

The South American Mollusca of Johann Baptist Ritter von Spix and their publication by Johann Andreas Wagner

Robert H. Cowie

Center for Conservation Research and
Training
University of Hawaii
3050 Maile Way, Gilmore 408
Honolulu, HI 96822 USA
cowie@hawaii.edu

Néstor J. Cazzaniga

Departamento de Biología, Bioquímica
y Farmacia
Universidad Nacional del Sur. San
Juan 670
(8000) Bahía Blanca
ARGENTINA
ficazzan@criba.edu.ar

Matthias Glaubrecht

Museum für Naturkunde
Humboldt-Universität zu Berlin
Institut für Systematische Zoologie
D-10115 Berlin
GERMANY
matthias.glaubrecht@rz.hu-berlin.de

ABSTRACT

Dr. Johann Baptist Ritter von Spix collected Mollusca in South America from 1817 to 1820. After his return to Europe he completed the plates, including their legends, and brief diagnoses for a monograph on the taxa he had collected, but died in 1826 before the main text was written. Dr. Johann Andreas Wagner was enlisted to complete the monograph, which he did, and it was published in 1827. In total, 64 gastropod and 20 bivalve taxa were illustrated. In developing the monograph for publication, Wagner altered Spix's concepts of many of the taxa, in some cases using his own name, not Spix's, as the author of the name. We discuss Wagner's rationale for making these changes. We discuss the appropriate citation of the authorship of the work, concluding that it should be cited as of Wagner alone. We also discuss the appropriate authorship of the species, concluding that in all cases in which Spix had provided a name on the plates authorship should be given as "Spix in Wagner". Wagner also created some new names, three of which are replacements for Spix's names, which are preoccupied, but the remaining ones are unnecessary replacement names for Spix's names (of which they are therefore junior objective synonyms). Spix's type material is in the Zoologische Staatssammlung in Munich, although some of it is missing as a result of damage sustained during World War II.

INTRODUCTION

Johann Baptist Ritter von Spix was born in Höchstadt an der Aisch, near Bamberg, Bavaria, on February 9, 1781, as the son of a surgeon. [For additional biographic information see Fittkau (1983) and Huber and Huber (1993)]. He gained a doctorate in theology at the University of Bamberg but then changed his career to medicine, gaining a medical degree in 1806 from the University of Würzburg. He then practiced medicine for a short period before traveling to Paris in 1808 to meet Cuvier, Lamarck, and other well-known naturalists. On October 31, 1810, the Bavarian king, Maximilian I Joseph, made him adjunct (scientific assistant) to the curator of the zoological-zoatomical collections of the Ba-

varian Academy of Sciences in Munich and, less than six months later, on April 24, 1811, following orders from the king, the Academy made him curator, and thus, director of these collections. During the period 1808–1811 Spix traveled not only in France but also in Italy and Switzerland. In 1811, he published his major work, *Geschichte und Beurtheilung aller Systeme in der Zoologie* [= History and evaluation of all systems in zoology] (xiv + 710 p., Achrag'sche Buchhandlung, Nürnberg). Spix greatly improved the old-fashioned arrangement of the natural history cabinet of the Bavarian Academy of Sciences and is regarded as the founder of the modern Bavarian zoological collections, now the Zoologische Staatssammlung München (ZSM).

In 1817, in the company of botanist Carl Friedrich Philipp von Martius (1794–1862) and a number of other naturalists, Spix embarked on a major expedition of exploration and natural history collecting to Brazil. They returned to Europe on December 10, 1820, with an enormous quantity of material that they had collected, which was deposited in the Bavarian Academy of Sciences where Spix was curator.

Based on that extensive material, Spix published numerous works, on monkeys and bats, turtles and frogs, lizards, and birds. Martius published on the plants. Sadly, only six years after his return from South America, Spix died, in Munich on May 15, 1826, apparently as a result of lingering illness contracted during the expedition. As a consequence, Spix's intended publications on fishes, insects, and mollusks remained unfinished and had to be completed by others.

Under the auspices of the editors (Franz von Paula von Schrank and Martius), the mollusk volume (*Testacea fluviatilia* . . .) was completed by Dr. Johann Andreas Wagner (March 21, 1797–December 17, 1861) and published in 1827. The primary aim of this paper is to clarify the authorship of the species described therein, following, when pertinent, the *International Code of Zootaxonomical Nomenclature* (ICZN, 1999), hereafter the *Code*, as

well as correct attribution of the work itself. In order to do this, it is necessary to discuss in detail the history of the production of the volume.

HISTORY OF THE TESTACEA FLUVIATILIA

The title page of the original issue of the mollusk work printed in Munich is shown in Figure I. The title translates as follows:

Freshwater mollusks that, while traveling through Brazil during the years 1817–1820 commanded by and under the auspices of Maximilian Joseph I, Most August King of Bavaria, were collected and taken care to be painted by Dr. J. B. von Spix, former Civilian Knight of the Royal Order of the Bavarian Crown, Ordinary Member of the Bavarian Academy of Sciences, curator of the collections of the Royal zoological, zootomical and ethnographical Museum. Arranged, described and illustrated with observations
by Dr. J. A. Wagner
Edited by Dr. F. von Paula von Schrank and
Dr. C. F. P. von Martius
Munich
Publisher C. Wolf
1827

A later issue was printed in Leipzig, also in 1827. It differs slightly in a number of ways, as discussed below.

In total, 64 gastropod and 20 bivalve species were illustrated. The title (*Testacea fluviatilia*), however, does not reflect the contents correctly because, although the preface reads that the mollusks studied only live in fresh waters ("quae nonnisi aquas dulces incolunt"), 43 out of 64 gastropod species are land snails (e.g., genera *Bulimus*, *Strophocheilus*, *Helix*, *Achatina*). This suggests that perhaps at least the editors (who were not malacologists) were not fully aware of the contents of the book. If Spix himself had had the opportunity of publishing his work, then he may have titled it "*Testacea fluviatilia et terrestria*" or "*Testacea Brasiliensis*"; the latter perhaps being his intention, as suggested by the heading on page 1 of the descriptive text, above the title of the *Amphibola* section. Wagner, of course, knew that many species were terrestrial, which suggests that he was not involved in deciding the title of the work nor in the writing of the preface.

The preface ("*Praefatio*") (Figure 2) to the work explains some of its history. It is difficult to translate it because several terms and structures are not classical, with many embedded sentences and quotations. For example, the preface begins with "*Reliquerat*" [= had left behind], which has its object "*icones*" [= illustrations] 21 words later. This object, "*icones*", has two modifying sentences connected by "ac" [= and]; the first runs from "*ad exemplaria*" to "*illustratas*" (14 words), while the second runs from "*reliquis*" to "*servituras*" (12 words). Within this second sentence, "*animalium collectorum*" is a genitive construction with a seven-word adverbial phrase in between. We have tried to make the following translation as close to the original as possible; however

this has led to the use of somewhat awkward English in places. Also, we have placed some nouns in brackets since in Latin it was common to omit them and leave the reader to recover the meaning from the adjective. In addition, some explanatory material and some of the original Latin wording is also placed in brackets for clarity. The following is our translation of the "*Praefatio*".

PREFACE.

Dr. Johann Baptist von Spix, formerly our colleague in the Royal Academy of Sciences, whose death, premature and calamitous for letters [i.e., science], we grieve, had left behind him illustrations of the animals with shells [*Testaceorum*] and the fishes, from the examples deposited by him in the Brazilian collections of the Academy [*"in Museo academico Brasiliano"*], drawn on stone [i.e., lithographs] and illustrated in colors, and had intended to use the [illustrations] to serve [creation of] the missing descriptions of the animals collected while traveling through the wide provinces of Brazil. These [illustrations] were handed to us by a brother of the now deceased man to be shared with the supporters of Spix's works. And there were not-weak arguments that impelled us to put hands to work; mainly the vividness and fidelity of the illustrations themselves, and the value of the depicted shells, most of which are now made known for the first time to those curious about nature; the rest [of the illustrations], even if [the species] have been described by other authors, will nonetheless be worth viewing because, as they were collected by Spix, these authors will themselves have future testimonial [to their work] by matching their [shells] with the illustrations of the indefatigable traveler.

Doubtless, descriptions, observations and other [notes], which could be useful to explain the illustrations, were lacking; but nature offers itself to the eyes. Moreover, being constrained by other issues and dedicated to other studies, we would have hardly had the necessary free time to accomplish the work: it seemed to us that this was a task for a man that measured up to him [i.e., Spix]. Conveniently, we happened to find out that Dr. J. A. Wagner had been engaged for several years in a large and important study of conchology, and was striving to publish a continuation of the works of Chemnitz, under the name of the Museum Conchyliologicum; the learned man did not refuse the commission that we requested of him, and got to work in order to complete [the present book].

What he achieved is evident from the work itself. He worked very hard in order that these mollusks, which only live in freshwater, should be included within the genera established by Lamarck and other recent authors, in the conviction that he had to do so in the interest of science because those [genera] that were given by Spix did not rely on a solid foundation, but rather seemed to be based on weak characters. Similarly, for the species, he reduced many to already known species, and carefully added all their synonyms. Even though by doing this the number of species that we consider new decreases, it is still the case that a large number of new [species] survives, which cannot be unpleasing to those interested in nature.

We hereby offer this posthumous work, trusting that it will enhance the memory of this man of natural sci-



Figure 1. The title page of the Munich edition of the "Testacea fluviatilia . . .".

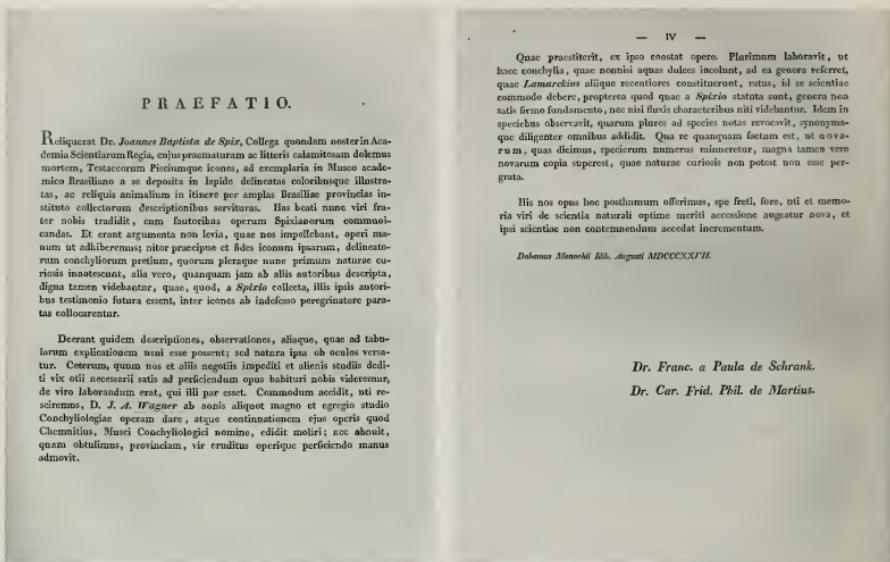


Figure 2. The "Praefatio" of the Munich edition of the "Testacea fluviatilia . . .".

ence of excellent merit through a new addition, and that it will be a non-negligible contribution to science itself.

Written in Munich, on August 13, 1827.

Dr. Franz von Paula von Schrank.

Dr. Carl Friedrich Philipp von Martius.

Thus, it is clear that Spix produced lithographs and that his brother passed them to the editors (Schrank and Martius), who in turn gave them to Wagner in order that he could produce the finished work, based upon Spix's illustrations. It is also clear that Spix provided names for his species.

Wagner was a systematist of the Blumenbach and Cuvier traditions (Martius, 1862). He is known to have avoided the creation of new genera and to have placed new species as far as possible in genera already established. His first published scientific work was in fact the description of the mollusks collected by Spix in Brazil. Gotthilf Heinrich von Schubert (1780–1860) and Wagner published, in 1829, the 12th volume of *Neues Systematisches Conchylien-Cabinet*, the famous German conchological series started by Friedrich Heinrich Wilhelm Martini (volumes 1–3, 1769–1774) and Johann Hieronymus Chemnitz (volumes 4–11, 1780–1788), as is alluded to in the preface (above), where reference is made to the "Museum Conchyliologicum" (which translates into English as "Conchological Museum" but was

probably intended as the Latin translation of the German "Conchylien-Cabinet"). In 1831, Wagner published a handbook of the natural history of the animal Kingdom, focusing in particular on mammals.

Wagner obtained his Ph.D. in 1826 from the University of Erlangen, having previously spent two years (1814–1816) at the University of Würzburg. He then became a Privatdozent—privately paid lecturer—in Erlangen, following a journey to Paris. On October 22, 1832, the Bavarian King awarded Wagner the position of adjunct (scientific assistant) to Schubert, his friend and Spix's successor as curator of the Munich zoological collection. It was apparently Schubert, following Spix's death in 1826, who arranged that Wagner be asked to publish Spix's material. The year 1832 is the earliest date we know for sure that Wagner was actually working in Munich. He became a member of the Royal Bavarian Academy of Science in 1835, and in 1849 was installed as the third curator of the zoological-zoontomical cabinet. [For additional biographic information see Martius (1862)].

Wagner received, as the basic material for his study, the 29 plates that Spix had created, with Spix's names, and probably some notes and Latin diagnoses (see below). This corpus was wholly included in the book and Wagner used Spix's names, either confirming them or

— IV —

Quae praesertim, ex ipso constat opere. Plurimum laboravit, ut habeat conchyliis, quae nomine aquas dulces incolunt, ad ea genera referret, quae *Lamarcus* aliquae recentiores constituerent, ratus, id se scientiae commode debere, propterea quod quae a *Spixio* statuta sunt, genera non satis firmo fundamento, nec nisi fluxi characteribus nisi videbantur. Idem in speciebus observavit, quarum plurimi ad species notas revocavit, synonymaque diligenter omnibus addidit. Quia re quanquam factum est, ut *ova*rum, quas dicit, specimen numerus insinceretur, magis tamen vere novarum copia suparet, quae naturae curiosi non potest non esse per grata.

Illi nos opus hoc posthumum offerimus, spe frati, fore, uti et memoria viri de scientia naturali optima meriti accessione augustinus nova, et ipsi scientiam non contempnendam accedit incrementum.

Dilectus Monachus filii Augusti MDCCCCXXVII.

Dr. Franc. a Paula de Schrank.

Dr. Car. Frid. Phil. de Martius.

TABULAE EXPLICATAE

Figure 3. The “*Tabulae explicatae*” of the Munich edition of the “*Testacea fluviatilia* . . .”.

reducing them to synonymy. Wagner also included two pages of "*Tabulae explicatae*" (Figure 3), essentially an index that listed all the names in the sequence in which they appeared on Spix's plates, with reference to the text page on which Wagner gave his own opinions regarding what he had interpreted about each species.

AUTHORSHIP OF THE WORK

Prior to Spix's death, he had produced plates, with names, illustrating the species. Following his death, the editors enlisted Wagner to provide descriptions of the species, which he did. The completed work was published in 1827. In the past, some authors (e.g., Ihering, 1890; Haas, 1969) have considered Spix as sole author of the work, perhaps because he provided the plates, legends, and probably a short diagnosis for each species (see below) that are the foundation of the work, which Wagner simply prepared for publication, that is, as a scientific editor of Spix's work. Others, however, most likely because Spix did not provide the text of the descriptions but only the names and illustrations (and probably the short diagnoses), have attributed authorship of the work either to Wagner alone (because he was the author of the descriptions) or to Spix and Wagner (as suggested for example by Glaubrecht (1996: 488)), following the convention that a name and illustration alone (Spix's contribution) did not satisfy the criteria of nomenclatural

availability. However, the *Code* (Article 12.2.7) states that a name associated with an illustration, published before 1931, is sufficient to establish availability. Thus, Spix's contribution to the work is sufficient to validate his authorship of the names associated with the illustrations on the plates, even in the absence of Wagner's descriptions, which also, however, standing alone, would be sufficient to validate the names. Additional reasons for attributing most of the names to Spix are discussed below.

Given Spix's contribution, that it is explicitly acknowledged in the preface, that his name is clearly part of the title page (in fact appearing first), and that there is no evidence that the plates were published separately from the text, authorship of the work should arguably be attributed to both Spix and Wagner, and in that order because that is the order in which they appear on the title page. Based on this argument, that is, that the work is neither Wagner's nor Spix's work alone, but their mixed contributions, authorship of the work as of Spix and Wagner could be justified, as was accepted by Fechter (1983b).

A similar argument was used by Kottelat (1988) in deciding that authorship of the work "Selecta genera et species piscium quos in itinere per Brasiliam . . . collegit et pingendos curavit Dr. J.B. de Spix" on the fishes collected by Spix but published in two fascicles: June 1829, January 1831) by Louis Agassiz (1807–1873) should be

attributed to Spix and Agassiz. This volume, the first monograph on Brazilian fishes, also contains descriptions of numerous new species and genera. While the plates of this fish volume were prepared at least in part under Spix's supervision, the text was written by Agassiz. However, Kottelat (1988: 73) argued, based on article 50(a) of the *Code* (3rd edition, 1985) and the fact that Spix was not author of both the names and the conditions making them available, that for nomenclatural purposes Agassiz is the sole author of the names. It appears that Agassiz wrote the whole of the text, and whatever Spix wrote, can only have been rough notes, although he provided the species names for the plates. According to Kottelat (1988: 73), most plates of the first fascicle were engraved and colored before Spix's death and bear the names Spix intended to give them. As we have seen above, however, a name associated with an illustration, published before 1931, is indeed sufficient to establish availability (and this was the case also in the 3rd edition of the *Code*). Thus, in this regard, Kottelat's interpretation of the *Code* was incorrect. As Wagner did in the case of the mollusks, in several cases Agassiz did not follow Spix's names on the plates of the first fascicle (regarding the names as inappropriate or in a "barbarian language" or the fishes as misidentified) and therefore introduced other names in the text. In contrast, the plates of the second fascicle bear names consistent with the text, undoubtedly given by Agassiz. Nevertheless, Kottelat decided, following Recommendation 51B of the *Code* (3rd edition), that the species names should be cited as "Agassiz in Spix and Agassiz", arguing that this seemed desirable to him "for bibliographic purposes".

Notwithstanding this entire argument, authorship of the work is not regulated by the *Code* and the most appropriate attribution of the work remains open for discussion. Spix's name forms part of the title, since the relative pronoun "*quae*" [= "that"] on the second line of the title page (Figure 1) opens a subordinate sentence with a subject ("Dr. J. B. de Spix") that requires one or more verbs ("*collegit et pingenda curavit*") to give meaning to the sentence. But conversely, Wagner's and the editors' contributions are not part of the title—Wagner "arranged, described and illustrated with observations" (see above) the work of Spix. The book does not contain only Spix's concepts, nor did Wagner communicate with him to clarify the reasons why Spix considered some of the shells as belonging to new species. Indeed there is no evidence that they ever met. In fact, Spix's views were contradicted several times in the text. So, the book is not a unity (i.e., a Spix-and-Wagner production) but an earlier work by Spix, critiqued and modified by Wagner. Therefore we consider that Wagner, being responsible for presenting the material following his own criteria, and deciding the fate of the work after Spix's death, is to be credited with the final product, as the only author of a book into which Spix's contribution has been incorporated.

We therefore consider it most appropriate to treat

Wagner as the sole author of the book, which should then be cited as

WAGNER, J.A. 1827. Testacea fluviatilia quae in itinere per Brasiliam annis MDCCCVII-MDCCCVIII jussu et auspicio Maximiliani Josephi I. Bavariae regis augustissimi suscepto collegit et pingenda curavit Dr. J. B. de Spix, quondam ordinis regii corona Bavariae civilis eques, academiae scientiarum Bavariae socius ordinarius, musei regii zoologici, zootomici et ethnographici conservator rel. C. Wolf, Monachii [= Munich]. iv + [ii] + 36 pp., 29 pls.

Another issue of the work was also published in Leipzig, but we consider this to have been published subsequent to the Munich edition, as discussed below.

AUTHORSHIP OF THE SPECIES

The following discussion relates to the Munich issue, as the Leipzig issue, published after the Munich issue (see below), has no bearing on nomenclature.

Spix consistently provided binomina in the figure legends for the new species he illustrated in the plates. He thereby accomplished the minimum pre-1931 conditions of availability for those names (*Code*, Articles 11 and 12), except for publication. It seems that he also provided two to three line diagnoses (see below). Arguably, because Wagner provided the longer descriptions (for most species), he also could be construed as an author, since the plates, diagnoses, and longer descriptions were published simultaneously. So, arguably, authorship could undoubtedly be considered as "Spix and Wagner" for all those species originally named by Spix.

Of course, Spix failed to publish his new species independently, but the act of being published by another person (Wagner) does not necessarily deprive Spix of nomenclatural authorship because, "if it is clear from the contents that some person other than the author of the work is alone responsible both for the name or act and for satisfying the criteria of availability *other than actual publication* [our italics], then that other person is the author of the name or act" (*Code*, Article 50.1.I). Wagner was careful to keep authorships recognizable by identifying them in the text and in the index [the "*Tabulae explicatae*"]. So, the illustrations, created by the deceased Spix, with associated names that were attributed to Spix, were published as a corpus together with an index in which each plate was listed in Spix's sequence. Thus, the names attributed to Spix in the work should indeed be attributed to Spix alone and not to Spix and Wagner. This has been the conclusion reached by earlier authors (e.g., Ihering, 1890; Morrison, 1954; Haas, 1969; Fechter, 1983a, b).

Furthermore, regarding precedence of Spix and Wagner's names and nomenclatural acts, the *Code* (Recommendation 24B) states that "Zoologists acting as First Revisors to determine the precedence of identical names published in the same or different works, and on the same day, are advised to follow attributions by authors concerned if these are known". And the *Code* (Article

50.6) states that "When two or more identical names for the same taxonomic taxon are published on the same date, by different authors in the same or different works, their precedence (and hence the authorship of the name) is determined by the application of Article 24". Therefore, because Wagner attributed the names to Spix, the latter's names take precedence, even though published simultaneously with the former's names. The following example is illustrative. Wagner considered *Amphillaria archimedes* Spix a synonym of *A. zonata* "Wagner" on the basis of Spix's figure alone; i.e., "... quae mihi tantum ex hac figura cognita est" [= "... which I only know from this figure"]. Therefore, *A. archimedes* cannot be co-authored by Wagner, because he did not consider it a valid species. The species has to be credited to Spix; thus, Wagner's act was to create a subjective synonym.

Both authors worked independently and did not share their taxonomic concepts, a further reason for authorship of the taxa not being Spix and Wagner, but Spix (or Wagner in a few cases) alone. Table 1 lists all the names of both authors, with their correct authorship and status.

Wagner's rationale for attributing authorship does not follow current rules of nomenclature. He accepted as of Spix only those species that he considered valid and correctly combined with a generic name (25 of the 84 species illustrated by Spix). In modern terms, citation of these species should be either as of Spix alone (*Code*, Article 50.1.1) or as of Spix in Wagner (*Code*, Recommendation 51E). On the basis of the following discussion, we consider that the names should be cited as of Spix in Wagner, with a small number of exceptions.

In the 13 cases in which Wagner transferred one of Spix's species to another genus he presented himself as the author (*Amphillaria lineata* Wagner for *Helix lineata* Spix, *Pupa exesa* Wagner for *Clausilia exesa* Spix, *Helix clausa* Wagner for *Tomigerus clausus* Spix, etc.). This was common practice for several decades in the late 1700s and early 1800s. He did not question the validity of such species, but simply re-assigned them to genera established by Lamarck and other authors (as explained in the Preface, above). This action is now treated as establishing a new combination, so a reference such as "*Bulinus sylvaticus* Wagn. (*Columna sylvatica* Spix)" [in the "*Tabulari explicatae*"] is now treated as *Bulinus sylvaticus* (Spix) or *Bulinus sylvaticus* (Spix) Wagner (*Code*, Recommendation 51G), although the latter practice has rarely, if ever, been used in mollusks.

Wagner changed three names because those given by Spix were preoccupied (i.e., *Bulinus hyalinus* Wagner for *B. fragilis* Spix, non Lamarck; *Bulinus magus* Wagner for *B. inflatus* Spix, non Lamarck; *Helicina variabilis* Wagner for *H. fasciata* Spix, non Lamarck). In these cases, Spix's names are junior primary homonyms and therefore invalid.

Wagner also changed other names, but for no explicit reason (e.g., *Melania scalaris* Wagner for *Aylacostoma glabrum* Spix; *Unio caudatus* Wagner for *Diplodon furcatus* Spix). In these cases, Spix's names are valid, while

Wagner's are unnecessary replacement names and thus junior objective synonyms (*Code*, Article 72.7).

Finally, in some cases Wagner added his name following what appear to be replacement names for some of Spix's binomina; however, the new names were not binomial and therefore not available. For example, *Anodon lituratus* Spix became "*Anodontis obtusi* specimen junius Wagn." [= "a young specimen of *Anodon obtusus* Wagner"], although he attributed *Anodon obtusus* to Spix. Similarly, and although Wagner did not add his name in this case, *Amphillaria figulina* Spix became "*Amphillaria lineata minor*" [= a smaller *Amphillaria lineata*]. In this instance "minor" is not to be considered a subspecific name forming part of a valid trinomen, but as a purely descriptive term. We conclude from these instances that Wagner aimed not to claim authorship of the species but to establish subjective synonymy.

Again, on the basis of all this evidence, the names are to be cited as of "Spix in Wagner", except in the case of the three invalid, preoccupied names of Spix, the replacements for which should be cited as of Wagner alone. The remainder of Wagner's names are unnecessary replacement names.

RELATIONSHIP OF THE TEXT TO THE PLATES

Most species are described twice. The first text, in a larger font, is a two to three line diagnosis mostly based on shape and colors, as are visible in Spix's figures. The second text, in a smaller font, is a more detailed description that also includes some measurements and information that can only be accurately assessed on actual shells (e.g., whorl number). An example is given in Figure 4. While it is possible that the first two-line text for each species is a description by Wagner of Spix's figure, and that the second text was written after comparing the plate with additional materials, we have no compelling evidence that this is the case. Rather, we believe that the short first text is attributable to Spix and only the longer second text to Wagner, for the following reasons.

The customary practice among conchologists at the time when describing new species was either to write all the text in Latin, i.e., a single description sometimes followed by comments (e.g., many papers in the *Zeitschrift für Malakozoologie* by Philippi, Pfeiffer, etc., Pfeiffer's *Monographia Helicorum Vicentium*), or to give a short Latin diagnosis, followed by additional descriptions and comments in a vernacular language (e.g., the *Voyage de d'Orbigny*, contributions to the *Systematisches Conchylien-Cabinet von Martini und Chemnitz* by Philippi, Küster, etc., Reeve's *Conchologia Iconica*). Neither of these patterns is followed. When Wagner shared Spix's concept and name for the species, then the two texts are arranged directly one after the other (e.g., *Amphillaria gigas*, *A. papyracea*, *A. rosea*). When, for some reason, Wagner changed the original name, usually because of a genus change (e.g., *Melania tuberculata* Wagner for *Aylacostoma tuberculatum* Spix), or to give a replacement name (e.g., *Pupa inflata* Wagner for *Clausilia pupoides*

Table 1. The names of Spix and Wagner listed in the order of Spix's plates and as they appear in the "Tabulae explicatae", with explanations of their treatment by Wagner if different from their treatment by Spix, and additional comments, as appropriate. In the "Tabulae explicatae" Wagner's treatment of the names appears in plain Roman type, with Spix's names in parentheses and italic type on the same line, if Wagner's treatment of them differed. All their new names are nomenclaturally available. Note that there are 29 printed plates, but that the "Tabulae explicatae" only number 27; the final two lines of the "Tabulae explicatae" lack the plate numbers, though the plates themselves have the correct legends: "Tab. XXVIII" and "Tab. XXIX".

Names as listed in the "Tabulae explicatae"	Plate and figure numbers	Names as they appear on the plates	Treatment by Wagner if different from that by Spix, with additional comments in square brackets
GASTROPODA			
<i>Ampullaria Gigas</i> Spix	Pl. I, figs. 1, 2	AMPULLARIA <i>Gigas</i> .	
<i>Ampullaria zonata</i> Spix	Pl. II, fig. 1	AMPULLARIA 1. <i>zonata</i> . 2. <i>Archimedes</i> . [see <i>Ampullaria zonata</i>]	[Listed as <i>Ampullaria zonata</i> Spix in the "Tabulae explicatae" but <i>Ampullaria zonata</i> Wagner in the text.] Smaller variety of <i>A. zonata</i> Spix.
<i>Ampullaria Archimedes</i> Spix	Pl. II, fig. 2		
<i>Ampullaria olivacea</i> Spix	Pl. III, fig. 1	AMPULLARIA 1. <i>olivacea</i> . 2. <i>quericina</i> .	<i>A. guyanensis</i> Lamarck, 1822, given as a synonym but Spix's name retained as valid. Compared to <i>A. rugosa</i> Lamarck, 1801, <i>A. globosa</i> Swainson, 1823, and <i>A. leucostoma</i> Swainson, 1823. [Junior primary homonym of <i>Ampullaria olivacea</i> Lamarck, 1816.] Smaller variety of <i>A. olivacea</i> Spix.
<i>Ampullaria quericina</i> Spix	Pl. III, fig. 2	[see <i>Ampullaria olivacea</i>]	
<i>Ampullaria papyracea</i> Spix	Pl. IV, figs. 1, 2	AMPULLARIA 1. 2. <i>papyracea</i> . 3. <i>rosea</i> . 4. <i>figulinia</i> . 5. <i>Cyclostoma</i> .	
<i>Ampullaria?</i> <i>rosea</i> Spix	Pl. IV, fig. 3	[see <i>Ampullaria papyracea</i>]	Valid species, although its identity as an <i>Ampullaria</i> doubted; considered a terrestrial snail in the genus <i>Bulinus</i> .
<i>Ampullaria figurina</i> Spix	Pl. IV, fig. 4	[see <i>Ampullaria papyracea</i>]	Smaller, yellowish variety of <i>Ampullaria lineata</i> (Spix).
<i>Ampullaria cyclostoma</i> Spix	Pl. IV, fig. 5	[see <i>Ampullaria papyracea</i>]	Extreme affinity to <i>Ampullaria effusa</i> (Müller, 1774) Swainson, 1823 [= <i>Nerita effusa</i> Müller, 1774] noted.
<i>Helix fasciolata</i> Spix	Pl. V, fig. 1	HELIX 1. <i>fasciolata</i> . 2. <i>lineata</i> . 3. <i>crass</i> . 4. <i>HELICINA exumbilicata</i> .	Variety of <i>Ampullaria crassa</i> Swainson, 1823, with a narrow umbilicus.
<i>Helix lineata</i> Spix	Pl. V, fig. 2	[see <i>Helix fasciolata</i>]	Placed in <i>Ampullaria</i> as <i>A. lineata</i> "Wagn." [= (Spix)]. <i>A. fasciata</i> Swainson, 1822, given as a synonym but Spix's name retained as valid. [<i>A. fasciata</i> Swainson, 1822, is a misidentification of <i>A. fasciata</i> Lamarck, 1816 (Cowie and Thiengo, 2003).] Compared to <i>A. reflexa</i> Swainson, 1823. [Junior primary homonym of <i>Helix lineata</i> Renier, 1804, and <i>Helix lineata</i> Say, 1817.] Not a new name; = <i>Ampullaria crassa</i> Swainson, 1823.
<i>Helix crassa</i> Spix	Pl. V, fig. 3	[see <i>Helix fasciolata</i>]	Variety of <i>Ampullaria crassa</i> Swainson, 1823, lacking an umbilicus. [see <i>Bulinus corrugatus</i> , below]
<i>Helicina exumbilicata</i> Spix	Pl. V, fig. 4	[see <i>Helix fasciolata</i>]	
<i>Bulinus terrestris</i> Spix	Pl. VI, fig. 1	BULIMUS 1. <i>terrestris</i> . 2. <i>durus</i> . 3. <i>fragilis</i> . 4. <i>virgatus</i> .	<i>Bulinus terrestris</i> Spix synonymized with <i>B. corrugatus</i> "Wagner" and considered to be but a juvenile of <i>Bulinus ovatus</i> (Müller, 1774) [= <i>Helix ovata</i> Müller, 1774], although <i>B. corrugatus</i> "Wagner" retained as the valid name. [Not a new name; = <i>Bulinus corrugatus</i> Bruguère, 1792.]
<i>Bulinus corrugatus</i> Wagner	Pl. VI, fig. 1	[see <i>Bulinus terrestris</i>]	
<i>Bulinus durus</i> Spix	Pl. VI, fig. 2	[see <i>Bulinus terrestris</i>]	
<i>Bulinus fragilis</i> Spix	Pl. VI, fig. 3	[see <i>Bulinus terrestris</i>]	Junior secondary homonym of <i>Bulinus fragilis</i> (Montagu, 1803) Lamarck, 1822 [= <i>Helix fragilis</i> Montagu, 1803].
<i>Bulinus hyalinus</i> Wagner	Pl. VI, fig. 3	[see <i>Bulinus terrestris</i>]	New replacement name for <i>Bulinus fragilis</i> Spix, non <i>Bulinus fragilis</i> (Montagu, 1803) Lamarck, 1822.

Table 1. Continued.

Names as listed in the "Tabulae explicatae"	Plate and figure numbers	Names as they appear on the plates	Treatment by Wagner if different from that by Spix, with additional comments in square brackets
<i>Bulimus virgatus</i> Spix	Pl. VI, fig. 4	[see <i>Bulimus terrestris</i>]	Incomplete shell of <i>Bulimus angostomus</i> Wagner [= <i>Stenostoma capueira</i> Spix].
<i>Bulimus angostomus</i> Wagner	Pl. VI, fig. 4	[see <i>Bulimus terrestris</i>]	[see additional listing, below]
<i>Bulimus inflatus</i> Spix	Pl. VII, fig. 1	BULIMUS 1. inflatus. 2. perlucidus. 3. lituratus. 4. vittatus. 5. Zebra. 6. lineatus.	Junior primary homonym of <i>Bulimus inflatus</i> Olivier, 1801, and <i>Bulimus inflatus</i> Lamarck, 1822.
<i>Bulimus Magus</i> Wagner	Pl. VII, fig. 1	[see <i>Bulimus inflatus</i>]	New replacement name for <i>Bulimus inflatus</i> Spix, non Olivier, non Lamarck.
<i>Bulimus perlucidus</i> Spix	Pl. VII, fig. 2	[see <i>Bulimus inflatus</i>]	
<i>Bulimus lituratus</i> Spix	Pl. VII, fig. 3	[see <i>Bulimus inflatus</i>]	<i>Helix lita</i> ["Freycinet, Voyage autour du monde"; = <i>Helix lita</i> Féérussac in Quoy and Gaimard] given as a synonym but Spix's name retained as valid.
<i>Bulimus vittatus</i> Spix	Pl. VII, fig. 4	[see <i>Bulimus inflatus</i>]	
<i>Bulimus zebra</i> Spix	Pl. VII, fig. 5	[see <i>Bulimus inflatus</i>]	Treated as a valid species. Also mentioned a larger variety with a basal, dark color band.
<i>Bulimus lineatus</i> Spix	Pl. VII, fig. 6	[see <i>Bulimus inflatus</i>]	[Primary junior homonym of <i>Bulimus zebra</i> Olivier, 1801, and <i>Bulimus zebra</i> Perry, 1810. Perhaps not intended by Spix as a new name, but a misidentification of <i>Buccinum zebra</i> Müller, 1774]. Extreme similarity to " <i>Bulimus radiatus</i> " noted. [Junior primary homonym of <i>Bulimus lineatus</i> Draparnaud, 1801. ? = <i>Bulimus radiatus</i> de Blainville, 1825—apparently the only <i>Bulimus radiatus</i> described.]
<i>Achatina perversa</i> Spix	Pl. VIII, fig. 1	I. ACHATINA perversa. 2. BULIMUS vitreus. 3. BULIMUS decapitatus. 4. AYLACOSTOMA tuberculatum. 5. glabrum.	Synonym of <i>Achatina melanostoma</i> Swainson. Dextral and sinistral shells of this species mentioned as deposited in the Munich Museum. [Not a new name; = <i>Achatina perversa</i> Swainson, 1821 (originally spelled "Achatinia" by Swainson). The original name of " <i>Achatina melanostoma</i> Swainson" is <i>melastoma</i> . Even if <i>melanostoma</i> were preferable from a scholarly perspective, a poor latinization is not to be corrected (<i>Code</i> , Article 32.5.1). Because Wagner cited the original and the changed name, and used the latter as valid, the change is considered demonstrably intentional (<i>Code</i> , Article 33.2.1). Wagner's nomenclatural act being an unjustified emendation, <i>Achatina melanostoma</i> Wagner, 1827, is a junior objective synonym of <i>Achatina melanostoma</i> Swainson, 1823.]
<i>Bulimus vitreus</i> Spix	Pl. VIII, fig. 2	[see <i>Achatina perversa</i>]	Synonym (an incomplete shell) of <i>Bulimus perlucidus</i> Spix.
<i>Bulimus decapitatus</i> Spix	Pl. VIII, fig. 3	[see <i>Achatina perversa</i>]	Extreme similarity to <i>Bulimus decollatus</i> (Linnaeus, 1758) Bruguière, 1789 [= <i>Helix decollata</i> Linnaeus, 1758] noted.
<i>Aylacostoma tuberculatum</i> Spix	Pl. VIII, fig. 4	[see <i>Achatina perversa</i>]	Placed in <i>Melania</i> as <i>Melania tuberculata</i> "Wagn." [= (Spix)]; compared to <i>Melania truncata</i> Lamarck, 1822.
<i>Aylacostoma glabrum</i> Spix	Pl. VIII, fig. 5	[see <i>Achatina perversa</i>]	Replaced by <i>Melania scalaris</i> Wagner.
<i>Melania scalaris</i> Wagner	Pl. VIII, fig. 5	[see <i>Achatina perversa</i>]	[Unnecessary replacement name for <i>Aylacostoma glabrum</i> Spix; junior objective synonym of <i>A. glabrum</i> Spix.]
<i>Achatina pavonina</i> Spix	Pl. IX, fig. 1	ACHATINA I. pavonina. 2. pulchella. 3. 4. floccosa.	Not mentioned in the text; synonym of <i>Bulimus gallinasultana</i> Lamarck, 1822, in the "Tabulae explicatae".

Table 1. Continued.

Names as listed in the "Tabulae explicatae"	Plate and figure numbers	Names as they appear on the plates	Treatment by Wagner if different from that by Spix, with additional comments in square brackets
<i>Achatina pulchella</i> Spix	Pl. IX, fig. 2	[see <i>Achatina pavaonina</i>]	Synonym of <i>Bulinus undatus</i> Bruguière, 1789. <i>Buccinum zebra</i> Müller, 1774, among other names, listed in synonymy, but Bruguière's name retained as valid. Placed in <i>Bulinus</i> as <i>Bulinus floccosus</i> "Wagn." [= (Spix)].
<i>Achatina floccosa</i> Spix	Pl. IX, figs. 3, 4	[see <i>Achatina pavaonina</i>]	Synonym of " <i>Bulinus calcareus</i> Bruguière" [= <i>Helix calcareus</i> Born, 1775].
<i>Columna maritima</i> Spix	Pl. X, fig. 1	COLUMNA 1. maritima. 2. 8-gyrata. 3. bulimea. 4. sylvatica. 5. LYMNÆUS papyraceus.	Synonym of " <i>Bulinus calcareus</i> Bruguière" [= <i>Helix calcareus</i> Born, 1775].
<i>Columna 8-gyrata</i> Spix	Pl. X, fig. 2	[see <i>Columna maritima</i>]	Replaced by <i>Bulinus spixii</i> Wagner.
<i>Columna bulimea</i> Spix	Pl. X, fig. 3	[see <i>Columna maritima</i>]	[Unnecessary replacement name for <i>Columna bulimea</i> Spix; junior objective synonym of <i>C. bulimea</i> Spix.]
<i>Bulinus Spixii</i> Wagner	Pl. X, fig. 3	[see <i>Columna maritima</i>]	Placed in <i>Bulinus</i> as <i>Bulinus sylvaticus</i> "Wagner" [= (Spix)].
<i>Columna sylvatica</i> Spix	Pl. X, fig. 4	[see <i>Columna maritima</i>]	Spix's original spelling, " <i>Lymnaeus papyraceus</i> " (legend of plate X) changed to " <i>Lymnaeus papyraceus</i> Spix".
<i>Lymnaeus papyraceus</i> Spix	Pl. X, fig. 5	[see <i>Columna maritima</i>]	[<i>Lymnaeus</i> Pfeiffer, 1821 (emendation of <i>Limneus</i> Draparnaud, 1801, <i>Limnus</i> Montfort, 1810, and <i>Lymnaeus</i> Brand, 1810) is a junior synonym of <i>Lymnaea</i> Lamarck, 1799.]
<i>Strophocheilus Haemastromus</i> Spix	Pl. XI, fig. 1	STROPHOCHEILUS 1. Haemastomus. 2. 3. Almeida.	Synonym of " <i>Bulinus ovatus</i> Bruguière" [= <i>Helix ovata</i> Müller, 1774].
<i>Strophocheilus Almeida Spix</i>	Pl. XI, figs. 2, 3	[see <i>Strophocheilus Haemastomus</i>]	Synonym of " <i>Bulinus virgineus</i> Bruguière, 1789" [= <i>Helix pudica</i> Müller, 1774].
<i>Auris melastoma</i> Spix	Pl. XII, figs. 1, 2	AURIS 1. 2. Melastoma. 3. signata. 4. vittata.	Not a new name but a reference to <i>Bulinus melastomus</i> Swainson, 1820; emended to " <i>Bulinus melastomus</i> Swainson", citing the original name together with the emended name; the latter used as valid. [Wagner's emendation was unjustified, so <i>Bulinus megalostomus</i> Wagner is an available, junior objective synonym of <i>Bulinus melastomus</i> Swainson, 1820 (<i>Code</i> , Article 33.2.3.).]
<i>Auris signata</i> Spix	Pl. XII, fig. 3	[see <i>Auris melastoma</i>]	Placed in <i>Auricula</i> as <i>Auricula signata</i> "Wagner" [= (Spix)]; compared with <i>Auricula silenti</i> Féruccac, 1807.
<i>Auris vittata</i> Spix	Pl. XII, fig. 4	[see <i>Auris melastoma</i>]	Faded specimen of <i>Auricula signata</i> Spix.
<i>Stenostoma auritum</i> Spix	Pl. XIII, figs. 1, 2	STENOSTOMA 1. 2. auritum. 3. Purú. 4. Capueira.	Synonym of <i>Auricula leporis</i> "Lamarck" [= "Bruguière", in Féruccac, 1807].
<i>Stenostoma Puru</i> Spix	Pl. XIII, fig. 3	[see <i>Stenostoma auritum</i>]	Replaced by <i>Bulinus angulatus</i> Wagner. The name Purú was printed with a written accent in the plate legend but without an accent in the <i>Tabulae explicatae</i> (Puru).
<i>Bulinus angulatus</i> Wagner	Pl. XIII, fig. 3	[see <i>Stenostoma auritum</i>]	[Unnecessary replacement name for <i>Stenostoma puru</i> Spix; junior objective synonym of <i>Stenostoma puru</i> Spix. Spix's name is the name of the Purú River, in apposition; perhaps Wagner considered such a name unacceptable, since he replaced both such names of Spix (see <i>B. angostomus</i> , below).]
<i>Stenostoma Capueira</i> Spix	Pl. XIII, fig. 4	[see <i>Stenostoma auritum</i>]	Replaced by <i>Bulinus angostomus</i> Wagner.
<i>Bulinus angostomus</i> Wagner	Pl. XIII, fig. 4	[see <i>Stenostoma auritum</i>]	[Unnecessary replacement name for <i>Stenostoma capueira</i> Spix; junior objective synonym of <i>Stenostoma capueira</i> Spix. Spix's name is the name of the Capueira River, in apposition. See <i>B. angulatus</i> , above.]

Table 1. Continued.

Names as listed in the "Tabulae explicatae"	Plate and figure numbers	Names as they appear on the plates	Treatment by Wagner if different from that by Spix, with additional comments in square brackets
<i>Clausilia exesa</i> Spix	Pl. XIV, fig. 1	CLAUSILIA 1. exesa. 2. striata. 3. 6-dentata. 4. pupoides.	Placed in <i>Pupa</i> as <i>Pupa exesa</i> "Wagner" [= (Spix)].
<i>Clausilia striata</i> Spix	Pl. XIV, fig. 2	[see <i>Clausilia exesa</i>]	Placed in <i>Pupa</i> as <i>Pupa striata</i> "Wagner" [= (Spix)].
<i>Clausilia 6-dentata</i> Spix	Pl. XIV, fig. 3	[see <i>Clausilia exesa</i>]	Placed in <i>Pupa</i> as <i>Pupa sexdentata</i> "Wagner" [= (Spix)].
<i>Clausilia pupoides</i> Spix	Pl. XIV, fig. 4	[see <i>Clausilia exesa</i>]	Replaced by <i>Pupa inflata</i> Wagner.
<i>Pupa inflata</i> Wagner	Pl. XIV, fig. 4	[see <i>Clausilia exesa</i>]	Compared to <i>Clausilia sexdentata</i> Spix. [Unnecessary replacement name for <i>Clausilia pupoides</i> Spix; junior objective synonym of <i>Clausilia pupoides</i> Spix.]
<i>Pupa elatior</i> Spix	Pl. XV, fig. 1	I. PUPA elatior. 2. 3. NAVICULA fasciata. 4. 5. TOMIGERUS clausus.	
<i>Navicula fasciata</i> Spix	Pl. XV, figs. 2, 3	[see <i>Pupa elatior</i>]	Replaced by <i>Helix navicula</i> Wagner. [The genus-group name <i>Navicula</i> Spix is a junior primary homonym of <i>Navicula</i> Blainville, 1825.]
<i>Helix Navicula</i> Wagner	Pl. XV, figs. 2, 3	[see <i>Pupa elatior</i>]	[Unnecessary replacement name for <i>Navicula fasciata</i> Spix; junior objective synonym of <i>Navicula fasciata</i> Spix.]
<i>Tomigerus clausus</i> Spix	Pl. XV, figs. 4, 5	[see <i>Pupa elatior</i>]	Placed in <i>Helix</i> as <i>Helix clausa</i> "Wagner" [= (Spix)].
<i>Helicina Pyramidella</i> Spix	Pl. XVI, figs. 1, 2	HELICINA I. 2. Pyramidella. 3. 4. fasciata. 5. flava.	Placed in <i>Helix</i> as <i>Helix Pyramidella</i> "Wagner" [= (Spix)].
<i>Helicina fasciata</i> Spix	Pl. XVI, figs. 3, 4	[see <i>Helicina Pyramidella</i>]	Junior primary homonym of <i>Helicina fasciata</i> Lamarck, 1822; replaced by <i>Helicina variabilis</i> Wagner.
<i>Helicina variabilis</i> Wagner	Pl. XVI, figs. 3, 4	[see <i>Helicina Pyramidella</i>]	New replacement name for <i>Helicina fasciata</i> Spix.
<i>Helicina flava</i> Spix	Pl. XVI, fig. 5	[see <i>Helicina Pyramidella</i>]	Variety of <i>Helicina variabilis</i> Wagner.
<i>Solarium Serpens</i> Spix	Pl. XVII, figs. 1, 2	SOLARIUM I. 2. Serpens. 3. 4. candidum. 5. vitreum. 6. imperforatum. 7. pygmaeum.	Spix's apical (pl. XVII, fig. 1) and basal (pl. XVII, fig. 2) views of this species identified as two distinct but very similar species (see below, and see the discussion of this species in the text).
<i>Helix PELLIS serpentis</i> Chemnitz	Pl. XVII, fig. 1	[see <i>Solarium Serpens</i>]	The apical view (pl. XVII, fig. 1) of <i>Solarium serpens</i> Spix identified by Wagner as <i>Helix pellisserpentis</i> "Chemnitz" [= Gmelin, 1794, since Chemnitz is unavailable].
<i>Helix punctata</i> Wagner	Pl. XVII, fig. 2	[see <i>Solarium Serpens</i>]	New name for <i>Solarium serpens</i> Spix of pl. XVII, fig. 2 (non Spix of pl. XVII, fig. 1). [Junior primary homonym of <i>Helix punctata</i> Müller, 1774.]
<i>Solarium candidum</i> Spix	Pl. XVII, figs. 3, 4	[see <i>Solarium Serpens</i>]	[see <i>Helix perspectiva</i> , below]
<i>Solarium vitreum</i> Spix	Pl. XVII, fig. 5	[see <i>Solarium Serpens</i>]	[see <i>Helix perspectiva</i> , below]
<i>Helix perspectiva</i> Wagner	Pl. XVII, figs. 3–5	[see <i>Solarium Serpens</i>]	<i>Solarium candidum</i> Spix and <i>S. vitreum</i> Spix listed as adult ("testa completa adulta") and younger ("testa junior") specimens, respectively of <i>Helix perspectiva</i> Wagner. [Junior primary homonym of <i>Helix perspectiva</i> Megerle, 1816, and <i>Helix perspectiva</i> Say, 1817. As first revisers, we treat <i>Helix perspectiva</i> Wagner as an unnecessary new name for <i>Solarium candidum</i> Spix, not for <i>S. vitreum</i> Spix. <i>Helix perspectiva</i> Wagner is therefore a junior objective synonym of <i>S. candidum</i> Spix and <i>Solarium vitreum</i> Spix is a junior subjective synonym of <i>S. candidum</i> Spix, according to Wagner's opinion.]
<i>Solarium imperforatum</i> Spix	Pl. XVII, fig. 6	[see <i>Solarium Serpens</i>]	Replaced by <i>Helix vitrina</i> Wagner.

Table I. Continued.

Names as listed in the "Tabulae explicatae"	Plate and figure numbers	Names as they appear on the plates	Treatment by Wagner if different from that by Spix, with additional comments in square brackets
<i>Helix vitrina</i> Wagner	Pl. XVII, fig. 6	[see <i>Solarium Serpens</i>]	[Unnecessary replacement name for <i>Solarium imperforatum</i> Spix; junior objective synonym of <i>Solarium imperforatum</i> Spix.]
<i>Solarium pygmaeum</i> Spix	Pl. XVII, fig. 7	[see <i>Solarium Serpens</i>]	Replaced by <i>Helix nana</i> Wagner.
<i>Helix nana</i> Wagner	Pl. XVII, fig. 7	[see <i>Solarium Serpens</i>]	[Junior primary homonym of <i>Helix nana</i> Martens, 1824, and <i>Helix nana</i> Megerle, 1824. Unnecessary replacement name for <i>Solarium pygmaeum</i> Spix; junior objective synonym of <i>Solarium pygmaeum</i> Spix.]
<i>Planorbis ferrugineus</i> Spix	Pl. XVIII, fig. 1	PLANORBIS I. ferrugineus. 2. olivaceus. 3. 4. nigricans. 5. albescens. 6. viridis.	Synonym of <i>Planorbis olivaceus</i> Spix.
<i>Planorbis olivaceus</i> Wagner and Spix	Pl. XVIII, fig. 2	[see <i>Planorbis ferrugineus</i>]	Compared to " <i>Planorbis corneus</i> " [= <i>Helix cornea</i> Linnaeus, 1758].
<i>Planorbis nigricans</i> Spix	Pl. XVIII, figs. 3, 4	[see <i>Planorbis ferrugineus</i>]	[The only claim of joint authorship is in the "Tabulae explicatae". However, no author is mentioned for this species in the text (p. 26); if there was a reason for this departure, it is not evident from the work itself, and species authorship is therefore assignable to Spix alone.]
<i>Planorbis albescens</i> Spix	Pl. XVIII, fig. 5	[see <i>Planorbis ferrugineus</i>]	[see <i>Planorbis lugubris</i> , below]
<i>Planorbis viridis</i> Spix	Pl. XVIII, fig. 6	[see <i>Planorbis ferrugineus</i>]	[see <i>Planorbis lugubris</i> , below]
<i>Planorbis lugubris</i> Wagner	Pl. XVIII, figs. 3–6	[see <i>Planorbis ferrugineus</i>]	<i>Planorbis nigricans</i> Spix, <i>P. albescens</i> Spix, and <i>P. viridis</i> Spix considered as juvenile specimens of <i>P. lugubris</i> Wagner. Compared to " <i>Planorbis corneus</i> " [= <i>Helix cornea</i> Linnaeus, 1758].
BIVALVIA (see footnote)			[Unnecessary replacement name. <i>Planorbis nigricans</i> Spix is the first of the three names listed as <i>Planorbis lugubris</i> Wagner in the "Tabulae explicatae". We, as first revisers, take <i>P. lugubris</i> Wagner to be the replacement name for <i>P. nigricans</i> ; the former is thus a junior objective synonym of the latter. <i>Planorbis albescens</i> Spix and <i>P. viridis</i> Spix are then subjective synonyms according to Wagner's opinion.]
<i>Anodon giganteus</i> Spix	Pl. XIX, figs. 1, 2	ANODON giganteum. 1. juv. 2. adult.	<i>Anodon crassus</i> Swainson, 1823, considered a variety of this species, even though Swainson's name has priority.
<i>Anodon trapezeus</i> Spix	Pl. XX, fig. 1	ANODON I. trapezeum. 2. 4. rotundum.	
<i>Anodon rotundus</i> Spix	Pl. XX, figs. 2–4	[see <i>Anodon trapezeus</i>]	
<i>Anodon anserinus</i> Spix	Pl. XXI, figs. 1, 2	ANODON anserinum.	
<i>Anodon longinus</i> Spix	Pl. XXII, fig. 1	ANODON I. longinum. 2. trigonum. 3. obtusum. 4. lituratum.	<i>Anodon membranaceus</i> [= <i>Mytilus membranaceus</i> Martin, 1811] given as a synonym, but Spix's name retained as valid. Compared to <i>Anodon trapezeus</i> Spix. Compared to <i>Anodon giganteus</i> Spix. [Though the figures have numbers 1 (outer view) and 2 (inner view of both valves), the legend does not mention any numbers].
<i>Anodon trigonus</i> Spix	Pl. XXII, fig. 2.	[see <i>Anodon longinus</i>]	Compared to " <i>Anodon sulcatus</i> Lamarck" [= <i>Anodon sulcatus</i> Lamarck, 1819].
<i>Anodon obtusus</i> Spix	Pl. XXII, fig. 3	[see <i>Anodon longinus</i>]	
<i>Anodon lituratus</i> Spix	Pl. XXII, fig. 4	[see <i>Anodon longinus</i>]	Synonym (young specimen) of <i>Anodon obtusus</i> Spix.

Table 1. Continued.

Names as listed in the "Tabulae explicatae"	Plate and figure numbers	Names as they appear on the plates	Treatment by Wagner if different from that by Spix, with additional comments in square brackets
<i>Anodon radiatus</i> Spix	Pl. XXIII, fig. 1	ANODON 1. radiatum. 2. siliquosum. 3. 4. pygmaeum.	Compared to "Anodon glaucus Humboldt" [= <i>Anodonta glauca</i> Valenciennes, 1827].
<i>Anodon siliquosus</i> Spix	Pl. XXIII, fig. 2	[see <i>Anodon radiatus</i>]	Compared to <i>Anodon longinus</i> Spix.
<i>Anodon pygmaeus</i> Spix	Pl. XXIII, figs. 3, 4	[see <i>Anodon radiatus</i>]	Synonym (young specimen) of <i>Anodon siliquosus</i> Spix.
<i>Anodon ensiformis</i> Spix	Pl. XXIV, figs. 1, 2	ANODON ensiforme.	[Though the figures have numbers 1 (outer view) and 2 (inner view of both valves), the legend does not mention any numbers].
<i>Aplodon inermis</i> Spix	Pl. XXV, figs. 1, 2	1. 2. APLODON inerme. 3. 4. TETRAPLODON pectinatum. 5. 6. CYCLAS bahiensis.	Possible synonym of <i>Anodon rotundus</i> Spix.
<i>Tetraplodon pectinatus</i> Spix	Pl. XXV, figs. 3, 4	[see <i>Anodon inermis</i>]	Placed in <i>Unio</i> as <i>Unio pectinatus</i> "Wagner" [= (Spix)]. <i>Castalia ambiguia</i> Lamarck, 1819, given as a synonym, but Spix's name retained as valid.
<i>Cyclas bahiensis</i> Wagner	Pl. XXV, figs. 5, 6	[see <i>Anodon inermis</i>]	Compared to <i>Cyclas fontinalis</i> Draparnaud, 1801. [Authorship should be Spix not Wagner; probably a <i>lapsus calami</i> , because the legend on plate XXV reads " <i>Cyclas bahiensis</i> " (Spix's original spelling) and the text subtitle on p. 32 reads " <i>Cyclas bahiensis</i> Spix".]
<i>Diplodon ellipticus</i> Spix	Pl. XXVI, figs. 1, 2	DIPLODON 1. 2. ellipticum. 3. 4. rotundum.	Placed in <i>Unio</i> as <i>Unio ellipticus</i> "Wagner" [= (Spix)]. Compared to <i>Unio pictorum</i> (Linnaeus, 1758).
<i>Diplodon rotundus</i> Spix	Pl. XXVI, figs. 3, 4	[see <i>Diplodon ellipticus</i>]	Placed in <i>Unio</i> as <i>Unio rotundus</i> "Wagner" [= (Spix)]. <i>Mya variabilis</i> Maton, 1811, given as a synonym but Spix's name retained as valid.
<i>Diplodon furcatus</i> Spix	Pl. XXVII, figs. 1, 2	DIPLODON furcatum.	Replaced by <i>Unio caudatus</i> Wagner. [No numbers printed either with the figures (outer view and inner view of both valves) or in the legend].
<i>Unio caudatus</i> Wagner	Pl. XXVII, figs. 1, 2	[see <i>Diplodon furcatus</i>]	<i>Hyria avicularis</i> Lamarck, 1819, given as a synonym but Spix's name retained as valid.
<i>Diplodon rhombeus</i> Spix	Pl. XXVIII, figs. 1, 2	DIPLODON rhombeum.	[Unnecessary replacement name for <i>Diplodon furcatus</i> Spix; junior objective synonym of <i>Diplodon furcatus</i> Spix.]
<i>Triplodon rugosus</i> Spix	Pl. XXIX, figs. 1, 2	TRIPLODON rugosum.	Placed in <i>Unio</i> as <i>Unio rhombeus</i> "Wagner" [= (Spix)]. Compared to <i>Unio peruvianus</i> Lamarck, 1819. [Though the figures have numbers 1 (outer view) and 2 (inner view of both valves), the legend does not mention any numbers].
			Placed in <i>Unio</i> as <i>Unio rugosus</i> "Wagner" [= (Spix)]. Compared to <i>Hyria corrugata</i> Lamarck, 1819. [Though the figures have numbers 1 (outer view) and 2 (inner view of both valves), the legend does not mention any numbers].

Note—Most Greek nouns ending in -on are neuter. However, the word -odon (= tooth) and its derived genera ending in -odon are masculine. Spix apparently did not realize the difference and gave neuter endings (-un or -e) to all species in *Anodon*, *Diplodon*, *Triplodon*, and *Tetraplodon*. All these names are, therefore, incorrect original spellings that were rightly corrected by Wagner in the "Tabulae explicatae" and in the text (*Code*, Articles 31.2, 32.5, 34.2).

Spix), he provided Spix's species name after the short diagnosis, before describing the species in the longer description. When he combined two of Spix's species as varieties under a single Wagner species (e.g., *Helix lineata* Spix and *Ampullaria figurina* Spix under *Ampullaria lineata* Wagner), or synonymized two of Spix's spe-

cies (*Ampullaria zonata* Spix and *A. archimedes* Spix under *A. zonata* Wagner), he provided another, still shorter diagnosis on the same line as each of Spix's species names, following the two-line diagnosis, before describing the species in the longer description. We suggest that this reflects the likelihood that Spix left not only the

AMPULLARIA.

3

4. AMPULLARIA PAPYRACEA SPIX. Tab. IV. Fig. 1. 2.

A. testa ovata-globosa, tenuissima, longitudinaliter subtilissime striata, nigro-fusca; umbilico angusto; apertura nigra.

Testa oblongo-ovata, globosa, tenuissima, fragilis; striis longitudinalibus crebris, irregulis, striae transversae, remotas, absortas decussantibus. Anfractus quinque aut sex convexi, ultimus maximus. Spira brevis, striis longitudinalibus profundioribus. Apertura ovato-oblonga; labrum acutum, tenue, margine sinistro subreflexo. Umbilicus angustus, longitudinalis. Color testae nigro-fuscus; ultimus anfractus interdum fascia olivacea brunnea cinctus. Spirafusco-rubra; apertura nigra.

Longitudo 2 poll. 2 lin.; lat. 1 poll. 9 lin.

Habitat in flum et stagnum Provinciarum Bahiensis, Pernambucanae et Piauiensis.

5. AMPULLARIA ROSEA SPIX. Tab. IV. Fig. 3.

A. testa ovata, ventricosa, tenui, pellucida, longitudinaliter striata, perforata, albido-rubella; apertura oblongo-ovata, inferne ampla.

Testa oblongo-orata, ventricosa, tenuis, pellucida, longitudinaliter striata. Anfractus quinque convexi; ultimus maximus, usque ad medium striis longitudinalibus eleganter ornatus, infra medium laevis. Spira exserticula, obtusa; striis longitudinalibus crebris. Apertura oblongo-ovata, superne anfractu penultimo valde angustata, inferne ampla. Labrum acutum, tenue, margine sinistro subreflexum. Umbilicus angustissimus. Color testae rubello-albidus, margo aperturæ sinister roseus.

Longitudo 9 1/2 lin.; lat. 7 1/2 lin.

Habitat in aqua Brasiliæ australioris.

Observatio. Ille species, nihil tantum ex uno specimine cognita, dubie Ampullarii adscribenda est, forsitan in Bulimi genus amandanda.

6. AMPULLARIA LINEATA WAGN. Tab. V. Fig. 2 et Tab. IV. Fig. 4.

A. testa ovato-globosa, olivaceo-virente aut lutescente, fasciis obscure purpureis ornata; spira elevata; umbilico mediocri; apertura alba, transversim fasciata.

a) VAR. testa maiore, adulta, olivaceo-virente, fasciis purpurascensibus cincta: *Helix lineata* Spix, Tab. V. Fig. 2.

Siebold, *Zoological Illustrations*. No. 21. Tab. 103.: *Ampullaria fasciata*.

b) VAR. testa minore lutescente, fasciis fuscis cincta: *Ampullaria figurina*, Spix Tab. IV. Fig. 4.

Figure 4. An example of species descriptions, from p. 3 of the Munich edition of the "Testacea fluviatilia . . .".

tana). Thus, for those species for which Wagner gave his own full description, or for which he did not explicitly state that he had not seen specimens, he had arguably seen the actual material.

Regarding *Bulimus floccosus* [= *Achatina floccosa* Spix], Wagner stated that "Museum Monacense possidet specimen unicum, cuius apex abruptus est; itaque numerum anfractorum et longitudinem totius testae non indicare possum" (The Munich Museum has only one specimen, the apex of which is broken; so I cannot indicate either the number of whorls or the total length of the shell). However, Spix's figures 3 and 4 on plate IX do not show a broken apex; perhaps the shell was damaged during its shipping or handling, before Wagner had the opportunity of measuring it. This also implies that shell measurements given by Wagner were probably not taken from the lithographs but from the actual shells.

In some instances Wagner made unambiguous statements that could probably not have been made had he not studied the collection. For example, on p. 31, he said that "Anodon siliquosum et pygnaeum cl. Spixii aetate sola inter se diversa esse plurimus speciminiis intermedis, quae in Museo Monachensi asservatur, facile probatur" (*Anodon siliquosum* and *pygnaeum* of the eminent Spix only differ from each other by their age, as can be easily demonstrated by the many intermediate specimens conserved in the Munich Museum). On the same page, Wagner made the following comment on *Anodon radiatus* Spix: "Museum Monachense permulta specimen hujus speciei asservat, quae omnia ab *Anodone glaucu* cl. *Humboldti* diversa sunt" (The Munich Museum conserves a lot of specimens of this species, all of which differ from *Anodon glaucus* of the eminent Humboldt).

The instance of *Solarium serpens* Spix is also intriguing. Wagner divided the genus *Helix* into three sections: a) *dentatae*, non *carinatae* (with apertural teeth, not carinated); b) *carinatae*, and c) *planorbes*, neque *carinatae*, neque *dentatae* (planorbital, neither carinated, nor toothed). He placed *Helix punctata* Wagner [= *Solarium serpens* Spix of pl. XVII fig. 2] in section b (*carinatae*), while *Helix pellisserpentis* "Chemnitz" [= *Solarium serpens* Spix of pl. XVII fig. 1] was placed in section c. However, Spix's illustrations are of apical (Spix's fig. 1) and basal (Spix's fig. 2) views, from which it is not possible to determine whether the shell was carinate or not, suggesting that if he was not simply guessing Wagner saw the shell(s).

So, Wagner introduced some severe errors in the description of the bivalves, which induced Ihering (1890) to conclude that he had not seen the specimens. However, the above discussion leads us to conclude that he did indeed work with at least the greater part of Spix's type material, though perhaps not all it.

TYPES

The natural history material collected by Spix and Martius in Brazil formed a major part of what was intended

as the "Museum Brasiliense" (Fittkau, 1983). The zoological material and the types were later integrated into the collection of the Zoologische Staatssammlung in Munich, where most of it is still held. Fechter (1983a, b) surveyed the molluscan types of Spix, listing 64 gastropod species and 19 species of Unionoidea, collected, illustrated and named by Spix, as evidenced by the labels and the 1827 publication. However, some of the type material is now missing, as a result of damage the museum suffered during World War II. Also, Spix's original labels are not all extant, and according to Fechter (1983a) it was only possible in four cases, by comparing the labels to letters written by Wagner, to attribute some of the existing older labels to Wagner, apparently stemming from his working in the collection years after Spix's death (see above).

ACKNOWLEDGMENTS

We thank the following for comments and discussion: Gene Coan, Kevin Cummings, Neal Evenhuis, Riccardo Giannuzzi-Savelli, Otto Kraus, Fabio Moretzsohn, Michael Ohl, Andrew Rindsberg, Barry Roth, and Michael Schrödl. They may not all agree with our interpretations. We especially thank Dick Pettit for a detailed review of the manuscript. We also thank Michael Schrödl and Enrico Schwabe (ZSM), Ingeborg Kiliaus (Museum für Naturkunde, Humboldt-Universität zu Berlin), and Peter Mordan (The Natural History Museum, London) for help with obtaining literature. For help with Latin translation of the "Praefatio", M. G. thanks Bernhard Richer (Ahrensburg) and N. J. C. thanks Lea Cazzaniga. N. J. C. is a staff researcher of the Comisión de Investigaciones Científicas de la Provincia de Buenos Aires (Argentina). R. H. C. thanks the USDA T-STAR program for partial support on his work on Ampullariidae.

LITERATURE CITED

- Cowie, R. H. and S. C. Thiengo. 2003. The apple snails of the Americas (Mollusca: Gastropoda: Ampullariidae: *Asolene*, *Felipponea*, *Marisa*, *Pomacea*, *Pomella*): a nomenclatural and type catalog. Malacologia 45: 41–100.
- Fechter, R. 1983a. Das Typenmaterial der von J.B. v. Spix in Brasilien gesammelten Unionaceia. *Spixiana Supplement* 9: 225–255.
- Fechter, R. 1983b. Liste des Typenmaterials der von J.B. v. Spix in Brasilien gesammelten Gastropoda. *Spixiana Supplement* 9: 221–223.
- Fittkau, E. J. 1983. Johann Baptist Ritter von Spix. Sein Leben und sein wissenschaftliches Werk. *Spixiana Supplement* 9: 11–18.
- Glaubrecht, M. 1996. Evolutionsökologie und Systematik am Beispiel von Süß- und Brackwasserschnecken (Mollusca: Caenogastropoda: Cerithioidea): Ontogenese-Stratigien, paläontologische Befunde und historische Zoogeographie. Backhuys Publishers, Leiden, vi + 544 pp.
- Haas, F. 1969. Superfamilie Unionacea. In: Das Tierreich. Lieferung 88 (I–X). Berlin. 663 pp.
- Huber, B. and W. Huber. 1993. Dr. Johann Baptist Ritter von

- Spix—eine “berühmte Münchner Persönlichkeit”. *Spixiana* 16: 97–104.
- ICZN [International Commission on Zoological Nomenclature]. 1999. International Code of Zoological Nomenclature. Fourth edition. International Trust for Zoological Nomenclature, London, xxix + 306 pp.
- Ihering, H. von. 1890. Revision der von Spix in Brasilien gesammelten Najaden. *Archiv für Naturgeschichte* 56(1): 117–170.
- Kottelat, M. 1988. Authorship, dates of publication, status and types of Spix and Agassiz's Brazilian fishes. *Spixiana* 11(1): 69–93.
- Martius, C. F. P. von. 1862. Denkrede auf Joh. Andreas Wagner. München. Verlag der Königlichen Akademie. 16 pp.
- Morrison, J. P. E. 1954. The relationships of Old and New World melanians. *Proceedings of the United States National Museum* 103: 357–394, pl. 11.