagu, 1803
Perforatus perforatus (Bruguière, 1789)
affixed to Lepas ansifera &ctr

B. striatus Bruguière, 1789
? Semibalanus balanoides (Linnaeus, 1767)
on shells, stones, roots of algae

B. radiatus Bruguière, 1789
Newmaniella radiata (Brug. 1789)
on a vessel in Tenby Pier

B. scotica Wood, 1815
Balanus balanus (Linnaeus, 1758)
Dº Dº & Frith of Forth

Lepas

L. anatifera Linnaeus, 1758
Lepas anatifera Linnaeus, 1758
adhering to a large piece of timber picked up by a vessel off Caldy

L. anserifera Linnaeus, 1767
Lepas anserifera Linnaeus, 1767
on the bottom of a vessel in Tenby Pier

L. sulcata Montagu, 1803
Lepas (Anatifa) pectinata Spengler, 1793
half a mile on S. Sands affixed to a deal spar

L. scalpellum Linnaeus, 1767
Scalpellum scalpellum (Linnaeus, 1767)
by Captain Roberts

L. fascicularis Ellis
Dosima fascicularis (Ellis & Solander, 1786)
on the S. Sands after a severe storm. at different times of all sizes

L. membranacea Montagu, 1808
Conchoderma virgatum Spengler, 1789
on the Bᵐ of a ship in Tenby Pier

L. cornuta Montagu, 1815
Conchoderma auritum (Linnaeus, 1767)
on Dº Dº. animal alive

L. vittata of Wood ? Wood, 1815
Conchoderma virgatum Spengler, 1789

L. dentata of Do variety of L. anatifera
Lepas anatifera Linnaeus, 1758

Pholas

P. dactylus
Pholas dactylus Linnaeus, 1758
burrow'd in decayed timber covered with the tide except at low water beyond Saundersfoot

P. candidus
Barnea candida (Linnaeus, 1758)
Dº Dº--beyond Saundersfoot 5 miles fm Tenby

P. parvus
Barnea parva (Pennant, 1777)
burrowed in soft stone St Catherines rock

P. crispatus
Zirfaea crispata (Linnaeus, 1758)
in clay near Milford Haven

P. variety of P. dactylus
Dº in soft stone St. Cˢ rock

Pholas crassa variety of P. dactylus
St Catherine's Rock

Teredo

T. navalis Linnaeus, 1758
Teredo navalis Linnaeus, 1758
in decayed piles at the back of Tenby Pier in a large piece of timber picked up by a vessel in Carmarthen Bay

T. sulcata nov.
manuscript name

Mya

M. pholadia Montagu, 1803
Rocellaria dubia (Pennant, 1777)
burrowed in the lower valve of large old oyster shells

– arenaria Linnaeus, 1758
Mya arenaria Linnaeus, 1758
half a foot below the surface of sand & gravel at the island of Caldy

– truncata Linnaeus, 1758
Mya truncata Linnaeus, 1758
lodged under gravel near low water mark

– margaritifera Linnaeus, 1758
Margaritifera margaritifera (Linnaeus, 1758)
rapid rivers Pembrokeshire

– pictorum Linnaeus, 1758
Unio pictorum (Linnaeus, 1758)
Dº Dº

– inaequivalvis Montagu, 1803
Corbula gibba (Olivi, 1792)
on South Sands & Saundersfoot Sands

– suborbicularis Montagu, 1803
Kellia suborbicularis (Montagu, 1803)
embedded in Limestone

– pubescens Pulteney, 1799
Thracia pubescens (Pulteney, 1799)
on South Sands & Saundersfoot Sands

– praetenuis Pulteney, 1799
Cochlodesma praetenue (Pulteney, 1799)
Dº Dº

– distorta Montagu, 1803
Thracia distorta (Montagu, 1803)
among boat refuse after dredging

– bidentata Montagu, 1803
Kurtiella bidentata (Montagu, 1803)

burrowed in the valves of old oyster shells, S. Sands

– *ferruginosa* Montagu, 1803
Tellimya ferruginosa (Montagu, 1808)
on the South Sands

– *prismatica* Montagu, 1808
Abra prismatica (Montagu, 1808)
on the shore near Manorbeer

– *substriata* Montagu, 1803
Montacuta substriata (Montagu, 1808)
on the spines of an Echinus dredged in the Bay

– *purpurea* Montagu, 1808
Turtonia minuta (Fabricius, 1780)
beyond Manorbier

Mactra

M. solida Linnaeus, 1758
Spisula solida (Linnaeus, 1758)
Muscle bank under Gilter Rocks

– *subtruncata* da Costa, 1778
Spisula subtruncata (da Costa, 1778)
sandy beach Saundersfoot

– *stultorum* Linnaeus, 1758
Mactra stultorum (Linnaeus, 1758)
D° D° & South Sands

– *dealbata* Pulteney in Montagu, 1803
Standella pellucida (Gmelin, 1791)
This is an exotic species, not clear what Lyons had
D° D° D°

– *compressa* Pulteney, 1799
Scrobicularia plana (da Costa, 1778)
at the mouth of the river near Tenby

– *boysii* Montagu, 1803
Abra alba (W. Wood, 1802)
beach near Saundersfoot

– *triangularis* Montagu, 1803
Goodallia triangularis (Montagu, 1803)
sand from Caldy

– *lutraria* Linnaeus, 1758)
Lutraria lutraria (Linnaeus, 1758)
at D° and South Sands

– *hians* Pulteney, 1799
Lutraria oblonga (Gmelin, 1791)
D° D° & Fishguard

– *truncata* Montagu, 1808
Spisula solida (Linnaeus, 1758)
Muscle Bank

– *minutissima* Montagu, 1808
Goodallia triangularis (Montagu, 1803)
in sand from Caldy

– *cinerea, large variety of M. stultorum* Montagu, 1803
Mactra stultorum (Linnaeus, 1758)

Donax

D. trunculus Linnaeus, 1758
Donax trunculus Linnaeus, 1758
plentiful between Tenby & Llaugharne

– *rubra* Montagu, 1808
Uncertain but from Turton it is probably *Ervilia castanea* Montagu, 1803
in fine sand from Caldy Island

– *irus* Linnaeus, 1758
Irus irus (Linnaeus, 1758)
thrown upon the S. Sands after a storm

Venus

V. — fasciata
Clausinella fasciata (E.M. da Costa, 1778)
on the South Sands

— paphia Montagu, 1803
Clausinella fasciata (E.M. da Costa, 1778)
in oyster boats Milford Haven

— verrucosa
Venus verrucosa Linnaeus, 1758
D°_ D° _ and on the South Sands

— striatula
Chamelea striatula (E.M. da Costa, 1778)
on the sands Saundersfoot

— islandica
Arctica islandica (Linnaeus, 1767)
D°_ D° _and Gilter

— exoleta
Dosinia exoleta (Linnaeus, 1758)
D°_ D° _South Sands

— undata
Mysia undata (Pennant, 1777)
North Sands and D°

— sinuosa
Mysia undata (Pennant, 1777)
D°, very rare

— ovata
Timoclea ovata (Pennant, 1777)
on all parts of the sands

— decussata
Ruditapes decussatus (Linnaeus, 1758)
Caldy island

— pullastra Montagu, 1803
Venerupis corrugata (Gmelin, 1791)
D° _South Sands

— perforans Montagu, 1803
Venerupis corrugata (Gmelin, 1791)
St Catherines

— virginea Linnaeus, 1758 nom. dub.
Politapes rhomboides (Pennant, 1777)
on the South Sands & in the trawl much larger size

— aurea
Polititapes aureus (Gmelin, 1791)
D°_ D° _and from off Lands End

— sulcata
Astarte sulcata (E.M. da Costa, 1778)
Oyster boats Milford Haven

— *danmonia* Montagu, 1808
Astarte sulcata (E.M. da Costa, 1778)
on the South Sands
— *scotica* Maton & Racket, 1807
Astarte sulcata (da Costa, 1778)
D°_ and from the Trawler
— *lactea* Donovan, 1803
Venus casina Linnaeus, 1758
D°_ D° _
— *cassina*
Venus casina Linnaeus, 1758
Milford Haven
— *reflexa* Montagu, 1808
Venus casina Linnaeus, 1758
D°_ D° _
— *triangularis*
Gouldia minima (Montagu, 1803)
Oyster boats Milford Haven

Solen

S. siliqua
Ensis siliqua (Linnaeus, 1758)
buried to the depth of a foot, S. Sands
— *ensis*
Ensis ensis (Linnaeus, 1758)
D°_ D° _ near low water mark
— *vagina*
Solen marginatus Pulteney, 1799
D°_ the sands Saundersfoot
— *pellucidus*
Phaxas pellucidus (Pennant, 1777)
Saundersfoot D°_ two miles from Tenby
— *legumen*
Pharus legumen (Linnaeus, 1758)
D°_ D° _ and South Sands
— *antiquatus* Pulteney, 1799
Azorinus chamasolen (da Costa, 1778)
rare Milford Haven
— *minutus* Linnaeus, 1767
Hiatella arctica (Linnaeus, 1767)
*Oyster boats &c_*
— *vespertinus* Gmelin, 1791
Gari depressa (Pennant, 1777)
on the coast near Milford Haven
— *floridus Psammobia floridus of Turton* 1822
Gari tellinella (Lamarck, 1818)
S. Sands
— *pinna*
Pandora pinna (Montagu, 1803)
Dredged off Caldy
— *squamosus*
Lepton squamosum (Montagu, 1803)
among refuse of Oyster boats

Tellina

T. fervensis
Gari fervensis (Gmelin, 1791)
on all parts of the coast of Pembrokeshire
— *D°_ variety, bright yellow*
Gari fervensis (Gmelin, 1791)
S. Sands after a storm of wind
— *squalida*
Tellina incarnata Linnaeus, 1758
on the sands Saundersfoot
— *donacina*
Moerella donacina (Linnaeus, 1758)
dredged in the bay and on South Sands
— *tenuis*
Macomangulus tenuis (E.M. da Costa, 1778)
on all parts of the sands
— *fabula*
Fabulina fabula (Gmelin, 1791)
plentiful on Saundersfoot sandy shore
— *solidula* Pulteney, 1799
Limecola balthica (Linnaeus, 1758)
common in the bays along the coast
— *crassa*
Arcopagia crassa (Pennant, 1777)
in the trawl off Worms Head
— *D°_ variety, half grown shell*
Arcopagia crassa (Pennant, 1777)
Milford
T. radula Montagu, 1803
Lucinoma borealis (Linnaeus, 1767)
sea shore Caldy Island
— *rotundata*
Diplodonta rotundata (Montagu, 1803)
D°_ D° _ D°_
— *maculata, a variety of of T. tenuis Adams*
Arcopella balaustina (Linnaeus, 1758)
— *fragilis*
Gastrana fragilis (Linnaeus, 1758)
sandy beach about two miles from Tenby

Cardium

C. edule
Cerastoderma edule (Linnaeus, 1758)
on all coasts where the shore is sandy
— *D°_ variety*
Cerastoderma edule (Linnaeus, 1758)
near Gilter Rocks
— *echinatum*
Acanthocardia echinata (Linnaeus, 1758)
by dredging
— *ciliare*
Cardium ciliare Linnaeus, 1758. nomen dubium
D°_ & South Sands after a gale
— *laevigatum*
Laevicardium crassum (Gmelin, 1791)
dredging in Tenby Bay
— *exiguum*
Parvicardium exiguum (Gmelin, 1791)

D°_ & and on the shore

— *rubrum*
Lasaea rubra (Montagu, 1803)
on St Catherines rocks half tide

— *fasciatum* Montagu, 1803
Parvicardium pinnulatum (Conrad, 1831)
on the coast and at Laugharne of a large size

— *corneum*
Sphaerium corneum (Linnaeus, 1758)
in a small river near Tenby

— *amnicum*
Pisidium amnicum (O.F. Müller, 1774)
D°_ D° _

— *lacustre*
Musculium lacustre (O.F. Müller, 1774)
D°_ D° _ and ponds

Arca

A. pilosa Linnaeus, 1767
Glycymeris glycymeris (Linnaeus, 1758)
oyster boats Milford Haven

— *lactea*
Striarca lactea (Linnaeus, 1758)
on the South Sands

— *noae*
probably *Arca tetragona* Poli, 1795. *noae* is Mediterranean
dredged off Mumstone in the bay

— *barbata var. of A. perforans* Turton, 1819
Striarca lactea (Linnaeus, 1758)
D°_ near Milford

— *minuta*
Nuculana minuta (O.F. Müller, 1776)
dredged off Caldy

— *nucleus*
Nucula nucleus (Linnaeus, 1758)
at Saundersfoot sands &cr

Pecten

P. maximus
Pecten maximus (Linnaeus, 1758)
dredged from oyster beds in the bay

— *jacobaeus*
Pecten jacobeus (Linnaeus, 1758) not British
on the South Sands

— *opercularis*
Aequipecten opercularis (Linnaeus, 1758)
dredged from Caldy beds

— *varius*
Mimachlamys varia (Linnaeus, 1758)
Do_ Do_ common

— *lineatus* E.M. da Costa, 1778
Aequipecten opercularis (Linnaeus, 1758)
on the South Sands & dredging

— *distortus* E.M. da Costa, 1778
Talochlamys pusio (Linnaeus, 1758)
Do_ in deep water affixed to stones &ctr

— *obsoletus* Pennant, 1777
Palliolum tigerinum (O.F. Müller, 1776)
under Gilter Rocks

— *pusio*
Talochlamys pusio (Linnaeus, 1758)
dredged near Stackpole Head

Ostrea

O. edulis
Ostrea edulis Linnaeus, 1758
in vast beds many parts of the coast

— *striata E.M.* da Costa, 1778
Ostrea edulis Linnaeus, 1758
on rocks low water mark

— *parasitica* Turton, 1819
Ostrea edulis Linnaeus, 1758
adhering to a piece of timber picked up by a boat in the Bay

— *crista galli*
Lopha cristagalli (Linnaeus, 1758) (Indian Ocean)
more likely was Dendostrea frons (Linnaeus, 1758) (Caribbean)
on the bottom of a vessel in Tenby Pier

Anomia

A. ephippium Linnaeus, 1758
Anomia ephippium Linnaeus, 1758
by the dredge fixed to oysters, rocks &c

— *squamula* Linnaeus, 1758
Heteranomia squamula (Linnaeus, 1758)
D°_ Lobsters, crabs & other bodies

— *aculeata* Linnaeus, 1758
Heteranomia squamula (Linnaeus, 1758)
adhering roots of algae &ctr

— *undulata* Gmelin 1791
Pododesmus patelliformis (Linnaeus, 1761)
affixed to shells stones & crabs

— *cymbiformis* Maton & Rackett, 1807
Heteranomia squamula (Linnaeus, 1758)
Do_ & on the stalks of Fucus digitatus

— *electrica* Linnaeus, 1758
Anomia ephippium Linnaeus, 1758
affixed to Pecten maximus

Mytilus

M. edulis
Mytilus edulis Linnaeus, 1758
in beds near Gilter

— *incurvatus* Pennant, 1777
Modiolus barbatus (Linnaeus, 1758)
rocks beyond East Wear Sands

— *pellucidus* Pennant, 1777
Mytilus edulis Linnaeus, 1758
St Catherines

— *barbatus*

Modiolus barbatus (Linnaeus, 1758)
deep water dredging

— *modiola*
Modiolus modiolus (Linnaeus, 1758)
D°_ D°_

— *umbilicatus* Pennant, 1777
Modiolus modiolus (Linnaeus, 1758)
deep dredging

— *praecisus* Montagu, 1803
Sphenia binghami, Turton, 1822
refuse of oyster boats

— *discors*
Musculus discors (Linnaeus, 1767)
among leaves of Fuci

— *discrepans* Montagu, 1803
Musculus discors (Linnaeus, 1767)
in the Trawl"" & dredging

— *cygneus*
Anodonta cygnea (Linnaeus, 1758)
in the extensive ponds Stackpool Court

— *avonensis* Montagu, 1803
? Unio pictorum (Linnaeus, 1758)
in Gumferston Brook

— *stagnalis*
? Anodonta cygnea (Linnaeus, 1758)
Stackpole Pond

Nautilus

Foraminifera

N. beccarii
Ammonia beccarii (Linnaeus, 1758)
on the roots of algae and on the shells of oysters

— *beccarii perversus*
D°_ D°_ & in fine sand

— *crispus*
Elphidium crispum (Linnaeus, 1758)
on oysters & with the preceding species

— *D°_ baricty*
sand from the South Sands

— *laevigatulus*
Nautilus laevigatulus Walker & Jacob, 1798
on oysters and D°

— *calcar*
Lenticulina calcar (Linnaeus, 1758)
dredged roots of algae

— *depressulus*
Haynesina depressula (Walker & Jacob, 1798)
D°_ D°_ and fine sand

— *umbilicatulus*
Nautilus umbilicatulus Walker & Jacob, 1798
on shells, corallines &c

— *crassuluis*
Nonion crassulum (Walker & Jacob, 1798)
D°_ D°_ and drifted sand

— *nitidus*
in fine sand

— *inflatus*
Trochammina inflata (Montagu, 1808)
D°_ from the South Sands

— *carinatulus*
Nautilus carinatulus Walker & Jacob, 1798
D° and the South Sands

— *subarcuatulus*
Astacolus subarcuatulus (Walker & Jacob, 1798)
in fine sand

— *radicula*
Nodosaria radicula (Linnaeus, 1758)
on shells and other substances

— *linearis*
Vaginulina linearis (Montagu, 1808)
in sand from the coast beyond Pembroke

— *rectus*
Nautilus rectus Montagu, 1803
D°_ D°_ & at Tenby, small

— *spirula*
North and South Sands

Cypraea

C. pediculus
probably *Trivia monacha* (E.M. da Costa, 1778. *pediculus* is Caribbean.
found in abundance on the South Sands

— *arctica*
Trivia arctica (Pulteney, 1799)

— *bullata* Montagu, 1803
Trivia arctica (Pulteney, 1799)

Bulla

B. lignaria
Scaphander lignarius (Linnaeus, 1758)
dredged Milford Haven & Tenby small

— *aperta*
Philine aperta (Linnaeus, 1767)
East Wear near low tide & South Sands

— *haliotoidea* Montagu, 1803
Lamellaria perspicua (Linnaeus, 1758)
Dredged and D°_ D°_

— *plumula*
Berthella plumula (Montagu, 1803)
Milford Haven

— *catena*
Philine catena (Montagu, 1803)
in fine sand from Caldy Island

— *D° variety*
with the preceding species

— *emarginata* J. Adams, 1800
Philine aperta (Linnaeus, 1767)
in fine sand nr St Catherines

— *denticulata*
Philine denticulata (J. Adams, 1800)
Tenby shore

— *hydatis*
Haminoea hydatis (Linnaeus, 1758)
Gilter and Milford Haven
— *akera*
Akera bullata O.F. Müller, 1776
D°_ South Sands
— *cylindracea*
Cylichna cylindracea (Pennant, 1777)
D°_ and on the extensive sands from Tenby to Laugharne
— *truncata* J. Adams, 1800
Retusa truncatula (Bruguière, 1792)
D°_ D°_ and Gilter
— *obtusa*
Retusa obtusa (Montagu, 1803)
South Sands
— *diaphana* Montagu, 1803
Trivia arctica (Pulteney, 1799)
near Gilter
— *fontinalis*
Physa fontinalis (Linnaeus, 1758)
ditches and ponds Gumferston
— *hypnorum*
Aplexa hypnorum (Linnaeus, 1758)
in a pond and brook near Penally
— *flexilis* Montagu, 1808
Velutina plicatilis (O.F. Müller, 1776)
South sands
— *fluviatilis* Turton, 1807
Physa fontinalis (Linnaeus, 1758)
rivulet near Gumferston
— *alba* Turton, 1825
Physa fontinalis (Linnaeus, 1758)
D°_ pools of water and ditches
— *aplysia*
Aplysia punctata (Cuvier, 1803)
Rock pools of sea water Manorbeer
— *minuta*
Diaphana minuta T. Brown, 1827
in fine sand
— *hyalina* Turton, 1834
Diaphana minuta T. Brown, 1827
D°_ and Caldy Island
— *catena*
Philine catena (Montagu, 1803)
fine sand from D°_
— *membranacea*
Pleurobranchus membranaceus (Montagu, 1816)
Dredging

Voluta

V. tornatilis
Acteon tornatilis (Linnaeus, 1758)
Saundersfoot sands, Sth Sands
— *denticulata*
Myosotella denticulata (Montagu, 1803)
inlets of the sea on alga
— *ringens* Turton, 1819
Myosotella denticulata (Montagu, 1803)
on Gumferston sea marsh
— *alba* Turton, 1819
Auriculinella bidentata (Montagu, 1808)
in sand from Caldy Island
— *bidentata*
Auriculinella bidentata (Montagu, 1808)
D°_ and South Sands

Buccinum

B. undatum
Buccinum undatum Linnaeus, 1758
taken in dredging & on rock
— *carinatum variety of B. undatum*
Buccinum undatum Linnaeus, 1758
— *lapillus*
Nucella lapillus (Linnaeus, 1758)
on St Catherines Rocks &c
— *reticulatum*
Tritia reticulata (Linnaeus, 1758)
Gilter & Broad Haven
— *macula* Montagu, 1803
Tritia incrassata (Strøm, 1768)
D°_ and South Sands
— *minimum* Montagu, 1803
Chauvetia brunnea (Donovan, 1804)
in sand from Caldy Island
— *terrestre* Montagu, 1803
Cecilioides acicula (Müller, 1774)
"" of grass & moss nr Penally
— *obtusulum* Kanmacher, 1798
Cecilioides acicula (Müller, 1774)
Gilter Rocks, fry of B. undatum
— *breve* J Adams, 1797
Nucella lapillus (Linnaeus, 1758)
in sand from Caldy Island
— *minutum* Pennant, 1777
Tritia incrassata (Strøm, 1768)
in fine sand from Manorbeer
— *laeve* J Adams, 1797
Nucella lapillus (Linnaeus, 1758)
D°_ and sand from Caldy Island
— *variety of B. undatum with the volutions reversed*
Buccinum undatum Linnaeus, 1758
Gilter Rocks

Strombus

S. pespelecani
Aporrhais pespelecani (Linnaeus, 1758)
South Sands & Milford Haven

Murex

M. despectus Linnaeus,
A northern species so expect this is *Neptunea antiqua* Linnaeus, 1758

on the coast between Fishguard and Tenby

— *corneus* E.M. da Costa non Linnaeus
Colus gracilis (E.M. da Costa, 1778)
D°_ and South Sands

— *erinaceus* Linnaeus, 1758
Ocenebra erinaceus (Linnaeus, 1758)
Gilter & oyster boats

— *purpureus* Montagu, 1803
Raphitoma purpurea (Montagu, 1803)
Dredging

— *linearis* Montagu, 1803
Raphitoma linearis (Montagu, 1803)
D°_ and South Sands

— *muricatus* Montagu, 1803
Trophonopsis muricata (Montagu, 1803)
among refuse of oyster boats

— *turricula* Montagu, 1803
Propebela turricula (Montagu, 1803)
D°_ and South Sands

— *rufus* Montagu, 1803
Propebela rufa (Montagu, 1803)
D°_ D°_

— *sinuosus* Montagu, 1803
Drillia sinuosa (Montagu, 1803)
This is not British so uncertain about what Lyons had.
D°_ and Gilter

— *costatus* Pennant, 1777
Mangelia costata (Pennant, 1777)
Dredging

— *attenuatus* Montagu, 1803
Mangelia attenuata (Montagu, 1803)
D°_ and South Sands

— *gracilis* Montagu, 1803
Comarmondia gracilis (Montagu, 1803)
oyster boats

— *nebula* Montagu, 1803
Bela nebula (Montagu, 1803)
D°_ and Gilter
D°_ variety
D°_ D°_

— *septangularis* Montagu, 1803
Haedropleura septangularis (Montagu, 1803)
D°_ and South Sands

— *tubercularis* Montagu, 1803
Cerithiopsis tubercularis (Montagu, 1803)
Dredging

— *adversus* Montagu, 1803
Marshallora adversa (Montagu, 1803)
oyster boats

— *reticulatus E.M.* da Costa, 1778)
Bittium reticulatum (da Costa, 1778)
common on sandy shores

— *minutissimus* Adams, 1797
Not in MolluscaBase or Jeffreys
in sand from Caldy Island

— *bamffius* Donovan, 1804
Boreotrophon clathratus (Linnaeus, 1767)
South Sands & dredging

— *gyrineus* Montagu, 1808
This is not a British shell so what Lyons had is doubtful
fine sand from Caldy

Trochus

T. zizyphinus Linnaeus, 1758
Calliostoma zizyphinum (Linnaeus, 1758)
Gilter Rocks

— *tenuis* Montagu, 1803
Calliostoma granulatum (Born, 1778)
Milford Haven and sea coast

— *tumidus* Montagu, 1803
Gibbula tumida (Montagu, 1803)
affixed to stones and dredged

— *crassus* Pulteney, 1799
Phorcus lineatus (da Costa, 1778)
adhering to rocks Caldy Island

— *magus* Linnaeus, 1758
Gibbula magus (Linnaeus, 1758)
by dredging & at Milford

— *cinerarius* Linnaeus, 1758
Steromphala cineraria (Linnaeus, 1758)
adhering to loose stones. dredge

— *umbilicatus E.M.* da Costa, 1778
Steromphala umbilicalis (E.M. da Costa, 1778)
St Catherines Rocks

— *conulus* Linnaeus, 1758
Calliostoma conulus (Linnaeus, 1758)
This is a Mediterranean shell and doubtfully found at Tenby
dredged in the Bay

Turbo

T. terebra Linnaeus, 1758
Not British so expect it is Turritella communis Risso, 1826
adhering to alga thrown upon the shore

— *cinctus E.M.* da Costa, 1778 *variety of T. terebra*
As above
Milford Haven,

— *clathrus*
Epitonium clathrus (Linnaeus, 1758)
on the shore Tenby & Laugharne

— *clathratulus*
Epitonium clathratulum (Kanmacher, 1798)
D°_ & Gilter

— *elegantissimus* Montagu, 1803
Turbonilla lactea (Linnaeus, 1758)
in sand from the South Sands

— *unicus* Montagu, 1803
Graphis albida (Kanmacher, 1798)
D°_ & fine sand from Caldy Island

— *littoreus* Linnaeus, 1758

Littorina littorea (Linnaeus, 1758)
on Gilter Rocks &cr

— *tenebrosus* Montagu, 1803
Littorina saxatilis (Olivi, 1792)
D°_ and Stackpole quay

— *rudis* Maton, 1797
Littorina saxatilis (Olivi, 1792)
on rocks on the pier & Milford Haven

— *striatulus E.M.* da Costa, 1778
Alvania carinata (da Costa, 1778)
sand from South Sands

— *vinctus* Montagu, 1803
Lacuna vincta (Montagu, 1803)
on algae St Catherines Rock

— *canalis* Montagu, 1803
Lacuna vincta (Montagu, 1803)
D°_ & Gilter

Turbo

T. crassior
Lacuna crassior (Montagu, 1803)
dredged and on the shore

— *parvus*
Rissoa parva (E.M. da Costa, 1778)
adhering algae St. Catherines Rock

— *costatus* J. Adams, 1797
Manzonia crassa (Kanmacher, 1798)
D°_ & in fine sand from Caldy Island

— *striatus* J. Adams, 1797
Onoba semicostata (Montagu, 1803)
D°_ D°_ & South Sands

— *cimex*
Alvania cimex (Linnaeus, 1758)
sand from South Sands

— *ventrosus*
Ecrobia ventrosa (Montagu, 1803)
on the shores of Tenby and Laugharne

— *ulvae*
Peringia ulvae (Pennant, 1777)
D°_ & Milford Haven

— *pullus*
Tricolia pullus (Linnaeus, 1758)
sand from Caldy Island and on algae

— *punctura*
Alvania punctura (Montagu, 1803)
in fine sand from D°_

— *ruber* J. Adams, 1797
Barleeia unifasciata (Montagu, 1803)
South Sand & Manorbeer

— *vitreus*
Hyala vitrea (Montagu, 1803)
D°_ and Caldy Island

— *spiralis*
Spiralinella spiralis (Montagu, 1803)
D°_ & Lydstep sands

— *interstinctus*
Parthenina interstincta (J. Adams, 1797)
D°_ & Caldy

— *unidentatus*
Odostomia unidentata (Montagu, 1803)
on oyster & other shells

— *plicatus*
Odostomia plicata (Montagu, 1803)
D°_ dredged & roots of algae

— *pallidus*
Turbo pallidus Montagu, 1803 nom dub.
on oysters &cr

— *semicostatus*
Onoba semicostata (Montagu, 1803)
D°_ and Caldy Island sand

— *cingillus* Montagu, 1803
Cingula trifasciata (J. Adams, 1800)
South Sands & from D°_

— *quadrifasciatus* Montagu, 1803
Lacuna vincta (Montagu, 1803)
D°_ and St Catherines Rocks

— *interruptus* J. Adams, 1800
Rissoa parva (da Costa, 1778)
dredged & South Sands

— *retiformis* Montagu, 1803
Alvania punctura (Montagu, 1803)
fine sand from D°_

— *fuscus*
Turbo fuscus nomen dubium
in D°_ from Tenby Pier washed ashore

— *sandvicensis* Turton in Montagu, 1803,
Turbo sandivicensis Montagu, 1803 nom dub.
in sand from Caldy

— *albulus*
Pusillina inconspicua (Alder, 1844)
D°_ & from South Sands

Turbo

Turbo scriptus J. Adams, 1797
Crisilla semistriata (Montagu, 1808)
in fine sand from Caldy Island

T. subrufus
Turbo subrufus J. Adams, 1797 nom. dub.
D°_ and South Sands

— *jugosus* Montagu, 1803
Littorina saxatilis (Olivi, 1792)
Rocks Manorbeer

— *fulgidus*
Eatonina fulgida (J. Adams, 1797)
in fine sand from Caldy

— *semistriatus*
Crisilla semistriata (Montagu, 1808)
D°_ and South Sands

— *indistinctus*
Parthenina indistincta (Montagu, 1808)
in sand from Caldy

— *insculptus* Montagu, 1803

Ondina divisa (J. Adams, 1797)
in fine sand from D°_

—
Rocks Leadstep

— ascaris
Aclis ascaris (Turton, 1819)
in fine sand from South Sands

— ambiguus Linnaeus
Epitonium turtonis (Turton, 1819) probably this species see Dillwyn, 1817, p. 855
found at Tenby above thirty years ago and named by Col. Montagu Dr Turton's Dictionary, Turtonis
Land & Freshwater

Turbo muscorum
Pupilla muscorum (Linnæus, 1758)
under the upper stones of the loose built walls north side of the town

— pupa marginata T. chrysalis
Pupilla muscorum (Linnæus, 1758)
Do_ and near the river

— sexdentatus
Vertigo antivertigo (Draparnaud, 1801)
among the rejectimenta of the D°_

— carychium
uncertain identity
under old timber nr Gumferston

— elegans J. Adams, 1797
uncertain identity
roots of ferns to the S. west of Tenby

— fasciatus Pennant, 1777
Cochlicella acuta (O.F. Müller, 1774)
Burrows near Penally

— perversus
Balea perversa (Linnæus, 1758)
adhering to the trunks of trees

— nigricans Maton & Racket, 1807
Clausilia (Clausilia) rugosa (Draparnaud, 1801)
ivy grown walls

— vertigo Montagu, 1803
Vertigo angustior Jeffreys, 1830
under stones and moss

Helix

H. stagnalis
Lymnaea stagnalis (Linnaeus, 1758)
Stackpole Court

— fragilis Montagu, 1803
Lymnaea stagnalis (Linnaeus, 1758)
D°_ in the extensive ponds

— palustris
Stagnicola palustris (O.F. Müller, 1774)
near Gumferston

— fossarius Montagu, 1803
Galba truncatula (O.F. Müller, 1774)
D°_ in moist muddy ditches nr Penally

— peregra
Radix labiata (Rossmässler, 1835)
stagnant pools D°_ D°_

— putris
Succinea putris (Linnaeus, 1758)
in muddy places

— auricularia
Radix auricularia (Linnaeus, 1758)
Kilgaren & Gumferston Rivers

— lutea Montagu, 1803
Radix balthica (Linnaeus, 1758)
in the South Sands

— limosa
Radix balthica (Linnaeus, 1758)
in the brook near Gumferston

— laevigata Linnaeus, 1758
Velutina velutina (O.F. Müller, 1776)
on the shore & dredging

— tentaculata
Bithynia tentaculata (Linnaeus, 1758)
in the rivulet near Penally

— lubrica
Cochlicopa lubrica (O.F. Müller, 1774)
under stones, trunks of trees &ctr

— polita
Melanella alba (E.M. da Costa, 1778)
dredged and South Sands

— labiosa
Rissoa membranacea (J. Adams, 1800)
D°_ and adhering to algae Gilter Rocks

— petraea
Melarhaphe neritoides (Linnaeus, 1758)
on rocks a little beneath high water mark

— aspersa
Cornu aspersum (O.F. Müller, 1774)
hedges and in old walls

— nemoralis
Cepaea nemoralis (Linnaeus, 1758)
Burrows near Penally

— hortensis
Cepaea hortensis (O.F. Müller, 1774)
gardens and hedges

— virgata
Cernuella virgata (E.M. da Costa, 1778)
barren stony situations near the coast

— cingenda
Theba pisana (O.F. Müller, 1774)
Tenby marsh near cliffs

— rufescens
Arianta arbustorum (Linnæus, 1758)
moist woods and shady places

— hispida
Trochulus hispidus (Linnæus, 1758)
in moss and under stones

— lucida

Oxychilus cellarius (O.F. Müller, 1774)
swampy places ctr

Helix

H. trochiformis
Euconulus trochiformis (Montagu, 1803)
D°_ under old timber near Gumferston

— lacuna Montagu, 1803
Lacuna parva (E.M. da Costa, 1778)
attached to algae Sr Catherine's rocks

— caperata
Candidula intersecta (Poiret, 1801)
dry banks near the coast

— radiata E.M. da Costa, 1778
Discus rotundatus (O.F. Müller, 1774)
D°_ and on old walls near Penally

— umbilicata
Pyramidula umbilicata (Montagu, 1803)
on loose built walls near Penally

— ericetorum O.F. Müller, 1774
Helicella itala (Linnaeus, 1758)
sandy heaths

— subcarinata
Tornus subcarinatus (Montagu, 1803)
in fine sand from Caldy &ctr

— depressa
Skeneopsis planorbis (Fabricius, 1780)
D°_ and from the South Sands

— paludosa E.M. da Costa, 1778
Vallonia pulchella (O.F. Müller, 1774)
wet swampy situations near Gumferston

— crenella
Vallonia costata (O.F. Muller, 1774)
D°_ and near the Rivulet

— cornea
Planorbarius corneus (Linnæus, 1758)
Milford Haven River

— complanata
Hippeutis complanatus (Linnæus, 1758)
D°_ and near Gumferston

— carinata
Planorbis carinatus O.F. Müller, 1774
D°_ D°_ near Penally

— vortex
Anisus vortex (Linnæus, 1758)
D°_ and Ditches Burrows

— spirorbis
Anisus spirorbis (Linnæus, 1758)
ponds Stackpole

— contorta
Bathyomphalus contortus (Linnæus, 1758)
D°_ and Ditches

— alba
Gyraulus albus (O.F. Müller, 1774)
in a pond nr the Pembroke road

— nautilea
Planorbis cristatus Draparnaud, 1805
D°_ & near Gumferston

— subulata
Eulima glabra (E.M. da Costa, 1778)
in fine sand from Freshwater West

— auricula
uncertain
Gilter Rocks

— Ianthina fragilis
Janthina janthina (Linnaeus, 1758)
"" *after a gale*

Nerita

— N. litoralis
Littorina obtusata (Linnaeus, 1758)
adhering to algae St. Catherines Rocks

— pallidula
Lacuna pallidula (E.M. da Costa, 1778)
D° _ D°_ & at Gilter

— glaucina Linnaeus ex auct
probably *Euspira nitida* (Donovan, 1804)
South and Laugharne sands

— fluviatilis
Theodoxus fluviatilis (Linnaeus, 1758)
Gumferston Rivulet adhering to stones

— alba
probably juvenile *Euspira nitida* (Donovan, 1804)
on the coast and Caldy

— canrena Linnaeus ex auct
probably *Euspira nitida* (Donovan, 1804)
D° _ D°_ in stomach of starfish

— rufa
Euspira montagui (Forbes, 1838)
on fuci at low water during spring tides

— mammilla
probably *Euspira nitida* (Donovan, 1804)
South Sands & Caldy

Patella

— P. vulgata
Patella vulgata Linnaeus, 1758
affixed to rocks North shore

— pellucida
Patella pellucida Linnaeus, 1758
adhering to the leaves of algae

— fluviatilis
Ancylus fluviatilis O.F. Müller, 1774
Rivulet near Gumferston

— lacustris
Acroloxus lacustris (Linnaeus, 1758)
Brook near Tenby & Stackpole ponds

— ungarica
Capulus ungaricus (Linnaeus, 1758)
dredged on oysters

— fissura
Emarginula fissura (Linnaeus, 1758)

D° _ between Tenby & Caldy

— ***apertura*** Montagu, 1803
Diodora graeca (Linnaeus, 1758)
in sand from south sands & Caldy

— ***graeca***
Diodora graeca (Linnaeus, 1758)
oyster boats adhering to old shells

— ***caerulea*** Montagu, 1803
Patella pellucida Linnaeus, 1758
on the roots of algae St Catherines rocks

— ***D° _ variety***
D° _ D°_ & Leadstep Rks

— ***granularis***
? name does not apply to British shell
Rocks on the North Sands

— ***lutea***
??
D° _ in pools of water

Dentalium

— ***D. entalis***
Antalis entalis (Linnaeus, 1758)
Muscle Bank Gilter &S. Sands

— ***striatum*** Montagu, 1803
Antalis dentalis (L. 1758) doubtful not British
D° _ D°_ and dredged off Caldy

— ***imperforatum***
Caecum imperforatum (Kanmacher, 1798)
on the shore fresh water Ba....

— ***glabrum***
Caecum glabrum (Montagu, 1803)
in sand from Caldy Island

— ***laeve*** Turton, 1819
Antalis vulgaris (E.M. da Costa, 1778)
near Gilter rock

— ***labiatum*** Turton, 1822
Antalis vulgaris (E.M. da Costa, 1778)
D° _ and South Sands

Serpula

Foraminifera /Polychaeta

— ***S. spirorbis***
Laeospira borealis (Daudin, 1800)
on stones, old shells & algae

— ***spirillum***
Serpula spirillum Linnaeus, 1758
on some species of algae

— ***granulata***
Bushiella (Jugaria) granulata (Linnaeus, 1767)
on the underside loose stones near Saundersfoot

— ***carinata***
Spirorbis carinatus Daudin, 1800
on old valves of Arca pilosa &ct

— ***corrugata***
Spirorbis corrugatus (Montagu, 1803)
on the slate rocks near Saundersfoot

— ***heterostrophia***
Janua heterostropha (Montagu, 1803)
on oysters and other old shells & algae

— ***sinistrosa***
Serpula spirillum Linnaeus, 1758
on lobsters and other animals

— ***minuta*** Montagu, 1803
Janua heterostropha (Montagu, 1803)
on Corallina &ct dredged

— ***lucida***
Serpula spirillum Linnaeus, 1758
on Sertularia thrown upon the coast

— ***reversa***
Serpula reversa Montagu, 1803
on shells crabs & stones

— ***vermicularis***
Serpula vermicularis Linnaeus, 1767
attached its whole length

— ***triquetra***
Serpula triquetra Linnaeus, 1758
adhering to stones, old shells &ctr

— ***complexa*** Turton, 1819
Filograna implexa Berkeley, 1835
dredged up off Caldy Island

— ***contortuplicata***
Serpula contortuplicata Linnaeus, 1758
from the bottom of a brig

— ***lobata***
Serpula lobata Montagu, 1803
on shells & in fine sand

— ***concamerata***
Eponides concameratus (Montagu, 1808)
D° _ D°_ & attached to zoophytes

Vermiculum

Foraminifera /Polychaeta

V. incurvatum Kanmacher, 1798
Spirorbis incurvatus Turton, 1802
in fine sand South Sands

— ***pervium*** Montagu, 1803
Spirorbis incurvatus Turton, 1802
D° _ D°_ & from Caldy Island

— ***perforatum***
Serpula perforata Walker & Jacob, 1798
in fine sand

— ***intortum***
Vermiculum intortum Montagu, 1803
plentiful on the sandy shores

— ***subrotundum***
Miliolinella subrotunda (Montagu, 1803)
D°_ & from Caldy

— ***oblongum***
Triloculina oblonga (Montagu, 1803)
in fine sand from the South Shore

— ***lacteum*** Kanmacher, 1798
Vermiculum lacteum Turton, 1802

in very fine D° _

— *striatum* Kanmacher, 1798

Serpula lagena Turton, 1802

in fine sand not common

— *globosum*

Oolina globosa (Montagu, 1803)

D° _ very rare

— *laeve*

Reussoolina laevis (Montagu, 1803)

in fine sand very rare

— *marginatum*

Fissurina marginata (Montagu, 1803)

from south sands

— *retortum*

Serpula retorta Walker & Jacob, 1798

D° _ very rare

New shells found at Tenby by WL

Chiton sixvalvis

Cannot find this name, was probably an aberrant specimen

under loose stones S. Sands

— *Balanus. the conia Lyonsii of Dr Leach*

This is *Conia lyonsii* Leach ms in J. Sowerby, 1823. *Newmanella radiata* (Brug. 1789) Not British it is Caribbean

bottom of a vessel, animal alive

B. sulcatus Brug. 1789

Balanus balanus Linnaeus, 1767

on the bottom of a vessel alive

— *N° 1*

D° _ D°_ Animal alive

— *N° 2*

D° _ D°_ D° _

— *Tenbiensis*

a manuscript name

on shells slate &ctr

insculptus

Cannot find this name

adhering to a piece of timber picked up in the Bay

— *Teredo sulcata*

Cannot find this name

from a piece of wood drifted in the harbour

— *Mya striata Lyonsia striata of Dr Turton*

Lyonsia norwegica (Gmelin, 1791)

S. sands, Animal alive

— *Mytilus*

in Tenby Pier Animal alive

— *Buccinum N° 1*

on the bottom of a vessel in Tenby Pier, Animal alive

— *B. N° 2*

Gilter Rocks

— *Nautilus auricula Auriculum lyonsii of JG Jeffreys*

This is a Foraminifera now *Cancris auricula* (Fichtel & Moll, 1798) cannot find *lyonsii*

— *N. N° 1. N° 2. N° 3 & 4. 6. 7*

D°_ fine sand South Sands

— *Turbo perforatus*

Cannot find this name

in sand from D°_

— *T. crenatus*

Cannot find this name

D°_ and Caldy Island

— *Turbo succinus*

Cannot find this name

in fine sand from Caldy

— *Turbo ater*

Cannot find this name

D°_ & South Sands

— *T. N°1. 2. 3. 4. & 5*

D°_ & Caldy some doubtful

— *Helix minima*

Cannot find this name

very fine sand from D°_

— *H. cylindrica*

Cannot find this name

near Tenby Pier on old timber covered with moss

— *Dentalium arcuatum*

Cannot find this name

— *Serpula N° 1 & N° 2.*

in boat rubbish after dredging

— *Vermiculum N°1. 2. 3. 4. & 5*

in fine sand from S. sands and

Discussion

Lost histories and demise of significant natural history collections in local museums

Through the curation and involved research we have shown that the Lyons collection in Tenby is significant for a number of reasons.

> Primarily it contains type specimens of value to international taxonomic research and as such must be conserved and made available to the research community.

> Secondarily the collection and archive give a historic perspective on the malacofauna some 200 years ago. As such the collection reflects changes in biodiversity through environmental changes.

> Thirdly there is a history of science element involved through the social networking of the collectors.

> Finally there is a perspective on Tenby as a sense of place both past and present.

This project has however revealed significant

degradation of the collection through progressive use as an exhibition resource. Repeated efforts were made to "upgrade" the collection and make it suitable for display and this was embarked upon very soon after its acquisition. This process partly disassociated the original data from the collection. Through changes in museological philosophies the roles of such collections have changed and after its removal from display all historic and scientific contexts were effectively lost. Such was this change in philosophy that it was not possible to gain state or local government funding to carry out the required curation and conservation. The collection had in essence lost all value to the current museological hegemony.

With some support from the Ruffer Foundation we have revealed the four significant features of the collection but having done so what future does this collection have?

"Too good for Tenby Museum!"

This would have been a common perspective from national museums some decades ago and recently there have been moves to focus natural history collections in so called hub museums. This had been a solution for small museums with collections but no relevant curatorial expertise, but this process only transfers the problem from one site to another. Such moves rarely if ever result in curatorial research or increases in accessibility. The lost histories remain lost primarily because there is insufficient expertise to expose the significance and interpret it for all potential audiences.

With current pressures on all museum curatorial departments (Mendoza, 2017) moving collections will not result in benefits with the only exception being if the said collection is in immediate danger of physical destruction.

There is much more potential in keeping collections in their contextual surroundings, as their stories have greater meaning to the local population and visitors alike (LGA & CLOA, 2017).

For a collection like that of Lyons physical security must be assured and appropriate resources must be forthcoming from our heritage sector. The scientifically important material can be accessible without its transfer to a national of hub museum. This is achieved by making such specimens available through the internet as by the "Mollusca Types Great British Museums" project (Ablett *et al*., 2020). The biodiversity data and changes in the fauna can be used to create community projects. In the case of Lyons and Tenby there is a current initiative to use the Lyons collection as a 200-year-old data set on which the current shell fauna can be compared. This project involves local schools and community groups.

The Lyons collection can also be used as a focus for Tenby as a sense of place in natural history, with many famous naturalists drawn to Tenby. By the end of the eighteenth-century Tenby as a maritime trading centre was in decline and much of its property decaying. William Paxton recognised the potential opportunity to develop the town as a spa resort and it was to a town in a state of change that William Lyons arrived. However, as well as a place beneficial to health, by the nineteenth century Tenby was visited by several natural historians and became a focus for marine biology. Margaret Davies (1981) traces the history of Victorian naturalists in Tenby among whom can be included Edward Donovan (1768–1837), James Scott Bowerbank (1797–1877), Thomas Henry Huxley (1825–1895) and Philip Henry Gosse (1810–1888) who wrote "*Tenby, A Seaside Holiday*" (Gosse, 1856). Donovan (1805: 389) wrote that "*no situation whatever can be more admirably adapted than the neighbourhood of Tenby for the study of the productions of the sea coast*" Whether this reputation attracted William Lyons to settle in Tenby we do not know but his shell collection came to the attention of Huxley who in 1850 remarked on the "*celebrated collection of the late Mr Lyons of Tenby*" (Huxley, 1900).

This project does however, highlight that subject expertise is required to correctly curate the collection and identify the lost stories. Such subject expertise cannot be permanently available in all museums holding conchological collections but such expertise should be available from larger museums on a peripatetic basis. This does require at least the national museums to maintain such expertise (Mendoza, 2017) a situation which is no longer secure.

Without the basic curation of collections their significance and potential stories will never be revealed and an irreplaceable legacy will eventually be lost.

Appendix 1

Kennard 1944

Table. Summary of the lots examined by Kennard (1944) linking Kennards citations to mu-

seum registration numbers and current nomenclature. *There are no locality data with this lot and therefore it does not agree with Kennards citation, the label may have been lost.

Museum number	Kennard name	Page	Lyons label	Current name	Provenance
2001.129.1	*Succinea pfeifferi Rossm*	1944, 2: 75	*Helix oblonga*	*Oxyloma elegans (Risso)*	Lyons
2001.129.2	*Ena detrita Müll*	1944, 2: 75	*Helix detrita*	*Drymaeus elongatus (Röding)*	unknown
2001.129.3	*Subulina octona*	1944, 2: 75-76	*Helix octona*	*Subulina octona (Bruguière)*	unknown
2001.129.4	*Subulina octona*	1944, 2: 75-76	*Achatina octona*	*Subulina octona (Bruguière)*	Miss Pocock
2001.129.5	*Physa fontinalis*	1944, 2: 76	*Physa alba*	*Physa fontinalis (Linnaeus)*	? W. Turton
2001.129.6	*Chondras similis*	1944, 2: 76	*Pupa cinerea var. parvula*	*Solatopupa similis (Bruguière)*	unknown
2001.129.7	*Ena montana*	1944, 2: 76	*Bulimus montanus*	*Ena montana (Draparnaud)*	unknown
missing	*Ancylastrum fluviatile*	1944, 2: 76			
2001.129.8	*Aplexa hypnorum*	1944, 2: 76	*Bulla hypnorum*	*Aplexa hypnorum (Linnaeus)*	Lyons
*2001.129.10	*Ancylus lacustris*	1944, 2: 76	*Patella lacustris*	*Acroloxus lacustris (Linnaeus)*	
missing	*Ancylastrum fluviatile*	1944, 2: 76			
2001.129.12	*Opeas pumilum*	1944, 2: 76	*Cochlicella clavulus*		J.S. Miller
2001.129.13	*Punctum pygmaeus*	1944, 2: 76	*Helix umbilicata*	*Pyramidula umbilicata (Montagu)*	
2001.129.14	*Lymnaea glabra*	1944, 2: 76	*Helix octanfracta*	*Omphiscola glaber (O.F. Müller)*	W. Bingley
2001.129.15	*Lymnium tumidum*	1944, 2: 77	*Mya pictorum*	*Unio tumidus Retzius*	J. Walcott
2001.129.16	*Azeca goodalli*	1944, 2: 77	*Turbo tridens*	*Azeca goodalli (Férussac.)*	Gen. R.Bingham
2001.129.17	*Zua lubrica*	1944, 2: 77	*Helix lubrica*	*Cochlicopa lubrica (O.F. Müller)*	Gen. R.Bingham
2001.129.18	*Pupilla muscorum*	1944, 2: 77	*Turbo chrysalis*	*Pupilla muscorum (Linnaeus)*	Gen. R.Bingham

2001.129.19	*Lauria cylindracea*	1944, 2: 77	*Turbo muscorum*	*Lauria cylindracea (E.M. da Costa)*	Gen. R.Bingham
2001.129.20	*Ena montana*	1944, 2: 77	*Helix lackhamensis*	*Ena montana (Draparnaud)*	Gen. R.Bingham
2001.129.21	*Balea perversa*	1944, 2: 77	*Turbo perversus*	*Balea perversa (Linnaeus)*	Gen. R.Bingham
2001.129.22	*Marpessa laminata*	1944, 2: 77		*Cochlodina laminata (Montagu)*	Gen. R.Bingham
2001.129.23	*Vitrea crystallina*	1944, 2: 77	*Helix crystallina*	*Vitrea crystallina (O.F. Müller)*	Gen. R.Bingham
2001.129.24A	*Oxychilus cellarius*	1944, 2: 77	*Helix lucida/nitida*	*Oxychilus cellarius (O.F. Müller)*	Gen. R.Bingham
2001.129.24B	*Retinella nitidula*	1944, 2: 77	*Helix lucida/nitida*	*Aegopinella nitidula (Draparnaud)*	Gen. R.Bingham
2001.129.25	*Retinella radiatula*	1944, 2: 77	*Helix striatula*	*Nesovitrea hammonis (Strøm)*	Gen. R.Bingham
2002.95	*Candidula caperata*	1944, 2: 77	*Helix caperata*	*Candidula intersecta (Poiret)*	Gen. R.Bingham
2002.94	*Vortex lapicida*	1944, 2: 77	*Helix lapicida*	*Helicigona lapicida (Linnaeus)*	Gen. R.Bingham
2001.129.28	*Pomatias elegans*	1944, 2: 77	*Turbo elegans*	*Pomatias elegans (Linnaeus)*	Gen. R.Bingham
2001.129.29	*Acme lineata*	1944, 2: 77	*Turbo fuscus*	*Acicula lineata (Draparnaud)*	W. Bean
2001.129.30	*Acanthinula aculeata*	1944, 2: 77	*Helix spinulosa*	*Acanthinula aculeata (O.F. Müller)*	W. Bean
2001.129.31	*Retinella pura*	1944, 2: 77	*Helix nitidula*	*Aegopinella pura (Alder)*	W. Bean
2001.129.32	*Lymnaea glabra*	1944, 2: 77	*Helix octanfracta*	*Omphiscola glaber (O.F. Müller)*	W. Bean
2001.129.33	*Vitrea crystallina*	1944, 2: 77	*Helix crystallina*	*Vitrea crystallina (O.F. Müller)*	W. Bean
2001.129.34	*Vallonia costata*	1944, 2: 77	*Helix crenella*	*Vallonia costata (O.F. Müller)*	W. Bean
2001.129.35	*Punctum pygmaeum*	1944, 2: 77	*Helix pygmaea*	*Punctum pygmaeum (Draparnaud)*	W. Bean
2001.129.36	*Vertigo pusilla*	1944, 2: 77	*Helix vertigo*	*Vertigo pusilla O.F. Müller*	W. Bean

2001.129.37	*Acanthinula lamellata*	1944, 2: 77	*Helix scarburgensis*	*Spermodea lamellata (Jeffreys)*	W. Bean
2001.129.39	*Planorbis crista*	1944, 2: 78	*Turbo nautileus*	*Gyraulus crista (Linnaeus)*	J.S. Miller
2001.129.40	*Theodoxus fluviatilis*	1944, 2: 78	*Nerita fluviatilis*	*Theodoxus fluviatilis (Linnaeus)*	J.S. Miller
2001.129.41	*Sphaerium rivicola*	1944, 2: 78	*Cardium corneum*	*Sphaerium rivicola (Lamarck)*	J.S. Miller
2001.129.42	*Opeas pumilum*	31944, 2: 78	*Helix cochlicella*	*Opeas hannense (Rang)*	J.S. Miller
2001.129.43	*Acanthinula lamellata*	1944, 2: 78	*Helix holosericea*	*Spermodea lamellata (Jeffreys)*	J.S. Miller
2001.129.44	*Helix subrufescens*	1944, 2: 78	*Helix subrufescens*	*Zenobiella subrufescens (J.S. Miller)*	J.S. Miller
2001.129.45 mount only	*Vertigo anglica*	1944, 2: 78			J.S. Miller
2002.94	*Theodoxus fluviatilis*	1944, 2: 78	*Nerita fluviatilis*	*Theodoxus fluviatilis (Linnaeus)*	Rev. Goodall
2002.92	*Vertigo pygmaea*	1944, 2: 78	Turbo 6-dentatus	Vertigo pygmaea (Draparnaud)	Rev. Goodall
2001.129.48	*Azeca goodalli*	1944, 2: 78	*Turbo tridens*	*Azeca goodalli (Férussac)*	Rev. Goodall
missing	*Vitrea crystallina*	1944, 2: 79			L. Jenyns
2001.129.50	*Planorbis planorbis*	1944, 2: 79	Helix planorbis	Planorbis planorbis (Linnaeus)	T. Rackett?
2001.129.51	*Planorbis albus*	1944, 2: 79	*Helix alba*	*Gyraulus albus (O.F. Müller)*	T. Rackett?
2001.129.52	*Clausilia rugosa*	1944, 2: 79	*Turbo nigricans*	*Clausilia rugosa (Draparnaud)*	T. Rackett?
2001.129.53	*Laciniaria biplicata*	1944, 2: 79	*Turbo biplicata*	*Alinda biplicata (Montagu)*	T. Rackett?
2001.129.54	*Marpessa laminata*	1944, 2: 79	*Turbo laminatus*	*Cochlodina laminata (Montagu)*	T. Rackett?
2001.129.55	*white var*	1944, 2: 79	*Turbo laminatus*	*Cochlodina laminata (Montagu)*	T. Rackett?

Fig. 38. Reproduction of the lithograph "Conchology of Tenby" by Charles Norris, 1813. Original size. From the archives of the Tenby Museum.

Appendix 2

Norris's *Conchology of Tenby*

The Mr Norris, who sent specimens of *Lyonsia striata* to Montagu, was Charles Norris of Tenby (1779-1885) (Norris, 1966). Norris was a prolific topographical etcher (Tipton, 1997) who in 1813 had made a print entitled "Conchology of Tenby" (**Fig. 38**) and we like to believe that he drew on the Lyons collection for his specimens.

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The akan multiplication table. The akan weighing system, part two

La table de multiplication akan. Le système pondéral akan, deuxième partie

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Henry Abel
Rudolph Zeller
Louis Binger
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ba
mitqal
proto-currencies

MOTS-CLÉS

akan
ashanti
baoulé
poids à peser l'or
Ghana
Côte d'Ivoire
Gold Coast
système dualiste
ethno-mathématiques
Timothy Garrard
Henry Abel
Rudolph Zeller
Louis Binger
taku
ba
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Summary: In addition to a previous communication which showed the sophistication and the African origin of the Akan Weighing System, this article explains how, by the compilation of previous works sometimes more than a century old, the authors understood that it's acted of a dualistic system light weight / heavy weight and reconstituted the multiplication table which underlined the value of its various units. These hypotheses having been demonstrated with a very high level of evidence by the study of thousands of weights. It remains to be understood how the Akan were able to perform multiplications as complex as, for example 13 by 192, without being able to write the operation.

Résumé : En complément d'une précédente communication qui a montré la sophistication et l'origine africaine du système pondéral akan, cet article explique comment, par la compilation de travaux antérieurs vieux parfois de plus d'un siècle, les auteurs ont compris qu'il s'agissait d'un système dualiste poids-faible/poids-forts et reconstitué la table de multiplication qui sous-tendait la valeur de ses différentes unités. Ces hypothèses ayant été démontrées avec un très fort niveau de preuve par l'étude de milliers de poids, il reste à comprendre comment les Akan ont pu procéder à des multiplications aussi complexes que, par exemple 13 par 192, sans pouvoir, faute de numération écrite, poser l'opération.

Introduction

This article is the second in a series devoted to the study of the Akan gold weights, well known to collectors and ethnologists, but whose functioning has given rise to little research and remains poorly understood. In our original article, we showed, by studying the largest collection of geometric weights ever studied (9031 including 298 chef's weights over 80 g) (Crappier *et al.*, 2019), the organization and precision of this weighted system and invalidated the theory which made it derive from that of the Arabs, in favor of an African origin.

Our reasoning assumes that the weight distribution has obeyed a complex multiplication table, which we had only briefly explained, so as not to weigh down our demonstration. Our purpose is to fill this gap here and show how this so-called Akan Multiplication Table was constructed and to think about the problems it raises.

Method

To penetrate the Akan Weighing System (AWS), we have many lists of weights collected from the beginning of the 17th century by European merchants or explorers and field surveys carried out by Henri Abel and Timothy Garrard in the second half of the 20th century. But these lists, drawn up in Portuguese, Dutch, English or French units, are more or less exact and complete, and the field surveys suffer from having been carried out several generations after the Akan stopped using them. Data interpretation is complicated by great linguistic variability and a gradual tangle over time. It is therefore not surprising that the authors who studied it during the 20th century, all came to different conclusions about the nature and functioning of AWS, and that the work ended there.

Despite the passage of time and the uncertainty about data, it seemed possible to propose a synthesis of the different theories from four main sources which are in chronological order the publications of Louis Gustave Binger in 1892, of Rudolph Zeller in 1903, by Henri Abel from 1952 to 1973 and by Timothy Garrard in 1982. We have dissected the lists of weights reported by these authors to understand their structure. We translated them in the form of tables that an overview is enough to understand the reasoning that led us to the Akan Multiplication Table. The interested reader will find more detailed information in the framed texts.

To find your way around the weights and coins of Europeans:

The Portuguese were the first to come into contact with Akan people in 1471 and to obtain a coastal concession in 1482. Their currency was the Cruzado, weighing (until 1584), 3.6 g and containing 0.358 g of fine gold (almost 24 carats). They used to weigh gold the Cologne ounce of 28.7 g they called *onça*.

The Dutch of the United Provinces supplanted the Portuguese in 1637. They had a Ducat of 3.5 g of 23.5 carat gold, but mainly struck silver *Rijksdaaler*. They used a Troy ounce of 30.7 g.

The English came into play in the last quarter of the 17th century. They will take 200 years to oust the Dutch competition on the Gold Coast, before undertaking the conquest of the interior of the country to the detriment of the Ashanti. Their monetary unit was the Sovereign (£), weighing 7.99 g, containing 7.32 g of fine gold (22 carats). Their Troy ounce (Ozt) weighs 31.1 g.

The French, who arrived too late, did not manage to settle, except, from 1842, on the "Coast of the Teeth", in the western part of the Akan states. The Franc weighs 0.32 g and contains 0.29 g of fine gold (21.6 carats). They used in Africa a "trade ounce" of 32 g.

Results

The weight lists allow us to get a precise idea of the relationship between them of the main Akan weights denominations, but as they are established, for the most part, in monetary equivalent value, they do not give us directly the corresponding mass. To calculate it, we must therefore know the price at which an ounce of akan gold was negotiated, knowing that these ounces, like currencies, differed from one country to another, that the fine metal content was variously appreciated by Europeans traders, and that it varied depending on whether it was gold dust or nuggets.

There were 3 kinds of units:

- Basic units which rest on seeds, the *ba*, and the *taku* [1], in a ratio between them of 3 *ba* for 2 *taku*. The *ba* is worth 2 *damma*, that is to say two seeds of *Abrus precatorius*, a forest liana. Taku is also a seed, but its exact nature is unknown to the authors;

- *Ake* [2] is another frequently cited unit, given for 1/16 of an ounce. An *ake* is worth 8 *taku*;

- The *benna* [3] which is worth 2 ounces, whether Portuguese, Dutch or English, is therefore worth 256 *taku*.

Typically, the name akan of weights is formed by a radical (*ba* or *taku* for small units) followed by a suffix which can mean either a "multiplication by", or more rarely an "addition of". There are thus around twenty radicals and their multiples by 1/2, 2, 3 or 4, sometimes up to 8, corresponding to around sixty different weights.

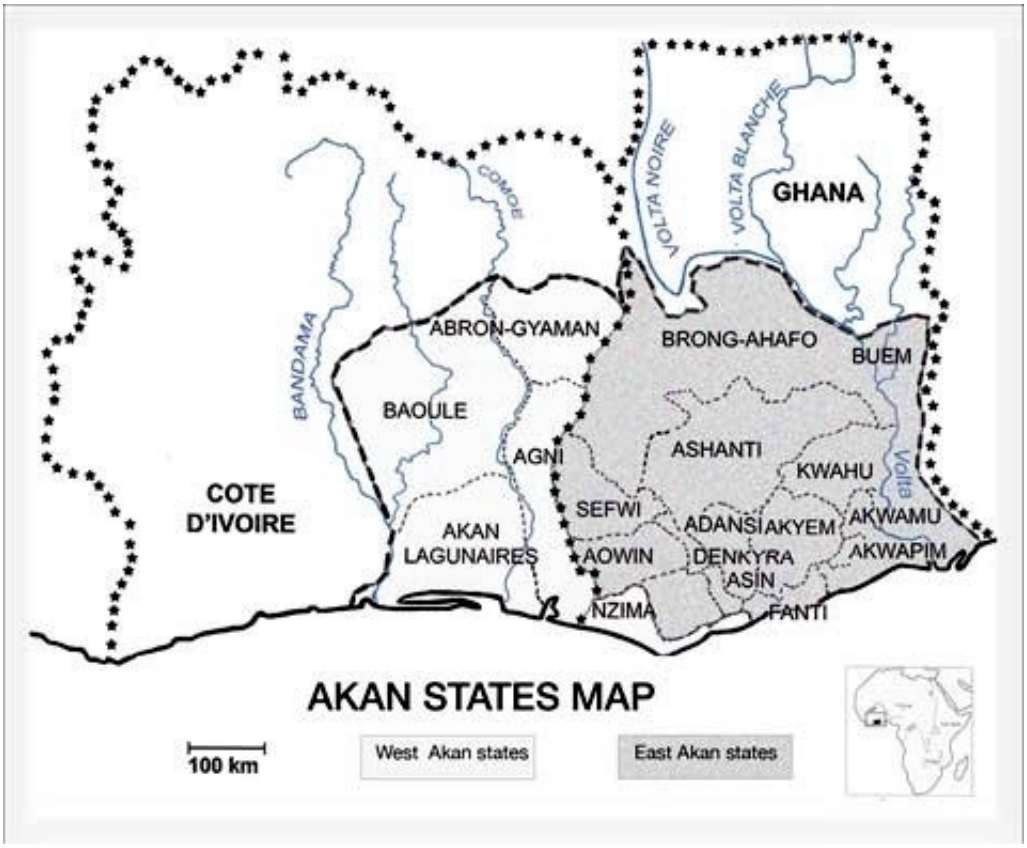
Standardized numbering

Although they belong to the same linguistic group, the Akan languages differ significantly from one state to another and the names of the weights vary, in particular between eastern and western states (see **map**), or take different values. To facilitate the comparison between the different sources, we have simplified and standardized the Akan numeration (**Table 1**). For more information, the reader will refer to **Appendix 1**, reproduced from Bowdich, which shows all its complexity (Bowdich, 1819). We have used Ashanti names for Eastern Akan lists and Baule names for Western Akan lists, with their simplest spelling since the European translation is arbitrary. To avoid confusion, the word weight will henceforth be

1. *Tokoo, takou, takoi or tekkoo.*

2. *Akye, ackie, acquay* or *akee*.

3. *Benna, banna* or benda.



½= fa or suru*	1 = ko	2 = no	3 = nsa	4 = nan	5 = nun
	6 = asia	7 = nso	8 = otwe	9 = gun	10 = buru
* *The suffix suru can mean either [x 1/2] or [+ 1/2]. Ne means plus*					

Table 1. Simplified akan numeration.

reserved for the designation of objects, and the word mass for their value in grams.

Weight classification according to Zeller (1869-1940)

Rudolph Zeller, director of the ethnographic section of the Historical Museum of Bern is the first, in 1913, to publish a synthesis of the Akan Weighing System, from information provided by Rudolph Bürki, a Swiss missionary who lived in Gold-Coast [4] at the beginning of the 20th century, and from older lists established when the weights were still in use. The data are of Akyem and Ashanti origin, so eastern akan. Zeller's system is based on the *taku*, whose weight he calculates at 0.25 g. He doesn't talk about *ba*. He distributes the weights into 8 series [5], the main 7 of which have 1,3,5,7,9,11 and 13 *taku* as their first term, and each element of which is double the previous one. He presents his results in the form of a table (**Appendix 2**) which can easily be transformed into a multiplication table composed of 7 columns, one per series, the first weights of which are respectively 1,3,5,7,9,11 and 13 *taku*, and of a dozen lines corresponding to multipliers by the powers of 2, that is to say 2,4,8 and so on until 2048 for series 1 (**Table 2**).

Zeller also claims that the *mitqal* [6], the weight of Arab origin which represents the mass of a dinar [7], was not used in the Gold Coast and reports the testimony of Christaller affirming that the Akan used different weights to buy or sell (Zeller, 1903).

4. Name given by the English to the colony that will become Ghana.

5. The first series is based on the *damma*, 2 of which make a *ba*, although he does not quote this last unit.

6. *Mithqal*, *mitiqal* or *mitkal*.

7. Arabian currency with a canonical weight of 4.25 g of almost pure gold.

	S1	S3	S5	S7	S9	S11	S13
1	1 (0,25 g) **TAKU**	3 (0,75 g) taku-nsa		7 (1,75 g) domma-fa	9 (2,25 g) **AGIRAOTWE-FA**	11 (2,75 g) bodomo-fa	13 (3,25 g) fiaso
2		6 (1,5 g) sowa-fa	10 (2,5 g) nsonsa-fa	14 (3,5 g) domma	18 (4,5 g) agiraotwe	22 (5,5 g) bodomo	26 (6,5 g) nsa-no
4		12 (3 g) sowa	20 (5 g) nso-nsa	28 (7 g) dwoa-suru	36 (9 g) suru	44 (11 g) takimansua	
8	8 (2 g) borofo-fa	24 (6 g) nsano	40 (10 g) pere-suru	56 (14 g) dwoa	72 (18 g) osua		
16	16 (4 g) borofo	48 (12 g) asia			144 (36 g) osua-no		
24					216 (54 g) osua-nsa		
32	32 (8 g) namfi-suru	96 (24 g)	160 (40 g) dwoano ne dwoasuru		288 (72 g) pereguan = nta ⮑	x40=360 (90 g) pereguan osua	
48	asia (12g)				432 (104 g) pereguan osuano		
64	64 (16 g) namfi	192 (48 g) egwa-nsa			576 (144 g) pereguan-no ⮑	x80=720 (180 g) pereguan no osuano	
96					864 (208 g) pereguan-nsa		
128	128 (32 g) benna-fa						
256 ⮑	256 (64 g) **BENNA** ⮑	x 512 (128 g) benna-no ⮑	x 768 (192 g) benna-nsa ⮑	x1024 (256 g) benna-nan ⮑	x2048 (512 g) benna-otwe		

Table 2. 1 *taku* = 0.25 g. Ashanti appellations. According to *tabelle III* et *IV* of Zeller. Values are given in *taku*.

Weight classification according to Garrard (1943-2007)

An English native, Timothy Garrard spent most of his career in Ghana as a lawyer and ethnologist. His work is authoritative in terms of Akan weight. His theory contradicts that of Zeller. For him, the AWS is a loan from the Arabs, the basic unit of which was the *mitqal* of 4.4 g and the *uqiya*, the Arabic ounce, of 26.4 g. The Akan are said to have learned from the Dioula, a caste of Islamized Soninke merchants, who traded with the two parties in the context of the trans-Saharan trade. They would later have added European weights to it, once contact had been established with them, thus explaining the complexity of the system, which he said consisted of four series, two modeled after the Arab weights (one on *mitqal*, the other on *uqiya*), one on the Portuguese weights, and the last one on English weights, each weight being, in a series, twice the previous one (**Appendix 3**). The *uquiya* series is said to have been used mostly among western Akan.

The *taku*, to which he attributes the mass of 0.25 g like Zeller, and the *ba*, would have played only an ancillary role for small transactions. He does not find a trace in his investigations of the difference between weight to sell and weight to buy (Garrard, 1982).

This thesis is well argued, but is contradicted by the lists of weights which he himself collected in the various Akan states from notables who still knew their names and their counter values in English currency. None of them cites *mitqal*, but all report a 6 pence *taku* weighing 0.22 g. The summary table which he

	S1	S3	S5	S7	S9	S11	S13
1	1 (0,22 g) **TAKU**	3 (0,66 g) taku-nsa	5 (1,1 g) taku-nun	7 (1,54 g) domma-fa	9 (1,98 g) **AGIRAOTWE-FA**	11 (2,42 g) bodomo-fa	13 (2,86 g) fiaso (ak)
2	2 (0,44 g) taku-no	6 (1,32 g) sowa-fa	10 (2,2 g) nsonsa-fa	14 (3,08 g) domma	18 (3,9 g) agiraotwe	22 (4,84) bodomo	26 (5,72 g) nsano
4	4 (0,88 g) taku-nan	12 (2,64 g) sowa	20 (4,4 g) nso-nsa		36 (7,8 g) onansua-suru	44 (9,68 g) pere-suru	52 (11,44 g) asia
6			30 (6,6 g) dwoa-suru				
8	8 (1,76 g) borofo-fa	24 (5,28 g) sowa-no	40 (8,8 g) suru		72 (15,6g) onansua		
			60 (13,2 g) dwoa				
16	16 (3,52 g) borofo	47 (48-10,56 g) techimansua	80 (17,6 g) osua		144 (31,7 g) dwoa-no (ak)		200 (208-43,76 g) osuano ne suru
24			120 (26,4 g) osua ne suru				
32	32 (7,04 g) namfi-suru	94 (96-21,1 g) osua ne domma	160 (35,2 g) osua-no		280 (288-61,6 g) **BENNA**		
48			240 (52,8 g) osua-nsa				
64	64 (14,08 g) namfi	186 (192-42,2 g) osuano ne nsano	320 (70,4 g) pereguan = nta				
96	96 (21,12 g) *osua ne borofo*		480 (106 g) pereguan osua-no				
128		372 (384-84,5 g) pereguan ne asia	640 (141 g) pereguan-no				
			nta-nsa				
256		744 (768-169 g) pereguan no ne osua-no	1280 (282 g) pereguan-nan				
			pereguan nun				

Table 3. 1 *taku* = 0.22 g. Ashanti appellations. According to Garrard, p. 348-349. The values are given in *taku.*

establishes from the lists of 16 different states is too large to be carried over here. We only cite (**Appendix 4**) the Ashanti and Akyem lists which allow to find, on the basis of a *taku* of 0.22 g, the seven series of Zeller, and to reconstruct, albeit in a different order, a multiplication table (**Table 3**).

Weight classification according to Binger (1856-1936)

Captain of the Marine Infantry, Louis-Gustave Binger explored West Africa. He ended his career as governor of Ivory Coast. The account of his trip from Niger to the Gulf of Guinea is our third source (Binger, 1892). Precisely that of his stay in 1889 in Agni country, a western Akan people, of which he wrote down the list of weights (**Annex 6**). It is established on the basis of an ounce rounded to 32 g, and a price of 3 francs per gram of gold ore. The basic unit is the *ba* which is worth 50 c and therefore weighs 1.66 g. (It is equivalent to 2/3 of the 0.25 g *taku*). The mass of the *damma* seed must therefore be 0.83 g. This list can, like the others, be transformed in a multiplication table (**Table 4**), on the model of that of **Table 2**.

X	S1	S3	S5	S7	S9	S11	S13
1/2	½ (0,08 g) damma	1,5 (0,25 g) ba ne damma	0,36 (0,41 g) ba-no ne damma				
1	1 (0,166 g) **BA**	3 (0,5 g) ba-san (3)	5 (0,83 g ba-nun (5)	7 (1,16 g) ba-nsa	9 (1,5 g) ba-gun (9)	11 (1,83 g) baburu ne ko	13 (2,16 g) meteba ne ko
2	2 (0,33 g) ba-no	6 (1 g) ba-zien (6)	10 (1,66 g) ba-buru (10)	14 (2,32 g) nso-no	18 / 3 g assoba	22 (3,66 g) nsonsa ne ba-no	26 (4,5 g) nso-nsa
3				21 (3,48 g) nso-nsa			
4	4 (0,66 g) ba nan (4)	12 (2 g) **METEBA**			36 (6 g) bandia-suru	44 (7,32 g) tra	
6			30 (4,98 g) kuabo		54 (9 g) bari		
8	8 (1,32 g) ba-otwe (8)	24 (4 g) simbari-fa	40 (6,64 g) anui-suru		72 (12 g) bandia	88 (14,6 g) gua	
12			60 (9,96 g) nsonsa-nsa		108 (18 g) bandia-suru		
16	16 (2,64 g) baotwe-no	48 (8 g) simbari	80 (13,3 g) anui		144 (24 g) ba-ndea		
24			120 (20 g) essan-no	x18 (126-42 g) ndua-san	216 (36 g) attatue		312 (52 g) nta
32	32 (5,28 g) ndara-suru	96 (16 g) anan	160 (26,6 g) anui-no				
64	64 (10,6 g) gbang-bandia	192 (32 g) anan-no	x 48 (240-39,9 g) anui-nsa ➥	x 96 (480-80 g) *(anuinsa-no)* ➥	x 192 (960-160 g) anuinsa-nan		
128	128 (21,2 g) gbangbandia-no	384 (64 g) **BANNA**					

Tableau 4. 1 *ba* = 0.166 g = 50 c. Baule appellations. According to Binger. The values are given in *ba*.

Weight classification according to Abel (1896-1958)

French colonial administrator, Henri Abel was Mayor of Abidjan from 1948 to 1952. His field investigations in 1952 in Baule, Agni and Aboure countries, therefore in the Western Akan area, enabled him to meet notables who still had weights, who they no longer knew how to use, but whose names and values they knew in Fr or in £. His informants report to him a system based on *taku* and *ba* and comprising for each unit male and female weights (Abel, 1973). The analysis of their appellations allows him to classify them into seven series like Zeller and, by weighing them, to calculate the mass of *ba* and *taku*, respectively 0.146 g and 0.22 g (in the ratio of 3 to 2). The idea of transforming the lists into a multiplication table came from him, but the one he establishes, both in *ba* and in *taku*, is complex and wobbly (**Appendix 7**). Reconstructed with 1,3,5,7,9,11,13 ba as the baseline, it finds a coherent structure according to the model of Binger (**Table 5**).

Synthesis

Four documented and credible sources, four different units, contradictory interpretations, but four tables from which lessons emerge on the Akan weighting system:

- The possibility to distribute the weights in 7 series, within which each unit is the multiple by 2, sometimes by 3, of the previous one;

- The preferential use of *ba* in the western states and *taku* in the eastern states;

- The coexistence in each region of light units and heavy units: in the west a light *ba* of 0.146 g and a heavy *ba* of 0.166 g, in the east a light *taku* of 0.22 g and a heavy *taku* of 0, 25 g,

X	S1	S3	S5	S7	S9	S11	S13
1/2	½ (0,074 g) damma	1,5 (0,22 g) **TAKU**					
1	1 (0,146 g) **BA**	3 (0,44 g) ba-nsa	5 (0,73 g) ba-nun	7 (1,02 g) ba-nso	9 (1,31 g) ba-gun	11 (1,60 g) ba-buru ne ko	13 (1,9 g) meteba ne ko
2	2 (0,29 g) ba-no	6 (0,88 g) ba-asia	10 (1,46 g) ba-buru	14 (2,04 g) nso-no	18 (2,62 g) asia-nsa	22 (3,20 g) nso-nsa ne ko	
3				21 (2,06 g) nso-nsa			
4	4 (0,58 g) ba-nan	12 (1,76 g) **METEBA**	20 (2,92 g) assoba	28 (4,08 g) simbari-fa	36 (5,24 g) ndara-suru	44 (6,40 g) anui-suru	
6			30 (4,4 g) nso-nsa				
8	8 (1,16g) ba-otwe	24 (3,52 g) otwe-nsa	40 (5,84 g) bandia-suru	56 (8,17 g) simbari	72 (10,48 g) gbangbandia	88 (12,8 g) anui	
12			60 (8,8 g) bari £				
16	16 (2,32 g) ba-otwe no	48 (7,04 g) tra	80 (11,68 g) bandia	112 (16,35) anan	144 (20,96 g) gbangbandia-no	176 (25,6 g) anui-no	
24			120 (17,6 g) bandia-suru			264 (38,4 g) anui-nsa	
32	32 (4,64 g) kuabo	96 (14,08 g) gua	160 (23,36 g) bandia-no	224 (32,7 g) anan-no	288 (41,92 g) gua-nsa	352 (51,2 g) anui-nan	
48			240 (35,2 g) atakpi				
64	64 (9,28 g) assan	192 (28,2 g) gua-no	360 (52,8 g) nta	448 (65,40 g) **BANNA**			
96			480 (70,2 g) pereguan				
128	128 (18,56 g) assan-no	384 (56,32 g) **BENDA**	x192= 960 (140,4 g) pereguan-no ➥	x384=1920 (280,8 g) pereguan-nan			

Tableau 5. 1 *ba* = 0.146 g. 1 *taku* = 0,22 g. Baule appellations. According to Abel. The values are given in *ba*.

in a light to heavy ratio of 8 to 7;

- Different appellations between western and eastern peoples, but which within each region are common to light and heavy weights. Sometimes with constant value (the weights of the same name have the same number of seeds but a different mass), sometimes with constant mass (the mass is constant but the number of seeds is different).

We conclude that the Akan, whose daily payments were made of gold dust, probably used, as Abel said, who was however mistaken about its nature [8], a dualist system of light weight / heavy weight based on the difference between light and heavy seeds: light ba and taku (now denoted B and T) to buy at low price, or make a loan, and heavy *ba* and *taku* (denoted B * and T *) to resell at high price or recover a debt with interest.

We also deduce a multiplication table common to the 2 regions and to the light and heavy subsystems by compiling tables 2, 3, 4 and 5, by filling in the missing boxes and by adding multipliers by 192, 384... 1536 which we let's call Akan Multiplication Table (**Appendix 7**). In doing so, we predict values unknown from our sources but which we should find by weighing the weights that we have collected, in particular that of the 298 chef weights.

8. Since he only described it within the light system, the only one he knew, with insufficient margin to be operative (**Annexe 6**).

ETHNOLOGIE

Table 2 comments:

How did Zeller calculate the value of the *taku*?

He averaged 9 *agiraotwe* (*agira* x 8) worth 16 *taku*, identified as such by Burki. He obtained 0.2585 g. He also calculated 1/256 of the mass of the *benna*, known to be worth 2 ounces. Theoretically 62.2 g in the troy system, which gives 0.243 g for the *taku*, but in this case counted for 64 g, which gives it the mass of 0.25 g, rounded value which will then be taken up by the most authors.

What is its equivalent in English currency?

For Zeller, *taku* is worth 7 pence (d). A Sovereign of gold which contains 20 shillings (s) of 12 d therefore corresponds to 0.25: 7 x 240 = 8.57 g of Akan gold, the purity of which is thus evaluated at 850 ‰ or 20, 4 carats. A troy ounce is worth 3 £ 12 s 6d. Zeller does not cite a weight corresponding to 1 £, but the latter is usually given for *suru* (S9), which is presumably the apheresis of *osua suru*. In this table, it is rounded to 9 g.

This table, like the following, uses our standardized numbering. Each series is made up of 4 to 10 units whose names are composite. In each box of the table appears the value in *taku*, followed in brackets by the mass in grams. Appellations are Ashanti, they appear on the second line. Values lower than *taku* have not been indicated. There are 43 different appellations. *Ake* does not appear as such but with the name of *agiraotwe-fa* (*agira* x 8: 2). It weighs 2 g (S1). *Asia* is worth 6 *ake*. In this same series, the multiples of *benna* appear for convenience in line 256. Series 11 and 13 are the least represented. For series 9 only, there are multiples by 24, 48 and 96, and even by 40 and 80 (these last 2 appearing for convenience in shaded boxes of column S11). These two unusual multiples, that appear in the column of S11, correspond to £ 10 and £ 20. Finally, note that *nso-nsa* (S5) which corresponds to the *mitqal*, and which results in 7 x 3 = 21 is in box 20 *taku*. We will discuss this anomaly in a further article.

Table 3 comments:

What value of *taku* Garrard did he choose?

He gives it the value of 0.26 g, close to the 0.258 g calculated by Zeller and corresponding, according to him, to the value attributed to *taku* by Mc Lean in 1847, on the basis of £ 4 for an Ozt.

What weight should *taku* have in function of its equivalent in English currency?

Contradictorily, Garrard is based on 3 £ 12 s for 1 Ozt, which corresponds to 8.64 g for 1 £, which he rounds to 8.8 g (830 ‰ = 20 carats). He takes this information from elderly notables from different Akan states, which also report a counter value of 6 d for 1 *taku*. It therefore weighs 0.22g. Garrard will not take it into account, but this is the value we used to build this table consistently, according to the Ashanti weight lists. Forty *taku* are worth £ 1, which corresponds in the table to *suru* (S5).

The number of lines is 16, due to new multiples by 6, 12, 192 and 320. Values lighter than *taku* have not been specified. The appellations have been brought into line with those of Zeller. There are 47. Some values change series compared to those of Zeller, especially for S9, several values of which are in S5. Two names, missing from the Ashanti list, are of akyem (ak) origin: *dwoano* (S9) and *fiaso* (S13)

Irregularities: The transcription into *taku* of the Ashanti weights gives for the series 3,9 and 13 irregular results. The expected value is indicated in brackets. *Benna*, who appeared for 256 *taku* in series 1 of Zeller is found in series 9, counted 280 *taku* instead of 288. This irregularity gives him the value of 2 Dutch Ozt. Similarly, *osuano suru* (S13), which counted 200 *taku* instead of 208 corresponds to £ 5. All these irregular values do not come from the multiplication table, but from the sum of the existing weights. Finally, *nso-nsa* is also counted there for 20 instead of 21 which gives it the value of 4.4 g that Garrard attributes to the *mitqal*.

Table 4 comments:

What does Binger teach us about *ba* and *taku*?

Binger uses a trade ounce weighing 32 g, worth 96 francs, for his calculations. 1/3 of a gram of gold bought from the Agni is therefore worth 1 franc with a purity of 880 ‰ (21 carats). The *ba*, that makes 2 *damma*, is sometimes called *taku*, which does not exist as such in the list. It is worth 50 c, its mass is therefore 1/6 of a gram, or 0.166 g. This value is in a ratio of 3 to 2 with the *taku* of Zeller. A *damma* seed should weigh 0.083 g.

The names of the weights have been translated into Baule, but the original list (**Appendix 5**) is Agni. They are different from Ashanti names. The numbering is that of **Table 1**. This table has 48 units, and 13 lines, 16 if we take in account an additional multiple by 18 of S7 and by 48, 96 and 192 of S5 (these last 3 appearing for convenience in shaded boxes of line 64). The *pereguan* which should make 480 *ba* (240 Francs) does not appear in Binger's list, but as its double is one of them, we have added it under the name of *anui-nsa-no*. The transcription of the Akan weights in Francs leads to drifts that we have corrected at best.

The table is constructed in *ba*, but we can feel the presence of *taku*. Thus *nso-nsa* appears for once in the S7 x 3 box, but it is also found in S13 x 2, that is 4.5 g = 20 *taku*, close to Garrard's *mitqal*. More obvious, the existence of multiples by 6, 12 and 24 (up to 192 for S5), which a 2/3 multiplication (4,8,16, 32 etc.) is enough to transform into *taku*. As in Zeller, the *ake* which appears under the name of *meteba*, weighs 2 g and *banna* 64 g.

In S5, *anui-suru* appears two times, as half *anui* and *anui* + ½ *anui*. Likewise for *bandia* in S9.

Table 5 comments:

How did Abel calculate *ba* and *taku*?

He calculated their masses by weighing weights, whose names and seed values he had obtained in 1952 from notables in Agni, Baule and Aboure states. He checked the value of *ba* by weighing seeds of *Abrus precatorius* (*damma*). The only copy of *taku* he had in his hand weighed 3 *damma* seeds, 0.22 g, but he did not identify the seed in question.

What is their equivalent value in European currency?

Abel cites two different values: one in franc, the other in English currency, but without drawing any conclusions about their masses, since he calculated them directly. We find the

values of Binger and Garrard:

- on the one hand 50 cents for a *ba*, which at 3 francs a gram of gold gives it the mass of 0.166 g ;

- on the other hand 144 *taku* for one ounce, which in troy ounce gives 31.1 g: 144 = 0.216 g and in so-called trade ounce (32 g), 0.222 g.

This table uses our standardized numbering. There are 54 different values divided into 7 series. The names are Baule. For convenience, the multiples of 192 and 384 in series 5 appear in line 128 (shaded boxes).

The original structure of Abel's table, built in *ba* and *taku* around 7 eponymous values, chosen from among the most used, is flawed (see **annex 6**) but it becomes coherent after reorganization in *ba* on the model of previous tables. The appellations in *ba* are stable.

Bari and *simbari* change series by changing value to keep the same mass. *Bari* which weighs 8.8 g corresponds to £ 1. *Nsonsa* keeps its double identity with in S7 the same value of 21 *ba* as in Binger, and the same weight of 4.4 g, but passing in S5, with the same value of 30 *ba* (20 *taku* = 1 *mitqal*) than in Garrard. Abel distinguishes between *banna* (S7) of 65 g and *benda* of 56 g (S3) when these two terms are usually synonymous. *meteba*, which is worth an *ake*, weighs here 1.76g. As in the previous table, we go from *ba* to *taku* by multiplying by 2/3 the lines 6,12,24 etc.

Discussion

Even if we were able to show in our original article, with a very high level of evidence, the plausibility of our conclusions, the Akan Multiplication Table nonetheless raises many theoretical and practical questions:

1. Does milligram precision make sense?

It is obvious that such precision was inaccessible to the Akan, given the rusticity of their scales, but it should be remembered that these are calculated values and not actual values. This did not prevent them from using an even lighter unit than *ba*, the *pesewa*, corresponding to a grain of rice, weighing 0.04 g.

This precision in the calculations is however necessary because if the rounding in the value of the *ba* and the *taku* has only little consequences for small and up to medium values, they cause from *benna* a significant drift, drift that we do not find during the weighing of the chef's weights and which therefore did not exist in reality. This is understandable since the larger the number of seeds, the closer we get to their average value and therefore the more precise the measurement.

2. What do we know about the basic units?

- What is the nature of *ba* and *taku*?

If *ba* is correctly identified with the seed of *Abrus precatorius*, there is a doubt on its exact weight. The seed that corresponds to *taku* is not known. We come back to this in detail in a dedicated article [9].

- What do we know about *ake*?

Worth 1/16 of an ounce, it does not appear under this name in the weight lists that we have studied. It corresponds to the weight that the Akan called *metaba* in western countries, *agiraotwe-fa* in eastern. The origin of the word is controversial [10]. Our opinion is that it comes from the word *aquiay*, which in Brong Ahafo country (alias Booroom, see map and **Appendix 1**), corresponded to the number 8 and which is said in the other dialects *otwe*, or *awotwe*, or even *oque*, in the account made by de Marees of the Gold Coast (de Marees, 1605). Thus *ake* would simply mean 8 *taku*.

We are therefore dealing with a light *ake* of 1.79 g (denoted A) and a heavy *ake* of 1.94 g (denoted A *).

- What about the *benda*?

Benna in eastern states, *banna* or *benda* in western, every author gives him the value of 2 ounces and the weight of 62 g in one or the other light or heavy system. Abel is the only one to distinguish between a 56 g *benda* and a 65 g *benna*. We will discuss it again. This unit is not attached to a seed.

3. What information can we get from these tables?

Do *Ba* and *taku* have a different origin?

If we admit that the presentation in multiplication table had a real meaning for Akan, the fact that they are calculated in *taku* in eastern regions, and *ba* in western, is an argument in favor of a geographical separation of the two systems, although *taku* and *ake* were also used in western states. Tables, however, tell us nothing about the precedence of one system over the other.

We can thus better understand how Garrard, anxious to prove Arab origin of the AWS, comes to the conclusion that Western Akan preferentially used *uqiya*. The latter being worth 6 *mitqal*, its submultiples by 1/8, 1/4, 1/2, and its multiples by 2,4,8 and so on, are found in a ratio of 3 to 2 with those of *mitqal*, which transforms them, de facto, into multiples of *ba*. This explanation seems more solid than that of Garrard, who saw in it a difference between the trade of gold, more abundant in eastern regions, and usually weighed in *mitqal*, and the trade of ivory, more abundant in the west, heavier, and which would therefore have been weighed in *uqiya*.

9. See *Seeking for seeds.*

10. For some it would be *achtjen*, a Dutch unit worths 1/16 of an ounce of Cologne (Muller, 1673), for others it would be the seed of a tree called aki (Ott, 1968).

11. See *Story of taku and mitqal*.

12. These weights are stacks of nested cups, each of which being half the of the previous one. One finds commonly buckets of 1, 2 or 4 Ozt, and their divisions, in the collections of weights.

Which of the light or heavy systems would have preceded the other?

There are several clues in these lists that allow us to discuss it. Thus, the almost perfect regularity of tables in T* compared to the apparent disorder of tables in T pleads for an anteriority of the first compared to the second. It is to ignore that one of the first reports of the Akan weights, by de Marees, which dates from 1605, reports an *ake* of 1.79 g and a *benda* of 57 g, belonging to the light series, and that *nso-nsa*, which corresponds to *mitqal* and therefore to the trans-Saharan trade, which is even older, also comes under this system. We must therefore consider a coexistence and interpenetration of the two systems.

Can we conclude that the two systems coexisted?

Just as *ba* predominated in western states, and *taku* in eastern, one might think that the differences between light and heavy weights corresponded to regional peculiarities. For Ott, this was the case between the coastal states and those in the interior. He saw in it the way in which African importers, who went to the forts on the coast to buy from Europeans traders the commodities which they redistributed in the land, took their profit (Ott, 1968).

But weighing gold dust with the scales, spoons and containers held by the Akan is difficult, and adding a weight during weighing takes the risk of compromising a precarious balance and losing gold. We can therefore hypothesize, with Abel, a dualistic system used daily in each state.

To imagine how it could have worked, we have to distinguish two cases.

First, a direct transaction between producer and consumer, in which only the price asked by the seller intervenes, corresponding to a quantity of gold dust usually fixed by custom and indicated by the name of a weight. Negotiation involves the quality and weighing of gold, each using their own weights to verify the transaction. Only one weight system is required in this case.

The second situation is that of a loan, or a resale by a merchant, in which the dualist system takes on its full meaning, the merchant, or the lender, using light weights to buy the goods, or to make the loan, and heavy weights to resell it or recover the debt. The difference in gold dust between weight to sell and weight to buy representing their profit.

Then two questions arise:

- Is the profit margin of 1/7 (14%) consistent with this assumption? This rate seems suitable for a loan, and even usurious in an economy without inflation. For a sale on the other hand, the profit seems very low, except if we take into account the fact that Akan people knew neither VAT, nor social charges, and that their structural costs were low. 14% of net profit at the end of the year would satisfy more than one trader these days. Furthermore, with regard to trade with the Arabs or the Europeans, internal demand was such that the intermediaries, whether Dioula or Akan, had probably found a way to take a greater profit, either by reducing the quantities further , or by increasing prices anyway.

- How can we explain that European informants did not report this dualism?

Only three of them refer to it more or less explicitly, but most do not mention it. We will discuss about this in a next article [11]. This system being intended for transactions between Akan, there was no reason why foreigners, who were paid in gold, for goods whose price they calculated according to supply and demand, should have been informed. The diversity of Akan weights was such that they only had to know, from the system, that part which corresponded to their own monetary weights: light for the *mitqal, uqiya* and *onça*, heavy for Dutch and English Ozt.

4. A very complicated Akan Multiplication Table! (Appendix 7)

- We only have 10 fingers to count. Series 11 and 13 therefore seem counter-intuitive. Do they really exist?

- Why all these additional values compared to our sources? Are there missing units used among them by the Akan but unknown to their European partners?

- Does the predominance of multiples of 2 in these tables result from an observation bias, linked to the use by European merchants of nested cup weights which are designed on this principle [12].

The study of the 298 weights above 80 g, known as Chiefs' weights, allows us to answer these three questions in the affirmative:

- **Table 6** shows the boxes in which they are distributed according to the value to which

Serie	S1	S3	S5	S7	S9	S11	S13	Total lines
32						352 12	416 32	44
48				336 14	432 13	528 12	624 10	49
64			320 15	448 8	576 13	704 14	832 8	58
96			480 17	672 12	864 9	1056 5	1248 2	45
128		384 17	640 16	896 10	1152 4	1408 1	1664 3	51
192			960 9	1344 3	1728	2112 2	2496 1	15
256		768 9	1280 2	1792	2304 1	2816	3328	12
384			1920 2	2688	3456 2	4284	4992	4
512	512 7	1536	2560 1	3584	4608	5632 1		9
768			3840	5376	6912			0
1024	1024 5	3072	5120	7168 1				6
1536			7680 1					1
2048	2048	6144 2						2
4096	4096 2							2
Total	14	28	63	48	42	47	56	184 114

Tableau 6. Distribution of the 298 chief's weights according Akan Multiplication Table. In red, number of weights > 80 g per box.

they are closest after transformation into T or T *. Series 11 (47 weights) and 13 (56 weights) are particularly well represented and their existence is therefore in no doubt.

- Of the 55 boxes provided for weights over 80 g (at least 320 T *) 14 only are not occupied. There were therefore many weights unknown by Europeans whose existence can be predicted by the Akan Multiplication Table.

- There are 114 weights in lines 48, 96, 192 and so on, that's to say 38% of the chief's weights that cannot be weigh with nested cup weights. Their small number in European sources seems to be due to a bias, potentially linked to the use of these cup weights.

Can we delete the series 9?

The number 9 is not a prime number. It is a multiple of 3. Can we delete series 9 by supplementing series 3 with additional multiples?

This would not be impossible since the multiples of 9 by 2, 4, 8, 16 and 32 correspond to the multiples of 3 by 6, 12, 24, 48, 96. They therefore already appear in the table, but it would be necessary, to replace the other lost values of S9, to add multipliers of 3 by 9, 18, 36 and so on, up to 384, which would considerably complicate an already complex table, since they should logically be applied to the other series.

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Why do weights of the same name in light and heavy systems have the same mass?

We have already noticed that both in western and eastern states, certain weights of the same name changed values in number of seeds, keeping an almost identical mass, which is not consistent with the dualistic system. This is the case, among others, of *agiraotwe-fa*, but also of *suru*, *pereguan* and *benna*. How to take a sufficient profit by lending light *pereguan* (70.4 g) if the heavy *pereguan* that the creditor reimburses has the same mass? We see at least two reasons for this.

- The first is due to the haste with which gold was demonetized at the end of the 19th century by the English and French colonizers. Their system having lost all interest, the Akan have ceased to ensure its transmission and have kept the memory of their weights only by their equivalent value in English or French currency, forgetting their value in seeds. This is the case for the informants of Garrard, those of Burki and Abel still remembering their values in *taku* and *ba*.

- The second reason is the variations in £ of the price of Akan gold ore between the beginning and the end of the 19th century. In 1817, an Ozt was worth £ 4 (Bowdich, 1819), in 1880, it was only worth £ 3 12 s (Mollat, 2003). The date of this devaluation of 80 to 72 s, linked to a poorer gold content of the ore, is not known to us precisely, but it can be dated to the middle of the century, when the system was still in use. For the Akan, this was exactly like going from the heavy system to the light system.

Then you have to take in account human realities and the difficulty of adapting to change. Currencies change, men forget, but names stay. The sources on which we have worked are subsequent to these upheavals and reflect the confusions that then occurred. Only the oldest lists, those of Pieter de Marees (1605), Wilhelm Muller (1676) and Willem Bosman (1705) allow, with linguistic variations and with a few errors, to restore each weight to its fair value in the good system.

* if we calculate taku on the basis of a *benna* weighing 2 ozt (62.2 g)

5. How could the Akan, without written numbers, make such complex calculations?

Their language allowed them, with a lot of circumlocution, to formulate numbers greater than 100, but how did they perform operations as complicated as 13 x 192 = 2496 in the absence of written support [13]? how did they pass on their knowledge? Can we consider with Abel that the decorations of the geometric weights had a numerical meaning? We think so, and we are able to decipher many weights, but we have not found any reproducible structure in their coding, which is more like a rebus than an ordered numeration. We don't know how they did it, but we know they did it, since the weights are there to testify it, and that we have proven that their distribution was not due to chance.

One way to circumscribe the problem is to assess the number of people involved. On a population of 1,400,000 Akan on the eve of colonization, Garrard evaluated the possessors of weight at 60,000, sharing a cumulative production over the centuries of three million weights, thus fifty each, and the number of goldsmiths in activity to a hundred. It was therefore a social and professional elite. If the owners of weights would easily memorized their value, the goldsmiths, whose Garrard estimates annual weight production at 100, could be the only ones to know all the subtleties.

One can nevertheless wonder if this multiplication table was really used as a means of calculation and if it is not a mathematical artefact, linked to the geometric structure of the series of weights, which appears when we translate into our units. If this were the case, this would open up the possibility of alternative calculation methods, as ethno-mathematicians have studied, for example, among the Siamou in Burkina-Faso (Traoré, 2008). But that does not change the value of what we have called the Akan Multiplication Table as a tool to unravel the skein of Akan gold weights.

13. To the numbers in **Table 1** we can add *oha* = 100 and *apem* = 1000 in Ashanti. Thus 2496 would be said: *Ahem-no ne oha-nan ne buru-otwe ne asia* which is not easy.

Conclusion

This article allowed us to explain how we built the Akan Multiplication Table from multiple sources, to detail its intricacies and to discuss its relevance. It is not ultimately excluded that it is the result of a mathematical bias that we are not qualified to demonstrate. But, since the quality of a scientific theory is judged by the predictions it allows, we consider that this one, with which we have both proved the dualism of the Akan Weighting System and predicted the distribution of *chief's weights*, is the one who describes it the best, except to discover how the Akan would have proceeded differently to calculate their weights. The floor is open to ethno-mathematicians.

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Annexes

Annex 1: The different akan numerations (Bowdich, 1819)

APPENDIX. No. VI.

	1. *Inta.*	2. *Booroom.*	3. *Ashantee.*	4. *Aöwin.*	5. *Amanaheä.*
One(*a*)	Koko	Ekoo	Akoon	Aconë	Aconë
Two(*b*)	Anyoe	Enoo	Anoo	Enyow	Enyow
Three(*c*)	Assa	Essa	Mensa	Inza	Insa
Four(*d*)	Anna	Enna	Ennung	Inna	Enna
Five(*e*)	Annoo	Annoo	Ennoom	Noo	Enoo
Six(*f*)	Assee	Esseä	Inseëä	Inzeah	Inseah
Seven(*g*)	Assoonno	Assoono	Inshong	Inzoo	Insoon
Eight(*h*)	Adoobrooa	Aquiay	Woquee	Motteä	Mottuay
Nine	Digrakoono	Akonno	Oonkonnong	Ongoona	Ongona
Ten(*i*)	Koodoo	Edoo	Edoo	Boloo	Booloo
	6. *Ahanta*	7. *Fantee*	8. *Affootoo*	9. *Inkran*†	10. *Adampë*
One	Akoon	Akoor	Achoomee	Ekkoo	Kakee
Two	Ayue	Abeeën	Ennuë	Ennuë	
Three	Assan	Abiasseh	Assah	Ettayh	
Four	Arra	Anan	Annah	Edjuë	
Five	Aoonoo	Ennoom	Ennoo	Ennoomó	
Six	Ayshing	Asseeä	Isshin	Eghpah	
Seven	Assooa	Ashong	Isshennooh	Paghwooh	
Eight	Awotchay	Awotwee	Ettchee	Paghnue	
Nine	Awonna	Akoon	Assan	Nahoon	
Ten	Boonoo	Edoo	Eddoo	Nongmah	

Bowdich page 503-504-505

Annex 2: Zeller's table IV

TABELLE IV.

DAS GEWICHTSYSTEM

ergänzt durch die Gewichtstypen von Müller (1776), Bellom (1872) und Christaller (1881).

Reihe I.

⅛ *Pẹsẹwa* = 1 *Pọwa*
1 *Pẹsẹwa* = 1 *Pẹsẹwa*
2 *Pẹsẹwa* = 1 *Damma*
4 *Pẹsẹwa* = 1 *Kọkọa.*

Reihe II.

3 *Pẹsẹwa* = *Takufã*
6 *Pẹsẹwa* = 1 *Tàkú*
12 *Pẹsẹwa* = 2 *Tàkú*
24 *Pẹsẹwa* = 4 *Tàkú*
8 *Tàkú* = 1 Ak. *Agyiratẅefã*
16 *Tàkú* = 1 Ak. *Agyiratẅe*
32 *Tàkú* = 1 Ak. *Dwowasuru*
64 *Tàkú* = 1 Ak. *Dŵowa*
128 *Tàkú* = 1 *Nṅwowa mmienu*
256 *Tàkú* = 1 *Bẹnnã*
512 *Tàkú* = ?
1024 *Tàkú* = 1 *Bẹnnã anaṅ*
2048 *Tàkú* = *Bẹnnã awotẅe.*

Reihe III.

3 *Tàkú* = 1 *Asẹ*
6 *Tàkú* = 1 *Sọwafã*
12 *Tàkú* = 1 *Sọwa*
24 *Tàkú* = 1 As. *Nsãno*
48 *Tàkú* = 1 As. *Asĩa*
96 *Tàkú* = 1 ?
192 *Tàkú* = 1 *Egwa abiessan.*

Reihe IV.

5 *Tàkú* = 1 ?
10 *Tàkú* = 1 Ak. *Bọdọmmofã*
20 *Tàkú* = 1 Ak. *Bọdọmmó*
40 *Tàkú* = 1 Ak. *Peresuru*
80 *Tàkú* = 1 ?
160 *Tàkú* = 1 *Nṅwowa mmienu né dŵowasuru.*

Reihe V.

7 *Tàkú* = 1 As. *Dọmmafã*
14 *Tàkú* = 1 As. *Dọmma*
28 *Tàkú* = 1 As. *Dwowasuru*
56 *Tàkú* = 1 As. *Dŵowa.*

Reihe VI.

9 *Tàkú* = 1 Ak. *Dọmmafã*
18 *Tàkú* = 1 Ak. *Dọmma*
36 *Tàkú* = 1 *Súrú*
72 *Tàkú* = 1 *Osŭã* = 2 *Súrú*
144 *Tàkú* = 1 *Asŭãnú* = 4 *Súrú*
288 *Tàkú* = 1 *Peredŵane* = 8 *Súru*
576 *Tàkú* = 1 *Ntãnu* = 16 *Súrú.*

Reihe VIa.

216 *Tàkú* = 1 *Asŭãsã* = 6 *Súrú*
432 *Tàkú* = 1 *Tasŭãnu* = 12 *Súrú*
864 *Tàkú* = 1 *Ntãsã* = 24 *Súrú.*

Reihe VIb.

360 *Tàkú* = 1 *Tõsŭã* = 10 *Súrú*
720 *Tàkú* = 1 *Ntãnu asŭãnu* = 20 *Súrú.*

Reihe VII.

11 *Tàkú* = 1 As. *Bọdọmmofã*
22 *Tàkú* = 1 As. *Bọdọmmó*
44 *Tàkú* = 1 *Takimansua.*

Reihe VIII.

6⅛ *Tàkú* = 1 *Fiasofã*
13 *Tàkú* = 1 *Fiáso*
26 *Tàkú* = 1 *Nsãno.*

Annex 3: The four Garrard's series

EVOLUTION OF THE AKAN WEIGHT-SYSTEM

ISLAMIC MITKAL SERIES

½ dirhem	1.4 grams	(*Soafa*. Equals ⅓ *mitkal*)
1 dirhem	2.9	(*Soa*).
2 dirhems	5.8	(*Nsano* or *nsoanu* = 2 *soa*. This weight is duplicated in the troy series: see below).
½ mitkal	2.2	
1 mitkal	4.4	
2 mitkals	8.8	
4 mitkals	17.6	
8 mitkals	35.2	
16 mitkals	70.4	
20 mitkals	88.0	
32 mitkals	141	
40 mitkals	176	
48 mitkals	211	(Equals 8 Islamic ounces: see below).
64 mitkals	282	
80 mitkals	352	(One *ratl* of Islamic weight).

ISLAMIC OUNCE STANDARD

1/16 ounce	1.65 grams	
3/32 ounce	2.5	
⅛ ounce	3.3	
3/16 ounce	4.9	
¼ ounce	6.6	
⅜ ounce	9.9	
½ ounce	13.2	
¾ ounce	19.8	
1 ounce	26.4	(One *uqiya*)

ISLAMIC OUNCE STANDARD

1½ ounces	39.6
2 ounces	52.8
3 ounces	79.2
4 ounces	106
6 ounces	158
8 ounces	211
10 ounces	264
12 ounces	317
15 ounces	396
20 ounces	528
60 ounces	1584

EUROPEAN OUNCE STANDARDS

	Portuguese	*Troy*
1/16 ounce	1.8	1.95
⅛ ounce	3.6	3.9
3/16 ounce	5.4	5.8
¼ ounce	7.2	7.8
⅜ ounce	10.8	11.7
½ ounce	14.3	15.6
¾ ounce	21.5	23.4
1 ounce	28.7	31.1
1½ ounces	43.0	46.7
2 ounces	57.4	62.2
4 ounces	115	124
8 ounces	230	249
12 ounces		373
24 ounces		747
60 ounces		1866

According to Garrard, p. 240-241.

Annex 4: Ashanti and Akyem weight lists according to Garrard

£	s	d	Akyem	Asante	taku	poids
		1	pesewa	pesewa		0
		2	damma	damma		0
		3	takufa	takufa	0,5	0,11
		4	kokoa	.		0
		4,5	.	kokoa		0
		6	taku	takufa	1	0,22
		9	.	kokoa no	1,5	0,33
	1		.	takuno	2	0,44
	1	6	.	takunsa	3	0,66
	2		.	takunan	4	0,88
	2	6	.	takunun	5	1,1
	3		soafa	soafa	6	1,32
	3	3	fiasofa	.	6,5	1,43
	3	6	.	dommafa	7	1,54
	4		dommafa	borofofa	8	1,76
	4	6	.	agiraotwefa	9	1,98
	5		.	nsonsafa	10	2,2
	5	6	.	bodommofa	11	2,42
	6		soa	soafa	12	2,64
	6	6	fiaso	.	13	2,86
	7		.	domma	14	3,08
	8		domma	borofo	16	3,52
	9		agiratwe	agiratwe	18	3,96
	10		nsonsa	nsonsa	20	4,4
	11		.	bodommo	22	4,84
	12		.	nnomano	24	5,28
	13		nsano	nsano	26	5,72
	15		.	dwoasuru	30	6,6
	16		nnomano	namfisuru	32	7,04
	17		.	bremanansuru	34	7,48
	18		dwoasuru	.	36	7,92

£	s	d	Akyem	Asante	taku	poids
1			suru	surupa	40	8,8
1	2		.	peresuru	44	9,68
1	3	6	.	techimansua	47	10,34
1	4		suru ne dommafa	.	48	10,56
1	6		.	asia	52	11,44
1	10		asia	dwoa	60	13,2
1	12		.	namfi	64	14,08
1	16		dwoa	onansua	72	15,84
2			osua	osua pa	80	17,6
2	7		.	osua ne domma	94	20,68
2	8		osua ne domma	.	96	21,12
3			osua ne suru	osua ne suru	120	26,4
3	12		dwoano	.	144	31,68
4			osuano	osuano	160	35,2
4	13		.	osuano ne nsano	186	40,92
4	18		osuano ne dwoasuru	.	196	43,12
5			.	osuano ne suru	200	44
6			osuansa	osuansa	240	52,8
7			benna	benna	280	61,6
8			pereguan (nta)	pereguan (nta)	320	70,4
9	6		.	perguan asia	372	81,84
9	10		pereguan asia	.	380	83,6
12			tasuano	.	480	105,6
16			ntano	pereguan no	640	140,8
18	12		.	perguan no asia no	744	163,68
24			ntansa	ntansa	960	211,2
32			.	pereguan nan	1280	281,6
40			.	pereguan nun	1600	352

Akyem and Ashanti Appellations, according to Garrard, p. 347-349. Based on 3 £ 12 s for one Ozt.
The numeric suffixes have been standardized according to **table 1**.

ETHNOLOGIE

Annex 5: Agni appellations for gold, according to Binger

Dans les factoreries, on se sert de l'once de 32 grammes (96 francs or) et de ses subdivisions pour les affaires que l'on traite en or.

Chaque once vaut 16 *ackés* à 6 francs.

Chaque acké vaut 12 *takou* à 50 centimes.

Voici les appellations agni pour l'or :

Pouassaba (commun aux Mandé), valeur décomptée à 3 francs le gramme	0f125
Damma (commun aux Mandé)	0 25
Dé, égal au banankili mandé, ou takou (au pluriel *dé* se dit *ba*)	0 50
Dé n'damma	0 75
Bâa (ne pas confondre avec le *ba* court, pluriel de *dé*)	1 »
Bâa n'damma	1 25
Ba san (*ba* pluriel de *dé* ; *san*, trois)	1 50
Ba na (4)	2f »
Ba nou (5)	2 50
Ba sien (6)	3 »
Ba nso (7)	3 50
Ba mokué (8 fois 50 centimes)	4 »
Ba ngouna	4 50
Ba bourou	5 »
Ba bourou n'takou (0,50 × 10 + 0,50) = 5,50	5 50
Méttéba ou Méttéva ou 1 acké	6 »
Mettéba n'takou	6 50
Njunia	7 »
Mokué	8 »
Essoba	9 »
Nzonzan	10 »
Nzonzan bâa	11 »
Zamalfan (moitié)	12 »
Enzouazan	13 »
Enzouazan bâa (terme peu usité et chiffre peu employé par superstition)	14 »
Tuabo	15 »
Nzarazué ou encore : tuabo ani ba san	16 50
Bandézui	18 »
Anu zui	19 »
Taraé	21 »
Zémaré	24 »
Baré	27 »
Essan (ce devrait être : nzonzan essan, l'usage a fait tomber le premier terme)	30 »
Bagoua n'déa	33 »
Étéa	36 »
Anrué ou anrui	39 »
N'dua	42 »
N'dua (ni) ba sien (42 + 3)	45 »
Anraé (demi-once, le barifiri des Mandé)	48 »
Etté sui	54 »
Assé nua (essan nua ou 30 × 2)	60 »
Bagoua ndé nua (33 × 2)	66 »
Ba ndéa	72 »
Anumia	78 »
Ndua niua (42 × 2)	84 »
Ndua niua mettéba (42 × 2 + 6)	90 »
Anra niua (48 × 2) (1 once)	96 »
Anra niua mettéba (48 × 2 + 6)	102 »
Attatué	108 »
Anrué san (39 × 3)	117 »
Ndua san (42 × 3)	126 »
Anra san (48 × 3)	144 »
Ta	162 »
Banna (2 onces) (96 × 2)	192 »
Banna (suivi d'un autre chiffre qui le multiplie, banna n'est plus qu'une once ; ainsi, dans le chiffre suivant : *banna ani niua*, c'est comme si l'on disait 1 once + 2 = 3 onces)	288 »
Anra niua bourou, ce qui revient à dire 1 once 10 fois = 10 onces ou	960 »

Annex 6: Abel's table.

1° Série des *ba* :

kpesseba	1/2 graine (*abrus precatorius*)	*ba-n'san*	3 *ba*	*ba-n'gunan*	9 *ba*
dama	1 graine	*ba-nan*	4 *ba*	*ba-buru*	10 *ba*
degn ou *ba*	2 graines	*ba-nu*	5 *ba*	*n'zié-nyon*	12 *ba*
taku	3 graines	*ba-zien*	6 *ba*	*n'zu-nyon*	14 *ba*
ba-nyon	2 *ba*	*ba-zu*	7 *ba*	*mokué-nyon*	16 *ba*
		ba-mokué	8 *ba*	*n'zié-nsan*	18 *ba*

2° Séries Principales :

assan		*gbangbandya*		*tya*		*anui*		*gua*		*anan*		*tya-sué*	
série f	*série m*	série *f*	série *m*	série *f*	série *m*	série *f*	série *m*	série *f*	série *m*	série *f*	série *m*	série *f*	série *m*
								mélèba 12 *ba* 8 *t* 1,77 g					
mokué-nyon		*n'zié-nsan*		*assoba*		*n'zu-n'san*		*mokué-n'san*		*simbari-fan*		*n'zuanzan*	
16 *ba*			18 *ba*	19½ *ba*	20 *ba*	21 *ba*		23 *ba*	24½ *ba*	27 *ba*	28½ *ba*		
10½ *t*	11 *t*		12 *t*	13 *t*	13½ *t*	14 *t*	14½ *t*	15½ *t*	16 *t*	18 *t*	19 *t*	19½ *t*	20¼ *t*
2,36 g	2,44 g		2,66 g	2,88 g	2,99 g	3,10 g	3,21 g	3,44 g	3,55 g	3,99 g	4,21 g	4,32 g	4,49 g
kuabo		*n'darasué*		*bandya-sué*		*anui-sué*		*tra*		*simbari*		*bari*	
31½ *ba*	33 *ba*	34½ *ba*	36 *ba*	39 *ba*	40½ *ba*	42 *ba*	43½ *ba*	46 *ba*	48 *ba*	54 *ba*	57 *ba*	58½ *ba*	60¾ *ba*
21 *t*	22 *t*	23 *t*	24 *t*	26 *t*	27 *t*	28 *t*	29 *t*	32 *t*	34 *t*	36 *t*	38 *t*	39 *t*	40½ *t*
4,66 g	4,88 g	5,10 g	5,32 g	5,77 g	5,99 g	6,21 g	6,43 g	7,10 g	7,54 g	7,99 g	8,43 g	8,65 g	8,99 g
assan		*gbangbandya*		*tya*		*anui*		*gua*		*anan*		*tya-sué*	
63 *ba*	66 *ba*	69 *ba*	72 *ba*	78 *ba*	81 *ba*	84 *ba*	87 *ba*	92 *ba*	96 *ba*	108 *ba*	114 *ba*	117 *ba*	121 ½ *ba*
42 *t*	44 *t*	46 *t*	48 *t*	52 *t*	54 *t*	56 *t*	58 *t*	62 *t*	64 *t*	72 *t*	76 *t*	78 *t*	81 *t*
9,32 g	9,76 g	10,21 g	10,65 g	11,54 g	11,98 g	12,43 g	12,86 g	13,76 g	14,20 g	15,98 g	16,87 g	17,31 g	17,98 g
assan-nyon		*gbangbd.-nyon*		*bandya-nyon*		*anui-nyon*		*gua-nyon*		*anan-nyon*		*atakpi*	
126 *ba*	132 *ba*	138 *ba*	144 *ba*	156 *ba*	162 *ba*	168 *ba*	174 *ba*	184 *ba*	192 *ba*	216 *ba*	228 *ba*	234 *ba*	243 *ba*
84 *t*	88 *t*	92 *t*	96 *t*	104 *t*	108 *t*	112 *t*	116 *t*	124 *t*	128 *t*	144 *t*	152 *t*	156 *t*	162 *t*
18,64 g	19,52 g	20,42 g	21,30 g	23,08 g	23,96 g	24,86 g	25,72 g	27,52 g	28,40 g	31,96 g	33,74 g	34,62 g	35,96 g
						anui-n'san		*gua-n'san*		*anan-n'san*		*ta*	
						252 *ba*	261 *ba*	276 *ba*	288 *ba*	324 *ba*	342 *ba*	351 *ba*	364 ½ *ba*
						168 *t*	174 *t*	180 *t*	192 *t*	216 *t*	228 *t*	234 *t*	243 *t*
						37,29 g	38,58 g	41,88 g	42,60 g	47,94 g	50,61 g	51,93 g	53,94 g
						ta		*benda*		*banna*		*péréguan*	
						348 *ba*		362 *ba*	384 *ba*	432 *ba*	456 *ba*	468 *ba*	486 *ba*
						232 *t*		248 *t*	256 *t*	288 *t*	312 *t*	312 *t*	324 *t*
						51,44 g		55,04 g	56,80 g	63,92 g	67,48 g	69,24g	71,92 g

Weight appellations are Baule. This table is complicated by the presence of male (m series) and female (f series) values, the difference between which is too small to be operative. It is also wobbly because Abel dos not take as base units 1,3,5... 13 *taku*, but intermediate values, those whose names would have been the most used, with their multiples and sub-multiples. This gives an irregular progression, passing in *taku* from a reason 6 to a reason 8 as follows: 42 (*assan*), 48 (*gbangbandya*), 52 (*tya*), 56 (*anui*), 64 (*gua*), 72 (*anan*), 80 (*tyasué*). In addition, these weights should not be on the same line because they are not multiple from each other.

The table becomes coherent again, when it is reconstructed in *ba*, taking as base units 1, 3, 5... 13 *ba* and changing the order of the columns (**Table 5**). In *ba* rather than in *taku*, because the names of several weights in the first line show that they are multiples of *ba* (*mokué-nyon* = 16, *n'zié-nsan* = 18, *n'zu n'san* = 21, *mokué n'san* = 24.

Annex 7: Akan Multiplication Table

Akan Multiplication Table							
Serie	S1	S3	S5	S7	S9	S11	S13
1	1	3	5	7	9	11	13
2	2	6	10	14	18	22	26
3	(3)	(9)	15	21	27	33	39
4	4	12	20	28	36	44	52
6	(6)	(18)	30	42	54	66	78
8	8	24	40	56	72	88	104
12	(12)	(36)	60	84	108	132	156
16	16	48	80	112	144	176	208
24	(24)	(72)	120	168	216	264	312
32	32	96	160	224	288	352	416
48	(48)	(144)	240	336	432	528	624
64	64	192	320	448	576	704	832
96	(96)	(288)	480	672	864	1056	1248
128	128	384	640	896	1152	1408	1664
192	(192)	(576)	960	1344	1728	2112	2496
256	256	768	1280	1792	2304	2816	3328
384	(384)	(1152)	1920	2688	3456	4284	4992
512	512	1536	2560	3584	4608	5632	
768	(768)	(2304)	3840	5376	6912		
1024	1024	3072	5120	7168			
1536	(1536)	(4608)	7680				
2048	2048	6144					
4096	4096						

A story of Taku and Mitqal. The akan weighing system, part three

Histoire de Taku et de Mitqal. Le système pondéral akan, troisième partie

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Summary: A dozen testimonials about the Akan ponderal system, between the beginning of the 17th century and the end of the 19th, mention taku (and /or damma), and sometimes a double system of weight, but probably report just that what the Akan showed them. Weak system against portuguese weights, strong system against dutch and english weights, then again weak system at the end of the 19th century when the gold dust became scarce and of less good quality. The founding role of mitqal is also questioned in favor of a likely coincidence between the Arab and Akan weight systems. In addition, the value of 4.4 g attributed to it would not have been established in the context of the trans-Saharan trade, but later after the arrival of the Europeans, to adapt to their weights.

KEY-WORDS

akan
ashanti
baule
gold weight (goldweight, goldgewitch)
Ghana
Côte d'Ivoire
Gold Coast
dualistic system
ethnomathematics
Timothy Garrard
Henry Abel
taku
ba
mitqal
proto-currency

Résumé : Du début du 17e à la fin du 19e siècle, une douzaine de témoignages font état du rôle que tenaient les graines de taku et/ou du damma dans le système pondéral des Akan, et parfois d'un double système poids-faibles/poids forts. Ils n'en rapportent cependant que ce que les Akan en montraient, système faible avec les Portugais, système fort avec les Hollandais et les Anglais, puis à nouveau système faible à la fin du 19e siècle quand la qualité de la poudre d'or eut baissé. Le rôle fondateur du mitqal est par ailleurs remis en question au profit d'une convergence entre les systèmes pondéraux arabes et akan. De plus, la valeur de 4,4 g qui lui est attribuée ne se serait pas établie dans le cadre de la traite transsaharienne, mais plus tardivement après l'arrivée des Européens, pour s'adapter aux poids de ces derniers.

MOTS-CLÉS

akan
ashanti
baoulé
poids à peser l'or
Ghana
Côte d'Ivoire
Gold Coast
système dualiste
ethno-mathématiques
Timothy Garrard
Henry Abel
taku
ba
mitqal
proto-monnaies

Introduction

This article is the third in our series on the study of Akan gold weights. In our princeps publication (Crappier *et al.*, 2019), we showed, by studying the largest collection of geometric weights ever studied (9031 including 298 head weights over 80 g) that the Akan weighing system (AWS) was of African origin. But our demonstration, which is based only on metrological arguments, goes against the thesis of Timothy Garrard (Garrard, 1980), which derives it from the Arab weight system, on historical and ethnological arguments and some archaeological clues, which is the authoritative thesis. So we looked at historical sources to see what they could tell us that was different about the origin of the AWS.

Taku story

The question of the nature and the mass of *taku* is the central problem of our investigation of the Akan Weighing System (AWS). Has it varied over centuries, places or witnesses? Are there several *taku*? A heavy and a light? Jointly or separately? What seeds corresponded to him? Did *taku* even really exist?

What do the sources say about this?

Method

To answer these questions, we looked for testimonies, accumulated since the 17th century, from Dutch, English, French, German and Swiss informants. We present them in chronological order, distinguishing between first-hand accounts, when we have been able to access the source document, and second-hand accounts, when they are reported by modern authors. We only retained from these authors the direct or indirect information on the seeds, as well as those which report a double system of weights (dualism). We will then wonder about the *mitqal*, of which Garrard made the cornerstone of the AWS by taking up his reasoning step by step. Akan units will be noted with our usual abbreviations:

Light *taku* (≈ 0.22 g) noted T, heavy *taku* (≈ 0.25 g) noted T*.
Light *Ake* (≈ 1.76 g) noted A, heavy *ake* (≈ 2 g) noted A*.
Light *Ba* (≈ 0.146 g) noted B, *ba* (≈ 0.166 g) noted B*.

The main weights and currencies of Europeans involved in Akan gold trade are listed in table 1 and 2 (**Annex**)

Results

The *taku* exists. Most witnesses state it, whether or not associated with *damma*.

1602. De Marees:
The oldest testimony that we have found is that of Pieter de Marees. Dating from 1602, we consulted it on the Gallica base in a French translation of 1605. At that time Portugal was the dominant power on the Gold Coast and, although Dutch, de Marees gives its information in pesos and refers to the Portuguese ounce. However, this list seems marred by a few errors that Garrard corrected. The main information we get from this is that the *benda* is worth 2 ounces, or 57.4 g. He does not speak of *taku*, but of red and black seeds that Africans use and of which they know the value, without indicating the latter. We also learn that *agiraotwe*, is worth ½ peso, or 3.6 g and therefore that *agiraotwe-fa*, which corresponds to *ake*, weighs 1.8 g. We are in the light system (de Marees, 1605).

1668. Dapper:
The following testimony is that of Olfert Dapper in 1668. Second hand testimony since Dapper, who has never set foot in Africa, uses a source which has been lost. A French translation of his work dating from 1685 can be found on Gallica, but the list of Akan weights it contains is incorrect because it has been shifted by one line. Garrard provided an exact version. Dapper theoretically refers to the Dutch troy ounce in which 1 *engel* weighs 1.92 g and is worth 2 *guilders* but on closer inspection it can be seen that, if the name correspondence with the heavy system is valid up to at 3 *engels*, everything goes wrong from 10 *engels*, where the weights can correspond to the theoretical values only in the light system. This is a clue in favor of dualism, especially since Dapper would report, according to Garrard because we do not find any trace of it in the French edition, that the people of Accra used 2 distinct series of weights, the one light, the other heavy (Dapper, 1686).

1676. Muller:
Hamburg merchant, Wilhelm Johann Muller published in 1676 a very detailed list of the weights used by the Fanti. He is the first to speak of *damma* and *taku*, without describing them. However, we can calculate the mass of the *taku* that he gives for 1/6 of a guilder, i.e. 0.16 g. In our terminology, this means B*. This list is therefore drawn up in heavy weights (Muller, 1676).

1678. Barbot:
Jean Barbot, French trader for the Senegal company, tells us in 1678 that the inhabitants of Accra "*commonly used two kinds of weight for gold, one heavier than the other, and divided proportionally so that each (ounce) contains 16 angels or acke, and bargained between them to pay with the heaviest or the lightest*, which is an exact description of the dualistic system and how to use it (Debien, 1979).

1704. Bosman:
Willem Bosman is a Dutch merchant who wrote in 1704 and uses the 30.7 g Dutch troy ounce. He cites *damba*, a small red bean encrusted with black, 24 of which make a

gold *esterlin* (1.92 g), but also other seeds, some of which are white, encrusted with black, sometimes even all black, called *tacoe* and weighing a little more than double the *damba*. He thus describes a *damma* seed (*Abrus precatorius*) of 0.08 g, two of which make a B* of 0.16 g (and three of 0.24 g a T*), and perhaps also the seed of *nere* (*Parkia biglobosa*), beige and black when it is in her cuticle, black when she has been rid of it. We are in the heavy system (Bosman, 1705).

1817. Bowdich:

Thomas Bowdich is English. His book is one of our main sources of information on the Ashanti, with whom he stayed as ambassador in 1817. He tells us that at the time an English troy ounce of 31.1 g of Akan gold was worth £ 4. (or 7.8g for £ 1 [1]) or 16 *ackie*. The *ake* therefore worth 1.94 g. We are in the heavy system. He also tells us, somewhat cryptically that "*8 tokoos (a small berry) are reckoned to the ackie, but it will not weight more than seven*" which means that its *tokoo* weighed 1.94 / 8 ≈ 0.24 g (T*) and which suggests that there was also a lighter *ake* weighing "*no more than seven*" *tokoos*, ≈ 1.70 g and opens the door to the dualistic system (Bowdich, 1819).

1848. Bouët-Willaumez :

In the account of his exploration of the western coasts of Africa, this future French admiral tells us, page 110, that the currency in Gold Coast, from Grand Bassam, is the *acquêt*, which is worth 5.60 f , or 1.84 g at the local rate of 3 f per gram of gold. On page 115, he tells about a golden *takon*, used in Elmina, the mass of which is 1/16 of *gros*, or 0.24 g. We will recognize *ake* and *taku* in their heavy version. (Bouët-Willaumez, 1848).

1852. MacLean, 1868; Horton, 1868, quoted by Garrard:

English governor of fort from 1830 to 1847, MacLean published a list of weights in both ozt and pound, which Garrard reports on page 256 when translating it to grams. MacLean mentions among the Ashanti a *damma* of 0.074 g, a *takufan* (half-*taku*) of 0.11 g but also a *taku* of 0.26 g as well as *sul* (*suru*) of 8.8 g, which must correspond to 1 £. The value of the *damma* corresponds to that of the light *ba*, and the values given for *taku* to a T of 0.22 g and a T* of 0.26 g. He also mentions in a list of Fanti weights a *taku* of 0.33 g which corresponds to a *taku* of 9 pence (p) which seems to have existed among the Fanti, and which we find later in a list collected by Garrard (page 341).

Garrard, however, reports a contradictory information which he found in Horton (1868) which gives this 9 p weight, still in Fanti country, the name of *teycoo na simpoir*. *Simpoir (sempowa)* being worth 3 p, we fall back in facts on the *taku* of 6 p. Horton also cites this 6 p *teycoo*, as well as an *archi* of $ 1, equal to 4 s 6 d. One could not better describe a T of 0.22 g and 1 A* of 1.95 g, which again refers to the dualistic system (Garrard, 1980).

1874. Bonnat; 1875. Kuhne et Ramseyer, quoted by Menzel:

Marie-Joseph Bonnat, a French merchant, was hostage to the Ashanti from 1869 to 1874. His notes have been published in 1994. He described at length the Ashanti society.

Swiss missionaries Kuehne and Ramseyer, as well as Mrs. Ramseyer, shared this captivity and made an independent account of it.

Although provided with gold and weight for his daily life by his forced hosts, Bonnat did not detail how it worked. He teaches us however over the pages that 6 *tacous* are worth 4.80 F, (page 327), that 2 *periguans* are worth $72, (page 405), and that 20 *periguans* weigh 45 ounces (of 32 g [2]) (page 396). Bonnat also explains to us how the Ashanti, having exhausted their natural resources of gold dust, went about making it from nuggets in order to ensure their monetary circulation (Perrot, 1984). Kuehne for his part reports a detailed list of Ashanti weights with their correspondence in *dakoo* and dollars which tells us that one US dollar is worth 8 *dakoo* and that $16 are worth one ounce of gold powder. At the coast, in Fanti country, this ounce is worth £ 3 12, one dollar is worth 1 *ackie* and a *pereguin* is counted for $ 36 (Menzel 1968).

From this information, we retain from Bonnat, that a *tacou* which is worth 80 cents weighs 1/3 g x 0.80 = 0.26 g and that a *periguan* weighs 2.25 ozt, or 72 g, the mass that Zeller gives to it [3].

We also note that for Kuehne the dollar corresponds to 1.95 g of Akan gold, that the *dakoo* weighs 0.243 g and that the *pereguin* weighs 70.2 g.

Although Bonnat values the *taku* too high, these data are consistent with the heavyweight system.

1875. Christaller :

Johann Christaller, German missionary lived from 1853 to 1868 in Ghana. He is one of the first translators of Twi, the language of the Akan. According to Zeller, he reports a double

1. This corresponds to a fine gold grade of 925 ‰, higher than that of a sovereign's gold coin which is 916 ‰.

2. Bonnat probably counts in a 32 g "trade ounce", a unit used in French counters in Africa. His biographers seem to have been mistaken on this point of detail.

3. For Zeller, the *pereguan* is worth 288 T* and therefore weighs 72 g. See *The Akan multiplication table*, table 2.

system of weights and also of scales, different for buying or selling (Zeller, 1913).

1889. Binger :

Between 1887 and 1889 Captain Binger explored Africa from west of Niger to the Gulf of Guinea. He is the last author to document a functioning AWS. He tells us about the current currencies in Salaga (North-East of Kumasi), Bondoukou [4] and in Agni country. Binger uses a 32 g trade ounce, and estimates the gram of akan gold at 3 f, or 0.33 g for 1 franc [5]. In Salaga, you pay in cowries but also in metal bars (*barifari* of 17.6 g). The *mitqal* is worth 4 g, although 1 *barifari* is supposed to make 4 *mitqal*.

In Bondoukou you pay in cowries, but also in seeds and metal weights. The smallest seed, the *damma*, is worth 2.25 f and therefore weighs 0.075 g which corresponds to low weights.

Here the *barifari* also weighs 16 g and the *mitqal* 4 g. Binger also notes that the small weights are too heavy and that the merchants buy gold from prospectors with heavy weights, and resell it to the Ashanti with low weights.

In Agni country in the south-east of the Ivory Coast, cowries are no longer used. Binger draws up a very complete list of Agni weights, with their equivalents in gold francs. We retain for our purposes that the ounce is worth 16 *ake* at 6 fr, that each *ake* is worth 12 *ba* (sometimes called *tacou*) at 50 cents and that the *damma* is worth 0.25 fr. The *barifari* weighs 16 g. A *damma* weighs 0.082 g, and a *taku* weighs 0.164 g, which is actually B*. We therefore have a *barifari* which varies from 17.6 g to 16 g, which Binger explains by imprecision and wear, and a *damma* which varies from 0.075 g to 0.082 g which again lays the foundations for a dualistic system.

Note that 3 Binger *ba* at 50 c are worth about 2 Bonnat *tacou* at 80 c, in the usual ratio of 3 to 2 between these two units (Binger, 1892).

After 1900. Garrard and Abel:

Abel's information was gathered in 1952 from the Agni, Baule and Aboure. None of the notables interviewed, even the older ones, knew how to use weights, but most remembered the existence of male and female weights (Abel, 1973).

Garrard reports 12 lists from informants of different Akan states. The oldest was born in 1872. The values are given in English currency. They are calculated at 3 £ 12 s per ounce, so in the light system, with a *taku* at 6 p, or 0.22 g. None of them remembers the existence of male and female weights, nor does he ever mention the name of the *mitqal* (Garrard, 1980).

Discussion

Out of 12 recorded testimonies, only 3 make no mention of the seeds, those of Dapper and Barbot, and that of Bouet (who however quotes the *takon*) but all speak of *ake*, as 1/16 of an ounce. Dapper, Barbot and Binger directly point to a dualistic system, which is also reflected in the inconsistencies of the other lists. We are in fact in the presence of two closed systems, which communicate only through commercial transactions. The Akan system on the one hand, the European system on the other. Akan operate at constant price and variable weight, Europeans at constant weight and variable price. We only have information on the first through the second.

On the one hand, are internal transactions between Akan through the exchange of gold dust. Regardless of its purity they are not able to assess it with precision. Once the quality of the gold is deemed acceptable by both parties, only counts the difference between the weight of the buyers and the weight of the sellers. For the retail trade which makes the bulk of sales between Akan, they use the small weights [6]. For wholesale trade with Europeans, Akan merchants use the highest values, *benda* or beyond, using those of their weights which correspond to those of their interlocutors.

On the other hand, the Europeans. We will choose the English because they are the ones on which we are the best documented. Their currency, the Sovereign, is stabilized since 1816 at 8 g of gold at 916 ‰ (22 carats) or 7.32 g of fine gold. Their aim is to acquire gold in exchange of goods which they have paid for in £ to their suppliers. They calculate their profit in that currency, taking in account the purity of the gold ore they get as payment. They weigh it in troy ounces, with their scales and weights, but they cannot impose their weighings because their interlocutors are able to verify the transactions with their own apparatus. It is on this occasion that information on the respective weight systems is exchanged. Each European therefore only needs to know the part of the Akan system that corresponds to his weights.

If we can easily understand that the transactions were made with the Portuguese in the

4. On the border between Ivory Coast and Ghana, east of the Baoulé country.

5. 1 gold Franc weighs 0.32 g at 900 ‰, or 0.29 g of fine gold. The purity of Akan gold is therefore estimated at 878 ‰.

6. Note that a single weighting system is sufficient for direct purchases from producers, then there is no middleman who has his benefit to take.

light system (*onça* of 28.7 g), then with the Dutch and the English in the heavy one (troy ounce of 30.6 and 31.1 g), It remains to be explained why in the last quarter of the 19th century the light system was again resorted to. Things happens as if Akan gold had been devalued from 925 ‰ (22.2 carats) to 800 ‰ (19.2 carats) which can be explained by the rarefaction of natural gold dust, the purity of which exceeds 22 carats, and its replacement by nuggets, of lesser grade, or artificial powder as the Ashanti knew how to make. It is therefore difficult to understand why the conversions would have been made in the first case in the heavy system, and in the second in the light system. The reverse seems more logical, the Akan buyer having to donate more gold to get the same product from the English merchant. To understand, let's analyze the sale of a trade gun.

In 1820, the price of a Brown Bess rifle [7] was around £ 1. With an ozt of gold having a buying power of £ 4, it takes 7.8 g for £ 1. The Akan buyer had to pay 4 A* at 1.95 g or 32 T* at 0.24 g. The transaction was therefore done in the heavy system. In 1870, an ozt of gold had a purchasing power of only 3 £ 12 s, it took 8.8 g for 1 £. For the Akan buyer this amount corresponds to 5 A of 1.76 g or 40 T of 0.22 g. The transaction was then done for him in the light system. The switch from one system to another was therefore done simply, without the English trader realizing it and therefore not being able to report it.

Conclusion

Our original article had highlighted the duality of the weights, but without being able to affirm, because of the heterogeneity in time and space of the collection on which our study concerned, that it was an integrated system weight to sell / weight to buy. This analysis of the sources confirms the plausibility of this dualist theory, which is, on reflection, more than the weight of the taku, the essential point of the Akan Weight System.

Mitqal story

What about the *mitqal* which Zeller claims to be not used in the Gold Coast, but which Garrard makes the cornerstone of the AWS. Could it be, like the weights corresponding to European weights, just one of the many facets of the Akan system, used in trade with North Africa?

Let us summarize Garrard's thesis

In the year 600, the weights and coins in use in the Mediterranean and Middle Eastern worlds were those of the Byzantines, inherited from the Romans, and those of the Persians, a distant heritage of the Greeks of Alexander the Great. Fifty years later, after having conquered a large part of these empires, the Arabs merged these Persian and Byzantine currencies into their bimetallic system. From the first they adopt the *drachme*, a silver coin which they make their *dirhem*, from the second the *denarius aureus*, a gold coin which they make their *dinar*. For weighing, they keep the Roman weight units in use. The 27.3 g *uncia* takes the name *uqiya* and the *sextula*, its sixth becomes the *mitqal*, which gives it the mass of 4.55 g. Weights and currencies meet at the level of the *dinar* and the *mitqal* [8], two terms that will end up meaning the same thing. This system reaches the Sahel via the Sahara, then the Akan, at the same time as the process of manufacturing the weights. The Akan would thus have imported a system based on the *mitqal* with as proof the discovery of very old weights, in terracotta, to this standard. They would then have adapted to European weights, as the Portuguese, Dutch and English arrived on the Gulf of Guinea coasts. Garrard, after a very documented historical account on the *dinar*, but ultimately unrelated to his conclusion, tells us that it would be this *uqiya* of 27.3 g, reduced, he does not say why, at 26.4 g, divisible into six 4.4 g *mitqal* and the so-called trading ounce, which is said to have been used in Sudan [9] for the gold trade [10].

Discussion

The problem is that we have not found a trace of a 4.40 g *dinar* or *mitqal* at any time in a North African country involved in the trans-Saharan trade. In Egypt, the starting point of the eastern caravans, the *dinar*, around 1200, weighs 4 g. In Morocco, where the northern come from, its nominal weight varies from 4.25 g around 1050 to 4.72 g around 1130 (see **framed text** and **map**).

To find our way around, let's see schematically the course of an ounce of gold versus that of a load of salt around 1150, a date on which the Akan were probably already integrated into the trans-Saharan trade as gold producers: - In the north, the Berbers of Morocco control the salt mines in the Sahara. They use *dinars*

7. The Brown Bess, or long pattern rifle, the rifle of the English infantry during the Napoleonic wars, was highly prized for its robustness by Africans. Most informants report a price between 3 and 4 A*.

8. *Mitqal*, in Arabic, would mean mass (Dourssther, 1840).

9. In Arabic *sudan* literally means land of blacks, as opposed to *beidan*, land of whites (North Africa).

10. There are several inaccuracies in Garrard's book. First, it was not the Arabs who "invented" the *dinar*, but the Persians, apparently following a confusion of weight and term between silver *denarius* with a weight of 4.5 g and the *aureus*, improperly called *denarius aureus*. Secondly, the weight of Diocletian's *aureus*, to which he gives the value of 4.7 g, fluctuates a lot, varying from ≈ 5.6 to ≈ 4.8 g, but being more often> 5.45 g. Finally, the 12th century Almohad *dinar* did not weigh 4.5 g, but 4.72 g. These details have little influence on his thesis, since ultimately he only takes into account the Roman ounce of 27 g and its 1/6.

among themselves, the mass of which they can control with the corresponding *mitqal*, but which in their trade with Sudan is only a unit of account whose cash does not circulate [11]. At that time, they count in Almohad *dinars* of 4.7 g. They use monetary weights of glass or brass to weigh the gold which they exchange for salt. Their dinars have a purity of 23 carats.

- In the south, Akan people, who domesticated the forest and about whom we do not know much in this time. We will assume that they already use gold dust as currency and that they weigh it with *damma* or *taku* seeds in their dualistic system. They have gold, but no salt.
- Between them the Dioula. This caste of Islamized Soninke merchants monopolizes trade along the Niger, where the northern caravans end in Timbuktu. They exchange salt for gold, dust or nuggets. Transactions are done in *mitqal*. They learn from Berbers how to handle weights and how to make them themselves using lost wax. They then trade salt for gold in production areas, the closest of which are Bambuk in Senegal and Bure in Guinea. This barter is sometimes done there silently [12], at least without weighing goods, depending on supply and demand, and probably regulated by traditional criteria. These deposits being exhausted, the Dioula venture further south, to the edge of the forest where they founded, around 1050 according to Binger, the city of Kong in contact with the Akan, with whom gold is not simply bartered by esteem, but weighed. Of all the gold producers frequented by the Dioula, they are the only ones with whom this has happened. It makes sense if you admit that they already had their own weighing system in which the *mitqal* found itself in phase with an Akan weight.

If this weight is *nso-nsa* (that is to say 7x3), the name that has come down to us, and if we keep at *taku* the value of 0.22 g in the light system, its value would have been 0.22 x 21 = 4, 6 g, which corresponds to an Almohad *dinar* with almost parity of purity, which is quite likely because Akan gold was considered very pure. So, how can we explain that *nso-nsa*, in every list of weights that we have studied, is given for 20 *taku*, a value which in our terminology should have been called *nun-nan* (5x4)?

7x3 = 20 or the crossroads of worlds

Let's go back to our reasoning:
We are now at the end of the 15th century. Exchanges between Akan and Dioula are always done on the basis of a *mitqal* of 4.72 g, or 21 *taku* in the weak system. These *mitqals* are measured with monetary weights of brass that the Akan have learned to make. They adopted for their foreign trade this unit, widely used in the Mediterranean world and well known to Portuguese sailors with whom they have just started to trade.

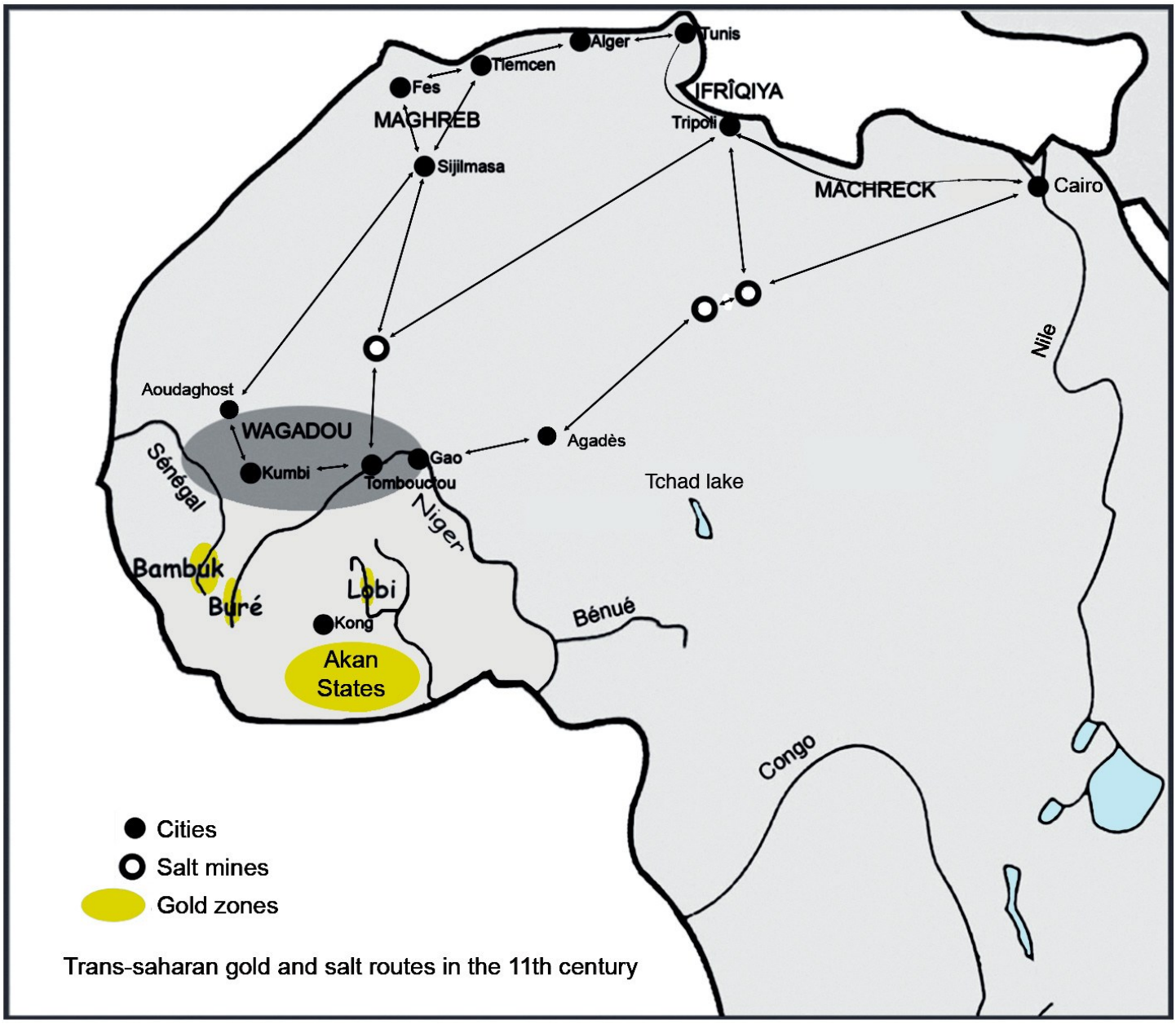
The Portuguese use as a unit for weighting precious metals *onça*, in fact the ounce of Cologne, of 28.7 g, which is divided by 4, 8.16 and 32 but also by 24 which corresponds to one *escrupulos* of 1.16 g (Doursther, 1840). Four of these *escrupulos* weigh 4.64 g, exactly *nso-nsa*. As a result of this coincidence, the Akan would have had nothing to change in their habits to control the weighings of the Portuguese if they had, like the Dioula, used monetary weights. But, because it is easier when traveling, they used nested cup weights, each of which weighs half the previous one (see the detail of the painting by Quentin Metsys), with which it is therefore not possible to weigh 1/6 of ounce. You can only approximate it, by adding two cups of 1/8 and 1/32 = 5/32 (≈ 4,5 g).

If we admit that they exchanged in *mitqal*, a unit known to both parties, the Akan, to adapt, went from their multiples by 3, 6, 12 ... to those by 2, 4, 8 ... and therefore from *nso-nsa* to *nun-nan*. The difference was small and from their point of view, it was a gain. As for the Portuguese, Akan gold was such a boon to them that, even if they had been aware of this subtlety, they would not have cared.

11. It would be absurd to buy gold dust with gold coins.

12. To ensure their safety, the two parts do not meet. The Dioula deposit their salt, the producers deposit a certain amount of gold in exchange, and so on until they come to an agreement.

The *dinar* is a complex currency and a brief historical reminder is necessary. From the Arab conquest to the Ottomans, many dynasties succeeded each other in North Africa, terminus of the trans-Saharan gold routes, starting with the Umayyads, then the Abbasids who extended their empire as far as Spain over a mosaic of nations which in the 9th century fragmented in the Maghreb in the west (Morocco and Algeria), Ifrîqiya in the center (Constantine, Tunisia, Tripolitania) and Mashrek in the east (Cyrenaica, Egypt), (see **map**). Each state strikes *dinars*, the mass of which will vary significantly around the canonical standard of 4.25 g decreed in 686 by Caliph Abd-Al-Malik. Thus, in Egypt, in the 10th century, the Fatimid *dinars* weigh barely 4 g, while in Morocco, their weight, which is 4.25 g in the 11th century, under the Almoravids (Roux, 2000) passes to 4.72 g from 1130 under the Almohads (Ben Rhomdane, 1979), a standard which will remain unchanged thereafter. Note the high fine gold content of these *dinars*, often grading around 950 ‰ (23 carats) Each of these weights corresponds to a different ounce. 7 legal *dinars* of 4.25 g make one of 29.75 g while 6 + 2/3 *dinars* of 4.72 grams make one 31.5 g.



When, why and how did the confusion of names occur between the weight used with the Dioula and its surrogate with the Portuguese? We will never know, but we understand that through mixing, recombination and approximation, this semantic shift has occurred over the centuries. This mathematical incongruity would thus be the trace of the entry of the Akan into the first globalization, the crossroads of the European and African worlds.

Conclusion

Thing are going as if the diversity of their weights has allowed the Akan to adapt to the Arab system in the same way they would later adapt to European systems. The *mitqal* would only be a guest, not the basement. As we progress in our investigation, the image of an autonomous and indigenous AWS becomes increasingly clear. However, it is difficult to think that it could have been born in the heart of the forest for the simple reason that there were no metals suitable for the manufacture of scales, without which weighing, even in seeds, could not have been possible. The Akan claim to be the descendants of the *Wagadou* [13], empire, a legend of which we do not know the part of the truth. Scales and weights were known there for the gold trade, which was already done with North Africa, and *Abrus precatorius*, whose red and black seeds make *damma*, as well as *Parkia biglobosa*, which the black seeds may be the *taku*, were growing there. The interpenetration between the Arab metal system and the African grain system was therefore able to take place there, before the Akan migrate south, towards the forest, to escape the Islamization imposed by the Almoravids.

13. Medieval African Empire better known as the Empire of Ghana.

Quentin Metsys. 1514. The lender and his wife. Detail. Foreground, nested cup weights. Louvre Museum.

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Annexe

TABLE 1 : European Weigh tUnits. (From Doursther,1840)

Country	Ounce	Mass	¼ ounce	Mass	1/8 ounce	Mass	1/16 ounce	Mass	1/24 ounce	Mass	1/32 ounce	Mass
Portugal	Onça	28,7	Peso	7,2	Ottavia	3,6	Media ottavia	1,8	Escrupulos	1,19 g		
The Nederlands	Ons	30,7					Engel,Achjten Esterlin	1,92			Florin Guilder	0,95
UK	Troy ounce	31,1			Drachme	3,88	Angel	1,94				
France	Once	30,6			Gros	3,82	1,5 denier	1,91	Denier	1,27		
Danmark	Unce	29,4			Quintin	3,67		1,84			Ort	0,92

TABLE 2 : Main Currencies involved in the Gold Coast trade

Country	Currency	Mass	Carats	Fine gold content
France	Franc	0,32 g	900‰	0,29 g
United Kingdom	Sovereign	7,98 g	917‰	7,31 g
Portugal <1584	Cruzado	3,6 g	998‰	3,58 g
Portugal >1584	Cruzado	3,1 g	998‰	3,1 g
Spane	Escudo	3,38 g	875‰	2,95 g
The Nederland (United Provinces)	Ducat	3,5 g	980‰	3,40 g
same	Rijksdaaler (Silver coin)	28,90 g	885‰	
USA	Dollar (Silver coin)	26,73 g	900‰	Fine gold equivalence :1,76 g
Austria	Thaler (Silver coin)	28,06 g	833‰	Fine gold equivalence:1,75 g

Seeking for seeds. The akan weighing system, part four

Sur la piste des graines. Le système pondéral akan, quatrième partie

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proto-currency
seeds

MOTS-CLÉS

akan
ashanti
baoulé
poids à peser l'or
Ghana
Côte d'Ivoire
Gold Coast
système dualiste
ethno-mathématiques taku
ba
Mitqal
proto-monnaie
graines

Summary: A study was conducted to test the hypothesis that the akan weight system was based not on two seed units, *ba* and *taku*, as usually considered, but on four, each of which was used under two varieties, a heavy and a light one. The *ba* is reputed to be two seeds of *damma*, aka *Abrus precatorius*, a forest liana. Examination of a 250 g batch originating from Côte d'Ivoire proves that there are two varieties, one of 74 mg and the other of 84 mg, presumably depending on whether they are harvested, dry season or wet season, which corresponds to the predicted 146 mg and 166 mg *ba*. Research on *taku*, the exact nature of which was unknown, leads to the *Parkia biglobosa* seed, the African carob tree, whose seed weighs 250 mg with its cuticle, and 220 mg when it is shed, that corresponds to the two *taku* values predicted by the calculation. These data support, but do not prove, the hypothesis of the duality of seeds that emerges from the study of akan weight lists collected over centuries by European observers.

Résumé : Une étude a été menée afin de tester l'hypothèse que le système pondéral akan ait reposé non pas sur deux unités semencières, le *ba* et le *taku*, comme habituellement considéré, mais sur quatre, chacune d'entre elles ayant été utilisée sous deux variétés, une lourde et une légère. Le *ba* est réputé valoir deux graines de *damma*, alias *Abrus precatorius*, une liane forestière. L'examen d'un lot de 250 g originaire de Côte d'Ivoire tend à prouver qu'il en existe bien deux variétés, l'une de 74 mg, l'autre de 84 mg, vraisemblablement selon qu'elles sont récoltées en saison sèche ou en saison humide, ce qui correspond aux *ba* de 146 mg et de 166 mg prédits par le calcul. Les recherches sur le *taku*, dont la nature exacte était inconnue, conduisent vers la graine de *Parkia biglobosa*, le caroubier africain, appelé localement *néré*, dont la graine pèse 250 mg avec sa cuticule, et 220 mg quand elle en est débarrassée, ce qui, là encore, correspond aux deux valeurs du *taku* prédites par le calcul. Ces données confortent, sans toutefois la prouver, l'hypothèse de la dualité des graines qui ressort de l'étude des listes de poids akan colligées au cours des siècles par les observateurs européens.

Introduction

In the first part of this investigation, it was brought to light, by the study of the weight lists established between the 17th and the 20th centuries by various explorers, traders and ethnologists that the weight system used by the Akan peoples of the Gulf of Guinea was based on a certain number of seeds whose African names are known and whose mass has been theoretically estimated.

According to all the authors, who differ only on their role, two seeds were mainly used by the Akan, one of which is identified as the seed of *Abrus precatorius*, locally called *damma*. The

other, the *taku*, has remained unidentified to this day. We only know of her its black color and its hardness, as well as her ratio of 1 to 3 *damma*. A third important unit could also correspond to a seed, the *ake*, in a ratio of 1 to 8 *taku*, but this data is very little documented. It could however correspond to the seed of *Blighia sapida*, a tree known locally as *aki*. Other seeds could also be used, which do not enter into the weight calculation, except the grain of rice, called *pesewa* and evaluated at ½ *damma*. The *damma* was counted by two under the name of *ba*. Finally, each of the three units, *ba*, *taku* and *ake* would have been used, as we have shown in our princeps publication, according to two different systems, one light (B, T, A), so called female, the other heavy, so called male (B*, T*, A*) in a ratio of 8 to 7 such as:

B = 0.146 g	T = 0.22 g	A = 1.76 g
B* = 0.166 g	T* = 0.25 g	A* = 1.98 g

At this stage, the only data verified by weighing is the mass of *damma*, 0.074 mg, which gives a *ba* of 0.146 g [1]. The objective of this second study is therefore to verify the duality of the *ba*, to identify the taku, and to learn more about the *aki* seed.

Method

As regards the *taku*, a priori unknown, it is an empirical research on the internet with the keywords, “carat”, “carob tree”, chosen on the basis of a quasi equivalence of weight and function, which led to the African carob tree, alias *nere*, alias *Parkia biglobosa* which proved to be a plausible candidate. The scientific names of the three seeds being known, the working method was, in the absence of personal botanical knowledge, to search for documentation on databases such as SID ([2]), the database of the Royal Botanic Gardens of KEW, and by a new empirical internet research on the names of plants.

This documentary research was supplemented by weighing seeds of *Abrus precatorius* and *Parkia biglobosa* from West Africa. From Ivory Coast for the former, from Benin for the latter. A mg sensitive electronic scale was used for this purpose.

Results

In Search of heavy *damma*

Damma, a small red seed with a black dot that is still found in the family *dja* [3] of Ivory Coast and the *futuo* [4] of Ghana has been reported since the 16th century and its average mass is usually given as 74 mg, while calculations according to Binger's report in Agni country give it a mass of 83 mg. A search on the SID database gives them an average mass of 77 mg, but with a dispersion of 63.5 to 91.6 mg. Abel (1952) for his part attests a mass of 74 mg in the dry season, and 84 mg in the rainy season, on an electronic scale from the 1950s.

We checked it on a batch of 250 g of seeds from Ivory Coast, without any notion of season, acquired from a diviner who used them for his practice. Their average mass, evaluated on a 100 g sample, is 0.08 g, but careful examination with the naked eye shows a significant disparity between them.

100 g of seeds has been selected and sorted by hand to gradually separate the larger from the smaller. The sorting was carried out to the end, leaving no seed indeterminate. Deformed and blackened seeds were removed. Ten of each type were measured in length and width with a caliper. The approximate dimensions are 5.8 mm by 4 mm and 6.3 mm by 4.5 mm. About 40% of the seeds of the first type and 60% of the second are obtained. The scrap is less than 1%. 100 seeds of each type taken at random were weighed. The result is in line with Abel's measurements, that’s to say a mean mass of 0.0736 mg for some and 0.0839 mg for others.

In search of *taku*

Nere is the Bambara name for *Parkia biglobosa*, a tree from the African savannah, which in West Africa grows between 7° and 12° north latitude. Its seed, peeled after boiling, is used to make a sauce with high nutritional value, particularly appreciated by Ivorians under the name of *soumbala* and by Ghanaians under that of *dawa-dawa*. Its fruits are pods very similar to that of *Ceratonia siliqua*, the Mediterranean carob tree whose seed, with a mass of 0.20 g, has been used since antiquity to weigh gold and jewels. Those of the *nere* are black under an adherent beige cuticle.

Further research on these seeds leads to an article published in a Beninese agronomic journal (Ahouansou *et al.*, 2006), which specifies that a thousand peeled seeds weighs 222 g, which is exactly the mass calculated for light taku by Abel. As for the mass of raw seeds, it is provided to us by the Burkina Faso seeds catalog (CNSF, 2015) which indicates 4,000 seeds

1. These two values are given to us by Abel, who had obtained the first by weighing, the second by calculation. This difference has no practical consequences.

2. *Seed information database. https://data.kew.org/sid/. Accessed online February 23, 2017.s.*

3. A name which in Western Akan countries refers to the treasure in which weights, weighing instruments and gold dust are kept.

4. The *dja* for Eastern Akan people.

per kg, that's to say 0.25 g each. Another Burkinabe source (Millogo, 2014), relating to seeds collected in Guinea, Ivory Coast, Benin and Cameroon, however reveals a strong regional disparity with a west-east mass gradient of 0.21 g to western Ivory Coast, up to 0.28 g in Cameroon, and north-south, from 0.22 g per 10.36° north latitude to 0.26 g per 7.25° latitude North.

Rainfall is another decisive factor, explaining the paradoxically high mass of seeds from Guinea (0.26 g) even though this state is the most northerly and the most westerly of the four countries studied, but by far the most watered. Having focused on 20-year-old seed collection, this study also shows their stability over time. We check it on a sample of 100 seeds originating in Benin, from a 1 kg lot, eliminating the largest and the smallest, and found a mass of 24.9 g. Brought to the boil for 2 minutes to get rid of their cuticle by friction then dried, it is effectively only 22 g.

The uncertainties of *ake*

There is no mention in the published literature of a seed corresponding to this weight value, which is a multiple by 8 of the *taku* and therefore of a mass of 1.76 or 1.98 g depending on the system of reference. This word is not considered as akan, but as a deformation by Europeans of the radical *agira*, *agiraotwe-fa* being the weight to which it corresponds (Bowdich, 1819).

Our hypothesis refers to the number 8, which is said *aquiay* in Brong Ahafo, a state bordering on Ashanti, where a very pure language was spoken. Term which is declined according to the same source in the other akan dialects in *otwe*, or *awotwe*, and which one still finds in the form *oque* in the relation made by de Marees of Gold Coast in 1605 (De Marees, 1605).

Only one author (Ott, 1968) mentions its possible relationship to the seed *Blighia sapida*, a tree whose African name is *aki*. This is a tree whose fruit is edible under certain conditions, and whose seed of around 1 cm x 2 cm could be a good candidate, but, according to SID, its average mass is 2.9 g, so too high. A well-documented study (Olufunke *et al.*, 2016) confirms this mass at picking and shows that it is very sensitive to desiccation so that its mass after 28 days of storage is only 2.24 g.

Weighing of 100 seeds of *nere* (*Parkia biglobosa*) from Benin.
Top, unshelled seeds, mean weight 0.25 g (theoretical weight 0.25 g).
Bottom, peeled seeds, mean weight 0.222 g (theoretical weight 0.222 g)

Weighing of 100 seeds of *damma* (*Abrus precatorius*) from Ivory Coast. Top, 100 heavy seeds, average weight 0.084 g (theoretical weight 0.083 g). Bottom, 100 light seeds, average weight 0.074 g (theoretical weight 0.073 g).

Discussion

Why are *nere* seeds not found in the *futuo* and *dja* that have been transmitted?

If we admit that the *taku* was the basis of the Eastern AWS, how is it that we no longer find its seeds in the *futuo* that have been preserved, while we find that of *damma* ? The answer may be very simple. The seed of *Abrus precatorius* is poisonous. It contains abrin, a deadly poison in low doses. However, its cuticle is sufficiently resistant to digestive juices to make absorption safe. The *nere* seed is a sweet treat, which is eaten raw by children who chew it. It is understandable that after the demonetization of gold dust and weights by the colonial powers, they had disappeared from the *dja*.

What mass should be retained for the *nere* seed?

The variability in seed weight casts doubt on the *nere* hypothesis. Those of Ghana are not documented, but, if we take into account the geographic data and rainfall (L'Hôte & Mahé, 1996), we see that the north of the Akan states is found in average for all these determinants of the weight. It is therefore logical to think that the same is true for seeds. If we also admit that the initiation of the goldsmiths taught them the correct provenance of the seeds, and that they knew how to select by eye those of the right weight, we can reasonably attribute to the unshelled *nere* seed used by the Akan a value approaching 0.25 g.

Why would the Akan, people of the forest, have used a seed from the savannah?

While the *damma* is the seed of a forest liana, the *nere* is a savannah tree. It is therefore surprising that the Akan, people of the forest, adopted it as the basis of their weight system. This can be seen as a confirmation of their

claimed link with *Wagadou*, the Ghanaian empire that flourished in the Middle Ages on the banks of the Niger. We can also see the influence of the Dioula, the Mande merchants who according to Garrard would have initiated the Akan in the use of weights and their lost wax casting, or simply north-south trade including the *nere*, although not reported by Europeans (who had no reason to be interested in this commodity), could be part. We can also refer to the history of the Ashanti, who would not have learned the use of weights until the beginning of the 18th century, after their conquest of Brong Ahafo, located on their northern border, at the edge of the savannah. Another possible explanation is the use of the seed of *Parkia bicolor*, which is a forest variety that grows further south than *biglobosa* and therefore in Akan territory. No information has been found on this seed that allows further discussion of this hypothesis.

What is the real mass of *damma*?

Kew's data are not consistent with the results of this study, but the origin of the seeds should be known, as there seems to be a great disparity from one region of the globe to another. Thus the average mass of a batch from Madagascar is 0.09 g and that of a batch from China 0.10 g. These seeds are known to be very resistant, in particular to desiccation, which has been verified by leaving them for a month on a radiator. The difference in mass observed therefore does not come from progressive dehydration. *Abrus precatorius* is a liana from the equatorial forest which fruits several times a year. We can think that the volume of seeds is dependent on annual variations in rainfall.

We do not know the harvest period of the Ivorian lot that was tested. It seems quite old as evidenced by the number of blackened seeds and could have been formed gradually, which explains the coexistence of the two types of seeds. We can therefore, subject to confirmation, admit that there were *damma* of 74 mg and 84 mg corresponding to B and B*.

Does *ake* match the *aki* seed?

For a seed to serve as a standard, its mass must remain stable and resist over time. Based on the available data, this is not the case with *aki*. Unless it stabilizes around 2 g beyond the 28 days that the Nigerian experience lasted, which remains to be demonstrated. As appealing as the homonymy is, it is so far a coincidence.

Conclusion

In conclusion, the data from the literature and from the experiment do not oppose the hypothesis of a duality of *ba* and *taku*, and show that the masses calculated by the theory are consistent with reality, but do not allow not to determine if these two systems were independent of each other, or integrated into a single system in the form of *male* and *female* weights. The Akan bequeathed us millions of weights, many of which are preserved in European collections. The study of their weight distribution, even their decoding if it is possible, should logically teach us more on this point.

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La collection de gorgones du Musée zoologique de Strasbourg : une histoire franco-allemande

The gorgonian collection of the Museum of Zoology, Strasbourg: a French-German history

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Résumé : La collection historique des gorgones du Musée zoologique de Strasbourg, constituée sur près d'un siècle et demi depuis l'héritage de Jean Hermann, est riche de 288 spécimens. La plupart n'avaient jamais été revus depuis la période allemande qui a fortement marqué l'histoire de cette collection (l'Alsace-Lorraine a été annexée à l'Empire allemand de 1871 à 1918), notamment avec la politique d'acquisition et les collectes personnelles de Ludwig Döderlein. La révision présente de l'ensemble du fonds permet de dresser une liste d'au moins 80 taxons (dont 67 espèces identifiées) qui sont répartis dans les trois sous-ordres de gorgones, dans 13 familles et 51 genres. Les informations (noms du taxon, dates, localités, collecteurs) principalement fournies par les étiquettes associées aux spécimens ont permis de redessiner l'historique des dons et achats, qu'il s'agisse de dépôts isolés par des Alsaciens expatriés ou de transactions via des comptoirs d'Histoire naturelle européens à la fin du XIX^{e} siècle. La collection est largement distribuée géographiquement, les régions les mieux représentées en effectif étant les côtes japonaises, le bassin méditerranéen et l'Ouest Atlantique tropical. Ce travail permet donc de valoriser un ensemble d'objets naturels comme autant de témoins d'une Histoire naturelle franco-allemande mais aussi de rendre accessibles des données faunistiques précieuses dans un contexte de changement global de la biodiversité marine.

MOTS-CLÉS

gorgones
Alcyonacea
collections muséales
histoire des sciences
systématique
biogéographie
échanges
comptoirs d'Histoire naturelle
XVIII^{e} siècle
XIX^{e} siècle

Summary: The historical collection of gorgonians (Cnidaria, Alcyonacea) in the Zoological Museum of Strasbourg, comprises a total of 288 specimens. The collection dates from the mid eighteenth century with the legacy of Jean Hermann (1738-1800). Most had never been examined since the German period, which strongly influenced the history of this collection (Alsace-Lorraine was annexed to the German empire between 1871 and 1918), especially with the acquisition policy and the personal collections of Ludwig Döderlein (1855-1936). The present revision of the entire collection lists more than 80 taxa distributed in the three suborders of gorgonians encompassing 13 families, 51 genera and 67 identified species. The information (taxa names of the taxa, dates, localities, collectors) mainly provided by the labels associated with the specimens has made it possible to redraw the history of donations and purchases, whether they were isolated deposits by expatriate Alsatians or transactions via European natural history agencies at the end of the 19th century. The collection has a wide geographic range, the regions best represented in terms of numbers being the Japanese coasts, the Mediterranean basin and the tropical West Atlantic. This work therefore makes it possible to enhance the value of a set of natural objects as witnesses of Franco-German natural history, but also to make valuable faunistic data accessible in a context of global change in marine biodiversity.

KEY-WORDS

gorgonians
Alcyonacea
museum collections
science history
systematics
biogeography
trade
natural history agencies
18th century
19th century

Introduction

Le Musée zoologique de Strasbourg détient une collection ancienne de polypiers appelés gorgones. Ce sont des épibiontes marins du phylum des Cnidaires et de la classe des Anthozoaires, laquelle englobe les Madréporaires et la sous-classe des Octocoralliaires caractérisée par une symétrie d'ordre huit. Les gorgones, dont le trait commun est la présence d'une structure axiale enveloppée par un manchon de cœnenchyme creusé par les loges des polypes, recouvrent trois sous-ordres de l'ordre des Alcyonacea. Ces animaux marins coloniaux et fixés vivent dans toutes les mers du monde à la condition de pouvoir s'ancrer sur un substrat dur. Ce sont des filtreurs actifs catégorisés parmi les suspensivores précieux pour l'épuration des eaux en général. Une autre stratégie nutritive est particulièrement bien développée chez les gorgones caraïbes très abondantes dans les eaux superficielles et chez qui la prédation exercée par les polypes serait insuffisante. Leurs tissus renferment des zooxanthelles, des algues unicellulaires symbiotiques, et ces gorgones sont dépendantes de la lumière.

Le matériel du musée est le fruit d'efforts de collections de différentes sources et étalés sur près d'un siècle et demi. Les spécimens proviennent de diverses mers du monde, des zones subpolaires aux zones intertropicales, au gré des voyages de naturalistes isolés ou d'achats de masse auprès de comptoirs reconnus. La collection a été amorcée par l'achat d'un fonds de cabinet d'Histoire naturelle local en 1804 et s'est enrichie, entre autres, de dons ou d'échanges avec d'autres muséums français et étrangers. Mais la grande spécificité de cette collection strasbourgeoise tient dans l'histoire transfrontalière des acquisitions, le musée ayant traversé une longue période d'administration allemande de 1871 à 1918. On peut ainsi diviser son histoire en quatre périodes chronologiques (Wandhammer, 2008) : 1) le cabinet d'Histoire naturelle constitué à partir de 1760 par Jean Hermann (1738-1800), 2) le musée d'Histoire naturelle de Strasbourg (français) fondé en 1818, 3) la période allemande de 1871 à 1918 au cours de laquelle est créé le Musée zoologique en 1893, 4) le Musée Zoologique après le retour à la France en 1919.

La présentation de cette collection à valeur historique indéniable est abordée selon trois approches qui se complètent et dialoguent : les approches historique, systématique et biogéographique. Ce choix explique quelques redondances, les spécimens en collection apportant chacun, lorsque cela est renseigné, des informations sur le contexte et la localité de leur collecte et une nomenclature valide au moment de leur détermination ou révision. Enfin, dans l'objectif d'alléger la lecture de ce texte, il a été fait le choix de ne pas systématiquement ajouter les auteurs et les dates de description aux noms des espèces citées. Ces renseignements sont apportés dans la liste taxinomique et dans le texte lorsque cela est opportun.

Matériel et méthode

Le matériel historique est composé de 288 colonies entières ou non, conservées à sec pour la plupart, parmi lesquelles 167 furent anciennement montées sur socle en bois, généralement peints en gris, en plus ou moins bon état et de factures diverses. Certaines sont présentées sur leur socle naturel (galet, fragment de roche). Vingt-six spécimens sont conditionnés en fluide de conservation (éthanol 70 %). Quelques spécimens sont couchés dans des boîtes cartonnées. Ceux qui n'étaient pas inventoriés (sans numéro) ont reçu une numérotation en adéquation avec la loi Musées de France et la charte d'inventaire du musée. La méthode utilisée pour déterminer les gorgones est décrite dans le travail relatif à la collection de gorgones du Muséum de Nice (France) (Philippot *et al.*, 2015). La validité des noms des taxons a été vérifiée dans la database WoRMS. La liste des spécimens par ordre de numérotation est fournie en annexe.

Approche historique de la collection de gorgones à Strasbourg : une collection constituée sur un siècle et demi (1790 env-1936)

Reconstituer l'histoire d'une collection d'objets naturels amassés au cours du temps, peu présentés à la curiosité du grand public, sinon quelques spécimens remarquables, et peu étudiés par les experts, eux-mêmes rares et dispersés, repose sur plusieurs sources. Ce sont les étiquettes attachées aux spécimens (souvent retranscrites) sur lesquelles le temps a fait son œuvre délétère, les cahiers ou registres d'entrée en collection, les courriers d'échanges entre les comptoirs et le principal directeur de la période allemande, Ludwig Döderlein. Cependant, cette dernière source n'a pas fourni

d'informations précises pour les gorgones car les spécimens de ce groupe un peu oublié, éventuellement concernés par ces échanges, sont confondus dans les achats de masse peu détaillés. La nomenclature en usage lors de l'élaboration des étiquettes est un indicateur précieux car les noms eux-mêmes ont une histoire attachée à des spécialistes qui ont laissé des écrits. Les mentions de donateurs, institutionnels ou individuels, aident beaucoup à comprendre la politique passée du musée et destinée à enrichir le fonds d'Histoire naturelle. Tous ces indicateurs nous permettent de retracer les grandes époques de la collection de gorgones, entre les naturalia rescapés de Jean Hermann et les dons conséquents de zoologistes renommés.

Des supports d'information précieux mais souvent peu détaillés

De rares spécimens comme MZS Cni0266, constitué de quatre petits fragments de l'ordre d'un centimètre de longueur, supposés provenir de la même colonie, glissés dans un petit tube en verre, sans étiquette historique, sans information et dont la détermination nous apparaît incertaine, ont été supprimés de notre inventaire. La plupart des spécimens de la collection historique du musée zoologique sont gardés à sec, seuls 26 sont conservés en fluide. Ces derniers proviennent pour l'essentiel d'Ambon via Semon Richard (9), de la Stazione Zoologica Napoli (5) et de la collection de Döderlein (5). Beaucoup de vieux spécimens à sec sont montés sur des socles de différentes factures. La face inférieure peut présenter des indications inscrites en cursive et souvent reportées fidèlement sur les étiquettes associées. Les fiches individuelles de renseignement mises à jour et informatisées ont été consultées. Néanmoins, les étiquettes demeurent le support d'information primaire privilégié et renseignent quelque 200 spécimens de gorgones soit environ 70 % de la collection. Elles transmettent des informations de plusieurs façons : par leur format, par le style d'écriture et par les indications mentionnées. Souvent, les spécimens sont dotés de plusieurs étiquettes datant de déterminations successives et il arrive que l'une d'elles indique un taxon éloigné d'un point de vue taxinomique comme le gorgonocéphale sur la gorgone Muricée MZS Cni1321.

En dehors des étiquettes improvisées sur des supports hétéroclites parfois remarquables comme les fragiles étiquettes de papier de soie pour des spécimens japonais (**Fig. 1**), il existe une dizaine de sortes d'étiquettes préformatées. Le format le plus fréquent (148 spécimens soit près des trois quarts des gorgones étiquetées) est une étiquette rectangulaire cartonnée rose ou jaunâtre selon le code couleur utilisé au musée zoologique, à liseré noir et un motif de vagues en bas (**Fig. 2**). Ce sont des étiquettes imprimées de la période allemande qui ont remplacé les originales, celles-ci ayant le plus souvent été perdues. Ces étiquettes, qui ont été réalisées au musée où les caractères en plomb sont encore conservés, comportent le nom de genre (en majuscules) et d'espèce (en minuscules) valides à l'époque de la retranscription ou de la création des étiquettes (entre 1871 et 1918). Ce type d'étiquette précise aussi, lorsqu'elle était connue, la date d'entrée au musée, l'origine géographique et le fournisseur (structure ou personne).

Fig. 1. Étiquette du spécimen MZS Cni2520 *Rumphella* sp., provenant du Japon.

Fig. 2. Étiquette du spécimen MZS Cni0299 *Leptogorgia punicea*.

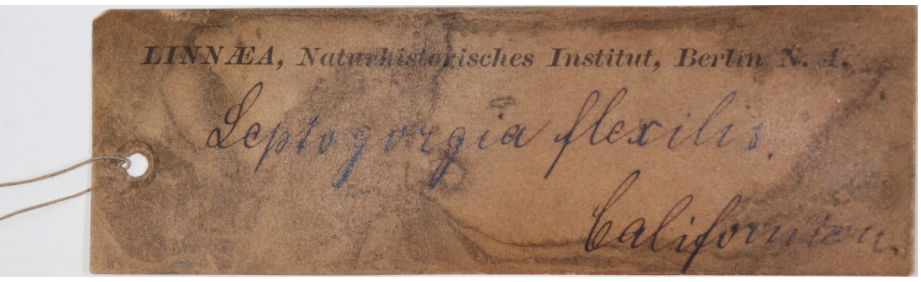

Fig. 3. Étiquette du spécimen MZS Cni0297 *Leptogorgia* sp. du comptoir Linné.

Fig. 4. Étiquette du spécimen MZS Cni0090 *Euniceopsis [Eunicea] flexuosa* du comptoir Schneider.

Les autres étiquettes préformatées sont très peu nombreuses et proviennent de structures institutionnelles ou privées. Les étiquettes institutionnelles sont celles du musée ou de l'institut de zoologie portant les indications : « Zool. Museum Strassburg », « Zool. Inst. Strassburg », « US » (Universität Strassburg). Celles des comptoirs vendeurs fournissent des indications sans ambiguïté : « *Linnaea, Naturhistorisches Institut, Berlin* » (**Fig. 3**) ; « F.G. UMLAUFF Hamburg, Spielbudenplatz, n°8, Museum Handlung » ; « Zoologisches Comptoir, Gustav Schneider in Basel » (**Fig. 4**).

Des noms utilisés sur les étiquettes qui témoignent de l'évolution de la nomenclature

Les noms des taxons reportés sur les étiquettes originelles renseignent sur les spécialistes, en majorité français et allemands, qui ont été consultés à travers leurs écrits ou directement et qui auraient contribué à identifier les spécimens. L'histoire de la nomenclature appliquée aux gorgones est en général complexe et caractérisée par une profusion de noms tombant très vite en synonymie et donc attachés à un nombre réduit d'auteurs (**Fig. 5**), surtout avant la généralisation de l'utilisation des formes et disposition des sclérites comme critères dominants à partir de la parution de l'atlas de l'anatomiste Kölliker (1865). La récurrence des erreurs d'identification, quelles qu'en soient les causes (erreurs vraies ou liées à l'état des connaissances du moment), est d'autant plus importante que les systématiciens travaillaient essentiellement sur des spécimens conservés en musée et des séries limitées alors que ces organismes modulaires montrent une forte plasticité morphologique. D'autres erreurs proviennent de retranscription hâtive de travaux antérieurs. Par exemple, les spécimens MZS Cni0240, MZS Cni0270, MZS Cni0275 initialement identifiés sous le nom de *Paramuricea placomus* ou *Gorgonia placomus* Linnaeus 1758, la Gorgone couronnée de Lamarck (1816 : 492), ont été ici redéterminés *Spinimuricea klavereni*. Carpine & Grasshoff (1975 : 31) rappellent l'histoire de ce taxon méditerranéen confondu depuis 1887 avec le taxon norvégien *P. placomus*.

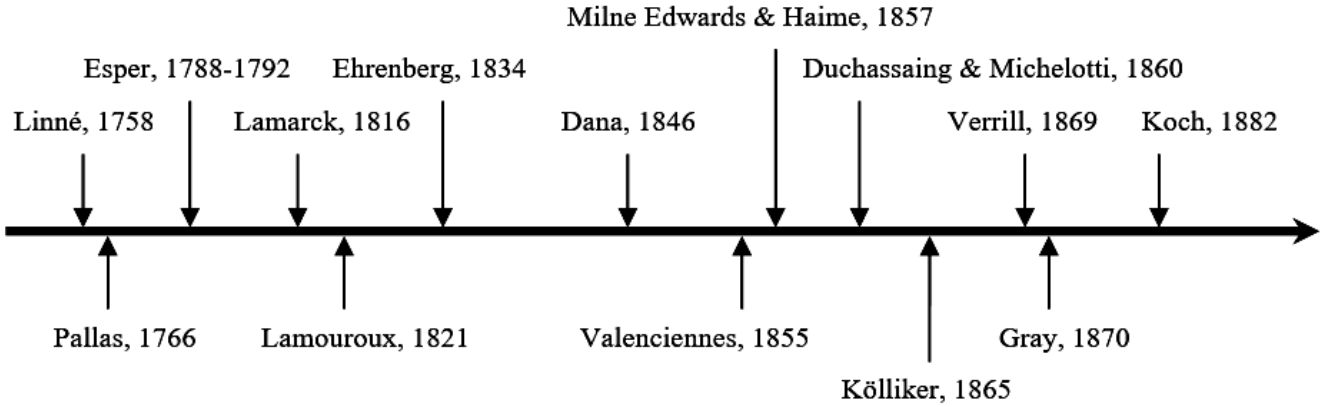

Fig. 5. Chronologie des principaux travaux de systématique de Linné à la fin du XIX siècle, cités dans ce travail et qui ont pu inspirer les identifications des gorgones du Musée zoologique de Strasbourg.

Au niveau du genre, il est possible d'associer l'occurrence des noms à des périodes bien définies. Pour les taxons caraïbes connus depuis le début de la colonisation des Antilles, il est possible de schématiser l'évolution des noms de genres attribués à certains spécimens du musée à travers quelques auteurs de Linné à la base de données WoRMS (World Register of Marine Species) sur près de trois siècles d'Histoire naturelle (**Tableau 1**). Pour les gorgones antillaises, brésiliennes et méditerranéennes en particulier (**Tableau 2**), des noms de genre généralement en usage au moment du remplacement des vieilles étiquettes ont été reportés manuellement entre crochets sur les formats les plus utilisés (**Fig. 6**) : [*Gorgonia*] de Linné (1758) ; [*Pterogorgia*] d'Ehrenberg (1834) ; [*Xiphigorgia*], [*Lophogorgia*] et [*Phyllogorgia*] de Milne Edwards & Haime (1850 et 1857) et [*Rhipidigorgia*] de Valenciennes (1855). Curieusement, c'est l'ancien nom de genre [*Gorgonia*] qui a été manuellement rajouté à côté d'*Eunicella* alors que ce dernier était en usage depuis Verrill (1869) mais l'utilisation de l'ancien nom de *Gorgonia verrucosa* a perduré jusqu'au début du XX^{e} siècle (Philippot *et al.*, 2015). L'histoire chaotique des noms de genres caraïbes des Gorgoniidae a été exposée dans la révision de la nomenclature de cette famille par Bayer (1951 : 91). Le genre *Rhipidigorgia* (ou *Rhipidogorgia* [1]), aujourd'hui non valide, désignait les gorgones réticulées jusqu'au milieu du XX^{e} siècle, y compris des formes planes anastomosées de *Leptogorgia* rebaptisées *Pacifigorgia* (MZS Cni0280, MZS Cni0287, MZS Cni0289, MZS Cni0301, MZS Cni0302, MZS Cni0325). Pour les gorgones méditerranéennes, le nom de genre *Gorgonella* proposé par Valenciennes (1855 : 14), aujourd'hui non valide et remplacé par le nom de genre *Verrucella*, apparaît sur une étiquette collée sur le contenant du spécimen MZS Cni0308 provenant de la station zoologique de Naples. Celui-ci est muni de deux étiquettes, l'une mentionnant *Gorgonella sarmentosa*, l'autre *Leptogorgia sarmentosa* (détermination confirmée). Deux autres spécimens de Singapour (MZS Cni0267 et MZS Cni0268) portent le nom de *Gorgonella stricta* mais ont été replacés dans le genre *Verrucella*. Le nom de *Gorgonella sarmentosa* apparaît dans Valenciennes (1855 : 14). Celui de *G. stricta* est également cité par Valenciennes (1855 : 14) puis par Gray (1870 : 658). Le nom de genre *Gorgonella* est utilisé par Milne Edwards & Haime (1857 : 183) et plus tard Koch (1882 : 546) décrit *Gorgonella bianci*.

Au niveau spécifique, certains noms d'espèces rarement attribués sont aujourd'hui non valides. Pour les Eunicelles de Méditerranée, les étiquettes de la collection du musée zoologique mentionnent les anciens noms d'espèces, *graminea* et *venosa*. L'histoire du nom *graminea* attaché aux genres *Gorgonia* (MZS Cni2087) ou *Eunicella* (MZS Cni0258 à MZS Cni0261) dans la collection, correspondant à la Gorgone graminée de Lamarck (1816 : 496) et aujourd'hui remplacé par *singularis* (Esper 1791), a été discutée par Carpine & Grasshoff (1975 : 74). L'espèce *venosa* mentionnée comme *Eunicella venosa* dans la collection du musée (MZS Cni0262, MZS Cni0264, MZS Cni0265) a été décrite par Valenciennes (1855 : 12) comme une espèce voisine de la Gorgone verruqueuse *E. verrucosa* et elle est citée par Milne Edwards & Haime (1857 : 158) et Verrill

1. Valenciennes (1855) mentionne deux espèces aujourd'hui validées sous le nom de *Gorgonia flabellum* par Bayer (1956) puis sous le nom de *G. ventalina* par Philippot (2017) : *Rhipidigorgia flabellum* et *Rhipidigorgia occatoria*. Milne Edwards & Haime (1857 : respectivement 173, 175, 177, 179) citent les espèces *flabellum, occatoria, ventalina* et *cancellata* dans le genre *Rhipidigorgia*. Duchassaing & Michelotti (1860 : 33) puis Kükenthal (1919 : 648) citent *Rhipidogorgia (Gorgonia) flabellum*. Deichmann (1936 : 193) cite *Rhipidogorgia flabellum* en renvoyant à Kükenthal (1924 : 350) et Bielschowsky (1929 : 192) pour les références bibliographiques. Il semble que l'orthographe *Rhipidogorgia* résulte d'une simple erreur de copie qui aurait perduré dans le temps.

Linné, 1758	Pallas, 1766	Esper, 1791	Lamarck, 1815	Lamouroux, 1821	Ehrenberg, 1834	Valenciennes, 1855	Milne Edwards & Haime, 1857	Deichmann, 1936	Bayer, 1956	Bayer, 1961	WoRMS, actuel
		Gorgonia						*Gorgonia*	*Pacifigorgia*		*Pacifigorgia*
	Gorgonia	*Gorgonia*	*Gorgonia*	*Gorgonia*		*Gorgonia*	*Leptogorgia*	*Leptogorgia*	*Leptogorgia*	*Leptogorgia*	*Leptogorgia*
									Lophogorgia	*Lophogorgia*	
Gorgonia		*Gorgonia*		*Gorgonia*		*Rhipidigorgia*	*Rhipidigorgia*	*Rhipidogorgia*	*Gorgonia*	*Gorgonia*	*Gorgonia*
	Gorgonia			*Gorgonia*	*Pterogorgia*	*Pterogorgia*	*Pterogorgia*	*Pterogorgia*	*Antillogorgia*	*Pseudopterogorgia*	*Antillogorgia*
	Gorgonia		*Gorgonia*		*Pterogorgia*	*Pterogorgia*	*Xiphigorgia*	*Xiphigorgia*	*Pterogorgia*	*Pterogorgia*	*Pterogorgia*
		Gorgonia				*Phyllogorgia*	*Phyllogorgia*	*Phyllogorgia*	*Phyllogorgia*	*Phyllogorgia*	*Phyllogorgia*
			Gorgonia	*Plexaura*		*Plexaura*	*Plexaura*	*Plexaura*	*Plexaura*	*Plexaura*	*Plexaura*
		Gorgonia	*Gorgonia*					*Plexaurella*	*Plexaurella*	*Plexaurella*	*Plexaurella*
	Gorgonia	*Gorgonia*		*Muricea*			*Muricea*	*Muricea*	*Muricea*	*Muricea*	*Muricea*

Tableau 1. Évolution des noms des vieux genres caraïbes au cours du temps selon quelques auteurs. (Par exemple, le genre *Gorgonia* validé par WoRMS rassemble aujourd'hui des espèces qui ont été antérieurement attribuées aux genres *Rhipidigorgia* et *Rhipidogorgia* mais décrites initialement sous le nom de genre *Gorgonia* par Linné).

Nom de genre	Nom de genre rajouté	révisé V. Philippot	Spécimens en collection concernés
LEPTOGORGIA	[*Gorgonia*]	*Leptogorgia*	MZS Cni0286, MZS Cni0293
LEPTOGORGIA	[*Lophogorgia*]	*Leptogorgia*	MZS Cni0318, MZS Cni0323, MZS Cni0324, MZS Cni0326, MZS Cni0328, MZS Cni0330, MZS Cni0331, MZS Cni0333, MZS Cni0334, MZS Cni0335, MZS Cni0336, MZS Cni0338, MZS Cni0340, MZS Cni0341, MZS Cni2447
LEPTOGORGIA	[*Pterogorgia*]	*Leptogorgia*	MZS Cni0290, MZS Cni0292, MZS Cni303, MZS Cni0320, MZS Cni0321, MZS Cni0322, MZS Cni2224
LEPTOGORGIA	[*Rhipidogorgia*]	*Pacifigorgia*	MZS Cni0280, MZS Cni0287, MZS Cni0289, MZS Cni0325
GORGONIA	[*Pterogorgia*]	*Antillogorgia*	MZS Cni0277, MZS Cni0309, MZS Cni0312, MZS Cni0314, MZS Cni2212, MZS Cni2484
GORGONIA	[*Rhipidogorgia*]	*Gorgonia*	MZS Cni0345, MZS Cni0347, MZS Cni0348, MZS Cni0350, MZS Cni0351, MZS Cni0354, MZS Cni0355, MZS Cni0356, MZS Cni0359, MZS Cni2211
GORGONIA	[*Phyllogorgia*]	*Phyllogorgia*	MZS Cni2219
GORGONIA	[*Xiphigorgia*]	*Pterogorgia*	MZS Cni0272, MZS Cni0273, MZS Cni0276, MZS Cni0278
EUNICELLA	[*Gorgonia*]	*Eunicella*	MZS Cni0243, MZS Cni0244, MZS Cni0245, MZS Cni0246, MZS Cni0248, MZS Cni0249, MZS Cni0251, MZS Cni0252, MZS Cni0253, MZS Cni0254, MZS Cni0255, MZS Cni0256, MZS Cni0258, MZS Cni0259, MZS Cni0260, MZS Cni0261, MZS Cni0262, MZS Cni0264, MZS Cni0265, MZS Cni2079

Tableau 2. Indications rapportées sur des étiquettes de facture allemande (nom de genre en majuscule suivi d'un nom de genre rajouté en cursive et entre crochets) pour des taxons caraïbes et méditerranéens.

Fig. 6. Étiquette du spécimen MZS Cni0261 *Eunicella singularis*.

(1869 : 426). Enfin, aucune Eunicelle du musée n'a reçu antérieurement le nom de la gorgone typiquement méditerranéenne *E. Singularis* pourtant décrite par Esper à la fin du XVIII^{e} siècle et représentée par huit spécimens en collection. Cette énigme est expliquée par Carpine & Grasshoff (1975 : 72) qui mettent en avant les confusions entre espèces méditerranéennes, les Eunicelles *cavoliini* et *singularis* ayant été considérées comme des variétés de *E. verrucosa* jusqu'au milieu du XX^{e} siècle.

Chez les gorgones caraïbes, les noms d'espèces *rhipidalis*, *salicornoides*, *occatoria*, *cancel lata*, *setosa*, *arenosa*, *spicifera* aujourd'hui tombés en désuétude se rapportent à des périodes de validité repérables. *Plexaura rhipidalis*, redéterminée *Euniceopsis flexuosa* et mentionnée sur l'étiquette du spécimen MZS Cni0097, est une espèce des Antilles décrite par Valenciennes (1855), rapportée par Milne Edwards & Haime (1857 : 155) et Duchassaing & Michelotti (1860). Les étiquettes des spécimens MZS Cni0090 et MZS Cni2455 respectivement entrés via le comptoir Schneider (1876-1897) et vendus en 1931 par la veuve d'Alexandre Myèvre (professeur d'Histoire naturelle de la Sorbonne et spécialisé dans l'anatomie des Alcyonaires) mentionnent le nom ancien de *Plexaura salicornoides*. Cette espèce arborescente commune est décrite par Valenciennes (1855) qui la signale en Martinique. Elle est mentionnée par Milne Edwards & Haime (1857 : 153) qui la disent « *semblable à* P. homomalla *par son port et sa disposition générale* », puis est mise en synonymie avec la *Plexaura flexuosa* de Lamouroux (1821). L'apport de la biologie moléculaire a fait basculer ce taxon parmi les *Eunicea* (Grajales *et al.*, 2007). Toutefois, le fragment MZS Cni2455 dont la détermination est erronée (probablement effectuée par un non expert et sans recours à la microscopie) a été rebaptisé *Plexaurella dichotoma*. Des gorgones réticulées jumelles *Gorgonia ventalina* et *G. flabellum* (considérées comme conspécifiques dans ce travail, Philippot, 2017) ont été nommées *G. occatoria* (MZS Cni0349) et la forme *plumosa* de *G. mariae* a été nommée *G. cancellata* (MZS Cni2211). Valenciennes (1855 : 13) mentionne *Rhipidigorgia occatoria* (*nomen nudum*), laquelle est décrite comme espèce par Milne Edwards & Haime (1857 : 175), puis *occatoria* devient une forme de l'espèce *G. flabellum*. Enfin, Dana (1846 : 658) décrit l'espèce *Gorgonia cancellata* et celle-ci est citée par Milne Edwards & Haime (1857 : 179) dans le genre *Rhipidigorgia* mais il ne semble pas que cet Éventail de mer corresponde à *G. mariae* décrite par Bayer (1961). Les grandes gorgones plumeuses aujourd'hui connues sous

le nom d'*Antillogorgia acerosa* (Pallas 1766) ont jadis reçu les noms de *Gorgonia setosa* (MZS Cni0309, MZS Cni0310, MZS Cni0311, MZS Cni0312, MZS Cni0314, MZS Cni0315, MZS Cni0316, MZS Cni2212, MZS Cni2484) et *Pterogorgia arenosa* (MZS Cni0313). *Gorgonia setosa* Esper 1791 est citée par Milne Edwards & Haime (1857 : 168) sous le nom de *Pterogorgia setosa*.

MZS Cni0345 et MZS Cni0346 ont anciennement été nommés *Gorgonia reticulum*, l'étiquette de second spécimen mentionnant « ?Indischer Ocean ». L'espèce *Gorgonia reticulum* dont la localité est précisée « *Oceanus Indicus* » a été décrite par Pallas (1766 : 167) et est la Gorgone réseau de Lamarck (1816 : 488). Valenciennes (1855 : 10) cite le taxon *Rhipidigorgia reticulum* en évoquant des « *sclérites fusiformes avec 4 ou 6 couronnes de tubercules* ». Les deux spécimens du musée ont été renommés par nos soins *Gorgonia ventalina*, laquelle est une espèce endémique au bassin caraïbe. Il semble que *G. reticulum* ait été confondue de façon récurrente avec *G. ventalina* depuis Linné et que les morphoses réticulées trouvées dans les différentes mers du monde aient été régulièrement confondues avant que les critères microscopiques ne soient généralisés.

Chez les Muricées dont les taxons du Pacifique est ont été revues récemment par Breedy & Guzman (2016), les vieilles espèces *spicifera* et *lima*, alors affiliées aux *Gorgonia*, ont été attribuées respectivement aux spécimens MZS Cni0094 et MZS Cni0087 comme synonymes de l'espèce valide *Muricea muricata* (Pallas 1766) d'après Bayer (1961). *M. spicifera* est la Gorgone spicifère de Lamouroux (1821 : 36) et l'espèce-type du genre *Muricea*. Elle est mentionnée par Milne Edwards & Haime (1857 : 142). Cependant, MZS Cni0094 provenant du Muséum de Paris et entré en 1829 a été ici redéterminé *Euniceopsis (Eunicea) tourneforti*. *Gorgonia lima* est la Gorgone lime de « l'Océan des Antilles » de Lamarck (1816 : 505) et est citée par Dana (1846 : 672). Verrill (1855 : 13) évoque une *Eunicea lima* tandis que Milne Edwards & Haime (1857 : 143) citent *Muricea lima* et remarquent qu'il s'agit d'une espèce extrêmement proche de *M. spicifera*.

Par ailleurs, on trouve dans la collection du musée zoologique des gorgones du vaste genre *Leptogorgia* à large distribution géographique dont les étiquettes présentent d'anciens noms tombés en désuétude : *pumicea* (MZS Cni0298 et MZS Cni0299), *miniacea* (MZS Cni0281), *caryi* (MZS Cni0291). Bayer (1961 : 207) met en synonymie *L. punicea* (nom donné en référence à la couleur rougeâtre) et *L. pumicea*. La gorgone brésilienne *Gorgonia pumicea* de Milne Edwards & Haime (1857 : 160) est une erreur de transcription de *G. punicea* de Valenciennes (1855 : 12), laquelle a perduré jusqu'au milieu du XIX^{e} siècle (Verrill, 1912 : 399 ; Stiasny, 1951 : 73). D'après Grasshoff (1991), le nom *Gorgonia miniacea* est douteux, le spécimen initialement décrit par Esper (1791) ayant disparu. La Gorgone miniacée a été citée par Lamouroux *et al.* (1824 : 441), Milne Edwards & Haime (1857 : 164) parmi les *Leptogorgia* et Kölliker (1865 : 139). Le nom *caryi* donné par Verrill (1869 : 421) est un *nomen dubium*.

Enfin, l'espèce de Linné *Isis hippuris* (Isis queue de cheval) est nommée *Isis moniliformis* sur les étiquettes de MZS Cni0055 et MZS Cni2214. Il s'avère que les plus anciens représentants de la Gorgone moniliforme telle que la nomment Lamarck (1816 : 496) ou Lamouroux *et al.* (1824 : 447) portent ce nom que l'on retrouve dans certains ouvrages de pharmacie et qui signifie en zoologie en forme de chapelet ou de collier (*monile* : collier) à cause des étranglements qui séparent des masses arrondies situées les unes à la suite des autres. Cette espèce aurait été confondue de façon récurrente avec *I. hippuris* d'après Milne Edwards & Haime (1857 : 195) qui en fait néanmoins une espèce à part.

Des fournisseurs de gorgones de toutes origines

Les informations relatives aux fournisseurs des gorgones du Musée zoologique de Strasbourg et illustrées par une frise chronologique (**Fig. 7**) montrent qu'ils sont nombreux, qu'il s'agisse d'institutions publiques ou privées, de naturalistes/zoologistes ou encore de voyageurs et collectionneurs :

- les botanistes ou zoologistes allemands : Georg Wilhelm Schimper (1804-1878) qui voyageait pour le compte de la Société des Voyages d'Esslinger et des muséums d'Histoire naturelle de Paris et de Berlin ; Oskar Schmidt (1823-1886) ; Richard Semon (1859-1918), biologiste de l'évolution et organisateur d'une expédition en Australie ; Franz Theodor Doflein (1873-1924) ;
- le zoologiste hélvético-américain Louis Agassiz (1807-1873) ;
- des officiers de marine comme M. Krieger ;

• des Strasbourgeois qui ont fait chacun un don isolé : G. Conrad, taxidermiste dans les années 1930-1950 et le collectionneur Albert Bergmann, directeur des salines de Chambray, qui a travaillé bénévolement sur les collections de coquilles du musée de sa ville, Strasbourg.

Parmi les tout premiers contributeurs, l'alsacien Kachelhofer établi du côté du Cap de Bonne Espérance (Afrique du Sud) envoie en 1829 six exemplaires de *Leptogorgia palma* (MZS Cni0328, MZS Cni0330, MZS Cni0333, MZS Cni0334, MZS Cni0336, MZS Cni0341). En 1830, Claude Esmangart préfet du Bas-Rhin de 1824 à 1828, fait don de l'Éventail de mer *Gorgonia ventalina* MZS Cni0347 issu de sa collection personnelle. Un peu plus tard, en 1836, Philippe Louis Voltz, l'un des fondateurs de l'Association strasbourgeoise des Amis de l'Histoire naturelle ajoute à la maigre collection une gorgone de Méditerranée *Eunicella verrucosa* (MZS Cni0253). Puis, un spécimen de la gorgone précieuse *Corallium rubrum* rejoint la collection en 1841 grâce au don d'un dénommé Merck de Brumath qui cède un lot de productions marines méditerranéennes. Par la suite, les arrivées de matériel vont beaucoup s'intensifier pendant la période allemande grâce aux échanges et achats auprès d'autres muséums et des comptoirs d'Histoire naturelle.

Les derniers spécimens de gorgones arrivés au musée sont surtout les dix inclus dans le lot d'Invertébrés de Myèvre vendus par sa veuve en 1931. Ils correspondent à cinq espèces différentes après révision des taxons par nos soins. Les étiquettes précisent que les gorgones proviennent d'Algérie, de Roscoff et de Nice. S'ajoutent des petits fragments de gorgones caraïbes conditionnés dans de petits tubes en verre, sans localité, qui appartiennent aux espèces proches *Plexaurella grisea* et *P. dichotoma*. Quatre des gorgones de Myèvre déterminées initialement sous le nom d'*Eunicella verrucosa* (identification confirmée par nos soins) proviennent de Roscoff en Bretagne. Deux ans plus tard, une autre colonie de la même espèce (MZS Cni0239) et venant également de Roscoff, a été déposée par Albert Schweitzer, prix Nobel de la paix en 1952. Ces

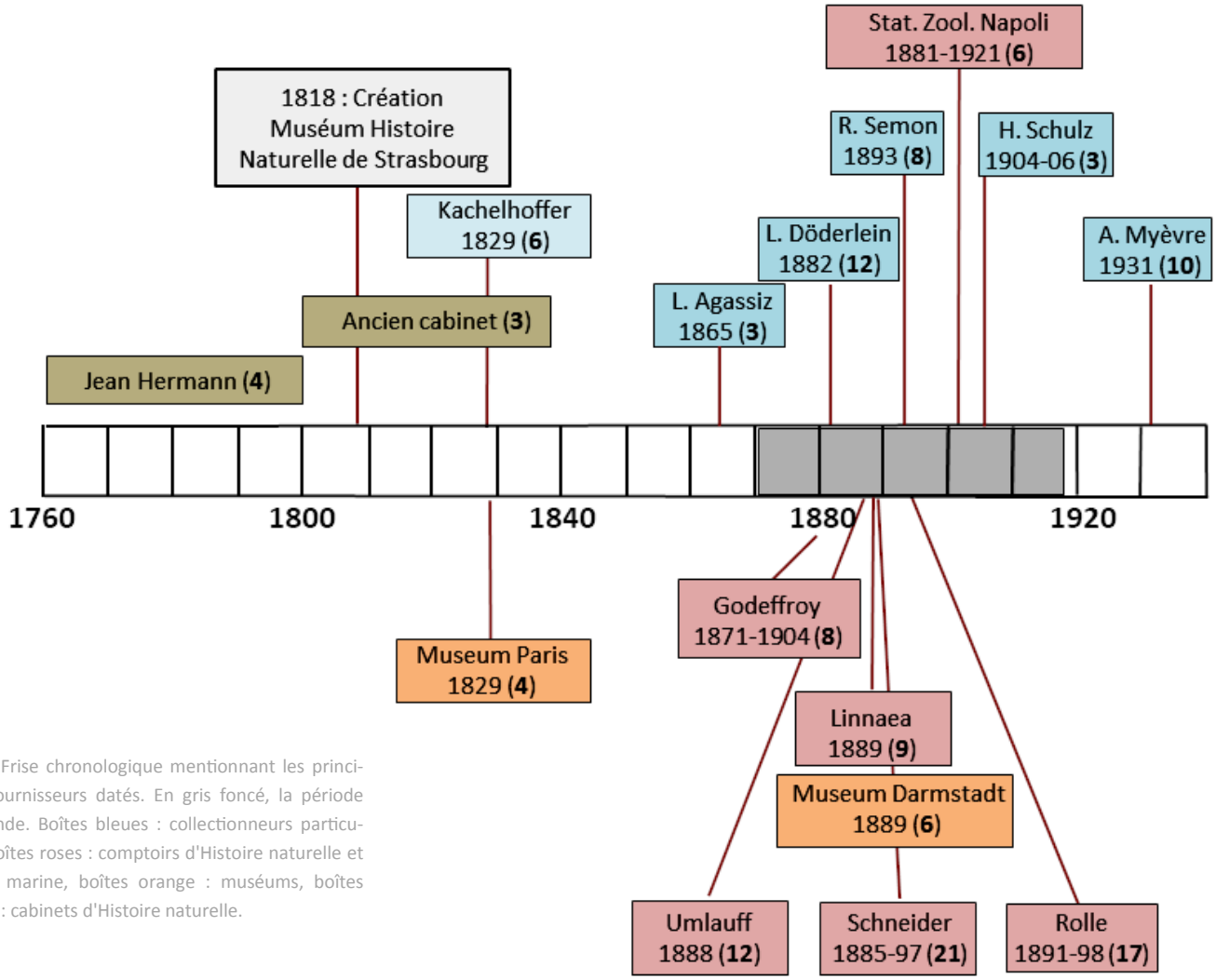

Fig. 7. Frise chronologique mentionnant les principaux fournisseurs datés. En gris foncé, la période allemande. Boîtes bleues : collectionneurs particuliers, boîtes roses : comptoirs d'Histoire naturelle et station marine, boîtes orange : muséums, boîtes brunes : cabinets d'Histoire naturelle.

gorgones bretonnes ont vraisemblablement été collectées et données par la station biologique de Roscoff fondée en 1872 par Henri Lacaze-Duthier (1821-1901). Ce personnage est d'ailleurs bien connu dans le monde des gorgones depuis le travail effectué auprès des corailleurs algériens et la parution en 1864 de son *Histoire naturelle du corail* (Lacaze-Duthier, 1864). Enfin, la toute dernière gorgone entrée en collection est l'Éventail de mer antillais MZS Cni0361 fourni par le collectionneur Albert Bergmann en 1936.

Les contributions des autres musées européens et des comptoirs d'Histoire naturelle sont présentées dans le chapitre suivant.

Les circonstances d'entrée en collection

Les renseignements apportés essentiellement par les étiquettes liées aux spécimens permettent de redessiner les grands épisodes de la constitution de la collection du Musée zoologique de Strasbourg et d'ancrer les diverses entrées de spécimens isolés ou de séries plus ou moins importantes dans un contexte historique s'étalant de la deuxième moitié du XVIII^{e} siècle jusqu'à la Seconde Guerre mondiale. Ce siècle et demi d'Histoire renvoie à différentes époques de l'Histoire naturelle. Il est marqué par des voyages scientifiques et des personnages incontournables ayant contribué soit à l'enrichissement des collections muséales soit à la systématique des gorgones.

L'héritage des cabinets anciens et les systématiciens des gorgones au XVIII^{e} siècle

Les XVII^{e} et XVIII^{e} siècles sont marqués par un engouement général pour les cabinets d'Histoire naturelle en Europe. Les plantes pierreuses ou *lithophytes* y trouvent une place privilégiée, ce qui motive la circulation de gorgones pour l'exposition (Philippot, 2015 ; 2020). Bien loin de la mer, c'est dans cette mouvance européenne que voit le jour le cabinet de l'érudit alsacien Jean Hermann, lequel bénéficie du dynamisme du commerce des objets de la nature. Dès 1768, Jean Hermann entame une carrière universitaire et il enseignera dans différents domaines : médecine, logique, métaphysique, chimie, botanique et Histoire naturelle. L'histoire de son cabinet créé vers 1760 dans sa maison canoniale localisée à Strasbourg place Saint-Thomas, à vocation scientifique et pédagogique, est présentée dans la thèse de Rusque (2018). A la création du cabinet, beaucoup de spécimens sont acquis lors de ventes aux enchères de collections privées. Il est fort probable que certains spécimens marins très convoités aient été achetés par la suite sur le marché des *naturalia* car, selon Rusque (2018 : 110), le savant n'était pas un voyageur naturaliste et il n'a pas poussé ses prospections de terrain jusqu'en Méditerranée ni même sur aucun littoral. Mais son réseau de correspondants comprend plusieurs voyageurs naturalistes dont certains ont recours à de simples pêcheurs (Rusque, 2018 : 119). Le fils de Jean Hermann, Jean-Frédéric, tout jeune médecin et brillant naturaliste, constitue l'inventaire de la collection de son père et réalise des planches représentant des échantillons de cette collection, avant de décéder du typhus à l'âge de 25 ans en 1794. Il consacre un ouvrage généraliste à propos du corail rouge intitulé « *Etwas über die Korallen* » (Hermann, 1788) dans lequel figurent deux illustrations expliquant la collecte du corail précieux à l'aide de la croix du corailleur et l'organisation anatomique d'une colonie.

D'après Rusque (2018 : 91), aucun catalogue complet des collections n'a été établi du vivant de Jean Hermann mais il existe quelques inventaires partiels, notamment des notes du professeur sur les objets rares de son cabinet. Celui-ci a été racheté par la ville de Strasbourg en 1804, ce qui occasionne la rédaction d'un inventaire général à vocation administrative qui évalue à 330 le nombre d'échantillons de vers et de zoophytes sans davantage de précisions. Le transfert des collections à l'Académie de Strasbourg n'intervient qu'en 1818, date de création du musée d'Histoire naturelle municipal. Hermann détenait également une très riche collection de livres. L'*Index rerum* du catalogue de la bibliothèque Hermann & Hammer (1813) mentionne à la fin les catégories *Zoophytologia* et *Lythophytologia*. D'après Rusque (2018 : 61), la bibliothèque est conçue comme un outil de travail pour le naturaliste.

Les cinq toutes premières gorgones entrées dans ce qui constituera le fonds historique du Musée zoologique de Strasbourg sont incluses dans le matériel vestige du cabinet d'Histoire naturelle de Jean Hermann (environ 200 spécimens) et dont les éponges ont été étudiées il y a un siècle (Topsent, 1920). Il s'agit de gorgones de provenances diverses :

• MZS Cni2441 dont l'étiquette date de l'époque allemande postérieure et porte les mentions de « ?*Plexaura homomalla*, ?Amerikanische

Fig. 8. Spécimen de Jean Hermann MZS Cni2441 *Plexaura homomalla*.

Fig. 9. Spécimen de Jean Hermann MZS Cni2447 *Leptogorgia palma*.

Meere » (**Fig. 8**). Le nom et l'aire géographique sont confirmés, ce genre étant endémique du bassin caraïbe.

• MZS Cni2447 dont l'étiquette date également de l'époque allemande et porte les mentions de « *Leptogorgia palma* Pall. [*Lophogorgia*] » (**Fig. 9**). Ce taxon est observé sur les côtes ouest africaines.

MZS Cni2496 et MZS Cni2497 présentement identifiés *Corallium rubrum*, cette espèce étant endémique du bassin méditerranéen.

Le spécimen de corail précieux d'Hermann MZS Cni2497 est un rare variant blanc qui porte la mention manuscrite de J. Hermann « *His nobilis varietas alba, natura alba con coctiona in cera* » (voici la fameuse variété blanche, naturellement blanche et non trempée dans de la cire). Le cinquième spécimen MZS Cni2521 est un grand squelette noir et nu d'une gorgone arbustive dont la détermination est impossible. La base a été calée anciennement sur son socle avec les fragments d'un brouillon de lettre de Jean-Frédéric Hermann adressée à un botaniste, donc antérieure à 1794.

Outre les cinq gorgones de Jean Hermann, trois autres colonies portent la mention AC, c'est-à-dire « Ancien Cabinet ». Cette dénomination correspond globalement aux spécimens des collections d'avant 1837, période Hermann comprise. Ces spécimens sont tous montés sur socle et dotés d'étiquettes datant de la période allemande. Ils proviennent des anciennes colonies françaises : la Guadeloupe (MZS Cni2484, *Antillogorgia acerosa*) et l'île de Bourbon [La Réunion] (MZS Cni0237, *Nicella carinata* ; MZS Cni2440, *Nicella* sp.). Durant cette même période, en 1829, la collection s'enrichit d'un lot de quatre gorgones antillaises communes provenant du Muséum de Paris (MZS Cni0094, MZS Cni0273, MZS Cni0309, MZS Cni0354).

Mais, il ne suffit pas de collecter, amasser et conserver pour constituer une collection d'Histoire naturelle dotée d'un intérêt scientifique. Les objets sont nommés et classés selon les systèmes en vigueur et en perpétuelle évolution. Hermann est contemporain et disciple de Carl von Linné (1707-1778), le père de la nomenclature binomiale et d'une nouvelle classification du vivant. Linné classe définitivement les *lithophyta* (coraux et futurs Octocoralliaires qui deviendront par la suite *zoophyta*) parmi les animaux seulement à partir de la cinquième édition de son *Systema naturae* en 1748

et donc plus de 20 ans après la découverte de Jean-André de Peyssonnel (1694-1759) en 1723. Ce dernier fait officiellement paraître son Traité du corail tardivement (Peyssonnel & Watson, 1753). Dans son *Systema naturae* de 1758, Linné a créé les premiers genres de gorgones : *Isis* (avec l'espèce *I. hippuris*) et *Gorgonia* pour des créatures qui ressemblaient de près ou de loin à l'espèce type *G. flabellum*, jadis nommé *balaoléchou* par les Amérindiens caraïbes (Breton, 1665-1666) et connu en Europe depuis la découverte des Indes américaines. Charles Clusius (1605) avait déjà décrit les formes réticulées sous le nom végétal de *Frutex marinus elegantissimus*. Hermann qui voue une grande admiration au naturaliste suédois adopte précocement le tout nouveau système de nomenclature linnéenne pour nommer les taxons sur les étiquettes attribuées à chaque objet végétal ou animal (Rusque, 2018 : 91 et 98). En tant que membre d'une quinzaine de sociétés savantes, il correspond en particulier avec Peter Simon Pallas (1741-1811) à Saint-Petersbourg (entre 1779 et 1788), le comte de Buffon, directeur du jardin et du Cabinet du Roi à Paris et l'anatomiste Georges Cuvier (entre 1795 et 1800), conservateur des collections zoologiques du muséum d'Histoire naturelle de Paris (Rusque, 2018 : 230, tab.12). Cuvier est en 1798 l'auteur du genre *Corallium* attribué initialement au fameux corail précieux de Méditerranée et dont deux spécimens étaient conservés par Hermann à Strasbourg. Celui-ci est en lien avec deux systématiciens allemands majeurs pour les Octocoralliaires au XVIII^{e} siècle, le naturaliste précité Pallas (1741-1811) et Eugen Johann Christoph Esper (1742-1810). Pallas rédige une importante monographie datée de 1766 avant d'être nommé professeur d'Histoire naturelle à l'Académie impériale des sciences de Saint-Pétersbourg par Catherine II de Russie. Il décrit parmi les vieilles espèces représentées au Musée zoologique de Strasbourg : *Gorgonia* [*Leptogorgia*] *violacea*, *Gorgonia* [*Leptogorgia*] *sanguinolenta*, *Gorgonia* [*Leptogorgia*] *setacea*, *Gorgonia* [*Leptogorgia*] *purpurea* et *Gorgonia* [*Pterogorgia*] *anceps* à partir de matériel localisé « *Mare americanum* » ; d'autres taxons caraïbes *Gorgonia* [*Antillogorgia*] *acerosa*, *Gorgonia* [*Muricea*] *muricata* et *Gorgonia* [*Ellisella*] *elongata*] ; les taxons européens *Gorgonia* [*Leptogorgia*] *viminalis*, *Gorgonia* [*Leptogorgia*] *verrucosa* et *Gorgonia* [*Callogorgia*] *verticillata* ainsi que *Gorgonia* [*Ctenocella*] *pectinata*, *Gorgonia* [*Junceella*] *juncea* et *Gorgonia* [*Leptogorgia*] *palma* de l'Océan Indien. Comme le rapporte un dictionnaire de sciences naturelles édité à Strasbourg (Collectif, 1818), Pallas a classé le corail rouge dans le genre *Isis* sous le nom d'*I. nobilis* Esper, classement définitivement rejeté par Lamarck (1801 : 377) qui réserve le genre *Isis* (*Isis* proprement dites) pour des gorgones « *interrompue*[*s*] *par des étranglements dont la matière ressemble à de la corne* ». Esper est l'auteur de « *Die Pflanzenthiere in Abbildungen nach der Natur* » (1788 -1792) dont l'œuvre est étudiée par Grasshoff (1991) et qui contient de nombreuses belles planches de gorgones. Il décrit, parmi les espèces présentes au musée zoologique, les vieilles espèces méditerranéennes *Gorgonia* [*Leptogorgia*] *sarmentosa*, *Gorgonia* [*Eunicella*] *singularis*, *Isis* [*Isidella*] *elongata* ainsi que l'espèce brésilienne *Gorgonia* [*Phyllogorgia*] *dilatata*. Pallas (1766) et Esper (1788-1830) reconnaissent les genres *Isis* et *Gorgonia* de Linné et les réorganisent par addition d'espèces. Lamarck (1801) divise l'ordre des Polypes en deux sections, les Polypes nus (futurs Alcyonaires) et les Polypes coralligènes (certains Octocoralliaires et Madréporaires) sur des critères exclusivement morphologiques. Le naturaliste Lamouroux (1821) ajoute de nouveaux genres, les Plexaures, Muricées et Eunicées.

La part des musées ou stations zoologiques et des comptoirs d'Histoire naturelle en Europe au XIX^{e} siècle

Le Musée zoologique de Strasbourg entretient des relations historiques avec d'autres musées d'Histoire naturelle d'Europe avec lesquels les échanges ou la vente de matériel sont fréquents au gré des relations personnelles entre conservateurs. Pour les gorgones, les institutions ou musées privés ayant contribué à l'enrichissement des collections sont le Muséum de Paris (France), le Muséum de Zurich (Suisse), le Muséum privé de Platow à Fribourg (Silésie), le Muséum de Darmstadt (Allemagne) et le Muséum de Heidelberg (Allemagne).

• Le Muséum de Paris fait don en 1829 de quatre gorgones antillaises (« Cuba », « W-Indies », « Antillen ») (MZS Cni0094, MZS Cni0273, MZS Cni0309, MZS Cni0354). Elles ont toutes été déterminées anciennement et trois des noms affectés à ces grands spécimens remarquables (*Muricea spicifera*, *Gorgonia citrina* et *G. setosa*) ne sont plus valides depuis longtemps. Leur acquisition est probablement liée à Georges Louis Duvernoy, titulaire de la chaire d'Histoire naturelle de Strasbourg et qui

prend la direction du musée en 1827. Il s'agit de l'élève de Georges Cuvier, lui-même directeur du Muséum de Paris. Une gorgone réticulée (MZS Cni0345), entrée au Musée zoologique de Strasbourg en 1851, est dotée d'une étiquette portant la mention « Buffon ». Elle provient probablement du Cabinet du Roi de Paris.

• Le Muséum de Zurich fait don en 1874 d'un spécimen de *Leptogorgia punicea* et provenant du Brésil (MZS Cni0299)

• Le Muséum de Platow fait parvenir en 1888 une gorgone de *Ctenocella pectinata* (MZS Cni2222).

• Le Muséum de Darmstadt procure six gorgones en 1889 appartenant à différentes espèces : un spécimen nommé *Leptogorgia sarmentosa* (MZS Cni0304), deux spécimens renommés par nos soins *Callogorgia verticillata* (MZS Cni0059) et *Filigorgia sanguinolenta* (MZS Cni0305), trois spécimens non identifiés nommés par nos soins *Bebryce* sp. (MZS Cni2080), *Echinogorgia* sp. (MZS Cni2081) et *Leptogorgia* sp. (MZS Cni2082).

• Le Muséum de Heidelberg fait don en 1889 d'une gorgone japonaise *Thouarella* sp. (MZS Cni0071).

Le Musée zoologique de Strasbourg a aussi des contacts avec la station zoologique de Naples, ou plutôt Stazione Zoologica Napoli, un institut de recherche en biologie marine fondé par l'allemand Anton Dohrn en 1872. Parmi les hôtes de cet institut, on trouve Oskar Schmidt, titulaire de la chaire de zoologie de Strasbourg qui a travaillé au musée à partir de 1872. Il y a déposé deux Eunicelles de Marseille (MZS Cni0242 et MZS Cni2087). Mais ces dons sont très probablement sans lien avec ceux effectués en 1881 et 1921, provenant directement de la station zoologique, et qui représentent six spécimens de quatre taxons méditerranéens (Naples) : *Isidella elongata* (MZS Cni0053, MZS Cni0062, MZS Cni0083), *Corallium rubrum* (MZS Cni0120), *Eunicella singularis* (MZS Cni0243) et *Leptogorgia sarmentosa* (MZS Cni0308).

Fig. 10. Spécimen MZS Cni0357 *Gorgonia ventalina*.

Nous mentionnons également une gorgone à valeur historique. Il s'agit d'un bel Éventail de mer réticulé monté sur socle et présenté sans étiquette dans une vitrine des expositions permanentes. Sous le socle, le texte tracé au crayon en écriture cursive précise son numéro d'inventaire MZS Cni0357 à côté d'une annotation plus ancienne avec le nom *Gorgonia arenata*. Ce dernier est celui d'un taxon réticulé décrit par Valenciennes (1846), cité par Milne Edwards & Haime (1857 : 176) sous le nom de genre *Rhipidigorgia* et aujourd'hui affilié au genre *Pacifigorgia*. Le spécimen a été redéterminé *Gorgonia ventalina*. Il y a donc eu probablement confusion entre espèces de morphoses similaires à une époque où on n'avait pas recours aux examens microscopiques. La localité de collecte n'est pas précisée mais il s'agit d'un taxon très commun aux Antilles. Il est écrit également « Association, 1850 ». Il s'agit d'un des tout premiers achats (ou achat anticipé) de l'Association strasbourgeoise des Amis de l'Histoire naturelle créée en 1851 par le directeur du musée Auguste Lereboullet et son assistant Wilhelm Philipp Schimper (cousin de Georg Wilhelm Schimper cité plus haut), un naturaliste alsacien.

Enfin, durant la période allemande marquée par la forte volonté du Reich de faire de l'université de Strasbourg un modèle du genre, le musée zoologique s'approvisionne à profusion auprès de nombreux comptoirs d'Histoire naturelle. Pour enrichir son fonds, le directeur Ludwig Döderlein a recours à ces commerces souvent créés par des naturalistes ou des scientifiques familiers des musées qui en connaissent bien les besoins et sont en lien avec des explorateurs naturalistes. A titre d'exemple, Gustav Schneider (1834-1900) a été préparateur

et conservateur au muséum d'Histoire naturelle de Bâle avant d'installer son comptoir dans la même ville. Les comptoirs ayant contribué à enrichir d'un total de 57 spécimens la collection de gorgones du Musée zoologique de Strasbourg sont ceux de Godeffroy (Hambourg) de 1871 à 1904, Gustav Schneider père & fils (Bâle) de 1879 à 1897, Linnaea (Berlin) en 1887 et 1889, Johann Gustav Umlauff (Hamburg) en 1888, Robert Damon (Weymouth) en 1888 et Hermann Rolle (Berlin) en 1891 et 1898. Plus précisément, le comptoir Godeffroy vend cinq gorgones du Pacifique (MZS Cni0098, Cni0114, Cni2057, Cni2058, Cni2059) appartenant aux espèces *Rumphella aggregata*, *Melithaea aurantia* et *Villogorgia* sp. Ce magasin privé (1861-1885) était dédié à l'anthropologie et à l'Histoire naturelle des « mers du sud ». L'entreprise commerce avec l'Amérique centrale et les Caraïbes. Quelques spécimens de gorgones entrent au Musée zoologique de Strasbourg après la mise en vente du musée. Le capitaine C.A. Pöhl dont les étiquettes de deux spécimens du Japon et d'Afrique portent mention (MZS Cni0123, MZS Cni0126) était assistant et correspondant du Muséum Godeffroy. Le musée achète également au comptoir Schneider 22 spécimens qui proviennent de Norvège (4), de Singapour (15), de Bahia au Brésil (1) et de Saint-Thomas dans les Caraïbes (1). Le dernier n'a pas de renseignement sur son origine mais l'espèce identifiée *Eunicella cavolinii* est endémique de Méditerranée. Le comptoir Umlauff fournit 12 spécimens provenant de l'île Maurice (2), de Mazatlán au Mexique (6), du Venezuela (1), de Saint-Thomas (1) et de la côte pacifique d'Amérique du sud (2). Sept spécimens japonais ont été vendus au musée par le comptoir Rolle. Le musée achète également neuf gorgones au comptoir Linnaea, lesquelles proviennent du bassin caraïbe (2), de Californie (3), du Mexique (1), d'Australie (1) et de Méditerranée (2). D'autres comptoirs vendent quelques spécimens au Musée zoologique de Strasbourg comme Damon avec deux gorgones des Bahamas.

La quasi-absence de gorgones provenant des expéditions scientifiques

La période allemande est marquée par quelques grandes expéditions océanographiques à travers le monde. Les Octocoralliaires, en particulier les Alcyons et les gorgones, prélevés lors de la Deutsche Tiefsee Expedition (1898-1899) à bord du Valdivia, ont été étudiés par le zoologiste allemand Willy Kükenthal (1919). La consultation du premier volume de Kükenthal (1919 : 19) nous apprend que les spécimens de gorgones de cette expédition ont été répartis dans plusieurs musées zoologiques allemands mais qu'aucun n'a été déposé dans celui de Strasbourg. Kükenthal a toutefois fourni deux spécimens de Cnidaires au musée (MZS Cni0040 et MZS Cni2100) ainsi que deux petits spécimens en alcool provenant de Ternate (entrés en 1894) enregistrés sous les numéros MZS Cni2262 et MZS Cni2276. L'examen rapide de ces bocaux dotés d'étiquettes semblables annotées « W. Kükenthal, Ternate 1894 », montre qu'ils ne contiennent pas de gorgones et qu'il s'agit d'un mélange non identifié de Scléractiniaires, d'Hydrozoaires et probablement de Bryozoaires.

En 1865, un spécimen venant d'Acapulco sur la côte pacifique du Mexique (MZS Cni0287) d'une gorgone réticulée initialement nommée *Leptogorgia agassizii* par Verrill 1864 et aujourd'hui affiliée au genre *Pacifigorgia* a été fourni par Louis Agassiz dont la notoriété est parvenue jusqu'à nous. Suisse de naissance, il est nommé professeur de zoologie et de géologie à l'université de Harvard en 1847 et est le premier zoologiste américain de réputation internationale. La collection du musée zoologique compte deux autres spécimens de *P. Agassizi* (MZS Cni0280 et MZS Cni0289) dont la date d'entrée, la localité et le collecteur ne sont pas précisés. Les étiquettes mentionnent respectivement *Leptogorgia* [*Rhipidogorgia*] et *Leptogorgia* [*Rhipidogorgia*] *agassizii* Verr.

La contribution de Ludwig Döderlein

Döderlein est l'un des premiers scientifiques occidentaux à pouvoir séjourner au Japon, entre fin 1879 et fin 1881 pour y enseigner à l'université de Tokyo et effectuer des recherches. A son retour il devient conservateur puis directeur du musée de 1882 à 1919. Lors de son séjour au Japon, il collecte extensivement des spécimens marins dans la baie de Sagami et dans les environs de Tokyo et ramène de son voyage plusieurs milliers de spécimens. En 1996, Teruaki Nishikawa a découvert à Strasbourg 42 spécimens de Cnidaires provenant de la collection Döderlein qui est aujourd'hui répartie entre la Zoologische Staatssammlung München et le musée zoologique. Il liste sept spécimens de gorgones dont deux non déterminés (Nishikawa, 1999). Il détaille aussi les origines géographiques et les collecteurs de l'ensemble de la collection d'An-

thozoaires du musée évaluée à 1936 spécimens au total, la collection constituée par Döderlein en rassemblant 35. Nishikawa dresse également la liste des types d'Anthozoaires conservés au musée. Les Coralliaires japonais ont été étudiés par le zoologiste suisse Théophile Studer (1845-1922) qui devient en 1878 le directeur des collections zoologiques du Muséum d'Histoire naturelle de Berne. En ce qui concerne les gorgones, la collection strasbourgeoise de Döderlein rassemble 12 spécimens du Japon et de Singapour (dont cinq en alcool) collectés entre 1879 et 1881, parmi lesquels l'holotype MZS Cni0061 de *Melithaea doederleini*. Ils ont été examinés en 2012 par la spécialiste japonaise Asako Matsumoto (Matsumoto, 2015 ; Matsumoto & van Ofwegen, 2015) et rassemblent huit genres : *Keratosis* (MZS Cni0049), *Melithaea* (MZS Cni0052, MZS Cni0057, MZS Cni0061, MZS Cni0235), *Acanella* MZS Cni0060), *Annella* (MZS Cni0078, MZS Cni0079), *Anthoplexaura* (MZS Cni0234), *Leptogorgia* (MZS Cni0319), *Menella* (MZS Cni0263) et probablement *Ellisella* (MZS Cni2066). Cependant les déterminations au niveau spécifique sont problématiques pour six exemplaires.

Description et aspect systématique de la collection de gorgones du Musée zoologique de Strasbourg

Généralités sur la collection

Dans la collection historique, il existe un MZS Cni0001 initialement nommé *Rhipidopathes flabellum* qui est en fait un Antipathaire (le genre *Rhipidopathes* correspond à *Rhipidipathes* Milne Edwards & Haime 1857). La liste des spécimens commence donc par le spécimen MZS Cni0002 dont l'étiquette ancienne a été détruite. D'autres spécimens examinés se sont révélés ne pas être des gorgones (Eponges, Hydrozoaires, Alcyonaires mous…) et ont été soustraits de cet inventaire. C'est le cas par exemple du spécimen MZS Cni0274 dont l'étiquette porte le nom de *Gorgonia oculata* et précise qu'il provient de Normandie alors qu'il s'agit très probablement de l'éponge *Haliclona oculata* (Linnaeus 1759). Certaines autres présumées gorgones n'ont pas été retrouvées et d'autres sont dans un état de conservation critique rendant toute identification impossible, comme le spécimen MZS Cni0004 dont il ne reste que la base du squelette mais dont les étiquettes attachées indiquent qu'il provient de l'institut zoologique d'Heidelberg et qu'il appartient à la collection japonaise. Globalement, la révision des gorgones retrouvées conduit à dresser une liste d'au moins 80 taxons différents (dont 67 nommés à l'espèce) répartis dans les trois sous-ordres de gorgones, 13 familles (dont une incertaine) et 51 genres (dont trois incertains) sous réserve d'une vérification ultérieure pour des taxons problématiques.

Les gorgones les plus spectaculaires, esthétiques ou précieuses sont bien représentées. Ce sont également souvent des taxons très communs et relativement faciles à collecter et transporter, bien que parfois encombrants. Deux d'entre eux ont une valeur marchande connue depuis longtemps puisqu'utilisés en bijouterie : le corail rouge de Méditerranée *Corallium rubrum* et le corail spongieux rouge (ou Gorgone noueuse) de l'Indopacifique tropical ouest *Melithaea ochracea*. Les sept espèces remarquables dans la collection du musée, soit par leurs effectifs, soit par leurs particularités sont les suivantes :

- *Gorgonia ventalina* (37 spécimens),
- *Eunicella verrucosa* (20 spécimens),
- *Leptogorgia palma* (18 spécimens),
- *Corallium rubrum* (15 spécimens),
- *Antillogorgia acerosa* (11 spécimens),
- *Melithaea ochracea* (6 spécimens),
- *Paragorgia arborea* (3 spécimens).

D'un point de vue taxinomique, notre révision prend en considération des modifications proposées par Philippot (2017) pour ce qui est des taxons caraïbes. Il s'agit de deux mises en synonymie concernant les couples d'espèces *Pterogorgia anceps* / *P. citrina* et *Gorgonia ventalina* / *G. flabellum*. Les Éventails de mer *G. flabellum* du musée ont été tous renommés *G. ventalina*. De plus, le genre endémique à la région caraïbe *Eunicea* Lamouroux 1816 a été scindé en deux genres *Eunicea* et *Euniceopsis* Verrill 1907 et cela concerne ici deux espèces de la collection.

Par ailleurs, les déterminations effectuées à Strasbourg en 1996 et 2012 par les experts japonais précités Namikawa et Matsumoto sur les gorgones du Japon (collection Döderlein) ont été respectées. Une partie du matériel examiné ayant contribué à la révision des gorgones de la famille des Melithaeidae (Matsumoto & van Ofwegen, 2015) provient du Musée zoologique de Strasbourg : l'holotype MZS Cni0061 de la nouvelle espèce *Melithaea*

doederleini Matsumoto & van Ofwegen 2015, MZS Cni0235 de *M. japonica* (Verrill 1865) et MZS Cni0057 de *M. undulata* (Kükenthal 1908).

Les types de gorgones signalés dans le rapport de Nishikawa (1999) sont les suivants :

• *Acanthomuricea australiensis* Hentschel 1903 (syn. *A. breviflora* Whitelegge 1897) [Grasshoff, 1999] ;
• *Acanthomuricea biserialis* Hentschel 1903 ;
• *Bebryce stellata* Hentschel 1903 (syn. *B. studeri* Whitelegge 1897) [Matsumoto, 2016] Le type a été réexaminé récemment en microscopie électronique (SEM) [Bayer & van Ofwegen, 2018] ;
• *Acabaria amboinensis* Hentschel 1903 (syn. *Melithaea laevis* Wright & Studer 1889) [Reijnen *et al.*, 2014]

Ce matériel conservé en alcool et initialement examiné par l'hydrobiologiste allemand Ernst Hentschel (1876-1945) provient d'Ambon situé dans le Pacifique ouest. Il a été confié à Döderlein par le zoologiste allemand Richard Wolfgang Semon à son retour d'expédition en Australie en 1893. Hentschel avait obtenu un court contrat d'assistant à l'institut de zoologie de Strasbourg et a décrit quatre nouvelles espèces dont trois mises en synonymie par la suite.

Enfin, le vaste genre *Leptogorgia* qui inclut les espèces de l'ancien genre *Lophogorgia* (mise en synonymie proposée par Grasshoff (1988: 97) est cosmopolite et représenté par au moins 55 espèces valides (Breedy & Guzman, 2007, 2008). Les espèces des côtes de l'Afrique de l'Ouest et du Pacifique ont été respectivement révisées par Grasshoff (1988) et Breedy & Guzman (2007). Dans la collection du musée, les étiquettes anciennes des gorgones désignées *Leptogorgia* ou correspondant (avec le nom de genre *Gorgonia*) à des *Leptogorgia* concernent 18 espèces mais cinq d'entre elles ont été basculées dans les genres *Pacifigorgia* (*P. agassizii* et *P. eximia*), *Pseudopterogorgia* (*P. australiensis*) ou *Filigorgia* (*F. sanguinolenta*). D'autres sont aujourd'hui non valides : *L. miniacea* (*nomen dubium*, voir Grasshoff, 1991), *cauliculus* (devenue *L. viminalis*), *L. pumicea* (devenue *L. punicea*). *L. sanguinolenta* Pallas 1766 à large variabilité morphologique (en particulier la coloration) est remise en question par Bayer (1961) et Grasshoff (1988). Le nom de l'espèce appelée *L. caryi* (Verrill 1868) (MZS Cni0291 dont la provenance de Californie n'est pas certaine) est un *nomen dubium* et *L. petechizans* (nom donné anciennement à MZS Cni0290 de l'Afrique de l'Ouest, MZS Cni0292 du Venezuela et MZS Cni0320) est un *nomen nudum* d'après Grasshoff (1988 : 114 ; 1992). Un travail particulier est par conséquent indispensable pour réviser les 58 représentants des *Leptogorgia* en collection (dont deux incertains et 23 non déterminés à l'espèce). Dans ce travail, seuls les spécimens ne présentant pas de difficulté particulière ont été identifiés (huit espèces dont deux douteuses) et certaines déterminations initiales douteuses n'ont pu être confirmées.

Liste taxinomique des gorgones représentées en collection

ORDRE ALCYONACEA (Lamouroux 1812)

Sous-Ordre des Calcaxonia Grasshoff 1999

? Famille Chrysogorgiidae Verrill 1883
- ? Genre *Chrysogorgia* Duchassaing & Michelotti 1864
  - ? *Chrysogorgia constricta* Hiles 1899

Famille Ellisellidae Gray 1859
- Genre *Ctenocella* Valenciennes 1855
  - *Ctenocella pectinata* (Pallas 1766)
- Genre *Dichotella* Gray 1870
  - *Dichotella gemmacea* (Milne Edwards & Haime 1857)
- Genre *Ellisella* Gray 1858
  - *Ellisella elongata* (Pallas 1766)
- Genre *Junceella* Valenciennes 1855
  - *Junceella juncea* (Pallas 1766)
- Genre *Nicella* Gray 1870
  - *Nicella carinata* Nutting 1910
- Genre *Verrucella* Milne Edwards & Haime 1857
  - *Verrucella* sp.
- Genre *Viminella* Gray 1870
  - *Viminella* sp.

Famille Isididae Lamouroux 1812
- Genre *Acanella* Gray 1870
  - *Acanella* sp.
- Genre *Isidella* Gray 1857
  - *Isidella elongata* (Esper 1788)
- Genre *Isis* Linnaeus 1858
  - *Isis hippuris* Linnaeus 1758
  - *Isis* sp.
- Genre *Keratoisis* Wright 1879
  - *Keratoisis japonica* Studer 1878
- Genre *Mopsea* Lamouroux 1816
  - *Mopsea dichotoma* (Linnaeus 1758)
- ? Genre *Sphaerokodisis* Alderslade 1998
  - ? *Sphaerokodisis australis* (Thomson & Mackinnon 1911)

Famille Primnoidae Milne Edwards 1857
Genre *Callogorgia* Gray 1858
Callogorgia verticillata (Pallas 1766)
Genre *Primnoa* Lamouroux 1812
Primnoa resedaeformis (Gunnerus 1763)
Genre *Thouarella* Gray 1870
Thouarella sp.

Sous-Ordre des Holaxonia Studer 1887

Famille Acanthogorgiidae Gray 1859
Genre *Acanthogorgia* Gray 1857
Acanthogorgia breviflora Whitelegge 1897
Acanthogorgia sp.

Famille Gorgoniidae Lamouroux 1812
Genre *Antillogorgia* Bayer 1951
Antillogorgia acerosa (Pallas 1766)
Genre *Eugorgia* Verrill 1868
Eugorgia aurantiaca (Horn 1860)
Genre *Eunicella* Verrill 1869
Eunicella albicans (Kölliker 1865)
Eunicella cavolinii (Koch 1887)
Eunicella singularis (Esper 1791)
Eunicella tricoronata Velimirov 1971
Eunicella verrucosa (Pallas 1766)
Genre *Filigorgia* Stiasny 1937
Filigorgia sanguinolenta (Pallas 1766)
Genre *Gorgonia* Linnaeus 1758
Gorgonia mariae Bayer 1961
Gorgonia ventalina Linnaeus 1758
Genre *Leptogorgia* Milne Edwards & Haime 1857
Leptogorgia californica Verrill 1868
Leptogorgia miniata (Milne Edwards & Haime 1857)
Leptogorgia palma (Pallas 1766)
Leptogorgia punicea (Milne Edwards & Haime 1857)
? *Leptogorgia purpurea* (Pallas 1767)
Leptogorgia sarmentosa (Esper 1791)
Leptogorgia viminalis (Pallas 1766)
? *Leptogorgia violacea* (Pallas 1766)
Leptogorgia sp.
Genre *Pacifigorgia* Bayer 1951
Pacifigorgia agassizii (Verrill 1864)
Pacifigorgia eximia (Verrill 1868)
Genre *Phyllogorgia* Milne Edwards & Haime 1850
Phyllogorgia dilatata (Esper 1806)
Genre *Pseudopterogorgia* Kükenthal 1919
Pseudopterogorgia australiensis (Ridley 1884)
Genre *Pterogorgia* Ehrenberg 1834
Pterogorgia anceps (Pallas 1766)
Pterogorgia guadalupensis Duchassaing & Michelin 1846
Genre *Rumphella* Bayer 1955
Rumphella aggregata (Nutting 1910)
Rumphella antipathies (Linnaeus 1758)
Rumphella sp.

Famille Plexauridae Gray 1859
Genre *Acanthomuricea* Hentschel 1903
Acanthomuricea biserialis Hentschel 1903
Genre *Anthoplexaura* Kükenthal 1908
Anthoplexaura dimorpha Kükenthal 1908
Genre *Bebryce* Philippi 1841
Bebryce studeri Whitelegge 1897
Bebryce sp.
Genre *Echinogorgia* Kölliker 1865
Echinogorgia umbratical (Esper 1791)
Echinogorgia sp.
Genre *Euniceopsis* Verrill 1907
Euniceopsis flexuosa (Lamouroux 1821)
Euniceopsis tourneforti (Milne Edwards & Haime 1857)
Genre *Euplexaura* Verrill 1865
Euplexaura sp.
Genre *Menella* Gray 1870
Menella indica (Ridley 1888)
Genre *Muricea* Lamouroux 1821
Muricea austera Verrill 1869
Muricea fruticosa Verrill 1869
Muricea muricata (Pallas 1766)
Muricea plantaginea (Valenciennes 1846)
Genre *Paramuricea* Kölliker 1865
Paramuricea placomus (Linnaeus 1758)
? Genre *Placogorgia* Wright & Studer 1889
? *Placogorgia* sp.
Genre *Plexaura* Lamouroux 1812
Plexaura homomalla (Esper 1792)
Genre *Plexaurella* Kölliker 1865
Plexaurella dichotoma (Esper 1791)
Plexaurella grisea Kunze 1916
Genre *Spinimuricea* Grasshoff 1992
Spinimuricea klaveneri (Carpine & Grasshoff 1975)
Genre *Trimuricea* Gordon 1926
Trimuricea sp.
Genre *Villogorgia* Duchassaing & Michelotti 1860
Villogorgia sp.

Sous-Ordre des Scleraxonia Studer 1887

Famille Anthothelidae Broch 1916
Genre *Lateothela* Moore, Alderslade & Miller 2017
Lateothela grandiflora (Tixier-Durivault & d'Hondt 1974)

Famille Coralliidae Lamouroux 1812
Genre *Corallium* Cuvier 1798
? *Corallium japonicum* Kishinouyi 1903

Corallium rubrum (Linnaeus 1758)

Famille Melithaeidae Gray 1870

Genre *Melithaea* Milne Edwards 1857

Melithaea albitincta (Ridley 1884)

Melithaea aurantia (Esper 1798)

Melithaea doederleini Matsumoto & van Ofwegen 2015

Melithaea japonica (Verrill 1865)

Melithaea laevis Wright & Studer 1889

Melithaea ochracea (Linnaeus 1758)

Melithaea undulata (Kükenthal 1908)

Melithaea virgate (Verrill 1846)

Famille Paragorgiidae Kükenthal 1916

Genre *Paragorgia* Milne Edwards 1857

Paragorgia arborea (Linnaeus 1758)

Famille Parisididae Aurivillius 1931

Genre *Parisis* Verrill, 1864

? *Parisis minor* Wright & Studer 1889

Famille Subergorgiidae Gray 1859

Genre *Subergorgia* Gray 1859

Subergorgia sp.

Genre *Annella* Gray 1858

Annella reticulata (Ellis & Solander 1786)

Annella sp.

Les provenances géographiques des gorgones en collection

Distribution géographique mondiale de la collection

Dans la collection du Musée zoologique de Strasbourg, la provenance est renseignée pour 171 spécimens. Presque toutes les régions du monde sont représentées et l'on peut considérer huit zones géographiques (**Fig. 11**). Les effectifs varient en fonction des zones (**Fig. 12**) et trois d'entre elles sont bien représentées : le bassin caraïbe (zone 7) avec 65 spécimens (localités précisées pour 30 d'entre eux), le bassin méditerranéen (zone 2) avec 51 spécimens (localités précisées pour 37 d'entre eux), le Pacifique ouest (zone 5) avec 38 spécimens (dotés de noms de lieux). Nous accorderons une attention particulière aux gorgones caraïbes et méditerranéennes, ainsi qu'aux gorgones du Japon et de Singapour, parce que ces quatre lots sont numériquement bien représentés dans les collections du musée.

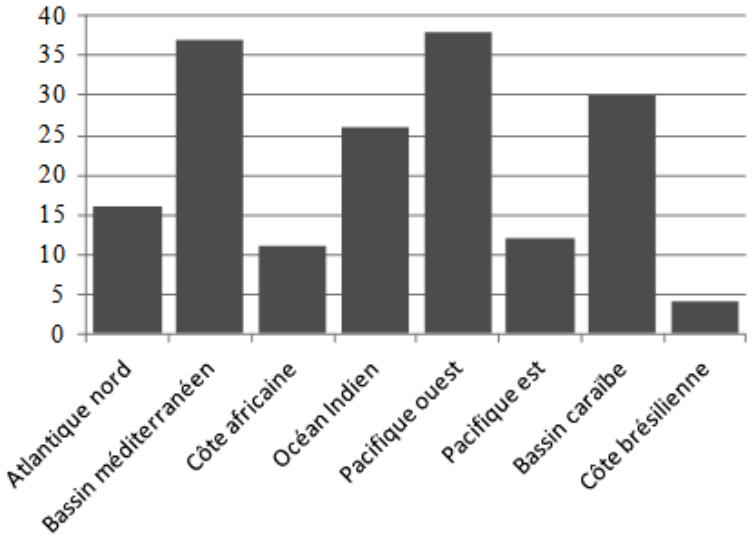

Fig. 12. Répartition géographique des gorgones du musée à partir des informations exclusivement apportées par les étiquettes associées aux spécimens.

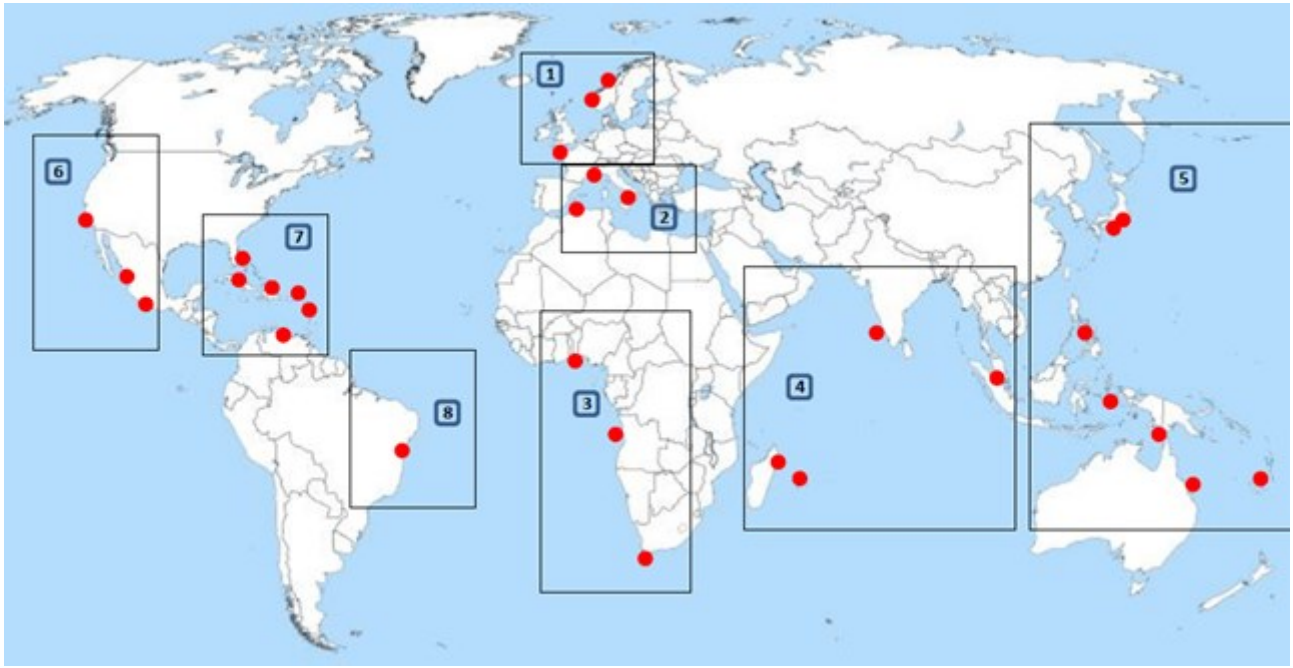

Fig. 11. Distribution mondiale des localités mentionnées pour la collection de gorgones du Musée zoologique de Strasbourg. Zone 1 : Atlantique nord, zone 2 : Bassin méditerranéen, zone 3 : côte africaine ouest et sud, zone 4 : Océan Indien, zone 5 : Pacifique ouest, zone 6 : Pacifique est, zone 7 : Bassin caraïbe, zone 8 : côte brésilienne.

Les gorgones du bassin caraïbe (zone 7)

Trente gorgones dont les localités d'origine sont indiquées proviennent de cette région du monde réputée pour son fort taux d'endémisme et il faut rajouter 35 spécimens sans indication d'origine géographique mais appartenant à des taxons endémiques des Caraïbes. Ils correspondent à 12 espèces différentes. Les deux premiers spécimens caraïbes arrivés, sous les noms *Muricea spicifera* (MZS Cni0094 de Cuba) et *Gorgonia citrina* (MZS Cni0273) sont entrés dès 1829, peu après la naissance du musée d'Histoire naturelle de Strasbourg et ont été donnés par le Muséum de Paris. L'année suivante, Esmangart a fait don de l'Éventail de mer caraïbe MZS Cni0347. Puis, la plume de mer MZS Cni0312 anciennement nommée *Gorgonia [Pterogorgia] setosa* est entrée en 1845. Elle provient de la Guadeloupe d'où elle a été rapportée par le capitaine d'infanterie de marine Louis-Philippe Caternault. Il existait en effet déjà des échanges précoces d'objets naturels depuis les débuts de la colonisation française et bien avant que des naturalistes ne s'attachent à inventorier scientifiquement les gorgones des îles, même si Peyssonnel, qui a découvert la nature animale des lithophytes, a résidé en Guadeloupe la majeure partie de sa vie (Philippot, 2013). Parmi la collection du musée, un Éventail de mer (MZS Cni0358) et une gorgone arborescente *Plexaura salicornoides* (MZS Cni0090) proviennent de l'île de Saint-Thomas (Iles Vierges des États-Unis) via respectivement les comptoirs Umlauff (1888) et Schneider. On peut s'interroger sur l'existence d'un lien avec le naturaliste et médecin créole Placide Duchassaing de Fontbressin (1819-1873) résidant en Guadeloupe et qui a constitué les premières collections et études publiées (citons son mémoire de 1860) des gorgones des Petites Antilles françaises. Une partie des spécimens de ses collections a été collectée sur l'île de Saint-Thomas. La collection Duchassaing est distribuée dans plusieurs musées d'Europe (Volpi & Benvenuti, 2003) et une partie a été achetée par le Muséum de Paris en 1868 (d'Hondt & d'Hondt, 2001). Une autre gorgone (MZS Cni0276) récoltée en Floride a été donnée en 1865 par Louis Agassiz, probablement avec le spécimen d'Acapulco MZS Cni0287. Il s'agit d'une “gorgone ailée” initialement nommée *Gorgonia [Xiphigorgia] anceps* mais qui est l'unique représentante à Strasbourg d'une gorgone peu commune (Philippot, 2017) décrite par Duchassaing & Michelin en 1846 sous le nom de *Pterogorgia guadalupensis*.

Les gorgones du bassin méditerranéen (zone 2)

Les étiquettes indiquent un lieu de collecte en Méditerranée (avec des localités parfois assez précises comme « Marseille ») pour 37 spécimens mais il faut rajouter 14 spécimens sans localisation et correspondant à des espèces dont l'aire de répartition est typiquement méditerranéenne. *Eunicella verrucosa* est une espèce vivant aussi bien en Méditerranée que sur les côtes bretonnes, et seuls les spécimens dont l'étiquette indique un lieu méditerranéen sont comptabilisés ici. Le lot de gorgones méditerranéennes est peu diversifié avec 10 espèces, parmi lesquelles le corail rouge *Corallium rubrum* est représenté par 15 exemplaires. Ces derniers ont été rapportés en particulier de Naples, de Nice, de l'Ile Sainte-Marguerite au large de Cannes et d'Algérie. Deux de ces spécimens précieux sont un héritage de Jean Hermann et 10 ne présentent pas de date d'entrée au musée. Les gorgones peu profondes de Méditerranée sont essentiellement représentées en collection par 17 Eunicelles (trois espèces communes) et huit *Leptogorgia sarmentosa*.

Les gorgones du Japon (zone 5 : Pacifique ouest) et de Singapour (zone 4 : Océan Indien)

La collection de 20 gorgones du Japon (la provenance est incertaine pour deux d'entres elles) a été essentiellement fournie par Döderlein en 1881 avec neuf spécimens dont un holotype et le comptoir Rolle avec sept spécimens en 1891. L'ensemble renferme une dizaine de genres différents mais beaucoup de spécimens n'ont pu être déterminés à l'espèce. Il est intéressant de constater que le spécimen MZS Cni0123 fourni par C.A. Pölh (1849), ainsi que les spécimens MZS Cni0129, MZS Cni0130, MZS Cni0131 fournis par Rolle (1898), ont été initialement nommés *Corallium rubrum*. Il s'agit probablement de *Corallium japonicum* [2].

Mieux renseignée, la collection de 19 gorgones de Singapour a surtout été constituée via le comptoir Gustav Schneider (1876, 1889 et 1897) avec 15 spécimens et trois autres proviennent des collectes de Döderlein (1881). Cette collection riche en Ellisellidae et Melithaeidae renferme neuf genres et huit espèces identifiées.

Conclusion

La révision de la collection de gorgones du Musée zoologique de Strasbourg, riche de 288 spécimens et 67 espèces identifiées, est présentée

2. Cette espèce était auparavant nommée *Paracorallium japonicum*. Le genre *Paracorallium* a été proposé par Bayer & Cairns (2003) puis récemment mis en synonymie avec *Corallium* (Tu *et al.*, 2016). Les premières colonies de *Paracorallium* ont été découvertes dans le Pacifique, au large du Japon, au début des années 1800 mais cette ressource matérielle n'a été exploitée qu'à partir des années 1870.

ici deux siècles après la création du musée d'Histoire naturelle de Strasbourg. A cette époque, le fonds de collection n'était pas dépourvu de toute gorgone puisque le musée héritait du très riche cabinet de Jean Hermann. Celui-ci possédait au moins cinq des fragiles organismes qui sont parvenus jusqu'à nous. Néanmoins, les acquisitions d'objets naturels, en particulier des Cnidaires, sont largement concentrées sur la période allemande et résultent d'efforts de collectes ou d'achats déployés par des personnages tels que Ludwig Döderlein lorsqu'il dirigeait l'établissement. L'intérêt historique de la collection est important. En effet, la révélation de l'histoire de chaque spécimen conservé, si les informations associées sont suffisantes, contribue à préciser le jeu des différents acteurs qui œuvrent à la construction collective de savoirs en sciences naturelles. Collecter, transporter, nommer et classer les gorgones de toutes les contrées du monde mobilisent des compétences et des fonctions qui relèvent d'activités et de réseaux oubliés et surtout témoignent des visions passées de l'Homme face à la faune marine. La riche nomenclature utilisée pour nommer les gorgones de la collection du musée montre qu'elle est en perpétuelle évolution dans le temps et que les noms tombés en désuétude sont autant de témoins d'une autre époque qu'il serait dommage de négliger. Comme pour tout le règne du vivant, les noms des taxons sont attachés à des noms d'experts, lesquels sont peu nombreux dans le domaine des gorgones. Si les acteurs de l'histoire de la collection du Musée zoologique de Strasbourg sont bien mis en évidence par cette étude, il est encore difficile de se représenter les réseaux tissés entre lieux dédiés à la conservation à une échelle plus vaste. La nécessité d'une vision d'ensemble implique d'autres révisions de collections de gorgones, en particulier celles du Muséum national d'Histoire naturelle (Paris) et de grands muséums de province tels les muséums d'Histoire naturelle de Lyon et de Marseille pour lesquels les révisions sont programmées à court terme. Notre étude met aussi en exergue la grande diversité géographique de la collection avec pas moins de huit grandes régions maritimes représentées. A une époque où les voyages lointains étaient réservés à certaines corporations professionnelles, l'acquisition d'objets exotiques reposait sur une politique franchement volontariste des musées, celui de Strasbourg en particulier, que ce soit pour le prestige français ou allemand. Les histoires des gorgones conservées aujourd'hui à Strasbourg croisent les histoires de particuliers, dont quelques Alsaciens partis exercer leurs activités loin de leur terre natale.

Au-delà de sa valeur patrimoniale, la collection du Musée zoologique de Strasbourg contribue à garder la mémoire des époques révolues dans un contexte de changement de la biodiversité important, tant dans les présences et abondances que dans les assemblages de taxons. Les gorgones conservées au musée et dans tous les autres musées d'Histoire naturelle sont autant de témoins de la biodiversité marine avant que les activités anthropiques n'affectent fortement les écosystèmes benthiques à partir du XX^{e} siècle. Les modalités de mise en collection d'objets de la nature tels que les gorgones qui ont longtemps échappé à la vue et la compréhension de l'Homme livrent aussi des données ethnobiologiques. La révision de la collection de gorgone du musée est une étape de plus, après celle qui a ciblé la collection du muséum de Nice, pour contribuer à mettre en lumière l'histoire globale de nos rapports avec des épibiontes qui fascinent et interrogent depuis la nuit des temps.

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Annexe

Numéro Inventaire	Ancienne détermination	Nouvelle détermination 2019	Famille	Date d'entrée	Collecteur/ vendeur	Origine géographique	Nature conservation
MZS Cni0002		*Leptogorgia* sp.	Gorgoniidae				
MZS Cni0049	*Keratoisis japonica*	*Keratosis japonica* Studer 1878	Isididae	1879/81	Döderlein Ludwig	Japan, Sagamibai	en alcool
MZS Cni0052	*Mopsea*	*Melithaea* sp. /*Melithaea japonica* (Verrill 1865)	Melithaeidae	1879/81	Döderlein Ludwig	Sagamibai	en alcool
MZS Cni0053	*Isidella elongata*	*Isidella elongata* (Esper 1788)	Isididae	1921	Stazione Zoologica Napoli	Naples?	en alcool
MZS Cni0054	*Mopsea*	*Isis hippuris* Linnaeus 1758	Isididae				à sec
MZS Cni0055	*Isis moniliformis*	? *Isis hippuris* Linnaeus 1758	Isididae				à sec
MZS Cni0056	*Mopsea*	? *Sphaerokodisis australis* (Thomson & Mackinnon 1911)	Isididae			Australien	en alcool
MZS Cni0057	*Mopsea*	*Melithaea* sp.	Melithaeidae	1879/81	Döderlein Ludwig	Sagamibai	en alcool
MZS Cni0058	*Mopsea dichotoma*	*Mopsea dichotoma* (Linnaeus 1758)	Isididae				à sec
MZS Cni0059	*Primnoa verticillaris*	*Callogorgia verticillata* (Pallas 1766)	Primnoidae	1889	Museum Darmstadt	Mittelmeer	à sec
MZS Cni0060	*Mopsea*	*Acanella* sp.	Isididae	1879/81	Döderlein Ludwig	Japan, Sagamibai	en alcool
MZS Cni0061	*Mopsea* HOLOTYPE	*Melithaea doederleini* Matsumoto & van Ofwegen 2015	Melithaeidae	1879/81	Döderlein Ludwig	Japan, Sagamibai	en alcool
MZS Cni0062	*Mopsea elongata*	*Isidella elongata* (Esper 1788)	Isididae	1881	Stazione Zoologica Napoli	Neapel	en alcool
MZS Cni0063	*Primnoa lepadifera*	*Primnoa resedaeformis* (Gunnerus 1763)	Primnoidae			Bucht von Drontheim	à sec
MZS Cni0064	*Primnoa lepadifera*	*Primnoa resedaeformis* (Gunnerus 1763)	Primnoidae			Bucht von Drontheim	à sec
MZS Cni0065	*Primnoa lepadifera*	*Primnoa resedaeformis* (Gunnerus 1763)	Primnoidae	1885	Schneider Gustav	Throndhjemsfjorden 60 Faden	à sec
MZS Cni0066	*Primnoa verticillaris*	*Callogorgia verticillata* (Pallas 1766)	Primnoidae	1889	Linnaea	Mittelmeer	à sec
MZS Cni0067	*Primnoa* sp.	*Callogorgia verticillata* (Pallas 1766)	Primnoidae		Schmidt	Helgoland	à sec
MZS Cni0068	*Primnoa verticillaris*	*Callogorgia verticillata* (Pallas 1766)	Primnoidae			Mittelmeer	à sec
MZS Cni0069	*Primnoa resedaeformis*	*Primnoa resedaeformis* (Gunnerus 1763)		sept 1909	Gisselbrecht	Bergen	en alcool
MZS Cni0070	*Plumarella hilgendorfi*	*Thouarella* sp.	Primnoidae	1891	Rolle	Japan, Yokohama	à sec
MZS Cni0071	*Plumarella hilgendorfi*	*Thouarella* sp.	Primnoidae	1889	Museum Heidelberg	Japan	à sec
MZS Cni0072	*Chrysogorgia constricta*	? *Chrysogorgia constricta* Hiles 1899	Chrysogorgiidae			Ambon	en alcool
MZS Cni0073	*Juncella gemmacea*	*Dichotella gemmacea* (Milne Edwards & Haime 1857)	Ellisellidae	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0074	*Juncella vimen var. alba*	? *Viminella* sp.	Ellisellidae	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0075	*Juncella juncea var. alba*	*Junceella juncea* (Pallas 1766)	Ellisellidae	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0076	*Juncella*	*Subergorgia* sp.	Subergorgiidae				à sec
MZS Cni0077	*Juncella gemmacea*	*Dichotella gemmacea* (Milne Edwards & Haime 1857)	Ellisellidae	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0078	*Juncella*	*Annella* sp.	Subergorgiidae	1879/81	Döderlein Ludwig	Singapur	à sec
MZS Cni0079	*Juncella*	*Annella* sp.	Subergorgiidae	1879/81	Döderlein Ludwig	Singapur	à sec
MZS Cni0080	*Juncella*	*Viminella* sp.	Ellisellidae				à sec
MZS Cni0081	*Juncella elongata*	*Ellisella elongata* (Pallas 1766)	Ellisellidae	1834		Algier	à sec
MZS Cni0082	*Ctenocella pectinata*	*Ctenocella pectinata* (Pallas 1766)	Ellisellidae	05/1897	Schneider Gustav	Singapore	à sec

Numéro Inventaire	Ancienne détermination	Nouvelle détermination 2019	Famille	Date d'entrée	Collecteur/ vendeur	Origine géographique	Nature conser-vation
MZS Cni0083	*Muricea chamaelleon*	*Isidella elongata* (Esper 1788)	**Isididae**	1921	Stazione Zoologica Napoli	Naples	en alcool
MZS Cni0084	*Muricea fruticosa*	*Muricea fruticosa* Verrill 1869	**Plexauridae**	1888	Umlauff	Mazatlan	à sec
MZS Cni0085	*Ctenocella pectinata*	*Ctenocella pectinata* (Pallas 1766)	**Ellisellidae**	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0086	*Echinogorgia pseudora*	? *Echinogorgia* sp.	**Plexauridae**			Ambon	en alcool
MZS Cni0087	*Muricea lima*	*Muricea muricata* (Pallas 1766)	**Plexauridae**	1888	Damon Robert	Bahama-Ins.	à sec
MZS Cni0088	*Muricea apressa*	*Muricea plantaginea* (Valenciennes 1846)	**Plexauridae**	1888	Umlauff	Mazatlan	à sec
MZS Cni0089	*Muricea austera*	*Muricea austera* Verrill 1869	**Plexauridae**	1888	Umlauff	Mazatlan	à sec
MZS Cni0090	*Plexaura salicornoides*	*Eunicea flexuosa* (Lamouroux 1821)	**Plexauridae**		Schneider Gustav	St Tomas	à sec
MZS Cni0091	*Muricea apressa*	*Muricea plantaginea* (Valenciennes 1846)	**Plexauridae**	1888	Umlauff	Mazatlan	à sec
MZS Cni0092	*Plexauroides indica*	*Menella indica* Gray 1870	**Plexauridae**	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0093	*Plexaura antipathes*	*Rumphella antipathes* (Linnaeus 1758)	**Gorgoniidae**		Semon Richard	Ambon	en alcool
MZS Cni0094	*Muricea spicifera*	*Eunicea tourneforti* Milne Edwards & Haime 1857	**Plexauridae**	1829	Museum Paris	Cuba	à sec
MZS Cni0095	*Plexaura homomalla*	*Plexaura homomalla* (Esper 1792)	**Plexauridae**	1865	Agassiz Louis	Florida	à sec
MZS Cni0096	*Euplexaura antipathes*	*Euplexaura* sp.	**Plexauridae**				à sec
MZS Cni0097	*Plexaura rhipidalis*	*Eunicea flexuosa* (Lamouroux 1821)	**Plexauridae**			Bahama-Ins.	à sec
MZS Cni0098	*Plexaura suffruticosa*	*Rumphella aggregata* Nutting 1910	**Gorgoniidae**	1871	Museum Go-deffroy	Viti-Insel	à sec
MZS Cni0099	*Plexaura flexuosa*	*Eunicea flexuosa* (Lamouroux 1821)	**Plexauridae**	1889	Linnaea	Haiti	à sec
MZS Cni0100	*Paramuricea placomus*	*Paramuricea placomus* (Linnaeus 1758)	**Plexauridae**	1885	Schneider Gustav	Thron-dhjemsfjorden, 40 Faden	à sec
MZS Cni0101	*Bebryce stellata*	*Bebryce studeri* Whitelegge 1897	**Plexauridae**		(Semon)	Ambon	en alcool
MZS Cni0102	*Acanthomuricea biserialis* **TYPE**	*Acanthomuricea biserialis* Hentschel 1903	**Plexauridae**		Semon Richard	Ambon	en alcool
MZS Cni0103	*Acanthogorgia australiensis*	*Acanthogorgia breviflora* Whitelegge 1897	**Plexauridae**		Semon Richard	Ambon	en alcool
MZS Cni0104	*Melithea ochracea*	*Melithaea ochracea* Linnaeus 1758	**Melithaeidae**	1889	Schneider Gustav	Singapur	à sec
MZS Cni0105	*Acabaria amboinensis*	*Melithaea laevis* Wright & Studer 1889	**Melithaeidae**		Semon Richard	Ambon	en alcool
MZS Cni0106	*Parisis minor*	*? Parisis minor* Wright & Studer 1889	**Parasididae**		Semon Richard	Ambon	en alcool
MZS Cni0107	*Acanthogorgia australiensis*	*Acanthogorgia breviflora* Whitelegge 1897	**Plexauridae**	1893	Semon Richard	Ambon	en alcool
MZS Cni0108	*Melithea virgata*	*Melithaea virgata* (Verrill 1846)	**Melithaeidae**				à sec
MZS Cni0109	*Melithea*	*Melithaea* sp.	**Melithaeidae**	1889	Schneider Gustav	Singapur	à sec
MZS Cni0110	*Melitodes albitincta*	*Melithaea albitincta* (Ridley 1884)	**Melithaeidae**	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0111	*Melitella coccinea*	*Melithaea aurantia* (Esper 1798)	**Melithaeidae**	1889	Linnaea	Australien	à sec
MZS Cni0112	*Melithea ochracea*	*Melithaea ochracea* Linnaeus 1758	**Melithaeidae**	1876	Schneider Gustav	Singapur	à sec
MZS Cni0113	*Mopsella aurantiaca*	*Melithaea aurantia* (Esper 1798)	**Melithaeidae**	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0114	*Melithea ochracea*	*Melithaea aurantia* (Esper 1798)	**Melithaeidae**	1878	Museum Godefroy	Viti-Insel	à sec
MZS Cni0115	*Melithea ochracea*	*Melithaea ochracea* Linnaeus 1758	**Melithaeidae**		Krieger M.	Neu-Caledonien	à sec
MZS Cni0116	*Melithea ochracea*	*Melithaea ochracea* Linnaeus 1758	**Melithaeidae**		Conrad G.	Bourbon	à sec
MZS Cni0117	*Melithea ochracea*	*Melithaea ochracea* Linnaeus 1758	**Melithaeidae**	1889	Schneider Gustav	Singapur	à sec
MZS Cni0118	*Melithea ochracea*	*Melithaea ochracea* Linnaeus 1758	**Melithaeidae**		Krieger M.	Neu-Caledonien	à sec
MZS Cni0119	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	**Coralliidae**	1841	Merk	Nizza	à sec
MZS Cni0120	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	**Coralliidae**		Stazione Zoologica Napoli	Naples	à sec
MZS Cni0121	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	**Coralliidae**				en alcool
MZS Cni0122	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	**Coralliidae**			Méditerranée	à sec
MZS Cni0123	*Corallium rubrum*	? *Corallium japonicum* Kishinouyi 1903	**Coralliidae**	1849	Pöhl C.A.	Japan	à sec
MZS Cni0124	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	**Coralliidae**		Myèvre Alexandre	Algérie	à sec
MZS Cni0125	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	**Coralliidae**			Mittelmeer	à sec
MZS Cni0126	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	**Coralliidae**	1888	Pöhl C.A.	Goldküste (Afrika)	à sec
MZS Cni0127	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	**Coralliidae**				à sec

Numéro Inventaire	Ancienne détermination	Nouvelle détermination 2019	Famille	Date d'entrée	Collecteur/vendeur	Origine géographique	Nature conser-vation
MZS Cni0128	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	Coralliidae	15/05/1885		Iles Ste Margueritte	à sec
MZS Cni0129	*Corallium rubrum*	? *Corallium japonicum* Kishinouyi 1903	Coralliidae	1898	Rolle	Japan	à sec
MZS Cni0130	*Corallium rubrum*	? *Corallium japonicum* Kishinouyi 1903	Coralliidae	1891	Rolle	Nagasaki (Japan)	à sec
MZS Cni0131	*Corallium rubrum*	? *Corallium japonicum* Kishinouyi 1903	Coralliidae	1891	Rolle	Nagasaki (Japan)	à sec
MZS Cni0132	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	Coralliidae				à sec
MZS Cni0134	*Paragorgia arborea*	*Paragorgia arborea* (Linnaeus 1758)	Paragorgiidae	1885	Schneider Gustav	Throndhjemsfjorden, 150 Faden	en alcool
MZS Cni0135	*Paragorgia arborea*	*Paragorgia arborea* (Linnaeus 1758)	Paragorgiidae			Bucht von Drondheim	en alcool
MZS Cni0138	*Briareum grandiflorum*	*Lateothela grandiflora* (Tixier-Durivault & d'Hondt 1974)	Anthothelidae	1885	Schneider Gustav	Throndheim, 150 Faden	en alcool
MZS Cni0233	*Eunicella albicans*	*Eunicella albicans* (Kölliker 1865)	Gorgoniidae	1860	Schimper	Cap der guten Hoffnung	à sec
MZS Cni0234		*Anthoplexaura dimorpha* Kükenthal 1908	Plexauridae	1879/81	Döderlein Ludwig	Enoshima	à sec
MZS Cni0235		*Melithaea japonica* (Verrill 1865)	Melithaeidae	1879/81	Döderlein Ludwig	Sagamibai	à sec
MZS Cni0236	*Verrucella*	*Nicella carinata* Nutting 1910	Ellisellidae				à sec
MZS Cni0237	*Verrucella*	*Nicella carinata* Nutting 1910	Ellisellidae		Ancien cabinet	Bourbon	à sec
MZS Cni0238	*Gorgonia verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae		Myèvre Alexandre	Roscoff	à sec
MZS Cni0239	*Gorgonia verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae	1933	Schweizer Albert	Roscoff	à sec
MZS Cni0240	*Gorgonia placomus*	*Spinimuricea klaveneri* (Carpine & Grasshoff 1975)	Plexauridae		Myèvre Alexandre	Nice	à sec
MZS Cni0241	*Gorgonia verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae		Myèvre Alexandre	Roscoff	à sec
MZS Cni0242	*Gorgonia verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae	1879	Schmidt Oskar	Marseille	à sec
MZS Cni0243	*Eunicella verrucosa*	*Eunicella singularis* (Esper 1791)	Gorgoniidae		Stazione Zoologica Napoli	Neapel	en alcool
MZS Cni0244	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae			Mittelmeer	à sec
MZS Cni0245	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae			Oran	à sec
MZS Cni0246	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0247	*Gorgonia verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae		Myèvre Alexandre	Roscoff	à sec
MZS Cni0248	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0249	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae			Oran	à sec
MZS Cni0250	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae	avant 1924			à sec
MZS Cni0251	*Eunicella verrucosa*	*Eunicella singularis* (Esper 1791)	Gorgoniidae				à sec
MZS Cni0252	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0253	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae	1836	Voltz Philippe	Nizza	à sec
MZS Cni0254	*Eunicella verrucosa*	*Eunicella singularis* (Esper 1791)	Gorgoniidae			Nizza	à sec
MZS Cni0255	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0256	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae	1860		Mittelmeer	à sec
MZS Cni0257	*Gorgonia verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae		Myèvre Alexandre	Roscoff	à sec
MZS Cni0258	*Eunicella graminea*	*Eunicella singularis* (Esper 1791)	Gorgoniidae				à sec
MZS Cni0259	*Eunicella graminea*	*Eunicella singularis* (Esper 1791)	Gorgoniidae				à sec
MZS Cni0260	*Eunicella graminea*	*Eunicella singularis* (Esper 1791)	Gorgoniidae				à sec
MZS Cni0261	*Eunicella graminea*	*Eunicella singularis* (Esper 1791)	Gorgoniidae	1889	Linnaea	Adriatisches Meer	à sec
MZS Cni0262	*Eunicella venosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae			Oran	à sec
MZS Cni0263	*Eunicea*	*Menella indica* Gray 1870	Plexauridae	1879/81	Döderlein Ludwig	Singapur	à sec
MZS Cni0264	*Eunicella venosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae			Oran	à sec
MZS Cni0265	*Eunicella venosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0267	*Gorgonella stricta var. alba*	*Verrucella* sp.	Ellisellidae	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0268	*Gorgonella stricta*	*Verrucella* sp.	Ellisellidae	05/1897	Schneider Gustav	Singapore	à sec
MZS Cni0269	*Eugorgia aurantiaca*	*Eugorgia aurantiaca* (Horn 1860)	Gorgoniidae	1888	Umlauff	Mazatlan	à sec
MZS Cni0270	*Gorgonia placomus*	*Spinimuricea klaveneri* (Carpine & Grasshoff 1975)	Plexauridae		Myèvre Alexandre	Nice	à sec
MZS Cni0271	*Gorgonia* sp.	*Villogorgia* sp.	Plexauridae		Umlauff	Mauritius	à sec
MZS Cni0272	*Gorgonia cf. citrina*	*Pterogorgia anceps* (Pallas 1766)	Gorgoniidae			West-Indien?	à sec

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MZS Cni0273	*Gorgonia cf. citrina*	*Pterogorgia anceps* (Pallas 1766)	Gorgoniidae	1829	Museum Paris	West-Indien?	à sec
MZS Cni0275	*Gorgonia placomus*	*Spinimuricea klaveneri* (Carpine & Grasshoff 1975)	Plexauridae		Myèvre Alexandre	Nice	à sec
MZS Cni0276	*Gorgonia anceps*	*Pterogorgia guadalupensis* Duchassaing & Michelin 1846	Gorgoniidae	1865	Agassiz Louis	Florida	à sec
MZS Cni0277	*Gorgonia americana*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae			Florida	à sec
MZS Cni0278	*Gorgonia anceps*	*Pterogorgia guadalupensis* Duchassaing & Michelin 1846	Gorgoniidae	1888	Damon Robert	Bahama Insel	à sec
MZS Cni0279	*Leptogorgia australiensis*	*Pseudopterogorgia australiensis* (Ridley 1884)	Gorgoniidae		Semon Richard	Thursday Insel	à sec
MZS Cni0280	*Leptogorgia*	*Pacifigorgia agassizii* (Verrill 1864)	Gorgoniidae				à sec
MZS Cni0281	*Leptogorgia cf. miniacea*	*Leptogorgia* sp.	Gorgoniidae				à sec
MZS Cni0282	*Leptogorgia miniata*	*Leptogorgia miniata* (Milne Edwards & Haime 1857)	Gorgoniidae			Antillen	à sec
MZS Cni0283	*Leptogorgia viminalis*	*Leptogorgia sarmentosa* (Esper 1791)	Gorgoniidae			Oran	à sec
MZS Cni0284	*Leptogorgia viminalis*	*Leptogorgia sarmentosa* (Esper 1791)	Gorgoniidae			Oran	à sec
MZS Cni0285	*Leptogorgia californica*	*Leptogorgia californica* Verrill 1868	Gorgoniidae		Umlauff	Mazatlan	à sec
MZS Cni0286	*Leptogorgia*	*Leptogorgia californica* Verrill 1868	Gorgoniidae				à sec
MZS Cni0287	*Leptogorgia agassizii*	*Pacifigorgia agassizii* (Verrill 1864)	Gorgoniidae	1865	Agassiz Louis	Acapulco	à sec
MZS Cni0288	*Leptogorgia purpurea*	? *Leptogorgia purpurea* (Pallas 1767)	Gorgoniidae		Linnaea	Mexico	à sec
MZS Cni0289	*Leptogorgia agassizii*	*Pacifigorgia agassizii* (Verrill 1864)	Gorgoniidae				à sec
MZS Cni0290	*Leptogorgia petechizans*	*Leptogorgia* sp.	Gorgoniidae	1889	Pöhl C.A.	West-Afrika	à sec
MZS Cni0291	*Leptogorgia caryi*	*Leptogorgia* sp.	Gorgoniidae			Californien?	à sec
MZS Cni0292	*Leptogorgia petechizans*	*Leptogorgia* sp.	Gorgoniidae	1888	Umlauff	Venezuella, Puerto Cabello	à sec
MZS Cni0293	*Leptogorgia*	*Leptogorgia* sp.	Gorgoniidae				à sec
MZS Cni0294	*Leptogorgia flexilis*	*Leptogorgia* sp.	Gorgoniidae	1889	Linnaea	Californien	à sec
MZS Cni0295	*Leptogorgia flexilis*	*Leptogorgia* sp.	Gorgoniidae	1887	Linnaea	Californien	à sec
MZS Cni0296	*Leptogorgia viminalis*	*Leptogorgia sarmentosa* (Esper 1791)	Gorgoniidae			Oran	à sec
MZS Cni0297	*Leptogorgia flexilis*	*Leptogorgia* sp.	Gorgoniidae		Linnaea	Californien	à sec
MZS Cni0298	*Leptogorgia pumicea*	*Leptogorgia punicea* (Milne Edwards & Haime 1857)	Gorgoniidae	1879		Brasilien	à sec
MZS Cni0299	*Leptogorgia pumicea*	*Leptogorgia punicea* (Milne Edwards & Haime 1857)	Gorgoniidae	1874	Museum Zurich	Brasilien	à sec
MZS Cni0300	*Leptogorgia miniata*	*Leptogorgia miniata* (Milne Edwards & Haime 1857)	Gorgoniidae				à sec
MZS Cni0301	*Leptogorgia eximia*	*Pacifigorgia eximia* (Verrill 1868)	Gorgoniidae	1888	Umlauff	Westl. Süd-Amerika	à sec
MZS Cni0302	*Leptogorgia eximia*	*Pacifigorgia eximia* (Verrill 1868)	Gorgoniidae	1888	Umlauff	Westl. Süd-Amerika	à sec
MZS Cni0303	*Leptogorgia violacea*	? *Leptogorgia violacea* (Pallas 1766)	Gorgoniidae			Antillen	à sec
MZS Cni0304	*Leptogorgia sarmentosa*	*Leptogorgia sarmentosa* (Esper 1791)	Gorgoniidae	1889	Museum Darmstadt	Mittelmeer	à sec
MZS Cni0305	*Leptogorgia sanguinolenta*	*Filigorgia sanguinolenta* (Pallas 1766)	Gorgoniidae	1889	Museum Darmstadt	Amerikanische-Meere	à sec
MZS Cni0306	*Leptogorgia sanguinea*	*Leptogorgia* sp.	Gorgoniidae			Amerikanische-Meere	à sec
MZS Cni0307	*Leptogorgia cauliculus*	*Leptogorgia viminalis* (Pallas 1766)	Gorgoniidae			Algier	à sec
MZS Cni0308	*Leptogorgia sarmentosa*	*Leptogorgia sarmentosa* (Esper 1791)	Gorgoniidae	1881	Stazione Zoologica Napoli	Neapel	en alcool
MZS Cni0309	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae	1829	Museum Paris	Antillen	à sec
MZS Cni0310	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0311	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae	07/06/1912	Becker		à sec
MZS Cni0312	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae	1845	Caternault L-P	Guadeloupe	à sec
MZS Cni0313	*Pterogorgia arenosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae			Bahama	à sec
MZS Cni0314	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0315	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0316	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0317	*Leptogorgia*	*Leptogorgia* sp.	Gorgoniidae				à sec

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MZS Cni0318	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0319	*Leptogorgia*	*Leptogorgia* sp. (3 espèces différentes)	Gorgoniidae	1879/81	Döderlein Ludwig	Japan, Sagamibai	à sec
MZS Cni0320	*Leptogorgia petechizans*	*Leptogorgia sarmentosa* (Esper 1791)	Gorgoniidae				à sec
MZS Cni0321	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0322	*Leptogorgia laxa*	*Leptogorgia sarmentosa* (Esper 1791)	Gorgoniidae				à sec
MZS Cni0323	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0324	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae			Cap d.g. Hoffnung	à sec
MZS Cni0325	*Leptogorgia*	*Pacifigorgia* sp.	Gorgoniidae				à sec
MZS Cni0326	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0327	*Leptogorgia viminalis*	*Leptogorgia sarmentosa* (Esper 1791)	Gorgoniidae			Oran	à sec
MZS Cni0328	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae		Kachelhofer	Cap d.g. Hoffnung	à sec
MZS Cni0329	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0330	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae		Kachelhofer	Cap d.g. Hoffnung	à sec
MZS Cni0331	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0332	*Leptogorgia*	*Leptogorgia* sp.	Gorgoniidae		Umlauff	Mauritius	à sec
MZS Cni0333	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae		Kachelhofer	Cap d.g. Hoffnung	à sec
MZS Cni0334	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae		Kachelhofer	Cap d.g. Hoffnung	à sec
MZS Cni0335	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0336	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae		Kachelhofer	Cap d.g. Hoffnung	à sec
MZS Cni0337	*Leptogorgia*	*Leptogorgia* sp.	Gorgoniidae				à sec
MZS Cni0338	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni0339	*Leptogorgia*	*Leptogorgia* sp.	Gorgoniidae				à sec
MZS Cni0340	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae			Cap d.g. Hoffnung	à sec
MZS Cni0341	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae		Kachelhofer	Cap d.g. Hoffnung	à sec
MZS Cni0342	indéterminé	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1906	Schulz Heinrich	West-Indien	à sec
MZS Cni0343	indéterminé	*Nicella* sp.	Ellisellidae			Indes	à sec
MZS Cni0344	indéterminé	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1901	Koch/Speyer Arthur	Cebu	à sec
MZS Cni0345	*Gorgonia reticulum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1831	Buffon (Museum?)		à sec
MZS Cni0346	*Gorgonia reticulum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae			? Indischer Ocean	à sec
MZS Cni0347	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1830	Esmangart Claude		à sec
MZS Cni0348	*Gorgonia flabellum*	*Gorgonia mariae* Bayer 1961	Gorgoniidae			Antillen	à sec
MZS Cni0349	*Gorgonia occatoria*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae			Antillen	à sec
MZS Cni0350	*Gorgonia*	*Gorgonia mariae* Bayer 1961	Gorgoniidae		Pfaff		à sec
MZS Cni0351	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae			Antillen	à sec
MZS Cni0352	*Rhipidigorgia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae		Linnaea	Bahama Ins.	à sec
MZS Cni0353	*Rhipidigorgia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	07/06/1912	Becker	West indisches Meer	à sec
MZS Cni0354	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1829	Museum Paris		à sec
MZS Cni0355	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae			Antillen	à sec
MZS Cni0356	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni0357	*Gorgonia arenata*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1850	Association Strasbourgeoise Amis Mus HN		à sec
MZS Cni0358	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1888	Umlauff	St. Thomas	à sec
MZS Cni0359	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae			Antillen	à sec
MZS Cni0360	*Gorgonia* sp.	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni0361	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1936	Bergmann Albert	Antillen	à sec
MZS Cni0362	*Gorgonia* sp.	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1904	Schulz Heinrich	Antillen	à sec
MZS Cni1383	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	Coralliidae				à sec
MZS Cni1562		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni1930		*Eunicea tourneforti* Milne Edwards & Haime 1857	Plexauridae		Doflein Franz	Martinique	à sec
MZS Cni1938	*Gorgonaria*	? *Placogorgia* sp.	Plexauridae			? Tanip	en alcool

CABINETS & MUSÉUMS

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MZS Cni2057		*Villogorgia* sp.	Plexauridae	(1904)	Mus. Godeffroy/ Kluckauf	Südsee	à sec
MZS Cni2058		*Villogorgia* sp.	Plexauridae	1904	Mus. Godeffroy/ Kluckauf	Südsee	à sec
MZS Cni2059		*Villogorgia* sp.	Plexauridae	1904	Mus. Godeffroy/ Kluckauf	Südsee	à sec
MZS Cni2063		*Leptogorgia* sp.	Gorgoniidae			Madagascar	à sec
MZS Cni2064		*Callogorgia* sp.	Primnoidae	1891	Rolle	Japan	à sec
MZS Cni2065		*Nicella* sp.	Ellisellidae	1891	Rolle	Japan	à sec
MZS Cni2066		? *Ellisella* sp.	Ellisellidae	1879/81	Döderlein Ludwig	Japan	à sec
MZS Cni2067		*Acanthogorgia* sp.	Acanthogorgiidae			? Japan	à sec
MZS Cni2070		*Euplexaura* sp.	Plexauridae			? Japan	à sec
MZS Cni2071		*Villogorgia* sp.	Plexauridae			Madagascar	à sec
MZS Cni2072		*Thouarella* sp.	Primnoidae	1891	Rolle	Japan	à sec
MZS Cni2077		*Leptogorgia* sp.	Gorgoniidae	1906	Schulz Heinrich	West-Indien	à sec
MZS Cni2079	*Eunicella verrucosa*	*Eunicella verrucosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni2080		*Bebryce* sp.	Plexauridae	1889	Museum Darmstadt		à sec
MZS Cni2081		*Echinogorgia* sp.	Plexauridae	1889	Museum Darmstadt		à sec
MZS Cni2082		*Leptogorgia* sp.	Gorgoniidae	1889	Museum Darmstadt		à sec
MZS Cni2087	*Gorgonia graminea*	*Eunicella singularis* (Esper 1791)	Gorgoniidae		Schmidt Oskar	Marseille	à sec
MZS Cni2088	*Paragorgia arborea*	*Paragorgia arborea* (Linnaeus 1758)	Paragorgiidae			Bucht von Drontheim	à sec
MZS Cni2117		*Eunicella cavolinii* (Koch 1887)	Gorgoniidae		Schneider Gustav		à sec
MZS Cni2150	*Gorgonia dilatata*	*Phyllogorgia dilatata* (Esper 1806)	Gorgoniidae				à sec
MZS Cni2210	*Mopsea*	*Melithaea* sp.	Melithaeidae			Australien	à sec
MZS Cni2211	*Gorgonia cancellata*	*Gorgonia mariae f. plumosa* Bayer 1961	Gorgoniidae				à sec
MZS Cni2212	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae				à sec
MZS Cni2214	*Isis moniliformis*	? *Isis hippuris* Linnaeus 1758	Isididae			? Indischer Ocean	à sec
MZS Cni2216	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2217	*Leptogorgia* sp.	*Leptogorgia* sp.	Gorgoniidae				à sec
MZS Cni2218	*Plexaura ? homomalla*	*Eunicea flexuosa* (Lamouroux 1821)	Plexauridae			? Florida	à sec
MZS Cni2219	*Gorgonia dilatata*	*Phyllogorgia dilatata* (Esper 1806)	Gorgoniidae	1879	Schneider Gustav	Bahia	à sec
MZS Cni2222		*Ctenocella pectinata* (Pallas 1766)	Ellisellidae	1888	Museum Platow		à sec
MZS Cni2223	*Echinogorgia umbra-culum*	*Echinogorgia umbratica* (Esper 1791)	Plexauridae			? Australien	à sec
MZS Cni2224	*Leptogorgia violacea*	*Leptogorgia* sp.	Gorgoniidae			Florida	à sec
MZS Cni2225	*Gorgonia* sp.	*Nicella* sp.	Ellisellidae				à sec
MZS Cni2229	*Leptogorgia* sp.	*Leptogorgia* sp.	Gorgoniidae				à sec
MZS Cni2232	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae			Cap der gute Hoffnung	à sec
MZS Cni2233	*Gorgonia flabellum*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2237	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	Coralliidae				
MZS Cni2263	*Eunicella albicans*	*Eunicella tricoronata* Velimirov 1971	Gorgoniidae				à sec
MZS Cni2264	*Eunicella albicans*	*Eunicella tricoronata* Velimirov 1971	Gorgoniidae				à sec
MZS Cni2278	*Gorgonia* sp.	*Annella reticulata* (Ellis & Solander 1786)	Subergorgiidae			Singapore	à sec
MZS Cni2440	*Verrucella* sp.	*Nicella* sp.	Ellisellidae		Ancien cabinet	Bourbon	à sec
MZS Cni2441	*? Plexaura homomalla*	*Plexaura homomalla* (Esper 1792)	Plexauridae		Hermann Jean	? Amerika-nische Meere	à sec
MZS Cni2447	*Leptogorgia palma*	*Leptogorgia palma* (Pallas 1766)	Gorgoniidae		Hermann Jean		à sec
MZS Cni2455	*Plexaura salicor-noides Edw.*	*Plexaurella dichotoma* (Esper 1791)	Plexauridae		Myèvre Alexandre		à sec
MZS Cni2456	*Plexaura homomalla / Gorgonia homomalla*	*Plexaurella dichotoma* (Esper 1791) *et P. grisea* Kunze 1916	Plexauridae		Myèvre Alexandre		à sec
MZS Cni2484	*Gorgonia setosa*	*Antillogorgia acerosa* (Pallas 1766)	Gorgoniidae		Ancien cabinet	Guadeloupe	à sec
MZS Cni2492	*Muricea placomus*	*Paramuricea placomus* (Linnaeus 1758)	Plexauridae			Bucht von Drontheim	à sec

Numéro Inventaire	Ancienne détermination	Nouvelle détermination 2019	Famille	Date d'entrée	Collecteur/ vendeur	Origine géographique	Nature conserva-tion
MZS Cni2496		*Corallium rubrum* (Linnaeus 1758)	Coralliidae		Ancien cabinet (JH)		à sec
MZS Cni2497		*Corallium rubrum* (Linnaeus 1758)	Coralliidae		Ancien cabinet (JH)	Mittelmeer	à sec
MZS Cni2502		*Leptogorgia* sp.	Gorgoniidae				à sec
MZS Cni2503		*Brebyce* sp.	Plexauridae				à sec
MZS Cni2504		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2505		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2506		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2507		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae	1901	Koch/ Speyer Arthur	? Cebu	à sec
MZS Cni2508		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2509		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2510		*Leptogorgia* sp.	Gorgoniidae				à sec
MZS Cni2511		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2512		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2513		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2514		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2515		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2516		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2517		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2518		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2519		*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec
MZS Cni2520		*Rumphella* sp.	Gorgoniidae		Zoolog. Institut Heidelberg		à sec
MZS Cni2521					Ancien cabinet (JH)		à sec
MZS Cni2522	*Corallium rubrum*	*Corallium rubrum* (Linnaeus 1758)	Coralliidae			Mittelmeer	à sec
MZS Cni2523	*Gorgonia arenata*	*Gorgonia ventalina* Linnaeus 1758	Gorgoniidae				à sec

Colligo

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Image de 1e de couverture : Matériel de la collection de William Lyons de Tenby au Tenby Museum & Art Gallery
Image de 4e de couverture : Pesée de 100 graines de damma (Abrus precatorius) provenant de Côte d'Ivoire.