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THE "LOST" JORDAN AND HAY FISH COLLECTION AT BUTLER UNIVERSITY

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ABSTRACT. A large fish collection, preserved in ethanol and assembled by Drs. David S. Jordan and Oliver P. Hay between 1875 and 1892, had been stored for over a century in the biology building at Butler University. The collection was of historical importance since it contained some of the earliest fish material ever recorded from the states of South Carolina, Georgia, Mississippi and Kansas, and also included types of many new species collected during the course of this work. In addition to material collected by Jordan and Hay, the collection also included specimens received by Butler University during the early 1880s from the Smithsonian Institution, in exchange for material (including many types) sent to that institution. Many ichthyologists had assumed that Jordan, upon his departure from Butler in 1879, had taken the collection, essentially intact, to Indiana University, where soon thereafter (in July 1883) it was destroyed by fire. The present study confirms that most of the collection was probably transferred to Indiana, but that significant parts of it remained at Butler. The most important results of this study are: a) analysis of the size and content of the existing Butler fish collection; b) discovery of four specimens of *Micropterus coosae* in the Saluda River collection, since the species had long been thought to have been introduced into that river; and c) the conclusion that none of Jordan's 1878 southeastern collections apparently remain and were probably taken intact to Indiana University, where they were lost in the 1883 fire. The collection discussed has now been incorporated into the fish collection at the Florida Museum of Natural History, in Gainesville.

Keywords: South Carolina, Georgia, Mississippi, Kansas, Indiana University, Smithsonian, Penikese, types

For many years a substantial collection of bottled fishes and other animals had lain dormant in the basement of the science building at Butler University, in Indianapolis. The collection was obviously old, as attested by the glass stoppered bottles housing the specimens (a type of bottle little used for scientific specimen storage since the beginning of the 20th century). It appears that unknown individuals were either assigned the task, or had taken it upon themselves, of replacing the ethanol preservative lost from some of the bottles through evaporation. Nevertheless, over time some specimen lots had either become completely desiccated or had rotted beyond hope of rehabilitation because of the greatly diluted alcohol, but a surprising number were still in relatively good condition.

Drs. James Berry, David Daniell and Stephen Perrill, faculty members in the Biological Sciences Department at Butler, took on the task of evaluating and determining the disposition of this collection, as well as of other items occupying space in the basement of the building. Closer examination not only confirmed the antiquity of the collection, but that it also comprised fish material collected by Drs. David Starr Jordan and Oliver Perry Hay during their respective tenures at the school from 1875–1892. Their collections are among the earliest made in certain areas of southern and midwestern North America; and the results of their work, published in several papers, included original descriptions of a number of new species of fishes. Perusal of the labels in the jars, together with metal tags attached to some individual specimens, indicated that those with tags had originally been catalogued into the National Museum of Natural History (Smithsonian Institution) fish collection, and had later been sent on exchange to Butler. Other lots included specimens collected, mostly by Jordan and Hay, during their years at the school. Eighty-nine salvageable lots from both sources were packed and shipped to the Smithsonian in September, 1993. Several of these lots were later determined to include type material, and were cited in publication (Gilbert 1998:59, 144). Later, many additional jars of specimens were discovered elsewhere, indicating that the earlier material actually represented only a fraction of the total collection. The three individuals

recognized the historical importance of this material, but the logistics of packing and shipping it to Washington represented more work than they were prepared to deal with. Dr. Berry, who by now had retired to Gainesville, Florida, during the winter months, asked the author for advice in the matter. It was pointed out that that the Florida Museum of Natural History (a department of the University of Florida) is a major museum in its own right and would be a highly suitable repository. Since Dr. Berry was continuing to commute by automobile between Gainesville and Indianapolis several times each year, the most logical solution was for him to bring parts of the collection down as space in his vehicle permitted. The transfer began, and eventually all remaining material was brought down to Gainesville. It was felt that the importance of the collection was such that a written history, together with an analysis of its contents, would be the next logical step, and I was asked if I would be willing to write this up. The present paper is the result of this agreement.

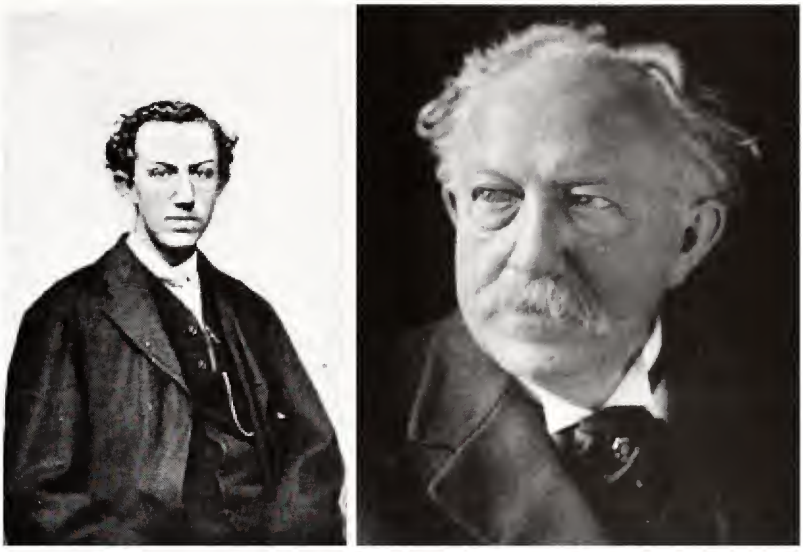
This paper has three main goals. The first is to review the history of the Butler University collection, with pertinent biographies of the two principal individuals (D.S. Jordan and O.P. Hay) responsible for the collection's development. The second is to record the incorporation of extant Butler specimen lots into the Florida Museum of Natural History fish collection. The third is to analyze these lots, with particular emphasis on Jordan's collections made during the summers of 1876–1878 and Hay's collections from the early to mid-1880s, and to deduce from this the approximate number and content of lots presumed to have been taken by Jordan to Indiana University, where they were later destroyed by fire during the summer of 1883, along with the rest of Jordan's fish collection, library, and unfinished manuscripts.

THE FISH COLLECTION

When one thinks of major natural history collections in the United States, institutions such as the National Museum of Natural History (Washington, D.C.) (USNM), Academy of Natural Sciences of Philadelphia (ANSP), American Museum of Natural History (New York, N.Y.) (AMNH), California Academy of Sciences (San Francisco) (CAS), and Field Museum of Natural History (Chicago) (FMNH) are among the first to come to mind. All of these museums had their origins in the 19th century. The earliest of these was the ANSP, which was founded in 1812, followed later by the USNM in 1846, CAS in 1853, AMNH in 1869, and FMNH in 1893. All of these museums are either private or public institutions. University-supported museums were mostly in the future, with the Museum of Comparative Zoology (Harvard University) and the Peabody Museum (Yale University) being exceptional in this regard, the former being founded in 1865 and the latter the following year. Other important university natural history museums, such as those at the University of Michigan, University of Kansas, University of California, Tulane University, and University of Florida were far in the future.

Faced with the relative paucity of established museums, together with relatively primitive means of communication and travel, biologists found it necessary to establish their own collections, usually housed in some small area at the educational institutions where they were employed. Normally such collections served the dual purpose of providing specimens for teaching, as well as material for whatever research activities the professor might find time outside his principal teaching duties. Such collections usually suffered from lack of institutional support, since few colleges or universities in those days had adequate financial resources or appreciation of the value for such collections. In many cases the responsible individuals found it necessary to use their own private funds for basic items such as jars and alcohol, and had to be content with whatever space happened to be available for housing their collections. The future of such collections was uncertain, since the responsible individual, upon leaving or retiring, was only rarely replaced by a colleague with similar interests. Sometimes these orphan collections were donated to well-established museums, but more often they were either discarded or stored in an attic, basement, or some other out-of-the way place, where they eventually succumbed to the ravages of time. These abandoned collections frequently included voucher material for floras and faunas now lost forever to the advances of civilization.

In many cases the professors responsible for collections at small educational institutions



Figures 1, 2.—David Starr Jordan. Photos from his autobiography (1922). The photo on the left was taken in 1868 when he was about 18. (*in the public domain*)

were not individuals who are widely remembered today. Teaching loads were typically heavy, included a wide range of subjects; and research time was generally very limited. Means of communication we take for granted today (e.g., telephones and computers) were far in the future, as were modern means of travel. Funded research was almost unheard of. The result was that few individuals of that era had the opportunity, initiative, or perseverance to conduct long, labor-intensive research projects, and what research as was produced usually consisted of short reports dealing with summaries of local floras or faunas.

Butler University was one of the many small educational institutions where a small natural-history collection was established. In contrast to most such places, however, Butler had the uncommon good fortune of having hired two individuals whose subsequent careers were anything but ordinary, and who were to become giants in their respective fields of specialization. These two, David Starr Jordan (Figs. 1,2) and Oliver Perry Hay (Figs. 3,4), both began their professional careers engaged in the study of fishes. Jordan continued to concentrate on this field for the rest of his life, but was probably even better known to the

Figures 3, 4.—Oliver Perry Hay. The photo on the left is from the 1891 Butler University yearbook. The photo on the right is copied with permission from a book by S.T. Ross (2001).

educational community and to the public at large for his achievements in higher education. Hay later shifted into the field of vertebrate paleontology, where he was to achieve his greatest renown. Before discussing the history and status of the Butler University fish collection *per se*, it is desirable to present brief biographies of the above two individuals, including a summary of their accomplishments, with emphasis on their years at Butler. Of these, Jordan's is the more detailed, a result of his two-volume autobiography, comprising approximately 1600 pages, published during the later years of his life (Jordan 1922a, b).

DAVID STARR JORDAN

David Starr Jordan (1851–1931) (Figs. 1,2) was born near the town of Gainesville, New York, in the western part of the state about 50 miles south of Rochester and 60 miles east of Buffalo. He graduated from Cornell University in 1872, having graduated in only three years with a Master of Science degree, rather than the conventional Bachelor's degree received by the remainder of his class, a result of having taken advanced botany courses required for the higher degree. Cornell University later voted to rescind this practice, which resulted in Jordan being the last student at that school to merge these two degrees into one (Jordan 1922a). Shortly thereafter, Jordan began his career as an educator, being employed in succeeding years at Lombard University (later Lombard College), in Galesburg, Illinois (1872–1873); the Appleton Collegiate Institute, in Appleton, Wisconsin (1873–1874); and the Indianapolis (Indiana) High School (1874–1875). Regarding his stay at Lombard, Jordan noted that he was "only twenty-one years old, without worldly experience, and ... more or less scornful of some of the social duties supposed to be incumbent on professors" (Jordan 1922a). He worked very hard (during the year he taught classes in zoology, botany, geology, mineralogy, chemistry, physics, political economy, and "evidence of Christianity," as well as German and Spanish!!), with very little in the way of teaching apparatus or laboratory facilities, and considered himself to be an effective teacher. Nevertheless, at the end of the school year, the Lombard trustees, "being short of money and none too appreciative, left me no acceptable alternative save to resign – which I did not unwillingly" (Jordan 1922a:106).

The summer of 1873 found Jordan on the island of Penikese, off the southern coast of Cape Cod, where he had been selected by the renowned Harvard zoologist, Louis Agassiz, to participate in a unique experiment involving the teaching of natural history, utilizing specimens in their natural environment. Summer courses are the norm today, but then they were a new and creative innovation. A number of the participating individuals were later to become prominent scientists and educators. In addition, it was here that Jordan met Susan Bowen, who (in 1875) was to become his wife. Jordan was to spend two summers at Penikese, the second season under the direction of Alexander Agassiz, following the senior Agassiz's death in December, 1873, after which the laboratory was permanently closed.

Although Jordan's contact with Louis Agassiz was limited to only a few months, the latter's influence was long lasting and was directly responsible for the future course of Jordan's career, in which his interests shifted from marine algae to fishes, which became his primary focus of research for the rest of his life. Jordan made a deep impression upon Agassiz as well. When a position opened at the newly-founded Appleton Collegiate Institute, a new preparatory school in Appleton, Wisconsin, at which science teaching was to be made a specialty, Agassiz was asked to recommend a suitable candidate. He immediately recommended Jordan. Jordan spent an enjoyable and productive year at Appleton, and would have stayed longer had the school not experienced unexpected financial reverses associated with a declining business climate. The school was reluctantly closed, with the land and buildings being turned over to neighboring Lawrence University.

Following his second summer at Penikese, Jordan went to Harvard University's Museum of Comparative Zoology, where the senior Agassiz had earlier promised him a job as curator of fossil vertebrates should such a position become available. Jordan would have taken the position, but knew that the financial future of the museum at the time was none too secure following Agassiz's death. About the same time, he received a telegram from the Indianapolis (Indiana) Superintendent of Schools, offering him a position as a teacher in that city's high school. Despite the allure of becoming a member of the Harvard faculty,

Jordan ultimately opted for greater job security and headed for Indianapolis. Jordan described the students there as a "fine body of pupils." Included among them were Charles H. Gilbert, later Jordan's close associate and a prominent ichthyologist in his own right; Charles Nutting, later professor of zoology at the University of Iowa; and Nellie Van de Grift, the sister in-law of Robert Louis Stevenson. During the school year, despite his many teaching duties, Jordan found time to take courses at the Indiana Medical College, with the objective of better preparing him for teaching courses in anatomy and physiology. This resulted in his being awarded, in June of 1875, the degree Doctor of Medicine, which Jordan described as "scarcely earned."

The following summer (1875), Jordan was asked to serve as an instructor in geology at a summer course run by Harvard University at Cumberland Gap, Tennessee. This experience served to introduce him to the southern Appalachians and its rich biota, which became the focus of his research during the next several years. While at Cumberland Gap, he received word that he had been selected "without warning" to be professor of biology at the Northwestern Christian University (soon afterward changed to Butler University), which had recently been moved from Indianapolis to the nearby suburb of Irvington. By the time he arrived there, Jordan had already embarked on a productive scientific career, having produced five publications (Jordan & Van Vleck 1874; Jordan 1875a–d), with another five to follow the next year (Jordan 1876a, b; Jordan & Copeland 1876–1877, 1876a, b). The most notable of these was the first edition of "*A Manual of the Vertebrates of the Northern United States* ...," which was to become the standard reference to vertebrate animal identification in that part of the country, and was to go through 13 editions over the next 53 years. Because of its wide distribution, the publication resulted in widespread recognition for Jordan, to a far greater degree than would be true for an average college professor barely 25 years old.

Jordan revitalized the teaching of biological sciences at Butler, and made his presence known in various ways. One result was the group of enthusiastic students that quickly gravitated to him, attracted by his knowledge, enthusiasm, and friendly demeanor, of which a number were induced to follow careers in the natural sciences. Charles Gilbert, mentioned previously, had followed Jordan to Butler. Another was Barton Warren Evermann, who was also to become a prominent ichthyologist and a close associate of Jordan's for the remainder of his life. Soon after the end of the college year in June 1876, Jordan departed, along with his wife and Gilbert, for Rome, Georgia. Using Rome as a base, they collected and studied the fishes from the headwaters of the Coosa River, as well as the adjacent Chattahoochee and Altamaha river drainages. The results, which were published the following year (Jordan 1877a, b), included 20 new species, of which all but three are recognized as valid today.

Stimulated by his Georgia experience, Jordan initiated several extended walking trips (Butler University Student Tramps [BUST]) during the next three summers (1877–1879) (Jordan 1922a: Daily 1961). Expenses were $15 tuition, $1 per day (average) for board, for a total of $70 for the entire summer. In August 1877, he trekked with six students from eastern Kentucky and Tennessee, on and adjacent to the Blue Ridge plateau in Tennessee and North Carolina, southward through western South Carolina, and ending in Rome, Georgia. Fish collections were made at various sites in different river drainages, including the Cumberland, Tennessee, Santee, Savannah, Altamaha, Chattahoochee, and Coosa (for summary of 1876–1877 collection sites see Jordan & Brayton [1878b:8–10]). During these stops, Jordan delivered a series of impromptu lectures covering a wide range of subjects, which centered on the biology and geology of the region, but included such subjects as sociology, history, and local politics. The trip included a number of interesting sidelights, including an ascent of Mt. Mitchell, the highest mountain east of the Rockies; and a visit with Alexander Stephens, the recent Vice-President of the Confederacy, at his home in Atlanta. A summary paper of the fishes collected and observed on that trip, later published by Jordan & Brayton (1878b), included nine new species (eight of which are still considered valid today), as well as a comparison of the fish fauna of the region with those from surrounding areas. Prior to the trip, Jordan had visited the Smithsonian Institution, in Washington, D.C., where he met many of the resident scientists.

The following summer Jordan took a larger group, including several females, on an even longer trip (totaling 550 miles) that began at Somerset, Kentucky, and ended at Toccoa, Georgia, through much of the same region as the year before (Jordan 1922a:165). Following conclusion of the 1878 trip, Jordan and five of his students spent a month in Beaufort, North Carolina, working on the local fishes (later summarized by Jordan & Gilbert 1879); and afterwards he and Gilbert traveled to Washington, D.C. for additional work.

The final summer session (1879), which actually occurred following Jordan's departure from Butler, was spent in Europe. Although this trip was more strictly in the nature of a tour, Jordan used this opportunity to visit major European museums, where he made the acquaintance of a number of ichthyologists and other scientists, and worked on North American fishes housed in those museums (Jordan 1879–1880a). It was one of Jordan's everlasting regrets that he was unable to meet Charles Darwin during this visit.

It is worth considering the circumstances under which these summer treks were organized and conducted, since this tells us much about Jordan's character and initiative. Jordan (1922a) discussed these in a matter-of-fact way, but he was simply describing things as they then existed, and not in the same way we would look at them today. It should be remembered that travel and communications in the 1870s were very primitive (no automobiles or telephones), and such modern conveniences as motels and fast-food restaurants did not exist. The groups' treks took them over poorly-marked trails through mountainous terrain, with horses or mules being rented when available to carry the heavier articles, and meals and lodging being obtained along the way by (hopefully) convincing a family to feed and house the party following payment of a negotiated sum of money. It was by no means certain in the morning that these amenities would be available at the end of a long and arduous day of travel. If not, the party was forced to camp along the trail, relying upon whatever provisions they might have available. At any time, of course, they could encounter inclement weather. Along with the travel, Jordan and his party were collecting specimens for later study, which had to be preserved (ethanol was the preservative of choice), packed, and transported along with the basic necessities. (The final disposition of these specimens, which is the principal focus of this paper, will be discussed in detail later). This was adventure in its purest form, and is the type of thing from which many would probably recoil today. All this is recounted in order to emphasize that it took a remarkable person to organize and conduct such arduous trips, to have established such rapport with his students that they would willingly participate, and for the students afterwards to agree that this was an experience to be remembered the rest of their lives.

Jordan's teaching activities at Butler have been summarized above, and allusion has been made to his scientific productivity. By the end of 1879 he had produced 35 scientific publications (see summary in Hays 1952:95–98), all of which involved fishes, and which had been expanded to include marine species, as well as freshwater fishes from western North America. For many, this would have been a respectable total for an entire career, but Jordan's career was barely underway.

Jordan never planned to remain at Butler indefinitely, and in fact during his years there he had applied unsuccessfully for teaching positions at several large universities. However, his departure was hastened, in the spring of 1879, by an ill-conceived decision by the school's directors to remove all non-church members from the faculty (Waller 2006). Jordan did not have strong views, pro or con, on religion, and could have joined a church in order to save his job, but being a man of strong moral principles he chose to resign rather than be coerced in this matter. As it turns out, he probably would have left Butler anyway, since about the same time he was offered the professorship of natural history (which included zoology, geology, botany, and physiology) at Indiana University, in Bloomington. An interesting aspect of this appointment is that Jordan never formally applied for the position, but instead went to Bloomington to speak on behalf of his friend, Alembert Brayton, who was a candidate for the job. Jordan made such a favorable impression on the selection committee that he was offered the position instead! It speaks well of Brayton that he did not feel slighted by this unexpected turn of events, which did nothing to affect their friendship.

Jordan had an extraordinarily distinguished career after leaving Butler. After only six years as professor of natural history at Indiana, he was unexpectedly named president of the university, a circumstance perpetuated by the sudden resignation of the previous president. While in this position, Jordan instituted a number of educational reforms and innovations that placed him in the forefront of American education. Chief among these was abolishment of the traditional fixed four-year curriculum, with its heavy emphasis on the classics, and confining those courses to the first two years. Under the new system, each student, at the beginning of the third year, was required to select a "major subject," with the more advanced courses selected in consultation with a major professor. This change in the direction of college education, which was a major innovation at the time, has since been universally adopted and is the norm for higher education today. After six years as president, Jordan was asked to become president of a foundling university in California, funded by the wealthy railroad magnate, Leland Stanford, to be named in honor of his young son, Leland Stanford, Jr., who had died tragically in 1884. Jordan accepted the challenge and headed west. He began to assemble a faculty (Gilbert was his first appointee), and saw Stanford University through its early years. This proved unexpectedly difficult, since, following Stanford's death in 1893, a suit was filed by the Attorney General of the United States involving repayment of a loan made earlier by the government to the Central Pacific Railroad Company. The amount of money (27 million dollars, plus accumulated interest) was of such magnitude that the future of Stanford University during the early years of its existence was very much in doubt. Details of this suit, which was eventually decided in the university's favor by the United States Supreme Court in March, 1896, appear in Jordan's (1922b) autobiography. Jordan served as president of Stanford until 1913, at which time he became chancellor, and in 1916 chancellor emeritus, in which position he remained until his death in 1931. In addition to his many administrative duties, Jordan was involved in a wide variety of outside activities, including memberships in scientific societies and on various national and international organizations, committees, and commissions too numerous to mention here. His early resignation from the presidency of Stanford University in 1913, at age 62, was precipitated by his intensive (and ultimately futile) activities on behalf of world peace. He did a remarkable amount of traveling in the United States and throughout the world (a far more difficult undertaking than it would be today), all the time collecting fish specimens for his studies. Anyone interested in the details of his remarkable life will find his autobiography (Jordan 1922a, b) fascinating reading.

Despite his many administrative duties and involvement in other outside activities, Jordan still found time for research and writing, which by the end of his life included 1939 titles (645 in ichthyology, 430 in international relationships, 373 in general science, 246 in education, and 245 generalia) (Hays 1952). By any standards this is a remarkable total. It should be noted that a high percentage of his publications were substantial in size, and included such major works as *Synopsis of the Fishes of North America* (Jordan & Gilbert 1883), the four-part *Fishes of North and Middle America* (Jordan & Evermann 1896, 1898a, 1898b, 1900), *American Food and Game Fishes* (Jordan & Evermann 1902), the aforementioned 13 editions of *Manual of the Vertebrates of the United States* (Jordan 1876b et seq.), and his two-volume autobiography *The Days of a Man* (Jordan 1922a, b).

Jordan was married twice. His first wife, Susan Bowen, died in 1885 after ten years of marriage and three children. His second wife, Jessie Knight, whom Jordan married in 1887 and with whom he had three children, survived him after his death in 1931.

OLIVER PERRY HAY

Oliver Perry Hay (1846–1930) (Figs. 3, 4) was born in Saluda, Indiana. He obtained his Bachelors's degree from Eureka College (Illinois) in 1870. He initially intended to enter the ministry, but after preaching only one sermon came to the conclusion that he was better suited to a career in science. He returned to Eureka College, where he served as professor of natural sciences for two years, and obtained his Master's degree from that institution in 1873. He then served two years as professor of biology at Oskaloosa College (Iowa) (1874–1876), and thereafter spent a year of graduate study at Yale University (1876–1877). He was appointed professor of biology and geology at

Butler in 1879, following Jordan's departure. Jordan had personally recommended Richard Rathbun (later a world-renowned expert on crustaceans) for the position, but Hay was selected, partly because of his religious background and because he "... had written articles on science for church papers, and who, it was thought, would be less pronouncedly an evolutionist than either Rathbun or myself" (Jordan 1922a:184). However, as Jordan (*op. cit.*) noted, Hay's views on Darwinism later turned out to be "quite as radical as mine." Hay proved to be a productive scientist in his own right, and by the end of the 1880s his list of publications had reached a respectable total of 25 published works (Lull 1931). Whereas Jordan's scientific publications during this period centered almost entirely on fishes, Hay's papers were broader in scope, and included amphibians and reptiles, birds, crustaceans, and fishes, as well as geology. Although he published relatively few papers on fishes, these were important inasmuch as they dealt with faunas from areas previously little or completely unknown ichthyologically. He worked in Mississippi in 1880 and 1881 (Hay 1881, 1882), and made a collecting trip to Kansas in 1885 (Hay 1887). In addition, he wrote a paper on several small collections of Florida fishes sent to him for identification (Hay 1885). Hay's Mississippi collections were among the first from that state, and those from western Florida were the first from that region. His collections were also among the earliest from Kansas, having been preceded only by those made during the Pacific Railroad surveys in the early 1850s, the results of which were published by Charles Girard (1856, 1858, 1859a, b). A summary of new fish taxa described in the above Hay papers reveals 17 new species from Mississippi [ten still valid], two new species from Florida [one valid], and two new from Kansas [neither valid]).

During his early years at Butler, Hay found time to work toward his Ph.D. degree, which he received from Indiana University in 1884, although there is no evidence that this was obtained under Jordan's direction. He served as an assistant for the Arkansas Geological Survey during summers from 1884–1888, and held a similar position with the Indiana Geological survey from 1891–1894. He was one of the founders of the Indiana Academy of Science, and served as president of that organization in 1890–1891. He resigned his position at Butler in 1892.

As noted earlier, Hay achieved his main scientific renown in vertebrate paleontology. His interest in this field apparently began while at Eureka College, at which time he began to work on a catalogue of paleontological literature, although his first extensive field experience was gained during a trip to western Kansas in 1889 or 1890 (Lull 1931:34). Hay's first published papers in vertebrate paleontology did not appear for another five years (Hay 1895a–c), but from that time on all but two (Hay 1894, 1896) of his scientific contributions were in that field. He was appointed an assistant curator in zoology at the newly founded Field Museum of Natural History, in Chicago, in 1895, and later (1901) became an assistant (later associate) curator of vertebrate paleontology at the American Museum of Natural History, in New York City. He resigned that position in 1907 to pursue independent paleontological research, and in 1912 received an appointment as research associate at the Carnegie Institution of Washington, a position he held until his retirement in 1926.

Dr. Hay was married to Mary Emily Howsmon in 1870. The marriage produced three children.

THE BUTLER UNIVERSITY NATURAL HISTORY COLLECTION

The Butler University collection had its genesis with Jordan's arrival in 1875, and remained active at least until Hay's departure in 1892. As was typical of the times, it was a general natural history collection, comprising different groups of vertebrates, although considering Jordan's lifelong interest in fishes it comes as no surprise that this group of animals was the one most heavily emphasized. A photograph of the room in which the collection was presumably housed (Fig. 5) shows banks of glass-stoppered alcoholic specimen jars on shelves along the walls, protected by glass-fronted doors. Other specimen jars, mostly of large size, completely fill a table in the center of the room, although it is unknown whether these had been removed for study, were awaiting placement on the shelves, or were simply too large to be housed elsewhere. Other large, waist-high, glass-topped specimen tables are positioned around the room. Although their

Figure 5.—Photo of a laboratory on the campus of Butler University where David Starr Jordan worked. This undated photo is likely from the 1880s. Note the gas-lit chandelier. (*Butler University archives*)

contents cannot be clearly seen, they presumably contained bird and mammal skins. Since the entire room is not visible in the photograph, it is impossible to say whether the room may have included a work area (i.e., no microscopes or work tables are evident), or if desks and chairs were present where classes might have been conducted. The room seen in the photograph is probably typical of other such collection facilities in the 19th century.

To what degree the Butler collection was utilized following Hay's departure is uncertain, although there is little evidence that additional material was added after 1892. Some care may have been afforded the collection from time to time by the occasional addition of ethanol to jars in which excessive evaporation had occurred, although this is uncertain since jars with properly fitted ground-glass stoppers can be effective in preventing evaporation over long periods of time. Even so, it is obvious that many specimens were lost during the century following Hay's departure, based on the number of extant jars in which little or no alcohol remains, the now-missing lots originally entered in the Butler catalogue ledger, and the numerous lots now unaccounted for among the material received from the USNM.

In terms of its composition, the fish collection may basically be divided into two segments. The first includes 143 lots of marine and freshwater fishes (mostly the former) received from the Smithsonian Institution (USNM) sometime during the early 1880s. They were presumably received in exchange for specimens of freshwater fishes, including many types, received from Jordan (types of 29 new species; 17 valid) and Hay (types of 18 new species; 11 valid), and which were obtained during their recent southern collecting expeditions (Jordan 1877a,b; Jordan & Brayton 1877–1878a, 1878b; Hay 1881, 1882). These USNM lots were accompanied by ledger sheets, on which data for each lot were painstakingly recorded (species name, collection locality, and original USNM catalogue number). These sheets are still extant, and duplicates were made available to me. The fish can be identified by metal tags,

bearing original USNM catalogue numbers attached to individual specimens (various numbers between 252 and 27416), and none was provided with a new catalogue number in the Butler ledger. Most of these USNM fishes are now in very poor condition, which probably has resulted in many having been discarded throughout the years, since only 56 of the original 143 lots can now be accounted for. Thirty-three of these lots were returned to the Smithsonian in the early 1990s (David G. Smith pers. comm.), and 23 were later catalogued into the collection of the Florida Museum of Natural History (UF). Most of the USNM lots are of no particular historical importance, but some have been determined to comprise type material, including a few nominal North American cyprinid, catostomid, and centrarchid species (Gilbert 1998). These include the cyprinid *Gila grahamii* Baird & Girard 1853 (USNM 252 [syntype]) (a synonym of *Gila robusta*) (see Gilbert 1998:88); the catostomids *Catostomus latipinnis* Baird & Girard 1853 (USNM 254 [paralectotype]) (see Gilbert 1998:189–190) and *Catostomus lactarius* Girard 1856 (USNM 257 [syntype]) (a synonym of *Catostomus catostomus*) (see Gilbert 1998:189); and the centrarchids *Pomoxis nitidus* Girard 1858 (USNM 261 [syntype]) (a synonym of *Pomoxis annularis*) (see Gilbert 1998:244) and *Enneacanthus margarotis* Gill & Jordan 1877 (USNM 20494 [syntype]) (a synonym of *Enneacanthus gloriosus*) (see Gilbert 1998:241). Of these, only the last was located among the Butler lots, and this has been recatalogued as UF 128460.

Nearly all remaining USNM type lots (each involving a single specimen) involve species described by Jordan & Gilbert (1880b, 1881b). These include the scorpaenid *Sebastichthys chrysomelas* Jordan & Gilbert 1881 (now *Sebastes chrysomelas*) (USNM 26968), which has been recatalogued as UF 173480; and the embiotocids *Ditrema atripes* Jordan & Gilbert 1880 (now *Phanerodon atripes*) and *Abeona aurora* Jordan & Gilbert 1880 (now *Micrometrus aurora*). *Ditrema atripes* (originally USNM 26987) has been recatalogued as UF 115520, and *A. aurora* (originally USNM 26996) has been recatalogued as UF 113801. Eschmeyer (1998:160,173,373; 2008: on-line) listed large numbers of types for each of the three species, including the indicated USNM lots. He indicated a number of paratypes for *D. atripes*, but gave no indication of a holotype or a catalogue number. All types of the other two species were said to be syntypes. Following Eschmeyer, and in the absence of further information, UF 115520 is considered a paratype, whereas the other two specimens are regarded as syntypes. A third embiotocid lot includes a specimen, in very poor condition and bearing the catalogue number USNM 26901, which has been recatalogued as UF 115509. It was identified as *Holconotus rhodoterus* Agassiz 1854 (now *Amphistichus rhodoterus*) when sent to Butler in the 1880s. The USNM lot from which this specimen was later removed formed the basis for Hubbs' (1933) original description of *Crossochir koelzi* (now *Amphistichus koelzi*). Since Hubbs' description occurred a half-century after transfer of the specimen to Butler, this specimen was obviously never examined by him and thus should not be considered a paratype of *C. koelzi*. This decision is confirmed by Eschmeyer (2008: on-line), who listed UF 115509 as "additional material," and made no reference to its possible type status. Three other type lots, each involving species described by Jordan & Gilbert (1880a, 1880b, 1881a) and including an undetermined number of specimens (probably one from each lot), were included in the Smithsonian exchange but could not be located. These include the pholid *Apodichthys fucorum* Jordan & Gilbert 1880 (USNM 26994) and the pleuronectids *Pleuronichthys decurrens* Jordan & Gilbert 1881 (USNM 27115) and *Pleuronichthys verticalis* Jordan & Gilbert 1880 (USNM 27280). All were listed as syntypes by Eschmeyer (1998:463,612–613; 2008: on-line).

The second segment of the collection includes fishes collected mostly by Jordan and Hay, nearly all from fresh water. Some are from Indiana and neighboring states, but since these include no important new ichthyological discoveries they are not discussed further. The remainder includes material emanating from collections made by Jordan and Hay during their expeditions to the southern United States (these trips have been discussed in detail earlier), and is by far the largest and historically most important part of the Butler collection. Jordan's fish collections were the earliest, or among the earliest, made in Georgia, South Carolina, and Tennessee; as were Hay's collections from Mississippi and Kansas. These include numerous new species and accompany-

ing type specimens, many of which have been identified among the present Butler material. Of equal importance, these collections were the first from those states to be studied and reported upon in a comprehensive way. Since they were made prior to the widespread introductions of fishes (primarily game species) by government agencies and private individuals throughout the country, they provide voucher specimens that are important in documenting natural ranges of these species (e.g., see especially discussions of *Notropis procne* and *Micropterus coosae* from Saluda River, South Carolina). Rapid and dramatic ecological changes, such as loss of subsurface water and associated surface wetlands, particularly springs and marshes, have resulted in attendant disappearances of fishes and other aquatic organisms. This is reflected in the fragmentation of distribution patterns of many species into highly isolated and usually temporary pockets, especially in the western plains states such as Kansas. Early biological collections from these areas are critical for documenting these changes. For example, one of only two records confirming the former presence in Kansas of the cyprinid *Notropis heterolepis* (Cross 1967:141–142) is a specimen (USNM 37949), actually a hybrid involving that species and *Hybognathus hankinsoni* (itself a species that is now nearly gone from the state), that was collected by Hay from Wallace, Kansas, and was described by him (Hay 1887:252–253) as a new species, *Notropis germanus*. Hubbs (1951a) determined its hybrid identity, thus verifying the former presence of *N. heterolepis* in the state.

As indicated above, a number of Jordan and Hay lots have been identified as types. This requires explanation, since circumstances pertaining to their type status may vary. Previously identified Butler specimens from a locality from which the species was originally described (and which were part of the original collection) are considered to be types, on the theory that these were likely examined by Jordan or Hay during preparation of their various species descriptions. This applies to lots both with and without BU catalogue numbers, the main criterion being that the lots were segregated and specifically identified. Specimens from large mixed and previously unidentified lots (mainly involving material from the Saluda River) were not regarded as types, since they almost surely had not been previously examined. The large series (225 specimens) of *Cyprinella xaenura* (UF 173579) contains a penciled label (presumably in Jordan's handwriting) identifying the specimens as "types." This was the only series for which this direct indication of type status was available. In other cases types were identified by a combination of factors, including study of original descriptions, knowledge of type localities, the fact that they were properly identified when originally catalogued, and information gleaned from type catalogues (Collette & Knapp 1967; Gilbert 1978, 1998; Eschmeyer 1998, 2008). For example, 49 specimens of *Hybognathus hayi* (not originally provided with a BU number and now catalogued as UF 115497) were discovered with a label indicating these were collected by Hay from the Pearl River. These are surely part of Hay's original series of *H. hayi*, but are only considered to be topotypes (thus no formal type status) since Jordan's (1885a) description of the species was based on ten specimens that had been removed from the original series and sent to Jordan for study (Gilbert 1998). Of the 19 total species described by Hay (1881, 1882, 1885, 1887), only the type material of *Opsopoeodus emiliae* had not previously been accounted for (Gilbert & Bailey 1972:20; Gilbert 1978:42; Gilbert 1998:75).

POSSIBLE FATE OF PART OF THE BUTLER FISH COLLECTION IN RELATION TO THE 1883 INDIANA UNIVERSITY FIRE

It is generally known that Jordan began the assembly of a substantial fish collection at Butler. This is substantiated by statements that large numbers of specimens taken by him and Charles Gilbert during their 1876 collecting trip to Georgia were deposited at Butler (Jordan 1877b:308), and later, in his autobiography, that he had left a substantial collection at the school following his departure for Indiana University (Jordan 1922a:184). The following is quoted directly from the latter work: "Hay ... finding material for the study of fishes already at hand in the collections I left at the college, proceeded to extend my operations in the Alabama Basin by a survey of the fauna of the state of Mississippi." Despite this, the perception has developed throughout the years that most of the collection was taken by Jordan to Indiana University to form the basis for

another collection, which was subsequently lost when the IU zoology building (Owen Hall) was struck by lightning and destroyed by fire in July 1883 (Jordan 1922a:279). This supposition is based on several factors. First, many fish species described by Jordan and others prior to that time cannot presently be accounted for (Collette & Knapp 1967:3–5; Taylor 1969; Gilbert 1978, 1998), and possible destruction of types in the Indiana University fire has been suggested for at least 19 nominal species, as follows: *Ictalurus simpsonii* Gill 1861 (Gilbert 1998:226), *Noturus exilis* Nelson 1876 (Gilbert 1998:212), *Noturus leptacanthus* Jordan 1877 (Taylor 1969:70; Gilbert 1998:217), *Noturus sialis* Jordan 1877 (Gilbert 1998:226), *Pimelodus lynx* Girard 1859 (Gilbert 1998:218) (family Ictaluridae); *Ceratichthys lucens* Jordan 1880 (Gilbert 1998:106), *Ceratichthys zanemus* Jordan & Brayton 1878 (Gilbert 1998:166); *Chrosomus pyrrhogaster* Jordan 1876 (Gilbert 1998:138); *Phoxinus flammeus* Jordan & Gilbert *in* Jordan 1878 (Gilbert 1998:80) (family Cyprinidae); *Bubalichthys altus* Nelson 1877 (Gilbert 1998:171), *Catostomus araeopus* Jordan 1878 (Gilbert 1998:171), *Ichthyobus cyanellus* Nelson 1876 (Gilbert 1998:179), *Ichthyobus ischyurus* Nelson 1877 (Gilbert 1998:187), *Lagochila lacera* Jordan & Brayton 1877 (Gilbert 1998:188), *Myxostoma euryops* Jordan 1877 (Gilbert 1998:182) (family Catostomidae); *Chaenobryttus antistius* McKay 1881 (Gilbert 1998:231), *Copelandia eriarcha* Jordan 1877 (Gilbert 1998:234), *Xenotis aureolus* Jordan 1877 (Gilbert 1998:232), *Xenotis lythrochloris* Jordan 1877 (Gilbert 1998:240–241) (family Centrarchidae). Although it cannot be proved that all, or any, of the above types were lost in the Owen Hall fire, the preponderance of missing types of species described during this period of time (all but two of the above were described between 1876 and 1881) is suggestive. It should also be noted that the number of species indicated is certainly minimal, since it involves only four freshwater families (Cyprinidae, Catostomidae, Ictaluridae, Centrarchidae). Jordan's research during that time included a number of additional families, many of them marine (see summary of publications in Hays 1952:96–106), and it is beyond the scope of this study to list all possibilities.

Other evidence pointing to likely loss of material in the Indiana fire is seen from a number of related circumstances. First is Jordan's (1877b:308) statement, regarding his 1876 Georgia collections, "Of most of the species here mentioned, hundreds of specimens were taken. ... These specimens are deposited in the Museum of Butler University at Indianapolis, Indiana, under the auspices of which institution they were collected." Coupled with this is the uneven presence of voucher material from these collections, as well as from collections made the following year in Georgia and adjacent southeastern states (Jordan & Brayton 1878b:8–10). In many cases species reported in those papers to be common or abundant are now poorly represented in museums, whereas other species whose presence was similarly described are well represented. For example, 225 specimens of *Cyprinella xaenura* (from the Ocmulgee River, Georgia), 340 specimens of *Notropis scepticus*, and 260 specimens of *Cyprinella pyrrhomelas* (the last two species from the Saluda River, South Carolina) were found in the Butler collection, and additional specimens of each of these species are present in other museums. Other species indicated as being equally common are now represented by few or no museum specimens.

The fate of Jordan's 1876 collection from Nancy's Creek, a tributary of the upper Chattahoochee River, is also pertinent to this discussion. Jordan (1877b:355–357) listed a total of seven species from this locality, of which one, *Photogenis eurystomus* (= *Cyprinella venusta eurystoma*), was described as new. It was said to be abundant, as were two other species (*Nocomis biguttatus* [= *Nocomis leptocephalus*] and *Ictalurus punctatus*) taken at the same time. Despite this, the only specimen remaining today of the original seven species appears to be the lectotype of *P. eurystomus* (MCZ 24388). The apparent absence of the remainder of this collection would seem to provide compelling evidence pointing to the loss of this material in the 1883 fire.

The fate of Jordan's 1878 southeastern collections remains a mystery. Jordan (1922a) described the route of his 1878 trip as beginning at Somerset, Kentucky, through southeastern Kentucky to Cumberland Gap, Tennessee, the French Broad River, North Carolina, and thence to Rabun Gap and the Gorge of the Tallulah River in northern Georgia. Collections were surely made during this time, although Jordan did not provide a precise list of collection sites, either in his autobiography

(Jordan 1922a) or elsewhere. Jordan & Brayton (1878b) specifically indicated that the sites listed in their paper were limited to collections made in 1876–1877 (the list also included a few miscellaneous collections made earlier by others), and in any event their paper went to press too early for Jordan's 1878 collections to be included. There is no evidence that any fishes obtained during the 1878 trip presently exist in any museum collections.

The conclusion to be drawn from the above is that large segments of Jordan's southeastern fish samples, and perhaps portions of Hay's collections from Mississippi as well (Hay's Kansas collections were made in 1885) were taken by Jordan to Indiana University, where they were later destroyed in the aforementioned fire. Possibly all of Jordan's 1878 summer collections were lost at this time, although questions will remain inasmuch as Jordan (1922a:279) made no mention of these in his brief summary of losses sustained from this disaster.

What had not previously been known, and what the present paper serves to convey, was the size and content of the collection remaining at Butler. One can only speculate why Jordan would have left disproportionately large numbers of certain common species at Butler (as discussed above), while leaving few or no specimens of other equally common fishes. In connection with this, I have included, in the individual collection accounts, direct quotes from the Jordan and Hay papers relating to relative abundance of the various species encountered.

ANALYSIS OF THE JORDAN AND HAY BUTLER FISH COLLECTIONS

The present paper includes analyses of: 1) Jordan's collections made in Georgia during 1876 (Jordan 1877b) and certain collections from his 1877 trip to Georgia, Tennessee, and South Carolina (Jordan & Brayton 1878b); 2) all of Hay's collections from Mississippi (1880–1881) and Kansas (1885) (including one from Memphis, Tennessee) (Hay 1881, 1882, 1887); and 3) collections from three widespread localities in Florida that were sent to Hay for study (Hay 1885). With two exceptions, localities from which specimen lots were missing from the Butler collection have been omitted from this analysis, although material may be present in other museum collections (primarily the USNM). One is Jordan's 1876 collection from Nancy's Creek, in the upper Chattahoochee River drainage, which is included because of its probable relevance to the 1883 Indiana University fire. The other is a Hay locality from Mississippi (Vaughan's Station), since it is the only Hay collection site from which Butler fish specimens were not found.

Included in the USNM collection (but not in the Butler collection) are specimens from the following sites visited by Jordan during his 1877 expedition: (Georgia) Toccoa Creek, below Toccoa Falls; Oconee River, at Sulphur Springs and Fuller's Mills; Suwannee Creek, near Suwannee; and Chattahoochee River, northwest of Gainesville; (Tennessee) Stone River, at Murfreesboro; Big Pigeon River, at Clifton; (North Carolina) Swannanoa River, at foot of Black Mountain.

Three other localities from which fish collections were obtained in 1877 were each represented by a single species in the Butler collection, none of which were included among the material transferred to the Florida Museum of Natural History and which were thus not incorporated into the UF collection. As a consequence, these localities are not included in the collection summaries below. A lot of *Notropis telescopus* from Chickamauga River, near Ringgold, Georgia was originally catalogued as BU 38, but this was not located. Three specimens of *Luxilus coccogenis* (BU 61) from the Powell River, near Cumberland Gap, Tennessee, were included in the early return of specimens to the Smithsonian and are now catalogued as USNM 329422. Six specimens of *Cottus carolinae zopherus* (BU 379) from Cave Spring, Georgia were likewise returned to the Smithsonian and are catalogued as USNM 329282.

Jordan and Brayton (1878b:8–10), in their summary of 1876–1877 collecting localities, listed a total of 53 different sites, which included eight collections from the same general region made by earlier workers. Jordan collected at 14 different places in the Coosa drainage in 1876, but only at one locality each in the Altamaha and Chattahoochee drainages. His principal collecting localities in the Coosa drainage were Silver and Rocky creeks (both near Rome), tributaries of the Etowah and Oostanaula rivers, respectively. He also collected in two other streams in the Etowah system and eight in the Oostanaula system, as well as

in three creeks directly tributary to the Coosa River. Unfortunately, all of the last collections were combined during the cataloging process under the collective name "Etowah," so it is impossible to know the exact provenance of individual lots of specimens. All of Jordan's 1876 specimens from the Altamaha drainage were taken from the South Fork of the Oconee River, at Flat Shoals. Three places in the Chattahoochee drainage were visited that year, but fish sampling could only be done in a clear headwater tributary, Nancy's Creek (see above discussion). To add further confusion, additional localities in these three drainages were visited the following year, and some 1876 sites were revisited (Jordan & Brayton 1878b:39–44; Jordan 1880b:235–241; Jordan 1922a:162–163). The last can only be distinguished by the indication of "Jordan and Brayton" as collectors in the USNM (Smithsonian) catalogue. (Collectors are not indicated in the Butler catalogue).

Only five percids were recorded by Jordan (1877b) from the upper Coosa River system (including *Sander vitreus*, of which none was secured), although subsequent study has shown at least a dozen additional darter species to inhabit this area (see Mettee et al. 1996:578–733). Most of these species were not described until many years later, and thus may have gone unrecognized in mixed lots of darters taken by Jordan to Indiana University. Evidence of this is seen from a single individual of *Etheostoma ditrema*, which was reidentified by Ramsey & Suttkus (1965) among a series of four specimens originally identified as *Boleosoma stigmaeum* at the Academy of Natural Sciences of Philadelphia. In addition, most darter species in the upper Coosa have small geographic ranges, and may not occur within the relatively limited geographical area from which Jordan's samples were taken.

All Butler specimens emanating from Jordan's 1876 Georgia trip are either from the South Fork of the Ocmulgee River, at Flat Shoals, or from various tributaries to the Etowah and Oostanaula rivers (both in the Coosa drainage), near Rome. As noted above, no specimens were found in the Butler collection from Nancy's Creek.

METHODS

The following analysis of Jordan collections from Georgia, South Carolina, and Tennessee does not include (as noted above) all collections made by him during his southern trips of 1876 or 1877 (Jordan 1877a,b; Jordan & Brayton 1878b), but rather only those for which lots of fishes were found in the Butler University collection. All localities visited by Hay in Mississippi and Kansas (Hay 1881, 1882, 1887) are included, as are a few small collections from Florida, which were sent to Hay for identification and were later reported upon by him (Hay 1885).

These appear in order of collection, with those made by Jordan (all in the late 1870s) listed first, followed by Hay collections made during the early 1880s, the Florida collections sent to Hay for study, and finally Hay's Kansas collections from 1885. For each collection, families are listed in phylogenetic sequence, based on the classification followed by Nelson (2006). This usually differs from the order in which they appeared in the original publications. Within each family, taxa are listed alphabetically by genus and species, with spelling based on presently accepted nomenclature, to be followed (in parentheses) by the scientific name as it appeared in the Jordan or Hay publications. If a name has been changed from that originally used, even if the present spelling differs only slightly from that employed by Jordan or Hay (e.g., *Ameiurus* vs. *Amiurus*; *Lepisosteus* vs. *Lepidosteus*), the original spelling is indicated in parentheses immediately following the presently accepted scientific name. If the present scientific name remains completely unchanged from that originally used, the parenthesized name is omitted. Following thereafter is the present museum catalogue number, followed (in parentheses and if applicable) by the original Butler catalogue number. For those Butler lots not originally provided with a BU catalogue number, the notation "BU uncat." appears instead. Listed thereafter is the number of specimens, and, if type status is involved, this is so indicated. If present, series in the Florida Museum of Natural History (UF) are listed first, followed by those in the National Museum of Natural History (USNM) and lots in other museums in no particular order (see below). It might seem more logical to reverse this order, both because the great majority of type specimens are housed in the USNM collection and also because USNM catalogue numbers are cited more frequently in this paper

than UF numbers (336 versus 167). Nevertheless, the present sequence is followed since the primary purpose of this paper is to report upon material formerly housed in the Butler collection, most of which is now in the Florida Museum of Natural History collection. Listing of UF catalogue numbers first also makes it much easier to locate former Butler University lots in this paper. Finally, a brief discussion may follow, relating to such things as nomenclature, taxonomy, and local abundance (the last often with relevant quotes taken verbatim from the original publication).

Listed species whose present identities are unknown are discussed prior to the other species from that locality. Alleged species based either on a proven, or alleged, hybrid combination and whose identify is unknown do not appear in the species list, but are discussed under the locality heading (e.g., *Notropis germanus*, from Wallace, Kansas; and *Notropis umbrifer*, from Beloit, Kansas).

Specimens were initially preserved in 70 percent ethyl alcohol, and have been permanently maintained in this strength solution ever since. As a result, their present condition is below present-day standards, the specimens usually being soft and flaccid. This has made identification of some species difficult, particularly certain cyprinids with similar meristic and morphometric characters and for which pigmentary features are critical for proper identification.

The majority of museum catalogue lots listed in the present paper are housed at the Florida Museum of Natural History (UF) and National Museum of Natural History (USNM). Other museums include the Academy of Natural Sciences of Philadelphia (ANSP); Museum of Comparative Zoology, Harvard University (MCZ); Museum of Zoology, University of Michigan (UMMZ); California Academy of Sciences (former Stanford University collection) (CAS-SU); Cornell University (CU); British Museum (Natural History) (BMNH); and Museum National d'Histoire Naturelle (MNHN). Lots formally catalogued into the Butler University collection are indicated by the acronym "BU," which represents an addition to the list of formal museum acronyms appearing in Leviton et al. (1985) and Leviton & Gibbs (1988).

In addition to material housed at the Florida Museum of Natural History (UF), I have examined listed type lots of the families Cyprinidae, Catostomidae, Ictaluridae, and Centrarchidae housed in the museums listed above (Gilbert 1978, 1998). For practical reasons, non-type lots from collections other than those at UF were not always examined by me, particularly well-defined species not likely to present identification problems.

Changes in original identifications for some of Jordan and Hay's USNM specimens have occurred throughout the years, but unfortunately the name (or names) of those responsible, together with the dates at which these changes might have occurred, are not indicated in the USNM database. Sometimes this information is available in the published record, and in such cases this is noted in the present paper. Occasionally there may be handwritten notes left in the specimen jars by earlier workers.

David G. Smith has kindly re-examined some potential problem specimens in the USNM, and a number of Hay specimens from Mississippi were reexamined by Stephen T. Ross (pers. commun.) during preparation of his book on Mississippi fishes (Ross 2001). Two USNM specimens originally identified as *Ameiurus nebulosus* from the Memphis area were borrowed by me and found to be *A. melas*. One specimen of a Mississippi sucker originally identified as *Moxostoma macrolepidotum* was reidentified by C. Richard Robins as *Minytrema melanops*. Specimens of *Carpiodes* and *Ictiobus* were likely examined and reidentified many years ago by Carl L. Hubbs during preparation of his 1930 revisionary study. A few specimens in these genera were also reexamined by Henry L. Bart. Hay's few remaining gar specimens from Mississippi were presumably examined by Royal D. Suttkus, although this has not been positively confirmed.

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able to me, and for help in various other ways. Stephen T. Ross, recently retired from the University of Southern Mississippi, has responded promptly to specific questions regarding Hay lots in the National Museum of Natural History that were examined by him during preparation of his book on Mississippi fishes (Ross 2001), and to other questions regarding Hay's work in Mississippi. Robert E. Jenkins, Roanoke College, responded to questions regarding specimens of *Moxostoma macrolepidotum* from Kansas; and he and David A. Neely, California Academy of Sciences, helped to update the number of extant museum specimens of *Lagochila lacera* (= *Moxostoma lacerum*) in museum collections. Douglas W. Nelson, Museum of Zoology, University of Michigan, answered queries regarding Jordan or Hay lots in the UMMZ collection. I thank all these individuals for their help. I particularly wish to acknowledge and thank James W. Berry, retired Professor at Butler University, who first alerted me to the Jordan and Hay specimens at his institution, urged me to work on these, and to write up the results for publication. He and his wife Betsy brought the jars of fishes to Gainesville in their automobile during numerous trips back and forth from Indianapolis. I also thank Jim for his patience during the several years it took me to finish this project. Finally, I thank my wife, Nancy, for her patience in having to look for so long at the many jars of fish sitting in one of our back rooms while this work was going on.

COLLECTION SUMMARIES

GEORGIA: Tributaries to Oostanaula, Etowah, and Coosa rivers (primarily Silver and Rocky creeks [tribs. to Etowah and Oostanaula rivers, respectively]), near Rome, Floyd County. D.S. Jordan & C.H. Gilbert, July 1876. Jordan 1877b:307–377.

Family Lepisosteidae

1. *Lepisosteus osseus* (= *Lepidosteus osseus*) – No voucher specimen found. "A single specimen was taken in the Etowah."

Family Anguillidae

2. *Anguilla rostrata* (= *Anguilla vulgaris*) – No voucher specimens saved. Jordan reported collecting a few small specimens, which "escaped through the cover of the livepail."

Family Cyprinidae

3. *Campostoma oligolepis* (= *Campostoma anomalum* var. *prolixum*) – USNM 31071 (1), USNM 36761 (3), USNM 101157 (1). BU 5 not located and presumed lost. "Quite abundant in the more sluggish tributaries of the Etowah and Oostanaula rivers." Populations in the Mobile Bay basin were referred to the species *oligolepis* by Burr & Cashner (1983).

4. *Cyprinella caerulea* (= *Photogenis caeruleus*) – UF 173839 (*ex* BU 45, BU 46) (1 *ex* syntypic series of *Hybopsis xaenocephalus*); USNM 17883 (lectotype of *Photogenis caeruleus*), USNM 20114 (2 paralectotypes); ANSP 19839–19841 (3 paralectotypes originally, now 0); MCZ 24396 (1 paralectotype); CU 1488 (1 paralectotype); BMNH 1880.1.21.10 (1 paralectotype); MNHN A.1306 (1 paralectotype). "Occurs in abundance in clear tributaries of the Oostanaula River." Identification of UF 173839 as *C. caerulea* based on presence of 1,4-4,1 pharyngeal teeth; 8 anal rays; and 11 scales above and between lateral lines on opposite sides of body. Source of original description.

5. *Cyprinella callistia* (= *Photogenis callistius*) – USNM 31148 (2 paralectotypes); MCZ 24363 (lectotype); ANSP 19658 (1 paralectotype), ANSP 19837–19838 (2 paralectotypes); BMNH 1880.1.21.67 (1 paralectotype); MNHN A.1289 (1 paralectotype). BU 66 not located and presumed lost. Most specimens "taken in Silver Creek." Source of original description.

6. *Cyprinella trichroistia* (= *Photogenis callistius*) – UF 173474 (BU 62) (17 *ex* syntypic series of *Photogenis stigmaturus*); USNM 31131 (lectotype), USNM 163956 (6 paralectotypes); MCZ 24393 (1 paralectotype); CAS-SU 2005 (1 paralectotype); MNHN A.1280 (1 paralectotype). Not originally distinguished by Jordan from *Photogenis callistius*. Original description of *Codoma trichroistia* Jordan & Gilbert appeared later in Jordan and Brayton (1878b:50–51), based on material from this collection.

7. *Cyprinella venusta stigmatura* (= *Photogenis stigmaturus*) – UF 173465 (BU 62) (55 paralectotypes); USNM 17891 (lectotype), USNM 20125 (1 paralectotype), USNM 31075 (1 paralectotype), USNM 31080 (20 paralectotypes), USNM 163958 (10 paralectotypes); ANSP 19820–19827 (8 paralectotypes); MCZ 24371 (1 paralectotype); MNHN A.1283 (2 paralectotypes). USNM nos. 31075 and 31080 not recorded by either Gibbs (1957:192) or Gilbert (1978:81; 1998:151). "Small tributaries of the Etowah, Coosa, and Oostanaula, where it is the most abundant minnow." The form *stigmatura* probably represents a distinct species in the *Cyprinella venusta* complex (see Gilbert 1998:151), but the systematics of *C. venusta* have not yet been formally resolved. Source of original description.

8. *Hybopsis lineapunctata* (= *Nocomis amblops* var. *winchelli*; *Hybopsis gracilis*) – UF 165617 (*ex* BU 45) (4 *ex* syntypic series of *Hybopsis xaenocephalus*), UF 173578 (1 *ex* BU 304) (*ex* syntypic series of *Nototropis lirus*); USNM 17884 (1), USNM 31119 (1), USNM 31121 (1); ANSP 19846 (1). BU 72 not located and presumed lost. "Abundant in all tributaries of the Etowah, Coosa, and Oostanaula."

9. *Luxilus chrysocephalus chrysocephalus* (= *Luxilus cornutus*) – No voucher specimens found. "Excessively abundant in the basin of the Etowah."

10. *Lythrurus lirus* (= *Nototropis lirus*) – UF 173473 (BU 304) (71 paralectoypes); USNM 17876 (6 paralectotypes); USNM 20138 (2 paralectotypes), USNM 101158 (5 paralectotypes); ANSP 19842 (1 paralectotype); MCZ 24383 (1 paralectotype); ANSP 19842 (lectotype); BMNH 1880.1.21.7-8.24 (3 paralectotypes); MNHN A.1303 (3 paralectotypes). "Abounds in still deep waters, and in the clear mill ponds." Source of original description.

11. *Notemigonus crysoleucas* (= *Notemigonus americanus*) – No voucher specimens found. "Quite abundant in still places."

12. *Notropis asperifrons* (= *Hybopsis xaenocephalus*) – USNM 164968 (1 paratype of *Notropis asperifrons*, *ex* syntypic series of *Hybopsis xaenocephalus* [USNM 17886]), USNM 164969 (1 paratype of *Notropis asperifrons*, *ex* syntypic series of *Hybopsis xaenocephalus* [USNM 20116]), reidentified by Suttkus & Raney (1955); CAS-SU 64422 (*ex* CAS-SU 3875) (2).

13. *Notropis chrosomus* (= *Hybopsis chrosomus*) – UF 115514 (BU 332) (3 paralectotypes); USNM 17881 (lectotype), USNM 203857 (1 paralectotype *ex* USNM 17881), USNM 329144 (BU 39) (48 paralectotypes); ANSP 19843–19845 (3 paralectotypes); MCZ 24373 (1 paralectotype); CAS-SU 64421 (*ex* CAS-SU 3875) (2); CAS-SU 3870 (1); CU 1487 (1 paralectotype); BMNH 1880.1.21.40 (1 paralectotype); MNHN A.1292 (3 paralectotypes). "Abounds in tributaries of the Etowah and Oostanaula." Source of original description.

14. *Notropis stilbius* (= *Nototropis stilbius*) – USNM 17879 (2 syntypes), USNM 203321 (1 *ex* syntypic series of *Nototropis lirus*); ANSP 118701–18702 (2 syntypes); CAS-SU 2528 (3 syntypes), CAS-SU 3870 (1); BMNH 1880.1.21.16 (1 syntype). BU 35 not located and presumed lost. "Abundant." Source of original description.

15. *Notropis xaenocephalus* (= *Hybopsis xaenocephalus*) – UF 115513 (BU 45, BU 46) (34 paralectotypes), UF 173485 (*ex* BU 62) (2 *ex* syntypic series of *Photogenis stigmaturus*), UF 173577 (*ex* BU 304) (1 *ex* syntypic series of *Nototropis lirus*); USNM 20116 (lectotype), USNM 17886 (2 paralectotypes); ANSP 19828–19837 (9 paralectotypes); MCZ 24394 (1 paralectotype); CAS-SU 3875 (1 paralectotype). Source of original description.

16. *Phenacobius catostomus* – USNM 17889 (lectotype), USNM 31087 (3 paralectotypes); ANSP 19847 (1 paralectotype); MCZ 24385 (1 paralectotype); MNHN A. 1307 (1 paralectotype); BMNH 1883.12.14.234 (1 paralectotype). "Abundant in Silver Creek." Source of original description.

17. *Rhinichthys obtusus* – USNM 17890 (1), USNM 101125 (1). BU 109 not located and presumed lost. "Abundant in the small clear brooks which flow from the springs in the hill country."

18. *Semotilus atromaculatus* (= *Semotilus corporalis*) – USNM 169375 (1). "Abundant in the basin of the Etowah and Oostanaula." At the time of publication of Jordan and Brayton's paper, the species name of the Creek Chub was mistakenly thought to be *corporalis*. This situation was later clarified by Jordan (1885b:817) (see Gilbert 1998:66).

Family Catostomidae

19. *Hypentelium etowanum* (= *Catostomus nigricans* var. *etowanus*) – USNM 17885 (1 syntype), USNM 31057 (1 syntype), USNM 31060 (2 syntypes), USNM 31091 (1 syntype); MNHN A.1270 (1 syntype). Only USNM 17885 and MNHN A.1270 listed as syntypes by Gilbert (1998:182). "Water basin of the Etowah and Oostanaula, abounding in rapids and clear places." Source of original description.

20. *Minytrema melanops* (= *Erimyzon melanops*) – No voucher specimens found. "Abundant in the Etowah River basin."

21. *Moxostoma duquesnei* (= *Myxostoma duquesnii* var. *lachrymalis*) – No voucher specimens found.

22. *Moxostoma erythrurum* (= *Myxostoma euryops*) – Gilbert (1998:182) reported the original description of *M. euryops* to be based on a single specimen (i.e., the holotype [now lost]), "taken in Lovejoy's Creek, a small tributary of Oostanaula River, near Floyd Springs, 14 miles north of Rome." However, a single specimen (USNM 31086), collected by Jordan and Gilbert from the Etowah River in 1876, is catalogued under the name *Moxostoma erythrurum*. Whether this is the supposed missing holotype of *Myxostoma euryops* cannot be determined. Source of original description of *Myxostoma euryops*.

Family Ictaluridae

23. *Ameiurus natalis* (= *Amiurus cupreus*) – No voucher specimens found. "Abounds in the deeper and more muddy tributaries of the Etowah and Oostanaula." It is uncertain whether Jordan's specimens represent *Ameiurus natalis* or *Pylodictis olivaris*, both of which are native to the Etowah River (Mettee et al., 1996:382–383, 412–413). *Silurus cupreus* is a junior synonym of *Pylodictis olivaris*, and *Pimelodus antoniensis* (which Jordan also included in the synonymy of *A. cupreus*) is a junior synonym of *Ameiurus natalis* (Gilbert 1998:208, 211). Of the two, *A. natalis* is the more likely possibility since BU 168, which was not located and is presumed lost, was

entered in the Butler catalogue as that species. See *Pylodictis olivaris* below.

24. *Ictalurus punctatus* (= *Ichthaelurus punctatus*) – No voucher specimens found. "Taken in considerable numbers in the Etowah and Oostanaula."

25. *Noturus leptacanthus* – UF 133554 (no BU number) (2). Jordan (1877b:352) reported having collected only a single specimen (the holotype), which is now lost (Taylor 1969:70; Gilbert 1998:217). The two extant specimens are thus topotypes, but have no formal standing. Source of original description.

26. *Pylodictis olivaris* – No voucher specimens found. See above remarks under *Ameiurus natalis*.

Family Esocidae

27. *Esox americanus* (= *Esox reticulatus* var. *affinis*) – USNM 17887 (2). "Very abundant in Dyke's Pond and other mill-ponds tributary to the Etowah River."

Family Fundulidae

28. *Fundulus stellifer* (= *Xenisma stellifera*) – UF 165609 (no BU number) (4 syntypes); USNM 17888 (2 syntypes), USNM 329280 (BU 329) (1 syntype); ANSP 20718 (3 syntypes); MCZ 24376 (1 syntype). "Very abundant in many tributaries of the Etowah, Oostanaula, and Coosa rivers, preferring the clear, cold water of the "spring branches." Source of original description.

Family Cottidae

29. *Cottus carolinae zopherus* (= *Potamocottus zopherus*) – USNM 17877 (7), USNM 329282 (BU 379) (6) (from Cave spring); ANSP 20721 (3); MCZ 24377 (1); BMNH 1880.1.21.18 (1); MNHN A.1295 (1). "Occurs in great abundance in tributaries of the Etowah and Oostanaula, particularly in Lovejoy, Rocky, and Silver Creeks. A hundred or more specimens secured." Some of the 19 specimens listed here could be syntypes. Jordan specifically indicated that the original description was based on the three largest specimens. Source of original description.

Family Centrarchidae

30. *Ambloplites ariommus* (= *Ambloplites rupestris*) – USNM 329109 (BU 136) (2). "Moderately common in the Etowah and Oostanaula."

31. *Lepomis macrochirus macrochirus* (= *Lepiopomus obscurus*; *Lepiopomus pallidus* [?]) – No voucher specimens found. *L. pallidus* was indicated as "abundant" and all specimens collected were young.

32. *Lepomis megalotis* (= *Xenotis inscriptus*; *Xenotis sanguinolentus*) – No voucher specimens found. *X. sanguinolentus* was said to "abound in all the tributaries of the Etowah, Oostanaula, and Coosa."

33. *Micropterus coosae* (= *Micropterus pallidus*) – USNM 31152 (1 paratype of *Micropterus coosae*). "Abundant in the Etowah, Oostanaula, and Coosa River, rather more so than the next species" (i.e., *M. salmoides*).

34. *Micropterus henshalli* (= *Micropterus salmoides*) – USNM 31142 (1 paratype of *Micropterus punctulatus henshalli*). The superficially similar Largemouth and Spotted basses were assumed to be identical prior to their separation by Hubbs (1927) as distinct species. The Mobile Bay population of Spotted Bass was described as a distinct subspecies of *M. punctulatus* (*henshalli*) by Hubbs & Bailey (1940), and was recently elevated to a full species by Baker et al. (2008). Both *Micropterus salmoides* and *M. henshalli* (as well as *M. coosae*) are present and widespread in the Etowah River system today (Etnier & Starnes 1994:433–435; Mettee et al. 1996:552–554).

35. *Micropterus salmoides salmoides* (= *Micropterus salmoides*) – USNM 329278 (BU 156) (5). See above remarks under *Micropterus henshalli*. The five specimens cited here have not been reexamined.

Family Percidae

36. *Etheostoma coosae* (= *Boleichthys elegans*) – USNM 31108 (2), USNM 31117 (1).

37. *Etheostoma ditrema* (= *Boleosoma stigmaeum*) – ANSP 20649 (1 paratype of *Etheostoma ditrema*). Specimen removed from series of four specimens of *Boleosoma stigmaeum* (originally ANSP 20646–20649) by Ramsey & Suttkus (1965), in their original description of *Etheostoma ditrema*. Based on preferred habitat of the species, this specimen likely came from Dyke's Pond, which was one of the collecting sites listed by Jordan and Brayton (1878b:9).

38. *Etheostoma stigmaeum* (= *Boleosoma stigmaeum*) – USNM 17880 (5 paralectotypes); ANSP 20645 (lectotype), ANSP 20646–20648 (3 paralectotypes [ANSP 20649 later removed by Ramsey & Suttkus (1965) and recatalogued as *Etheostoma ditrema*]). "Numerous specimens from the Etowah are identified with the above species." Source of original description.

39. *Percina kathae* (= *Percina caprodes*) – USNM 31146 (1). "Abundant in all the tributaries of the Etowah, Oostanaula, and Coosa Rivers." Until recently, all Gulf slope logperch populations were called *Percina caprodes*. Two species of logperch have recently been described from the Coosa River system of Alabama, Georgia, and Tennessee (Thompson 1985, 1997b), including the one listed here.

40. *Percina nigrofasciata* (= *Hadropterus nigrofasciatus*) – USNM 17878 (1), USNM 31082 (1). "My specimens were taken in small tributaries of the Etowah and Oostanaula Rivers."

41. *Sander vitreus* (= *Stizostethium salmoneum*) – Jordan had no adult specimens at hand, and reported this species only from the Oostanaula River.

Family Sciaenidae

42. *Aplodinotus grunniens* (= *Haploidonotus grunniens*) – "Abundant in the river-channels of the Etowah and Oostanaula, but I was unable to secure specimens."

GEORGIA: Nancy's Creek, tributary to Chattahoochee River, above Atlanta, Fulton County. D.S. Jordan & C.H. Gilbert, summer 1876. Jordan 1877a, 1877b:355–357.

The near total absence of specimens from this locality in museum collections is significant, and lends credence to the possibility that most were lost in the 1883 Indiana Univesity fire. Three species (*Cyprinella vesnusta eurystoma, Nocomis leptocephalus*, and *Ictalurus punctatus*) were said to be abundant, suggesting that numerous specimens were originally obtained.

Family Cyprinidae

1. *Cyprinella venusta eurystoma* (= *Photogenis eurystomus*) – MCZ 24388 (lectotype). "Quite abundant." The form *eurystoma* probably represents a distinct species within the *Cyprinella venusta* complex (see Gilbert 1998:77–78), but the systematics of *C. venusta* have not yet been formally resolved. Source of original description.

2. *Nocomis leptocephalus* (= *Nocomis biguttatus*) – No voucher specimens found. *Nocomis biguttatus* is a northern species that does not occur south into Georgia (Jenkins & Lachner 1980a). Taxonomy of genus *Nocomis* first clarified by Hubbs (1926).

Family Catostomidae

3. *Erimyzon oblongus* – No voucher specimens found.

4. *Moxostoma duquesnei* (= *Myxostoma duquesnii*) – No voucher specimens found.

Family Ictaluridae

5. *Ictalurus punctatus* (= *Ichthaehurus punctatus*) – No voucher specimens found. "This species is extremely abundant in Nancy's Creek, where we took two or three quite large specimens."

Family Centrarchidae

6. *Lepomis macrochirus macrochirus* (= *Helioperca pallida*) – No voucher specimens found.

7. *Micropterus salmoides salmoides* (= *Moxostoma salmoides*) – No voucher specimens found.

GEORGIA: South Fork of Ocmulgee River, at Flat Shoals, DeKalb County. D.S. Jordan and C.H. Gilbert, summer 1876. Jordan 1877a, 1877b:357–368.

Family Clupeidae

1. *Alosa sapidissima* – "Fishermen told us that the Shad ascends the Ocmulgee River as far as the Shoals. We saw no specimens."

Family Cyprinidae

2. *Cyprinella callisema* (= *Episema callisema*) – UF 165650 (BU 63) (49 *ex* paralectotype series of *Minnilus xaenurus*); USNM 17864 (lectotype), USNM 163954 (3 paralectotypes *ex* USNM 17864), USNM 20126 (1 paralectotype); MCZ 24384 (1 paralectotype); BMNH 1883.12.14.210 (1 paralectotype). BU 37 not located and presumed lost. "Very abundant in the South Fork of the Ocmulgee." Source of original description in Jordan (1877b:363–364).

3. *Cyprinella xaenura* (= *Photogenis xaenurus*) – UF 173579 (BU 63) (225 paralectotypes of *Minnilus xaenurus*); USNM 17862 (lectotype), USNM 163957 (4 paralectotypes *ex* USNM 17862), USNM 329284 (7 paralectotypes); MCZ 24365 (1 paralectotype); CAS-SU 1996 (1 paralectotype); BMNH 1880.1.21.82 (1 paralectotype); MNHN A.1313 (2 paralectotypes). "The most abundant species in the Ocmulgee River." Source of original description in Jordan (1877a:79).

4. *Hybopsis rubrifrons* (= *Nocomis rubrifrons*) – USNM 17863 (7 syntypes), USNM 20146 (1 syntype), USNM 329267 (BU 70) (1 syntype); MCZ 24381 (1 syntype). "Quite abundant." Source of original description in Jordan (1877b:330).

5. *Notemigonus crysoleucas* (= *Notemigonus ischanus*) – UF 173462 (BU 117) (14 syntypes of *Notemigonus ischanus*), UF 165807 (*ex* BU 63) (1 *ex* paralectotype series of *Minnilus xaenurus*); USNM 17865 (7 syntypes of *Notemigonus ischanus*), USNM 20112 (2 syntypes of *N. ischanus*); MCZ 24368 (1 syntype of *N. ischanus*). BU 115 not located and presumed lost. "Very abundant in still waters of the Ocmulgee River." Source of original description of *Notemigonus ischanus* in Jordan (1877b:364–365).

6. *Notropis hudsonius* (= *Hybopsis hudsonius* var. *amarus*) – USNM 17867 (1), USNM 117346 (1), USNM 329260 (BU 42) (26). "Very abundant."

7. *Notropis petersoni* (= ?) – UF 165808 (BU 63) (18 *ex* paralectotype series of *Minnilus xaenurus*). This species, which was not described until many years later (Fowler 1942), may have been confused by Jordan with either *Hybopsis rubrifrons* or *Notropis hudsonius*.

8. *Semotilus atromaculatus* (= *Semotilus corporalis*) – No voucher specimens found. "A few small specimens from a little Spring run – not found in the river." See earlier comment regarding nomenclature of this species.

Family Catostomidae

9. *Erimyzon oblongus* – No voucher specimens found. "This species in the Ocmulgee in some abundance."

10. *Moxostoma collapsum* (= *Myxostoma papillosum*) – No voucher specimens found. "Abounds in the Ocmulgee River." Specimens from this locality

identified as *Myxostoma papillosum* were referred to the southeastern race of *Moxostoma anisurum* by Jenkins (1970:475). (*M. papillosum* does not range this far south). *M. collapsum* recently elevated to full species in Nelson et al. (2004:204), on advice of R.E. Jenkins.

11. *Moxostoma rupiscartes* (= *Myxostoma cervinum*) – No voucher specimens found. "Abounds in the rapids and rock pools at the 'Falls' at Flat Shoals." Jordan's records of *M. cervinum* from this locality were referred to *M. rupiscartes* by Robins & Raney (1956:15.) (*M. cervinum* does not range this far south).

Family Ictaluridae

12. *Ameiurus brunneus* (= *Amiurus brunneus*) – USNM 17861 (lectotype), USNM 20148 (lectotype?), USNM 328910 (17); MCZ 24369 (1). BU 184 not located and presumed lost. "Extremely abundant in the South Fork of the Ocmulgee." For discussion of controversy surrounding lectotype designation see Gilbert (1998:12–14). Source of original description in Jordan (1877b:366–368).

13. *Ictalurus punctatus* (= *Ichthaelurus punctatus*) – USNM 17866 (1), USNM 328910 (BU 159) (17). "We obtained a great number of specimens, mostly small."

Family Esocidae

14. *Esox niger* (= *Esox reticulatus* var. *affinis*) – No voucher specimen found. "A single large specimen of this species was taken." Some question is attached to this identification, since at that time *Esox niger* and *Esox americanus* were not adequately distinguished. Present identification as *Esox niger* is based both on indication of large size (*E. americanus* attains a much smaller maximum size), as well as habitat (*E. americanus* is characteristic of very quiet, weedy waters, in contrast to lakes and small rivers usually favored by *E. niger*). It should be noted, however, that Jordan made no mention of the chain-like pigmentation pattern characteristic of large specimens of *E. niger*, and from which the common name "Chain Pickerel" is derived.

Family Centrarchidae

15. *Lepomis auritus* (= *Lepiopomus auritus*) – BU 142 not located and presumed lost. "Many small specimens of this species were taken."

16. *Lepomis gulosus* (= *Chaenobryttus gulosus*; *Chaenobryttus viridis*) – No voucher specimens found.

Family Percidae

17. *Percina nigrofasciata* (= *Hadropterus nigrofasciatus*) – No voucher specimens found. "Three large specimens taken in rapid water."

SOUTH CAROLINA: Saluda River, at Farr's Mills, near Greenville, Greenville County. D.S. Jordan, A.W. Brayton, et al., summer 1877. Jordan & Brayton 1878b:11–29.

Many BU specimens from this locality were included in several large, mixed, unsorted, and uncatalogued lots. Two species found in these unsorted lots, *Notropis procne* and *Micropterus coosae*, were not included among the species reported by Jordan and Brayton, although the latter (under the name *Micropterus pallidus*) was said by locals to be present occasionally. A specimen of *Notemigonus crysoleucas*, which was collected in Reedy River (i.e., Reedy Creek), at Greenville C.H., in close proximity to the Farr's Mills site, is included here for the sake of convenience.

Attention is called to a recent publication on South Carolina freshwater fishes (Rohde et al. 2009), which includes a discussion of the historical impact of Jordan's work and complete accounts and spot-distribution maps for all species known from the state.

Family Anguillidae

1. *Anguilla rostrata* (= *Anguilla vulgaris*) – Reported by Jordan & Brayton (1878b:29) from the Saluda, but no voucher specimens were located in collections.

Family Cyprinidae

2. *Campostoma anomalum* (= *Campostoma anomalum* subspecies *proxilum*) – USNM 329274 (BU 3) (1), USNM 341548 (1).

3. *Clinostomus funduloides* (= *Gila vandoisula*) – USNM 31149 (1); MCZ 24390 (1). BU 120 not located and presumed lost. "This species is common in the Saluda waters."

4. *Cyprinella chloristia* (= *Codoma chloristia*) – UF 173492 (*ex* BU 116; no BU number) (44) (topotypes of *Codoma chloristia*, with no formal standing); MCZ 24380 (lectotype); BMNH 1880.1.21.43 (1 paralectotype). "Abundant in the clear waters of the Saluda River." Source of original description.

5. *Cyprinella nivea* (= *Photogenis niveus*) – UF 165634 (*ex* BU 54; *ex* BU 116) (12); USNM 31115 (2). "Abundant in the Saluda River."

6. *Cyprinella pyrrhomelas* (= *Codoma pyrrhomelas*) – UF 165635 (*ex* BU 54; *ex* BU 63; *ex* BU 65; *ex* BU 116; no BU number) (260); USNM 329431 (BU 65) (49); MCZ 24374 (1). "Extremely abundant in the clear rapid waters of the Saluda and its tributaries."

7. *Cyprinella zanema* (= *Ceratichthys zanemus*) – UF 165638 (BU 81) (5 paralectotypes). "Abundant in the Saluda River." Source of original description.

8. *Hybognathus regius* (= *Hybognathus argyritis*) – No voucher specimens found. "A few specimens were obtained in Saluda River."

9. *Hybopsis hypsinotus* (= *Ceratichthys hypsinotus*) – No voucher specimens found. "Not uncommon in the Saluda."

10. *Nocomis leptocephalus leptocephalus* (= *Ceratichthys biguttatus*) – UF 173453 (no BU number) (13); USNM 329259 (no BU number) (11). "Common" in tributaries of the Saluda." See earlier comments concerning taxonomy of genus *Nocomis*.

11. *Notemigonus crysoleucas* (= *Notemigonus americanus*) – UF 173486 (BU 118) (1 [in two pieces]). "We obtained but a single specimen in the Reedy River." See earlier comment.

12. *Notropis hudsonius* (= *Alburnops saludanus*) – UF 165637 (no BU number) (1). "Abundant in the Saluda River." Topotype of *Alburnops saludanus*, with no formal standing. Source of original description of *Alburnops saludanus*.

13. *Notropis chlorocephalus* (= *Alburnops chlorocephalus*) – USNM 31112 (1). "Abundant in the clear rapid waters of the Saluda." Systematics of *Notropis chlorocephalus* and the closely related *Notropis lutipinnis* have, until recently, remained unclear. *Notropis chlorocephalus* was considered to be restricted to the Catawba River system in the Santee River drainage (Gilbert & Burgess 1980a), with *N. lutipinnis* occurring in other parts of the Santee drainage (i.e., including the Saluda River system) south to the Altamaha River drainage, in Georgia (Gilbert & Burgess 1980b). The situation was complicated, however, by the fact that other Santee drainage populations (i.e., outside the Catawba system) seemed to show some degree of morphological intermediacy between the two species. Wood & Mayden (1992), utilizing genetic data, concluded that the name *chlorocephalus* was applicable to all populations found throughout the Santee drainage, and that *N. lutipinnis* was confined to those drainages to the south (Rohde et al. 2009:152, 159). However, they declined to introduce a new name for the morphologically intermediate populations of *N. chlorocephalus* occurring outside the Catawba system.

14. *Notropis procne* (= ?) – UF 165636 (no BU number) (15). No specific reference to this species found in Jordan and Brayton's paper, and it is uncertain to what name, if any, it was referred by them. Although Hocutt et al. (1986) indicated the native range of this species to extend south to the Santee River drainage, all records mapped by Jenkins & Sorenson (1980) from this drainage are from the Broad and Catawba river systems. Rohde et al. (2009:164) partially confirmed the distribution indicated by Jenkins and Sorenson, since they showed records of the species from the Santee drainage to be heavily concentrated in the eastern river systems (Broad, Catawba, and Wateree), with only a single record mapped from the more westerly Saluda system (though not in the immediate vicinity of Farr's Mills). Despite this, antiquity of the specimens recorded here appears to confirm natural presence of *Notropis procne* in the Saluda River.

15. *Notropis scepticus* (= *Notropis photogenis*) – UF 165631 (*ex* BU 54; *ex* BU 116; no BU number) (340 topotypes, with no formal standing); USNM 328909 (BU 54) (38 topotypes); USNM 31081 (21 syntypes of *Minnilus scepticus*); CAS-SU 2529 (1 syntype); BMNH 1880.1.21.83 (1 syntype), BMNH 1883.12.14.212 (1 syntype); MNHN A. 1288 (5 syntypes) (Gilbert 1998:145). "The most abundant species in the Saluda waters." Reference to *Notropis photogenis*, with which this species was confused by Jordan and Brayton, appears on page 23 of their paper. It was later described by Jordan & Gilbert (1883) as *Minnilus scepticus*, based on a subset of specimens from the original collection. Since the specimens contained in UF 165631 and USNM 328909 were discovered long after preparation of the description of *Minnilus sceptcus*, they qualify only as topotypes and have no formal type status.

16. *Semotilus atromaculatus* (= *Semotilus corporalis*) – BU 98 not located and presumed lost. "This common species occurs in the tributaries of the Saluda." See earlier comment regarding nomenclature of this species.

Family Catostomidae

17. *Catostomus commersonii* (= *Catostomus commersoni*) – UF 173452 (BU 179) (3); USNM 329262 (BU 176) (1), USNM 341546 (no BU number) (1). "Common in the Saluda."

18. *Erimyzon oblongus* (= *Erimyzon sucetta*) – USNM 329520 (BU 388) (1). "Moderately abundant in the Saluda River."

19. *Minytrema melanops* – No voucher specimens found. "Abundant in mill ponds of the Saluda River, and is known as the Striped Sucker."

20. *Moxostoma papillosum* – USNM 329449 (BU 175) (6). Voucher specimens not examined. "A few specimens of this peculiar species were taken in Saluda River." Identification suggested by Jordan and Brayton's comment "... this peculiar species," which likely was in allusion to the distinctively shaped mouth. Entered in BU catalogue as *Moxostoma macrolepidotum*, which does not occur in the Saluda River.

21. *Moxostoma rupiscartes* (= *Myxostoma cervinum*) – UF 173451 (no BU number) (6). "Exceedingly abundant in the Saluda River."

Family Ictaluridae

22. *Ameiurus brunneus* (= *Amiurus brunneus*) – UF 173491 (no BU number) (5 *ex* original series of 28 specimens [61.0–84.2 mm SL]); USNM 20938 (1 [identification as this species questionable; see comments]), USNM 329444 (BU 189) (31 [identification of at least some specimens as this species questionable; see comments]). "The common catfish of the Saluda." This species was regarded as indistinguishable from *Ameiurus platycephalus* by Jordan (1889:131), and the two were later formally

synonymized by Jordan & Evermann (1896:142), who erroneously concluded that *A. brunneus* was the young of *A. platycephalus*. The two continued to be regarded as identical until diagnosed as valid species by Yerger & Relyea (1968), who indicated that sympatry throughout the region of co-occurrence was not uncommon. Principal diagnostic characters are slightly overlapping differences in anal-ray and total gill-raker counts (including rudiments) on outer gill arch (anal rays usually 17–20 in *A. brunneus* and usually 19–24 in *A. platycephalus*; gill rakers usually 14–17 in *A. brunneus* and usually 11–13 in *A. platycephalus*); and a consistently more inferior mouth in *A. brunneus*, with the premaxillary teeth in upper jaw slightly exposed (versus not exposed). In addition, the two exhibit discrete but broadly overlapping geographical ranges. Anal-ray counts for the five specimens comprising UF 173491:16, 17 (in two), 18 and 20; gill-raker counts: 14 (in 2) and 15 (in 3).

23. *Ameiurus platycephalus* (= *Amiurus brunneus*) – UF 173838 (no BU number) (23 specimens [24.6–143.2 mm SL] *ex* original series of 28 *Ameiurus brunneus* [UF 173491]); UMMZ 245206 (2). Anal-ray counts for five randomly-selected specimens: 20 (in two) and 21 (in three); gill-raker counts 11, 12 (in 3), and 13. UMMZ specimens identified by M.L. Smith. See above comments regarding differentiation of this species from *Ameiurus brunneus*, and possibility that USNM 20938 and a large part of USNM 329444 are this species.

Family Esocidae

24. *Esox niger* (= *Esox reticulatus*) – UF 173455 (no BU number) (1). "Very common."

Family Centrarchidae

25. *Lepomis auritus* (= *Lepiopomus auritus*) – UF 173454 (no BU number) (3).

26. *Lepomis gulosus* (= *Chaenobryttus viridis*) – No voucher specimens found. "Occurs in abundance in the Saluda."

27. *Micropterus coosae* (= *Micropterus pallidus*) – UF 167077 (no BU number) (4 [35.0–41.0 mm SL]). Jordan & Brayton (1878b) apparently did not see these four small specimens, since they stated, on page 15 (referring to *Micropterus pallidus*), that no black bass were collected either in the Saluda or Ennoree rivers, but that locals reported they "are frequently taken there." Identification of the present specimens as *Micropterus coosae*, rather than *M. salmoides*, is based primarily on a well-defined membrane connecting the spinous and soft dorsal fins, a character not found in the latter species. Rohde et al. (2009:337) stated unequivocally that *M. coosae* is introduced into the Saluda River, and indeed this seems logical from a zoogeographic standpoint. Despite this, antiquity of the present record argues strongly for natural occurrence of the species at this locality.

Family Percidae

28. *Etheostoma olmstedi* (= *Boleosoma maculaticeps*) – Jordan & Brayton (1878b:13) reported collecting one specimen at this locality. A single specimen, identified as *Etheostoma jessiae* and originally catalogued as BU 152, could not be located and is presumed lost. Since *E. jessiae*, which does not occur anywhere on the Atlantic slope, bears a superficial resemblance to *E. nigrum*, this could be the specimen in question.

29. *Etheostoma thalassinum* (= *Nothonotus thalassinus*) – UF 173494 (no BU number) (1); USNM 31122 (lectotype of *Nothonotus thalassinus*), USNM 257921 (2 paralectotypes); MCZ 24397 (1 paralectotype); CAS-SU 987 (1 paralectotype); BMNH 1880.1.21.68 (1 paralectotype). "Very abundant in all the streams seined." Source of original description.

30. *Percina crassa* (= *Alvordius crassus*) – UF 173495 (no BU number) (1); USNM 23459 (lectotype of *Alvordius crassus*), USNM 31111 (3 paralectotypes). "Especially abundant in the Saluda at Farr's Mills." Source of original description.

TENNESSEE: Elk River and tributaries, at Estill Springs, Franklin County. D.S. Jordan, A.W. Brayton, et al., summer 1877. Jordan & Brayton 1878b:56–71.

Although Jordan & Brayton (1878b:56) reported collecting only 17 species from this locality, the species listed below exceed that number by four. Unfortunately, those authors did not always specifically state whether or not a species was actually collected at the Estill Springs locality. In some cases these "additional" species (e.g., *Notropis* n. sp. cf *spectrunculus*) can be accounted for because they were not recognized in 1878, and it is uncertain with which of the identified species, if any, they might have been confused. In some cases no voucher specimens apparently remain, but the species was specifically stated to have been collected there, as for example *Moxostoma lacerum*. In those cases in which a species is not represented by vouchers, reasons for justifying its presence on the species list are included in the individual discussions.

A specimen lot originally in the Butler collection (BU 53) and identified as *Notropis scabriceps* was not found and is presumed lost. No reference to that species (which does not occur in the Tennessee River drainage) appears in the Jordan and Brayton paper. Five species of *Notropis* known today from the upper Elk River system were not recorded by Jordan and Brayton (e.g., *Notropis ariommus, N. atherinoides, N. leuciodus, N. photogenis, N. micropteryx*) (Etnier & Starnes 1994). Since Jordan and Brayton listed the last four from other parts of the Tennessee drainage, they obviously were familiar with those species.

Based on this, it seems most likely that the missing BU 53 is *Notropis ariommus*, although this is only conjecture.

Family Cyprinidae

1. *Clinostomus funduloides* (= *Gila estor*) – USNM 31147 (4 syntypes of *Gila estor*), USNM 101149 (1 syntype of *Gila estor*); BMNH 1880.1.21.71 (1 syntype). BU 119 not located and presumed lost. Source of original description of *Gila estor*.

2. *Cyprinella galactura* (= *Photogenis galacturus*) – UF 113796 (BU 40, BU 57) (16). "Abundant in every stream examined."

3. *Erimystax dissimilis* (and/or *Erimystax insignis*) (= *Ceratichthys dissimilis*) – BU 78 not located and presumed lost. "Obtained in Elk River." Reference could possibly be based, entirely or in part, on the similar (but readily distinguishable) *Erimystax insignis*, which occurs throughout much of the same geographic area (Harris 1980a, b).

4. *Hemitremia flammea* (= *Phoxinus flammeus*) – "A single specimen taken in Elk River, at Estill Springs." Type lost (Gilbert 1998:80). Source of original description.

5. *Hybopsis amblops* (= *Ceratichthys winchelli*) – UF 173477 (BU 43) (8). "Everywhere abundant in Tennessee River." *Hybopsis winchelli* is a closely related species restricted to Gulf slope drainages.

6. *Luxilus chrysocephalus chrysocephalus* (= *Luxilus cornutus*) – USNM 329277 (BU 56) (1). BU 41 not located and presumed lost. "Abundant in every stream examined."

7. *Luxilus coccogenis* – UF 173476 (no BU number) (47). "Abundant in every stream examined."

8. *Lythrurus lirus* (= *Notropis lirus*) – USNM 101150 (3). BU 334 not located and presumed lost. "Abounds in Elk River."

9. *Nocomis micropogon* (= *Ceratichthys biguttatus*) – No voucher specimens found. "Everywhere very abundant." *Nocomis biguttatus* is a more northern species that does not range south into Tennessee (Jenkins & Lachner 1980a). The closely related *N. micropogon* is abundant throughout the upper half of the Tennessee basin (Jenkins & Lachner 1980b), and is assumed to be the species on which Jordan and Brayton's record was based.

10. *Notropis telescopus* – USNM 329110 (BU 319) (49). "Abundant in Elk River."

11. *Notropis volucellus* (= ?) – UF 113794 (no BU number) (1). Not listed by Jordan and Brayton. It is uncertain to which species name, if any, it may have been referred.

12. *Notropis* new species cf *spectrunculus* (= ?) – UF 113771 (BU 50) (1). Not distinguished by Jordan and Brayton, and it is uncertain to which species name, if any, it may have been referred. Not recognized as a valid species until recently and still undescribed, it is currently known by the vernacular name "Sawfin Shiner" (Etnier & Starnes 1994:236–237).

13. *Phenacobius uranops* – USNM 31114 (1). BU 105 not located and presumed lost. "Rather common in the Elk River."

14. *Rhinichthys obtusus* – No voucher specimens found. "Abundant in all clear rocky brooks and in outlets of springs."

15. *Pimephales notatus* (= *Hyborhynchus notatus*) – USNM 329283 (no BU number) (4).

Family Catostomidae

16. *Catostomus commersonii* (= *Catostomus commersoni*) – No voucher specimens found. "Generally abundant."

17. *Hypentelium nigricans* (= *Catostomus nigricans*) – USNM 329430 (10). "Very abundant throughout the Tennessee Basin."

18. *Moxostoma lacerum* (= *Quassilabia lacera*) – No voucher specimen found. There is reason to believe that an individual catalogued as CAS-SU 3773 (and said to be from the Clinch River, Tennessee) could be this missing specimen (R.E. Jenkins, pers. comm.), although this cannot be proved. Species originally described (as *Lagochila lacera*) by Jordan & Brayton (1877–1878a). One of two original type localities, with type locality later fixed as Chickamauga River, near Ringgold, Georgia, by subsequent lectotype designation (see Gilbert 1998:188). Although it was not realized at the time of collection, this widespread species was in severe decline, with the last known specimens being collected only 15 years later (in 1893) from a tributary of the Maumee River, in northwestern Ohio (Kirsch 1895:328; Trautman 1981:452–454; Ono et al., 1983:211–212). A thorough survey has revealed that only 34 specimens (including one skeleton) remain today in museum collections (Jenkins 1970:541–545; Jenkins & Burkhead 1994: 519; R.E. Jenkins, pers. commun.).

Family Fundulidae

19. *Fundulus catenatus* (= *Xenisma catenatum*) – USNM 31151 (1). BU 341 not located and presumed lost. "Abundant in the Elk River ... in clear waters."

Family Centrarchidae

20. *Micropterus salmoides salmoides* (= *Micropterus salmoides*) (?) – BU 131 not located and presumed lost. Identification as *Micropterus salmoides* tentative, since the species of *Micropterus* were not differentiated at time of appearance of Jordan and Brayton's paper. Three members of this genus occur at the Estill Springs locality today (the present species, plus *M. dolomieu* and *M. punctulatus*) (Etnier & Starnes 1994:431–435), and Jordan's original sample could have included any, or all, of these species.

Family Percidae

21. *Percina caprodes caprodes* (= *Percina caprodes*) – No voucher specimens found. "Generally abundant in clear streams."

MISSISSIPPI: Tributary to Tuscumbia Creek, near railroad station at Corinth, Alcorn County. O.P. Hay, March 1880. Hay 1881:488–515.

Family Cyprinidae

1. *Luxilus chrysocephalus chrysocephalus* (= *Luxilus cornutus*) – UF 133525 (BU 47) (3).

2. *Lythrurus umbratilis cyanocephalus* (= *Minnilus punctulatus*) – USNM 27430 (lectotype), CAS-SU 4076 (4 paratypes). Although USNM 27430 was considered to be the holotype by Gilbert (1998:137–138), partly because there was no indication in the original description of multiple specimens in the original series, the presence of additional specimens dictates that this should be considered the lectotype, as originally designated by Snelson & Pflieger (1975:235) and as earlier listed by Gilbert (1978:73). Source of original description of *Minnilus punctulatus*.

3. *Notemigonus crysoleucas* (= *Notemigonus chrysoleucus*) – UF 133841 (BU 387) (5); USNM 27423 (1).

4. *Pimephales notatus* (= *Hyborhynchus notatus*) – UF 167078 (BU 17) (1).

Family Catostomidae

5. *Erimyzon oblongus* (?) (= *Erimyzon sucetta*) – No voucher specimens located. The three species of *Erimyzon* were not differentiated until Hubbs (1930) clarified situation, all species having previously gone under the species name *sucetta*. Two species, *E. sucetta* and *E. oblongus*, occur in the vicinity of Corinth, with the latter apparently being much more common here (Ross 2001:267, 269).

Family Fundulidae

6. *Fundulus olivaceus* (?) (= *Zygonectes notatus*) – UF 113780 (BU 342) (1). Specimen faded, so diagnostic body spotting cannot be seen. Since the very similar *Fundulus olivaceus* and *F. notatus* both occur in the area (with *F. olivaceus* more common and widespread [Ross 2001:364, 367]), a question mark accompanies this species identification.

Family Percidae

7. *Etheostoma chlorosoma* (= *Vaillantia chlorosoma*) – USNM 27428 (1 syntype [now disintegrated]). Source of original description, and one of three localities from which type material was collected (other localities include Artesia and Macon) (see Collette & Knapp 1967:72).

8. *Etheostoma proeliare* (= *Microperca proeliaris*) – USNM 27418 (holotype). Source of original description.

MISSISSIPPI: Catawba Creek, tributary to Tibbyhah Creek, at Artesia (Tombigbee River drainage), Lowndes County. O.P. Hay, March–April 1880. Hay 1881:488–515.

As noted below, the catfishes recorded from this locality are both from Sand Creek, another stream in the immediate area.

Family Cyprinidae

1. *Lythrurus bellus* (= *Minnilus bellus*) – UF 167072 (BU 60) (13 paralectotypes); USNM 27426 (lectotype), USNM 203332 (3 paralectotypes *ex* USNM 27426); CAS-SU 756 (6 paralectotypes), CAS-SU 2526 (1 paralectotype). Source of original description. Original description based on 40 specimens, including 36 from Artesia and 4 from Macon. Only the above 24 specimens from Artesia can now be accounted for.

2. *Notemigonus crysoleucas* (= *Notemigonus chrysoleucus*) – BU 114 not located and presumed lost.

3. *Opsopoeodus emiliae emiliae* (= *Opsopoeodus emiliae*) – UF 113784 (BU 110) (1 syntype). Types previously believed to have been lost (Gilbert & Bailey 1972; Gilbert 1998:75). Hay (1881:508) recorded one specimen from Artesia. Source of original description, and one of three localities from which the original type material came (other localities include Macon and Enterprise).

4. *Pimephales notatus* (= *Hyborhynchus notatus*) – UF 115527 (BU 100) (13).

5. *Semotilus atromaculatus* (= *Semotilus corporalis*) – BU 94 not located and presumed lost. When Hay's paper was published, the species name of the Creek Chub was mistakenly thought to be *corporalis*, a situation later clarified by Jordan (1885b) (see Gilbert 1998:66).

Family Catostomidae

6. *Erimyzon oblongus* (?) (= *Erimyzon sucetta*) – BU 181 not located and presumed lost. As noted earlier, the three species of *Erimyzon* were not differentiated until Hubbs' (1930) clarified situation, all species having previously gone under the species name *sucetta*. *Erimyzon sucetta* and *E. oblongus* both occur in the vicinity of Artesia, with the latter apparently being slightly more common (Ross 2001:267–269). *Erimyzon tenuis* has not been recorded from the immediate area, but could occur there (Ross 2001:270).

Family Ictaluridae

7. *Ameiurus melas* (= *Amiurus melas*) – UF 133527 (BU 166) (1). "One specimen from Sand Creek, Artesia."

8. *Ameiurus natalis* (= *Amiurus vulgaris*) – No voucher specimens found. "Two catfishes were purchased from a young negro, who had caught them in Sand Creek, near Artesia. One of these,

having a total length of 10 inches, I identify as the above." Hay further identified this specimen as *Amiurus vulgaris* subsp. *ailurus*. *A. vulgaris* is a junior synonym of *Ameiurus nebulosus*, which is not native to Mississippi (Gilbert 1998:227) (although it has recently been introduced into the state [Ross 2001:309]), whereas *ailurus* is a junior synonym of *Ameiurus natalis*, which is widespread and common in the state.

Family Fundulidae

9. *Fundulus olivaceus* (?) (= *Zygonectes notatus*) – UF 115528 (BU 345) (6). Remarks concerning identification of this species appearing in account from Corinth are applicable here.

Family Poeciliidae

10. *Gambusia affinis* (= *Zygonectes melanops*) – UF 133536 (BU 344) (17); USNM 27427 (12).

Family Centrarchidae

11. *Lepomis cyanellus* (= *Apomotis cyanellus*) – BU 143 not located and presumed lost.

12. *Lepomis macrochirus macrochirus* (= *Lepomis pallidus*) – UF 133537 (BU 140) (11).

13. *Micropterus salmoides salmoides* (= *Micropterus pallidus*) – BU 310 not located and presumed lost.

Family Percidae

14. *Etheostoma artesiae* (= *Poecilichthys artesiae*) – USNM 27434 (holotype). Source of original description.

15. *Etheostoma chlorosoma* (= *Vaillantia chlorosoma*) – No voucher specimens found from this locality. Source of original description, and one of three localities from which type material was collected (other localities include Corinth and Macon) (see Collette & Knapp 1967:72).

MISSISSIPPI: Horsehunter Creek, tributary to Noxubee River, at Macon (Tombigbee River drainage), Noxubee County, O.P. Hay, March–April 1880. Hay 1881:488–515.

Family Clupeidae

1. *Dorosoma cepedianum* – UF 133844 (BU 309) (3). "Several specimens of this species were caught ... along the Noxubee River, at Macon."

Family Cyprinidae

2. *Hybognathus hayi* (= *Hybognathus argyritis*) – UF 133533 (BU 21) (1). At the time of Hay's (1881) publication, he did not distinguish the two species of *Hybognathus* found in the region, all being identified as *H. argyritis*. He subsequently corrected this (Hay 1882:67–68) and restricted the name *argyritis* to the species later described by Jordan (1885a) as *Hybognathus hayi*. Cited by Ross (2001:159).

3. *Hybognathus nuchalis* (= *Hybognathus argyritis*) – USNM 27431 (1). See above comment. Cited by Ross (2001:160).

4. *Lythrurus bellus* (= *Minnilus bellus*) – BU 52 not located and presumed lost. Four syntypes were originally present from this locality (Hay 1881:511). A series originally comprising 36 species also obtained at Artesia (see previous account). One of sources of original description.

5. *Notemigonus crysoleucas* (= *Notemigonus chrysoleucus*) – BU 113 not located and presumed lost.

6. *Opsopoeodus emiliae emiliae* (= *Opsopoeodus emiliae*) – UF 115522 (BU 111) (1 syntype); USNM 27429 (lost; original number of specimens unknown); CAS-SU 620 (1 syntype). The specimens now catalogued as UF 115522 and CAS-SU 620 are two of the missing syntypes of this species (Gilbert & Bailey 1972:20; Gilbert 1978:42; Gilbert 1998:75). One of sources of original description.

7. *Pimephales notatus* (= *Hyborhynchus notatus*) – UF 133532 (BU 321) (12). "Many in the waters around ... Macon ..."

Family Catostomidae

8. *Erimyzon sucetta* (?) – BU 148 not located and presumed lost. Precise identification uncertain, and could apply to any of three species of *Erimyzon* (*E. sucetta*, *E. claviformis*, *E. tenuis*), all of which occur in Mississippi but were not distinguished until their taxonomy was clarified by Hubbs (1930). Based on distributions mapped by Ross (2001:267–270), *E. sucetta* and *E. oblongus* both are likely possibilities, with *E. tenuis* the least likely.

Family Ictaluridae

9. *Ameiurus melas* (= *Amiurus melas*) – UF 173457 (BU 161) (1).

10. *Ictalurus punctatus* – UF 173466 (BU 170) (3).

11. *Noturus gyrinus* – No voucher specimens found.

Family Aphredoderidae

12. *Aphredoderus sayanus* – No voucher specimens found.

Family Fundulidae

13. *Fundulus olivaceus* (?) (= *Zygonectes notatus*) – UF 173456 (BU 353) (17). Remarks concerning identification of this species appearing in account from Corinth are applicable here.

Family Poeciliidae

14. *Gambusia affinis* (= *Zygonectes melanops*) – UF 113779 (BU 347) (6).

Family Centrarchidae

15. *Lepomis cyanellus* (= *Apomotis cyanellus*) – UF 113776 (BU 141) (2).

16. *Lepomis macrochirus macrochirus* (= *Lepomis pallidus*) – BU 137 not located and presumed lost.

17. *Pomoxis annularis* (= *Pomoxys annularis*) – No voucher specimens found.

18. *Pomoxis nigromaculatus* (= *Pomoxys nigromaculatus*) – UF 133837 (BU 305) (2).

Family Percidae

19. *Etheostoma chlorosoma* (= *Vaillantia chlorosoma*) – CAS-SU 726 (3 syntypes) (see Collette & Knapp 1967:72). One of sources of original description. Other localities include Corinth and Artesia.

20. *Etheostoma nigrum* (= *Boleosoma maculatum*) – USNM 27443 (1).

Family Elassomatidae

21. *Elassoma zonatum* – USNM 27452 (1).

MISSISSIPPI: Sucarnochee River, at Narkeeta (Tombigbee River drainage), Kemper County. Hay 1881:488–515. Hay may not have collected specimens at this locality, based on his statement, "I saw a few 'Sunfishes' taken from the Sucarnochee River, a tributary of the Tombigbee." This seems to be bourne out by the apparent absence of any museum specimens from this locality. Of the two species recorded by Hay, one (*Lepomis obscurus*) cannot be positively identified. This nominal form is a junior synonym of *Lepomis macrochirus* (Gilbert 1998:245), but that species was consistently referred to by the name *Lepomis pallidus* elsewhere in Hay's paper. The other species, *Centrarchus macropterus*, is common in lowland areas of the Gulf slope, but was not recorded by Hay from any other locality visited by him in 1880.

MISSISSIPPI: Chickasawha River, at Enterprise (Pascagoula River drainage), Clarke County. O.P. Hay, April 1880. Hay 1881:488–515; Hay 1882:58–75. In addition to the original collections made by Hay in 1880 and reported upon in his 1881 paper, some additional specimens were later sent to him by Mr. William Warner, a resident of Enterprise. At least two species (*Alosa chrysochloris* and *Labidesthes sicculus*), and likely the two additional species of *Pomoxis*, emanate from the Warner collection. Although not collected at Enterprise, a specimen of *Pylodictis olivaris* was taken in the Chickasawha River, at Shubata, located a short distance to the south. This record is included here.

Family Hiodontidae

1. Hiodon tergisus (= *Hyodon selenops*) – USNM 27455 (1).

Family Clupeidae

2. *Alosa chrysochloris* (= *Clupea chrysochloris*) – Hay (1881:502) indicated that a single individual was later sent by Mr. William Warner. Present whereabouts of specimen unknown.

Family Cyprinidae

3. *Cyprinella venusta cercostigma* (= *Luxilus chickasavensis*) – UF 167075 (no BU number) (13 paralectotypes of *Luxilus chickasavensis*); USNM 27419 (lectotype); USNM 163953 (8 paralectotypes) (*ex* USNM 27419). Source of original description of *Luxilus chickasavensis*.

4. *Hybognathus nuchalis* (= *Hybognathus argyritis*) – UF 113797 (BU 322) (2); USNM 32253 (1). See above comment regarding this species under discussion of collection from Macon.

5. *Hybopsis winchelli* (= *Ceratichthys winchelli*) – USNM 329271 (BU 67) (1).

6. *Luxilus chrysocephalus isolepis* (= *Luxilus cornutus*) – UF 133535 (BU 249) (11).

7. *Lythrurus roseipinnis* (= *Minnilus rubripinnis*) – UF 167073 (BU 68) (81 paralectotypes of *Minnilus rubripinnis*); USNM 27420 (lectotype), USNM 203325 (16 paralectotypes *ex* USNM 27420). Source of original description of *Minnilus rubripinnis*. Species name later changed to *roseipinnis* on basis of homonymy (Jordan 1885b:815; Gilbert 1998: 142,144).

8. *Macrhybopsis storeriana* (= *Ceratichthys amblops* ?) – USNM 27436 (1). Species not listed in paper. Most likely misidentified as *Ceratichthys amblops*, which does not occur in Gulf slope drainages of Mississippi.

9. *Nocomis leptocephalus bellicus* (= *Ceratichthys biguttatus*) – USNM 27422 (1). BU 333 not located and presumed lost. *Nocomis biguttatus* is a northern species that does not range south into Mississippi (Jenkins & Lachner 1980a). Taxonomy of the species of *Nocomis* first clarified by Hubbs (1926).

10. *Notropis amplamala* (= *Ericymba buccata*) – USNM 27421 (1); CAS-SU 891 (1). "Several individuals of this species were seined in the Chickasawha River at Enterprise." *Notropis amplamala*, which was recently described by Pera & Armbruster (2006), represents disjunct southern populations formerly referred to *Ericymba buccata* (= *Notropis buccatus*) (Gilbert 1980).

11. *Notropis atherinoides* (= *Minnilus dilectus*) – UF 115494 (BU 48) (1). "A single specimen .... answering well enough to Girard's description, was obtained at Enterprise."

12. *Notropis longirostris* (= *Alburnops longirostris*) – UF 115495 (no BU number) (13 syntypes); USNM 27440 (11 syntypes), USNM 101118 (24 syntypes). Source of original description in Hay (1881:504).

13. *Notropis maculatus* (= *Hemitremia maculata*) – USNM 101174 (lectotype of *Hemitremia maculata*). Source of original description.

14. *Notropis texanus* (= *Alburnops xaenocephalus*) – USNM 27435 (4). *Notropis xaenocephalus* is confined to the Mobile Bay basin and does not range west into Mississippi.

15. *Notropis volucellus* – USNM 27438 (3 *ex* USNM 101174). Species not listed in paper. Speci-

mens removed from original syntypic series of *Hemitremia maculata*.

16. *Opsopoeodus emiliae emiliae* (= *Opspoeodus emiliae*) – No voucher specimen found. Hay (1881:508) reported one specimen from Enterprise. One of sources of original description, in addition to Artesia and Macon.

17. *Pinephales vigilax* (= *Alburnops taurocephalus*) – USNM 27439 (3 syntypes of *Alburnops taurocephalus*). Source of original description.

Family Catostomidae

18. *Hypentelium nigricans* (= *Catostomus nigricans*) – USNM 27447 (1).

19. *Minytrema melanops* (?) (= *Moxostoma macrolepidotum*) – No voucher specimens found. Identification of this species remains in doubt, except that it cannot possibly be *Moxostoma macrolepidotum*, which is not found in Mississippi. (Although the closely related, and formerly conspecific, *M. breviceps* does occur in the Tennessee River drainage in the extreme northeastern part of the state [Ross, 2001:290]). Examination of the various sucker accounts in Ross' (2001) books suggests only two possibilities, *Moxostoma carinatum* and *Minytrema melanops*. The former has only been recorded three times from the Pascagoula drainage (Ross 2001:284), however, with all records well removed from the Enterprise locality. *Mimytrema melanops* superficially resembles the various species of *Moxostoma*, and is relatively common throughout the Pascagoula River system and elsewhere along the Gulf Coast (Ross 2001:280). It is probably significant that *M. melanops* was not mentioned in either of Hay's 1881 or 1882 papers. Confirmation would appear to be confirmed by C.R. Robins' identification, as *Minytrema melanops*, of a similarly identified specimen from the Pearl River, at Jackson (USNM 32314).

20. *Moxostoma poecilurum* – UF 173464 (BU 252) (2); USNM 27463 (1). "One specimen from Enterprise." The present number of museum specimens exceeds that number by two.

Family Ictaluridae

19. *Ictalurus punctatus* – UF 133845 (BU 188) (1); USNM 27446 (1). "I have obtained specimens of this Catfish from the Noxubee River at Macon; others have been sent me from Enterprise, by Mr. Warner."

20. *Noturus nocturnus* (= *Noturus leptacanthus*?) – USNM 27442 (1). Specimen reidentified by Taylor (1969:74).

21. *Pylodictis olivaris* (= *Pilodictis olivaris*) – The skin of a large specimen collected near the closely adjacent community of Shubuta was provided to Hay and reported upon by him. The voucher does not appear to have been saved.

Family Aphredoderidae

22. *Aphredoderus sayanus* – UF 173590 (*ex* BU 385) (1 dried). Species not listed by Hay.

Family Atherinopsidae

23. *Labidesthes sicculus vanhyningi* (= *Labidesthes sicculus*) – USNM 32261 (2). Species not originally collected or listed by Hay (1881), but specimens later sent by William Warner were acknowledged and recorded in a later paper (Hay 1882:58).

Family Fundulidae

24. *Fundulus olivaceus* (= *Zygonectes notatus*) – UF 133534 (no BU number) (16); USNM 27444 (6). Positive species identification as *Fundulus olivaceus* based on statement "there are four or five longitudinal rows of black dots above the lateral line, especially conspicuous in specimens from Enterprise." It is possible that some specimens of the closely related and superficially similar *F. notatus* could also have been included in the series.

Family Centrarchidae

25. *Ambloplites ariommus* (= *Ambloplites rupestris*) – USNM 27451 (1). When Hay's paper was published, only one species of *Ambloplites* was recognized (i.e., *A. rupestris*). The Gulf coast populations were later described as a new species, *A. ariommus*, by Viosca (1936).

26. *Lepomis gulosus* (= *Chaenobryttus gulosus*) – UF 173589 (BU 385) (1 dried); USNM 27459 (1). BU 382 not located and presumed lost.

27. *Lepomis macrochirus macrochirus* (= *Lepomis pallidus*) – USNM 27457 (1).

28. *Lepomis megalotis* (= *Lepomis fallax*) – USNM 27456 (1). The present specimen has not been reexamined in order to determine whether it might be *Lepomis marginatus*, a similar species that was not regarded as specifically distinct when Hay's paper was published.

29. *Micropterus salmoides salmoides* (?) (= *Micropterus pallidus*) – No voucher specimens found. This identification is accompanied by a question mark since both *Micropterus salmoides* and the superficially similar *M. punctulatus* are common in the vicinity of Enterprise (Ross 2001:430, 432).

30. *Pomoxis annularis* – USNM 27460 (1). Although neither species of *Pomoxis* was included in Hay's list of species from Enterprise (Hay 1881:515), one specimen of each species from this locality is present in the USNM collection and attributed to Hay. These likely were included among the specimens from Enterprise later sent by William Warner, although there was no specific mention of these in Hay's (1882:58, 62–63) paper.

31. *Pomoxis nigromaculatus* – USNM 27461 (1). See above comments under *Pomoxis annularis*.

Family Percidae

32. *Ammocrypta beanii* (= *Ammocrypta gelida*) – USNM 27425 (2 syntypes of *Ammocrypta gelida*);

CAS-SU 745 (1 syntype lost). Source of original description of *Ammocrypta gelida*.

32. *Etheostoma lynceum* (= *Nanostoma elegans* and *Nanostoma zonale*) – USNM 27445 (lectotype of *Nanostoma elegans*); CAS-SU 627 (1 paralectotype). *Etheostoma lynceum* was originally considered to be, at most, a subspecies of *Etheostoma zonale*. Etnier & Starnes (1986) showed that the two are valid species. As now recognized, *E. zonale* does not occur in Mississippi. Source of original description of *Nanostoma elegans*.

33. *Etheostoma stigmaeum* (= *Poecilichthys saxatilis*) – USNM 27433 (holotype of *Poecilichthys saxatilis*). Source of original description of *Poecilichthys saxatilis*.

34. *Percina nigrofasciata* (= *Hadropterus spillmani*) – USNM 27432 (lectotype of *Hadropterus spillmani*). "Several specimens ... were caught in a branch flowing into the Chickasawha at Enterprise." Collette & Knapp (1967:48) included the following quote, which they attributed to Hay: "Several specimens were placed in Professor Jordan's collection and the remainder in Butler University." Hay (1882:60) reported another specimen from this locality, sent later by William Warner. Only the lectotype can now be located (Collette & Knapp 1967:48). Source of original description of *Hadropterus spillmani*.

35. *Percina suttkusi* (= *Percina caprodes*) – USNM 27424 (1). Logperch from this locality were long referred to *Percina caprodes*, but recently were described by Thompson (1997a) as a new species, *Percina suttkusi*.

TENNESSEE: Mississippi River, at Memphis (collections actually made in side pools of the river, across from Memphis, in Crittenden County, Arkansas). O.P. Hay, late June 1881. Hay 1882:57–75.

This collection, the first in a series of collections by Hay during his second southern trip (during the summer of 1881), was made in overflow pools on the opposite side of the river from Memphis, this necessitated by the absence of suitable collecting sites on the Memphis side of the river.

Family Lepisosteidae

1. *Atractosteus spatula* (= *Atractosteus tristoechus*) – No voucher specimens found. "Many of these were captured at Memphis ...." *Atractosteus tristoechus* is endemic to Cuba, and all specimens of *Atractosteus* from United States waters are *A. spatula*. Questions surround identification of Hay's gars, four species of which are known from the Memphis area (Etnier & Starnes 1994:109–113). As discussed below, only one museum specimen from this locality apparently still remains (USNM 32373 [see below]), and this has been reidentified as *Lepisosteus platostomus*, a species not reported by Hay. From this, it is obvious that at least some of Hay's specimens originally identified as Alligator Gars were misidentified, but does not negate the possibility that others were correctly identified.

2. *Lepisosteus osseus* (= *Lepidosteus osseus*) – No voucher specimens found. "A very common fish." In contrast to the other gar species, all of which have relatively short snouts and conceivably could be confused with one another, this species is so distinct that it could hardly have been misidentified by Hay.

3. *Lepisosteus platostomus* (= *Atractosteus tristoechus*) – USNM 32373 (1). The problems surrounding identification of Hay's short-snouted gar specimens have been discussed above. The possibility also exists that other specimens identified as Alligator Gars may be *Lepisosteus oculatus*, the fourth gar species known from the Memphis area.

Family Amiidae

4. *Amia calva* – UF 113755 (no BU number) (2); USNM 32275 (3 lost). "Many of these were taken at Memphis."

Family Clupeidae

5. *Dorosoma cepedianum* – UF 115502 (no BU number) (3); USNM 32316 (1 lost). "Abundant everywhere. Collected at Memphis ..."

Family Cyprinidae

6. *Hybognathus hayi* (= *Hybognathus argyritis*) – USNM 32239 (1). "These appear to be quite as abundant as the preceding (referring to *Hybognathus nuchalis* [ed.]) Found at the same places."

7. *Hybognathus nuchalis* – No voucher specimens found. "Numerous specimens collected at Memphis ..."

8. *Lythrurus fumeus* (= *Minnilus lirus*) – USNM 32236 (1 lost). "At Memphis I caught a single specimen of a *Minnilus* which I cannot distinguish from typical specimens of *M. lirus* from the Etowah River, in Georgia." Although the identification of this fish cannot be known with certainty, it is not *Lythrurus lirus*, which is confined to the Tennessee and Mobile Bay basins. The voucher specimen is lost, but it is presumed to be *Lythrurus fumeus* rather than *Lythrurus umbratilis*, the only other member of this genus known from the Memphis area (Etnier & Starnes 1994:189, 191). *L. fumeus* and *L. lirus* are very similar in appearance, both lacking a distinct dark blotch of pigment at the anterior base of the dorsal fin, a feature that distinguishes them from the related *L. umbratilis*. *Lythrurus fumeus* was not recognized when Hay's paper appeared, and was not described until ten years later (Evermann 1892:81). Finally, although it cannot be stated with certainty that Hay knew *L. umbratilis* in 1882, he was clearly familiar with the species several years later, since he identified it from Kansas (Hay 1887:249).

9. *Notemigonus crysoleucas* (= *Notemigonus chrysoleucus*) – No voucher specimens found. "Found in

abundance in the little lakes and ponds along the Mississippi at Memphis ...."

10. *Notropis atherinoides* (= *Notropis dilectus*) – No voucher specimens found. "Collected at Memphis ...."

11. *Opsopoeodus emiliae emiliae* (= *Opsopoeodus emiliae*) – USNM 32377 (1). "A very common fish throughout the region visited. Collected at Memphis ...."

12. *Pimephales vigilax* (= *Alburnops taurocephalus*) – USNM 32246 (1). "I have obtained specimens at Memphis ..."

Family Catostomidae

13. *Carpiodes carpio* (?) – No voucher specimens located. "This is an abundant fish everywhere in the region visited. Specimens were obtained at Memphis ..." None of Hay's Memphis specimens originally identified as this species are present in the USNM collection, although the species is known from this area (Etnier & Starnes 1994:265), and some of Hay's now-missing specimens could have been this species. The two remaining museum specimens from this locality originally identified by Hay as *C. carpio* have been reidentified as *Carpiodes velifer* and *Ictiobus bubalus*, respectively (see below). Neither of these species was recorded in either of Hay's papers, but taxonomy of the genera *Carpiodes* and *Ictiobus* was not clarified until Hubbs' (1930) study. Finally, two other ictiobine species (*Carpiodes cyprinus* and *Ictiobus niger*) not recognized by Hay and not included among extant museum material are known from the Memphis area (Etnier & Starnes 1994:265, 280).

14. *Carpiodes velifer* (= *Carpiodes carpio*) – USNM 32187 (1). See above comments under *Carpiodes carpio*.

15. *Ictiobus bubalus* (= *Carpiodes carpio*) – USNM 32325 (6). See above comments under *Carpiodes carpio*.

16. *Ictiobus cyprinellus* (= *Ictiobus cyprinella*) – UF 115503 (no BU number) (18). "Quite as common as the preceding" (i.e., referring to *Carpiodes carpio*).

Family Ictaluridae

17. *Ameiurus melas* (= *Amiurus melas*; *Amiurus marmoratus*) – USNM 35225 (2), USNM 32231 (lost). "Abundant everywhere." None of Hay's specimens originally identified as *A. melas* apparently are extant. The above two specimens were originally identified by Hay as *A. marmoratus* (a junior synonym of *A. nebulosus*), but were recently reidentified by me as *A. melas*.

Family Esocidae

18. *Esox americanus vermiculatus* (= *Esox umbrosus*) – USNM 32269 (4). "This appears to be a very abundant fish in the Lower Mississippi Valley, as well as further north. Specimens were secured at Memphis ...."

Family Aphredoderidae

19. *Aphredoderus sayanus* – USNM 32211 (3). "This was found to be a rather common fish at most of the localities visited. Specimens are in the collection from Memphis ..."

Family Atherinopsidae

20. *Labidesthes sicculus vanhyningi* (= *Labidesthes sicculus*) – No voucher specimens found. "This curious fish has representatives in my collections from the Mississippi at Memphis ...."

21. *Menidia audens* – USNM 32303 (1 paralectotype [cleared and partially deteriorated]). "A few specimens were obtained at Memphis ..." Controversy has surrounded the validity of this species. Some have contended it is conspecific with *Menidia beryllina* (Chernoff et al. 1981), whereas recent evidence has been presented (Suttkus & Thompson 2002; Suttkus et al. 2005) to support species recognition of *M. audens*. Most important to the latter contention, both morphological forms have been found to occur sympatrically at two localities, with no apparent evidence of gene interchange. *Menidia audens* is currently recognized as a valid species (Nelson et al., 2004:98, 215). One of sources of original description.

Family Moronidae

22. *Morone mississippiensis* (= *Morone interrupta*) – USNM 32195 (1 lost). "Two small specimens of this fish were secured at Memphis."

Family Centrarchidae

23. *Lepomis cyanellus* (= *Apomotis cyanellus*) – USNM 32177 (1), USNM 32289 (1). "A number of fine specimens of this fish were captured at Memphis ..."

24. *Lepomis gulosus* (= *Chaenobryttus gulosus*) – USNM 32180 (1 lost). "Abundant everywhere. From the Mississippi at Memphis ...."

25. *Lepomis humilis* – No voucher specimens found. "A number of specimens of a *Lepomis* are in the collections from Memphis ... which I refer to this species."

26. *Micropterus salmoides salmoides* (= *Micropterus salmoides*) – UF 115523 (no BU number) (2); USNM 32263 (5). "An abundant fish everywhere."

27. *Pomoxis annularis* (= *Pomoxys annularis*) – UF 115505 (no BU number) (2); USNM 32283 (1 lost). "Probably even more abundant than the preceding" (referring to *Pomoxys sparoides*).

28. *Pomoxis nigromaculatus* (= *Pomoxys sparoides*) – UF 115504 (no BU number) (4). "Abundant specimens were captured at Memphis ..."

Family Percidae

29. *Etheostoma chlorosoma* (= *Vaillantia camura*) – No voucher specimen found. "One specimen of this species was obtained at Memphis, Tenn. ..."

30. *Etheostoma gracile* (= *Poecilichthys butlerianus*) – USNM 195973 (1 paratype of *Poecilichthys butlerianus*). Original description of this species by Hay (1882:62) was based almost entirely on the holotype, from Vaughan's Station. A few remarks were made concerning the lone paratype. One of sources of original description of *Poecilichthys butlerianus*.

31. *Etheostoma proeliare* (= *Microperca proeliaris*) – USNM 32179 (1). "On my last trip I succeeded in getting additional specimens at Memphis ..."

MISSISSIPPI: Mississippi River and vicinity, at Vicksburg, Warren County, (most collections made in neighboring backwater areas, but some made at other places in Vicksburg region and across river in Madison Parish, Louisiana). O.P. Hay, early July 1881. Hay 1882:57–75.

Family Lepisosteidae

1. *Lepisosteus platostomus* (= *Atractosteus tristoechus*) – USNM 32311 (1). "Many of these were captured at ... Vicksburg ..." S.T. Ross (pers. commun.) is responsible for reidentification of the remaining voucher specimen as *Lepisosteus platostomus*, although it is possible that some Alligator Gars (*Atractosteus spatula*) may have been present in the original sample. A third species of "shortnose" gar (*Lepisosteus oculatus*) also occurs in the area, and could have been included in the original sample.

2. *Lepisosteus osseus* (= *Lepidosteus osseus*) – UF 133843 (no BU number) (3). "Found at ... Vicksburg."

Family Amiidae

3. *Amia calva* – UF 115518 (no BU number) (1). Hay did not specificially report this species from Vicksburg, but the species is common in that area (Ross 2001:93).

Family Clupeidae

4. *Alosa chrysochloris* (= *Clupea chrysochloris*) – USNM 32262 (1). "Two small specimens were secured at Vicksburg."

5. *Dorosoma cepedianum* – USNM 32184 (1 lost). "Abundant everywhere. Collected at ... Vicksburg ..."

Family Cyprinidae

6. *Hybognathus hayi* (= *Hybognathus argyritis*) – USNM 32193 (1), USNM 101163 (7). "Found at the same places" (referring to *Hybognathus nuchalis* [ed.]).

7. *Hybognathus nuchalis* – USNM 32249 (2). "Numerous specimens collected at ... Vicksburg ..."

8. *Notemigonus crysoleucas* (= *Notemigonus chrysoleucus*) – USNM 32203 (1). "Found in abundance in the little lakes and ponds along the Mississippi River at ... Vicksburg ..."

9. *Notropis atherinoides* (= *Minnilus dilectus*) – USNM 32218 (1). "Collected at ... Vicksburg ...".

10. *Notropis maculatus* (= *Hemitremia maculata*) – No voucher specimens found. "Several specimens of this species were secured at Vicksburg ..."

11. *Opsopoeodus emiliae emiliae* (= *Opsopoeodus emiliae*) – No voucher specimens found. "A very common minnow throughout the region visited. Collected at ... Vicksburg ..."

12. *Pimephales notatus* (= *Hyborhynchus notatus*) – No voucher specimens found. "Specimens of this widely distributed species were obtained at ... Vicksburg ..."

13. *Pimephales vigilax* (= *Alburnops taurocephalus*) – USNM 32247 (1). "I obtained specimens at ... Vicksburg ..."

Family Catostomidae

14. *Carpiodes carpio* – USNM 32182 (2), USNM 101173 (1). "This is an abundant fish everywhere in the region visited. Specimens were obtained at ... Vicksburg ..." Comments regarding this species from Memphis are applicable here, as well as for the following two species.

15. *Carpiodes velifer* (= *Carpiodes carpio*) – USNM 32174 (1). See above comment.

16. *Ictiobus bubalus* (= *Carpiodes carpio*) – USNM 32271 (1). See above comment.

17. *Ictiobus cyprinellus* (= *Ictiobus cyprinella*) – No voucher specimens found. "Quite as common as the preceding. The young were taken at ... Vicksburg ..."

Family Ictaluridae

18. *Ameiurus melas* (= *Amiurus melas*) – UF 173460 (no BU number) (4).

19. *Ictalurus punctatus* – No voucher specimens found. "Common everywhere. Taken at ... Vicksburg ..."

Family Aphredoderidae

20. *Aphredoderus sayanus* – USNM 32219 (1). "Specimens are in the collections from Memphis ..."

Family Esocidae

21. *Esox niger* (= *Esox reticulatus*) – UF 133835 (no BU number) (3). Not specifically reported by Hay from Vicksburg.

Family Atherinopsidae

22. *Menidia audens* – UF 165628 (BU 326) (two syntypes of *Menidia audens*); USNM 32308 (10 lost). One of sources of original description.

Family Poeciliidae

23. *Gambusia affinis* (= *Gambusia patruelis*) – USNM 32243 (1).

Family Centrarchidae

24. *Lepomis gulosus* (= *Chaenobryttus gulosus*) – USNM 32273 (1). "Abundant everywhere. From the Mississippi at ... Vicksburg ..."

25. *Lepomis humilis* – UF 113753 (no BU number) (3); USNM 32323 (1 lost). "A number of specimens of a *Lepomis* are in the collection from ... Vicksburg ... which I refer to this species."

26. *Lepomis macrochirus macrochirus* (= *Lepomis pallidus*) – USNM 32175 (1). "This species was found at every locality visited, except Memphis ..."

27. *Lepomis megalotis* – UF 173459 (no BU number) (4); USNM 32295 (2). "Specimens of this variable fish were obtained at all points, except Memphis." Reference to variability suggests that some Mississippi specimens may have been the closely related *Lepomis marginatus*, although the latter species appears to be much the less common of the two, at least in the Vicksburg area (Ross 2001:419).

28. *Micropterus salmoides salmoides* (= *Micropterus salmoides*) – UF 133836 (no BU number) (6); USNM 32240 (2).

29. *Pomoxis annularis* – USNM 32322 (1). Hay did not specifically report this species from Vicksburg.

30. *Pomoxis nigromaculatus* (= *Pomoxys sparoides*) – USNM 32292 (1). "Abundant specimens were captured at ... Vicksburg ..."

Family Percidae

31. *Etheostoma caeruleum* (= ?) – UF 115512 (no BU number) (1). Hay made no mention of this species, nor of any other darter answering its description, from this locality. Since *Etheostoma caeruleum* is known to occur in the vicinity of Vicksburg (Ross 2001:461), the present record is considered valid.

32. *Percina caprodes* – No voucher specimens found. "Specimens of this species were captured at Vicksburg ..."

Family Sciaenidae

33. *Aplodinotus grunniens* (= *Haplodinotus grunniens*) – No voucher specimens found. "Specimens of this species were secured at Vicksburg only."

MISSISSIPPI: Big Black River, at railroad crossing near Edwards, Hinds County. O.P. Hay, 20 August 1881. Hay 1882:57–75.

Family Clupeidae

1. *Dorosoma cepedianum* – USNM 32220 (1 lost).

Family Cyprinidae

2. *Cyprinella venusta cercostigma* (= *Luxilus stigmaturus*) – UF 133538 (BU 336) (11); USNM 32244 (1).

3. *Hybognathus nuchalis* – UF 167074 (BU 349) (1); USNM 32296 (1); CAS-SU 577 (1).

4. *Notemigonus crysoleucas* (= *Notemigonus chrysoleucus*) – USNM 32233 (1).

5. *Notropis atherinoides* (= *Minnilus dilectus*) – UF 115521 (BU 340) (2); USNM 32199 (1).

6. *Notropis texanus* (= *Alburnops xaenocephalus*) – USNM 32265 (14). See earlier remarks in connection with Enterprise collection regarding distribution of *Notropis xaenocephalus*.

7. *Pimephales notatus* – USNM 32204 (1).

8. *Semotilus atromaculatus* (= *Semotilus corporalis*) – No voucher specimens found. "A few were found along the Big Black near Edwards." See earlier remarks in connection with Artesia collection regarding nomenclature of this species.

Family Catostomidae

9. *Carpiodes velifer* (= *Carpiodes carpio*) – USNM 32293 (1). "This is an abundant fish everywhere."

10. *Ictiobus cyprinellus* (= *Ictiobus cyprinella*) – USNM 32320 (1). "One specimen 9 inches long was taken in the Big Black near Edwards."

Family Ictaluridae

11. *Ameiurus melas* (= *Amiurus melas*) – USNM 32251 (1).

12. *Noturus nocturnus* (= *Noturus leptacanthus*?) – USNM 32301 (1) (?). The indicated specimen, which has been identified as *Noturus nocturnus*, lacks locality data but is indicated to be from Mississippi. Based on the catalogue number, this is likely one of Hay's specimens. Since Hay (1882:73) indicated having obtained only one specimen of *Noturus* during his 1881 collecting trip (from Edwards), and since *N. nocturnus* is known to be common and widespread in the Big Black River system (Ross 2001:328), the present USNM lot is believed to represent the specimen in question.

Family Esocidae

13. *Esox niger* (= *Esox reticulatus*) – USNM 32288 (1).

Family Atherinopsidae

14. *Menidia audens* – USNM 32206 (1 syntype), USNM 32303 (1 syntype lost), USNM 32304 (1 syntype lost).

Family Fundulidae

15. *Fundulus notii* (= *Zygonectes dispar*) – USNM 32210 (1). Identification as *Fundulus nottii* confirmed by S.T. Ross (pers. commun.), who examined the specimen.

Family Centrarchidae

16. *Centrarchus macropterus* – USNM 32268 (2).

17. *Lepomis gulosus* (= *Chaenobryttus gulosus*) – UF 113787 (BU 415) (2); USNM 32230 (1), USNM 32291 (2).

18. *Lepomis macrochirus macrochirus* (= *Lepomis pallidus*) – USNM 32285 (1).

19. *Lepomis megalotis* – No voucher specimens found.

20. *Micropterus salmoides salmoides* (= *Micropterus salmoides*) – USNM 32208 (1 lost).

21. *Pomoxis annularis* (= *Pomoxys annularis*) – No voucher specimens found.

22. *Pomoxis nigromaculatus* (= *Pomoxys sparoides*) – No voucher specimens found.

Family Percidae

23. *Etheostoma gracile* (= *Poecilichthys butlerianus*) – USNM 32224 (holotype). Source of original description of *Poecilichthys butlerianus*.

24. *Etheostoma nigrum* (= *Boleosoma olmstedi*) – No voucher specimens found. "A very few specimens of this Darter were obtained in the Big Black River, near Edwards ..."

25. *Etheostoma proeliare* (= *Microperca proeliaris*) – No voucher specimens found. "On my last trip I succeeded in getting additional specimens ... from the Big Black at Edwards."

MISSISSIPPI: Pearl River, at Jackson, Hinds County (two separate collections). O.P. Hay, July–August, 1881. Hay 1882:57–75.

Family Lepisosteidae

1. *Lepisosteus oculatus* (= *Atractosteus tristoechus*) – USNM 32375 (1). Although Hay collected some Allligator Gar specimens from Mississippi (and possibly from Memphis) (see account of Vicksburg collection), it is obvious that other specimens of short-nosed gars were confused with that species, including the present one. Whether or not some Alligator Gars may have been included in Hay's Jackson collections cannot be determined, but it should be noted that Ross (2001:86) showed the species to ascend the Pearl River only a short distance into Mississippi, well below Jackson.

2. *Lepisosteus osseus* (= *Lepidosteus osseus*) – No voucher specimens found. "A very common fish. Found at ... Jackson ..."

Family Hiodontidae

3. *Hiodon tergisus* (= *Hyodon selenops*) – USNM 32254 (1). "Two specimens ... were caught for me in the Pearl River at Jackson."

Family Anguillidae

4. *Anguilla rostrata* – No voucher specimen found. "The head of a specimen of the common eel was given me by a fisherman at Jackson."

Family Clupeidae

5. *Dorosoma cepedianum* – No voucher specimens found. "Abundant everywhere. Collected at ... Jackson."

Family Cyprinidae

6. *Cyprinella venusta cercostigma* (= *Luxilus stigmaturus*) – UF 173468 (no BU number) (8); USNM 32237 (4); CAS-SU 2589 (1). *Cyprinella venusta stigmatura* is endemic to the Coosa River system of the Mobile Bay basin.

7. *Hybognathus hayi* (= *Hybognathus argyritis*) – UF 115497 (no BU number) (49 topotypes); USNM 32306 (lectotype), USNM 195573 (9 paralectotypes), USNM 32276 (15 topotypes); UMMZ 247531 (1 topotype). This species was recognized as distinct by Hay, but was called by him *Hybognathus argyritis*. *H. argyritis* was later shown by Pflieger (1971:365–369) to be a valid species endemic to the Missouri River basin (Pflieger 1980). Ten specimens from this locality were removed from the original series and later formed the basis for Jordan's (1885a) original description of *Hybognathus hayi*. The remaining specimens are topotypes, but have no formal standing since they were not involved in preparation of the original description.

8. *Hybognathus nuchalis* (= *Hybognathus nuchalis*; *Tirodon annigenus*) – UF 113793 (BU 330) (8); USNM 32192 (1), USNM 32300 (1), USNM 32157 (holotype of *Tirodon annigenus*). *Tirodon annigenus*, which was described as a new genus and species by Hay (Hay 1882:68–69), was determined by Hubbs (1947) to be based on a specimen of *H. nuchalis* with aberrant pharyngeal dentition.

9. *Macrhybopsis storeriana* (= *Ceratichthys amblops*?) – UF 133528 (no BU number) (1); USNM 32188 (1); CAS-SU 573 (1). "A few good specimens were secured in the Pearl River at Jackson." *Macrhybopsis storeriana* was not specifically mentioned by Hay, and Hay's reference to *Ceratichthys amblops* is presumed to be the basis for this record. *Hybopsis amblops* does not occur in any Gulf slope drainages, although a closely related species, *Hybopsis winchelli*, is found there, including the Pearl River drainage (Ross 2001:227). It is possible, in fact, that Hay's record may have been based, in part, on *H. winchelli*, but that cannot be proved given the absence of any voucher specimens of that species.

10. *Notemigonus crysoleucas* (= *Notemigonus chrysoleucus*) – UF 173471 (no BU number) (1); USNM 32248 (1). "Found in abundance ... in the Pearl at Jackson."

11. *Notropis atherinoides* (= *Minnilus dilectus*) – USNM 32194 (1); CAS-SU 1057 (1). "Collected at ... Jackson."

12. *Notropis maculatus* (= *Hemitremia maculata*) – USNM 32245 (1). "Several specimens of this species were secured at ... Jackson."

13. *Notropis texanus* (= *Alburnops xaenocephalus*) – UF 113795 (no BU number) (12). *Notropis xaenocephalus* is restricted to the upper Coosa River system of the Mobile Bay basin.

14. *Opsopoeodus emiliae emiliae* (= *Opsopoeodus emiliae*) – USNM 32215 (1), USNM 32222 (10), USNM 32310 (2); UMMZ 187267 (1). "A very common species throughout the region visited. Collected at ... Jackson."

15. *Pimephales vigilax* (= *Alburnops taurocephalus*) – UF 133529 (BU 55) (4); USNM 32190 (2), USNM 32309 (5); CAS-SU 3964 (1).

Family Catostomidae

16. *Carpiodes cyprinus* (= *Carpiodes carpio*) – USNM 32371 (1). As discussed elsewhere, the species of *Carpiodes* and *Ictiobus* were not distinguished prior to Hubbs' (1930) review. *Carpiodes carpio* does not occur in the Pearl River drainage (Ross 2001:259), and specimens identified as this species from there by Hay prove to be a mixture of *Carpiodes cyprinus*, *C. velifer*, and *Ictiobus bubalus*.

17. *Carpiodes velifer* (= *Carpiodes carpio*) – USNM 32313 (1), USNM 32317 (1). See above comment.

18. *Cycleptus meridionalis* (= *Cycleptus elongatus*) – No voucher specimen found. "One specimen having a total length of 21 inches was taken from the Pearl River." Eastern Gulf slope populations of *Cycleptus* were recently described as a new species, *meridionalis*, by Burr & Mayden (1999).

19. *Ictiobus bubalus* (= *Carpiodes carpio*) – UF 115499 (no BU number) (3). See above comment.

20. *Minytrema melanops* (= *Moxostoma macrolepidotum*) – USNM 32314 (1). As discussed in the account of the collection from Enterprise, *Moxostoma macrolepidotum* does not occur in Gulf slope drainages, and specimens identified as that species are presumed to be *Minytrema melanops*. Reidentification of the present specimen, by C.R. Robins, confirms this assumption.

21. *Moxostoma poecilurum* – No voucher specimens found.

Family Ictaluridae

22. *Ameiurus melas* (= *Amiurus melas*) – USNM 32370 (1).

23. *Ictalurus punctatus* – UF 173470 (no BU number) (1); USNM 32277 (1).

Family Esocidae

24. *Esox americanus* (= *Esox umbrosus*) – USNM 32242 (1), USNM 32374 (1). "This appears to be a very abundant fish in the Lower Mississippi Valley, as well as farther north. Specimens were secured at ... Jackson ..."

Family Aphredoderidae

25. *Aphredoderus sayanus* – USNM 32178 (1), USNM 32281 (1).

Family Atherinopsidae

26. *Labidesthes sicculus vanhyningi* (= *Labidesthes sicculus*) – UF 173469 (no BU number) (1); USNM 32196 (4); CAS-SU 1072 (1)

27. *Menidia audens* – USNM 32307 (1 paralectotype). One of sources of original description.

Family Fundulidae

28. *Fundulus nottii* (?) (= *Zygonectes dispar*) – USNM 32214 (1). "A ... male of this species was obtained in the Pearl at Jackson.

29. *Fundulus olivaceus* (?) (= *Zygonectes notatus*) – UF 173472 (no BU number) (4); USNM 32299 (6). "Numerous specimens were obtained at Jackson." See earlier comment regarding identification and occurrence of *Fundulus olivaceus* and *F. notatus*.

Family Poeciliidae

30. *Gambusia affinis* (= *Gambusia patruelis*) – USNM 32250 (1); CAS-SU 1092 (1).

Family Centrarchidae

31. *Centrarchus macropterus* – USNM 32282 (1). "A few were taken at Jackson."

32. *Lepomis cyanellus* (= *Apomotis cyanellus*) – UF 115498 (no BU number) (2); USNM 32278 (1), USNM 32378 (1). "A number of fine specimens of this species were collected at Memphis, and others at Jackson."

33. *Lepomis gulosus* (= *Chaenobryttus gulosus*) – No voucher specimens found. "Abundant everywhere. From the ... Pearl at Jackson."

34. *Lepomis humilis* – No voucher specimens found. "A number of specimens are in the collections from ... Jackson ... which I refer to this species."

35. *Lepomis macrochirus macrochirus* (= *Lepomis pallidus*; *Lepomis obscurus*) – USNM 32318 (1), USNM 32319 (1), USNM 32376 (1)

36. *Lepomis marginatus* (= *Lepomis megalotis*) – UF 133838 (no BU number) (2).

37. *Lepomis megalotis* – UF 113770 (no BU number) (1); USNM 32181 (1), USNM 32227 (1). Hay specifically mentioned the variable appearance of this species. Demonstrated presence of *Lepomis marginatus* is at least partly responsible for this observation.

38. *Pomoxis annularis* (= *Pomoxys annularis*) – UF 133531 (BU 418) (1). "Abundant. Found at ... Jackson."

39. *Pomoxis nigromaculatus* (= *Pomoxys sparoides*) – UF 133530 (no BU number) (9); USNM 32298 (1). Not specifically listed by Hay from Jackson.

40. *Micropterus salmoides salmoides* (= *Micropterus salmoides*) – No voucher specimens found. "An abundant fish everywhere."

Family Percidae

41. *Ammocrypta beanii* – USNM 32221 (1). "One specimen of this species was taken ... at Jackson."

42. *Ammocrypta vivax* – USNM 32213 (holotype). "Only a single specimen of this species was secured." Source of original description.

43. *Etheostoma chlorosoma* (= *Vaillantia camura*) – No voucher specimen found. "One specimen of this species was obtained at ... Jackson."

44. *Etheostoma proeliare* (= *Microperca proeliaris*) – USNM 32205 (1).

45. *Percina suttkusi* (= *Percina caprodes*) – UF 173467 (no BU number) (1). "Specimens of this species were captured ... at Jackson." Populations of logperch from the Pearl River drainage were recently described as the indicated new species by Thompson (1997a).

46. *Percina vigil* (= *Ioa vigil*) – USNM 32201 (holotype). Source of original description.

Family Aplodinotidae

47. *Aplodinotus grunniens* (= *Haplodinotus grunniens*) – No voucher specimens collected. "Evidence of its occurrence at Jackson were obtained."

MISSISSIPPI: Big Black River, at Vaughan's Station, along New Orleans and Chicago Railroad, Yazoo County. O.P. Hay, August 1881. Hay 1882:57–75.

Family Cyprinidae

1. *Hybognathus hayi* (= *Hybognathus argyritis*) – No voucher specimens found. "These appear to be quite as abundant as the preceding (referring to *Hybognathus nuchalis* [ed.]). Found at the same places."

2. *Hybognathus nuchalis* – No voucher specimens found. "Numerous specimens collected at ... Vaughan's."

3. *Notemigonus crysoleucas* (= *Notemigonus chrysoleucus*) – USNM 32272 (1). "Found in abundance at ... Vaughan's."

Family Catostomidae

4. *Ictiobus cyprinellus* – USNM 32189 (2 lost). "The young were taken at ... Vaughan's."

Family Ictaluridae

5. *Ameiurus melas* (= *Amiurus melas*) – USNM 32287 (1 lost).

6. *Ameiurus natalis* (=*Amiurus melas*) – USNM 32294 (2).

Family Esocidae

7. *Esox americanus* (= *Esox umbrosus*) – USNM 32264 (2). "Specimens were secured at ... Vaughan's."

Family Aphredoderidae

8. *Aphredoderus sayanus* – USNM 32197 (2). "This was found to be a rather common fish at most of the localities visited. Specimens are in the collections from ... Vaughan's."

Family Poeciliidae

9. *Gambusia affinis* (= *Gambusia patruelis*) – USNM 32209 (1). "Of thirty-two specimens collected at Vaughan's all are females."

Family Centrarchidae

10. *Lepomis cyanellus* (= *Apomotis cyanellus*) – USNM 32305 (5 lost). Not specifically reported by Hay from Vaughan's Station.

11. *Lepomis gulosus* (= *Chaenobryttus gulosus*) – USNM 32290 (4). "Abundant everywhere."

12. *Lepomis megalotis* – USNM 32255 (2 lost). Hay (1882:63) specifically mentioned that the two small individuals collected at Vaughan's were of a darker color and had a shorter opercular flap than Longear Sunfish specimens examined elsewhere. This suggests that the two missing specimens may have been *Lepomis marginatus*.

13. *Lepomis macrochirus macrochirus* (= *Lepomis pallidus*) – USNM 32372 (1).

14. *Micropterus salmoides salmoides* (= *Micropterus salmoides*) – USNM 32286 (1). "An abundant fish everywhere."

15. *Pomoxis annularis* (= *Pomoxys annularis*) – USNM 32270 (1)

16. *Pomoxis nigromaculatus* (= *Pomoxys sparoides*) – No voucher specimens found. "Abundant specimens were captured at ... Vaughan's ..."

MISSISSIPPI: Yalabusha River, at Grenada, Yalabusha County. O.P. Hay, August 1881. O.P. Hay, August 1881. Hay 1882:57–75.

Family Clupeidae

1. *Dorosoma cepedianum* – No voucher specimens found.

Family Cyprinidae

2. *Hybognathus hayi* (= *Hybognathus argyritis*) – UF 133526 (no BU number) (3); CAS-SU 4112 (2). "Found at the same places" (as the preceding).

3. *Hybognathus nuchalis* – USNM 32232 (1), USNM 32234 (10). "Numerous specimens collected at Grenada."

4. *Notropis atherinoides* (= *Minnilus dilectus*) – No voucher specimens found. "Collected at ... Grenada."

5. *Opsopoeodus emiliae emiliae* (= *Opsopoeodus emiliae*) – USNM 32207 (1). "A very common minnow throughout the region visited. Collected at ... Grenada."

6. *Pimephales notatus* (= *Hyborhynchus notatus*) – USNM 32223 (1). "Specimens of this widely distributed species were obtained at ... Grenada."

7. *Pimephales vigilax* (= *Alburnops taurocephalus*) – USNM 32241 (6). "I obtained specimens ... at Grenada."

Family Ictaluridae

8. *Ictalurus punctatus* – No voucher specimens found.

Family Esocidae

9. *Esox americanus* (= *Esox umbrosus*) –USNM 32173 (1).

Famly Atherinopsidae

10. *Labidesthes sicculus vanhyningi* (= *Labidesthes sicculus*) – USNM 32225 (1).

Family Fundulidae

11. *Fundulus olivaceus* (= *Zygonectes notatus*?) – USNM 32259 (6).

Family Poeciliidae

12. *Gambusia affinis* (= *Gambusia patruelis*) – USNM 32234 (1).

Family Centrarchidae

13. *Lepomis gulosus* (= *Chaenobryttus gulosus*) – USNM 32183 (1).

14. *Leponis macrochirus macrochirus* (= *Leponis pallidus*) – USNM 32186 (1).

15. *Leponis megalotis* – No voucher specimens found.

16. *Micropterus salmoides salmoides* (= *Micropterus salmoides*) – USNM 32200 (1).

17. *Pomoxis nigromaculatus* (= *Pomoxys sparoides*) – USNM 32266 (1).

Family Percidae

18. *Eheostoma nigrum* (= *Boleosoma olmstedi*) – No voucher specimens found.

19. *Percina maculata* or *Percina sciera* (= *Alvordius aspro*) – No voucher specimen found. "One specimen was secured while seining in the Yalabusha River at Grenada." *Percina maculata* and *P. sciera* are similar in appearance and both occur in the Yalabusha system, where the latter species is generally more common and widespread (Ross 2001:507, 513). *P. sciera* had not been formally described when Hay's paper was published.

FLORIDA: Collections from Florida, made by H.T. Mann and D.M. Davison, April 1885, and sent to O.P. Hay. Hay 1885:552–559.

In this paper are discussed some small collections from three localities in Florida, which were sent to Hay for analysis by H.T. Mann and D.M. Davison. The first is a brackish-water collection from St. Augustine, whereas the remaining two are freshwater collections from the western panhandle (Choctawhatchee River, at Westville, in Holmes County; and Yellow River, near Chaffin, in Santa Rosa County). The last two collections appear to be the first freshwater collections recorded from the Florida panhandle region.

Judging from the content of Hay's paper, it would appear that very few species were involved in these collections. Only two species were mentioned from St. Augustine, a goby (*Gobionellus smaragdus* [= *Ctenogobius smaragdus*]) and a mullet (*Mugil albula* [= probably *Mugil cephalus*]); four from Westville, a silverside (*Labidesthes sicculus*), and three killifishes (*Zygonectes auroguttatus* [= *Fundulus cingulatus*], *Zygonectes nottii* [= *Fundulus escambiae*], *Heterandria ommata* [= *Leptolucania ommata*]); and only a single species (a darter) from Chaffin (*Etheostoma davisoni*). However, two unsorted Butler collections, respectively labeled "St. Augustine" and "Westville," offer clear evidence that Hay did not include all species from these localities in his discussion. The lot from St. Augustine includes two species (*Poecilia latipinna* and *Cyprinodon variegatus*) not recorded by Hay, and a third species from the same locality (*Fundulus rubrifrons*), likewise unlisted by Hay, was found at the UMMZ (D.W. Nelson, pers. commun.). The collection from Westville contains three species similarly not mentioned (*Poecilia latipinna*, *Leponis macrochirus*, *Leponis marginatus*). In addition, the latter collection included Hay's unique voucher specimen of *Labidesthes sicculus*. There is no direct evidence that the collection from Chaffin included anything other than the single specimen (the holotype) of *Etheostoma davisoni*. In addition to the discovery of previously unreported species in two of the three collections, other indirect evidence that these collections were larger than originally indicated may be inferred from Hay's comment that "the greater part [*is from*] the eastern portion of the State, principally at Saint Augustine."

FLORIDA: vicinity of St. Augustine, St. Johns County, H.T. Mann & D.M. Davison 1885.

Family Mugilidae

1. *Mugil cephalus* (= *Mugil albula*) – USNM 37361 (lost; "several specimens" originally present). Identification based on Hay's comment that scales are absent from the fins (other than caudal).

Family Fundulidae

2. *Fundulus rubrifrons* – UMMZ 248381 (1). Species not reported by Hay. Record provided by D.W. Nelson.

Family Poeciliidae

3. *Poecilia latipinna* – UF 173580 (no BU number) (36). Species not reported by Hay.

Family Cyprinodontidae

4. *Cyprinodon variegatus* – UF 173581 (no BU number) (2). Species not reported by Hay.

Family Gobiidae

5. *Ctenogobius smaragdus* (= *Gobionellus smaragdus*) – USNM 37360 (1).

FLORIDA: Choctawhatchee River, at Westville, Holmes County, H.T. Mann & D.M. Davison, April 1885.

Family Atherinopsidae

1. *Labidesthes sicculus vanhyningi* (= *Labidesthes sicculus*) – UF 115508 (no BU number) (1). "A single specimen of this fish was obtained at Westville."

Family Fundulidae

2. *Fundulus cingulatus* (= *Zygonectes auroguttatus*) – USNM 37362 (lectotype of *Zygonectes auroguttatus* and neotype of *Fundulus cingulatus* [see below]), USNM 315090 (1 paralectotype). "Eight specimens obtained at Westville." Present disposition of the remaining six specimens unknown. Source of original description of *Zygonectes auroguttatus*. USNM 37362 designated as lectotype of *Zygonectes auroguttatus* by Gilbert et al. (1992:755) and as neotype of *Fundulus cingulatus* by Lazara (2002).

3. *Fundulus escambiae* (= *Zygonectes nottii*) – USNM 37363 (1). *Fundulus nottii* is not found in the Florida panhandle, but is very similar in appearance to *Fundulus escambiae*, which does occur there and was described by Bollman (1887) shortly after publication of Hay's paper.

4. *Leptolucania ommata* (= *Heterandria ommata*) – USNM 37364 (1). Hay initially believed this to be an undescribed species, and included the manuscript name "*Zygonectes mannii*" below the species heading.

Family Poeciliidae

5. *Poecilia latipinna* – UF 115507 (no BU number) (5). Species not reported by Hay.

Family Centrarchidae

6. *Lepomis macrochirus macrochirus* – UF 113752 (no BU number) (1). Species not reported by Hay.

7. *Lepomis marginatus* – UF 115506 (no BU number) (2). Species not reported by Hay.

FLORIDA: Yellow River, near Chaffin, Santa Rosa County, H.T. Mann & D.M. Davison, April 1885.

Family Percidae

1. *Etheostoma davisoni* – USNM 37365 (holotype). Source of original description.

KANSAS: Republican River, at Concordia, Cloud County, O.P. Hay & M.J. Thompson, July 1885. Hay 1887:242–253.

Family Hiodontidae

1. *Hiodon alosoides* (= *Hyodon alosoides*) – USNM 37932 (1).

Family Cyprinidae

2. *Cyprinella lutrensis* (= *Notropis lutrensis*) – No voucher specimens located.

Family Catostomidae

3. *Carpiodes carpio* (= *Ictiobus velifer*) – USNM 37931 (1). Although originally identified by Hay as *Ictiobus velifer* (now *Carpiodes velifer*), Metcalf (1966:142) identified Hay's USNM specimen as *Carpiodes carpio*. There are very few records of *Carpiodes velifer* from Kansas. Cross (1967:180) did not map any records of the species from any locality close to Cloud County, and the species is now nearly extirpated from the state.

Family Ictaluridae

4. *Ameiurus melas* (= *Amiurus melas*) – USNM 37929 (1).

5. *Ictalurus punctatus* – UF 115510 (no BU number) (1).

KANSAS: tributary to Solomon River, just west of Beloit, Mitchell County. Hay 1887:243–247.

Family Lepisosteidae

1. *Lepisosteus osseus* (= *Lepidosteus osseus*) – USNM 37959 (1). "One specimen, 3½ inches long."

Family Cyprinidae

2. *Campostoma anomalum* – UF 113800 (BU 2) (2). "Two specimens."

3. *Cyprinella lutrensis* (= *Notropis lutrensis*; *Notropis macrostoma* [?]) – UF 113798 (BU 27, BU 320, BU 339, BU 348) (54); USNM 37941 (5). "*Notropis macrostoma*" was included by Hay in the list of species from this locality, based on a single specimen having 1,4-4,1 phyarngeal teeth and 9 anal rays. However, *N. macrostoma* is a synonym of *Notropis amabilis*, a species whose native range (Texas and Mexico) is far distant from Kansas. These Kansas records were considered by Cross (1967:125) to be based on misidentified *Cyprinella lutrensis*, although this cannot be proved since none of the specimens specifically identified by Hay as *Notropis macrostoma* have been examined.

4. *Luxilus cornutus* (= *Notropis megalops*) – UF 113782 (BU 87) (3).

5. *Notropis stramineus missuriensis* (= *Notropis deliciosus*) – UF 115493 (BU 32) (2). "A single specimen .... is referred to this species."

6. *Notropis topeka* (= *Notropis topeka*; *Notropis aeneolus*) – USNM 37943 (two paratypes of *Notropis aeneolus*). Both *Notropis topeka* and *Notropis aeneolus* were recorded from this locality by Hay, with the latter being specifically described as a "new species." The situation is further confused by the fact that *N. aeneolus* (but not *N. topeka*) was included in subsequent species lists from Kirwin (two specimens), Wallace (one specimen), and WaKeeney, with

one of the original four specimens from the last locality (3⅛ inches total length) (USNM 37945) said to be "the type of the species." WaKeeney has usually been considered the type locality for *Notropis aeneolus* (Gilbert 1998:34–35), and the above-mentioned specimen (USNM 37945) has been regarded as the holotype (Gilbert 1978:23; 1998:34). In the present paper, additional specimens referred to *N. aeneolus* by Hay are shown to exist, including two from Kirwin (USNM 37942), three from Beloit (USNM 37943), one from WaKeeney (UF 133564), and one from Wallace (UF 113791). All are regarded as paratypes.

7. *Phenacobius mirabilis* – UF 115492 (BU 102) (1). "One specimen."

8. *Pimephales notatus* – USNM 37958 (10 lost). No other voucher specimens located. "Numerous specimens were collected which are referred to this species."

9. *Pimephales promelas* (= *Pimephales promelas confertus*) – UF 133555 (BU 337) (24). "Abundant."

10. *Semotilus atromaculatus* – UF 113764 (no BU number) (1 dried). "A single specimen."

Family Catostomidae

11. *Carpiodes carpio* (= *Ictiobus velifer*) – UF 115525 (BU 177) (1); USNM 37936 (1). See earlier remark under Concordia collection.

12. *Catostomus commersonii* (= *Catostomus teres*) – No voucher specimens located.

13. *Moxostoma macrolepidotum* – USNM 37930 (1). "Two specimens; one 10 inches long." The record for this species is located well west of its present range in Kansas (Cross 1967:189). Identity of remaining voucher specimen (USNM 37930) confirmed by R.E. Jenkins (pers. commun.).

Family Ictaluridae

14. *Ameiurus melas* (= *Amiurus melas*) – UF 115491 (BU 171) (7); USNM 38239 (2).

15. *Ictalurus punctatus* – BU 167 not located and presumed lost.

Family Centrarchidae

16. *Lepomis cyanellus* – UF 173475 (BU 145) (2). "Two specimens."

17. *Lepomis humilis* – USNM 37956 (3); USNM 101144 (2). BU 144 not located and presumed lost. "Many specimens ... were obtained."

Family Percidae

18. *Etheostoma nigrum* (= *Etheostoma olmstedi*) – USNM 37964 (3). "Two specimens secured."

KANSAS: North Fork of Solomon River, at Kirwin, Phillips County. Hay 1887:247–248.

Family Cyprinidae

1. *Cyprinella lutrensis* (= *Notropis lutrensis*) – UF 113775 (BU 28) (7); USNM 37965 (1). "Abundant."

2. *Luxilus cornutus* (= *Notropis megalops*) - UF 113788 (BU 82) (5).

3. *Notropis stramineus missuriensis* (= *Notropis deliciosus*) – UF 113774 (BU 30) (3); USNM 37954 (1). "Common."

4. *Notropis topeka* (= *Notropis aeneolus*) – USNM 37942 (two paratypes of *Notropis aeneolus*). "Two specimens." Although not formally designated as types of the supposed new species, *Notropis aeneolus* (for which the formal description appeared elsewhere in Hay's paper), the present specimens are tentatively considered paratypes, as discussed earlier.

5. *Pimephales notatus* – UF 115529 (BU 26) (1); USNM 37955 (1).

6. *Pimephales promelas* (= *Pimephales promelas confertus*) – UF 133556 (BU 22) (2).

7. *Semotilus atromaculatus* – UF 165629 (BU 92) (three dried).

Family Ictaluridae

8. *Ameiurus melas* (= *Amiurus melas*) – UF 113790 (no BU number) (1). "One specimen."

Family Centrarchidae

9. *Lepomis humilis* – UF 113777 (BU 146) (two dried).

KANSAS: North Fork of Solomon River, at Lenora, Norton County. Hay 1887:248–249.

Family Cyprinidae

1. *Campostoma anomalum* – UF 133558 (BU 1) (8); USNM 38236 (2 lost). "One of the commonest of fishes."

2. *Chrosomus erythrogaster* – UF 115553 (BU 9) (2); USNM 38241 (1). "Two specimens." (Number of extant specimens exceeds this number by one). This species until recently was placed in the genus *Phoxinus*, based on several close morphological similarities to species found in Eurasia. A recent study by Strange & Mayden (2009), utilizing genetic characters, indicates that it should be reassigned to the genus *Chrosomus*. Present inclusion in the latter genus is in anticipation of this change. Westernmost record for species, and one of only two records from western two-thirds of Kansas (Cross 1967:81).

3. *Cyprinella lutrensis* (= *Notropis lutrensis*) – No voucher specimens found. "Abundant."

4. *Luxilus cornutus* (= *Notropis megalops*) – UF 133557 (BU 84) (39).

5. *Lythrurus umbratilis umbratilis* (= *Notropis umbratilis*) – UF 113789 (BU 83) (1); USNM 38232 (2). "Four specimens secured." Westernmost record for species, and only record from the western two-thirds of Kansas (Cross 1967:108).

6. *Nocomis biguttatus* (?) – UF 133560 (BU 73) (1). Uncertainity surrounds the provenance of this record. The species was not included among those recorded by Hay from Lenora, and was not mapped

by Cross (1967:87) from this locality or from closely adjacent areas of Kansas. It is uncertain whether: a) the present specimen was originally misidentified, b) the specimen from this locality was correctly identified but was accidentally omitted by Hay from his paper, or c) the locality data is incorrect and the specimen is actually from either WaKeeney or Wallace, other localities from which *Nocomis biguttatus* was recorded by Hay.

7. *Notropis stramineus missuriensis* (= *Notropis deliciosus*) – UF 165630 (no BU number) (28); USNM 37950 (1).

8. *Phenacobius mirabilis* – UF 133561 (BU 103) (3); USNM 37962 (2). "Several specimens were secured."

9. *Pimephales notatus* – USNM 37939 (1).

10. *Pimephales promelas* (= *Pimephales promelas confertus*) – UF 133840 (BU 15, BU 19) (6); USNM 38240 (1).

11. *Semotilus atromaculatus* (= *Semotilus atromaculatus*; *Squalius elongatus*) – UF 133559 (BU 101) (1); USNM 38233 (1). "Quite common." The UF specimen was identified by Hay as *Semotilus atromaculatus*. He originally identified the USNM specimen as *Squalius elongatus*, but this was later determined by Hubbs (1951b) to be an individual of *S. atromaculatus* with aberrant pharyngeal dentition.

Family Catostomidae

12. *Catostomus commersonii* (= *Catostomus teres*) – No voucher specimens located.

Family Ictaluridae

13. *Noturus flavus* – USNM 37963 (1). "One specimen only."

Family Fundulidae

14. *Fundulus kansae* (= *Fundulus zebrinus*) – No voucher specimens located. "Abundant in the shallow tributary."Although *Fundulus kansae* was placed in the synonymy of *Fundulus zebrinus* (Clark Hubbs 1972; Poss & Miller 1983) (summarized by Robins et al. 1980), recent studies, emphasizing molecular data (Kreiser 2001; Kreiser et al. 2001), support reelevation of *F. kansae* to full species.

Family Centrarchidae

15. *Lepomis cyanellus* – No voucher specimens located. "Common."

Family Percidae

16. *Etheostoma spectabile pulchellum* (= *Etheostoma lepidum*) – USNM 37951 (6). BU 160 not located and presumed lost. "Numerous specimens secured at Lenora."

17. *Etheostoma nigrum* (= *Boleosoma olmstedi*) – UF 115524 (BU 155) (11). "Common."

KANSAS: Saline River, 5.6 mi. N of WaKeeney, Trego County. Hay 1887:250.

Family Hiodontidae

1. *Hiodon alosoides* (= *Hyodon alosoides*) – USNM 38238 (2 lost). "One small specimen."

Family Cyprinidae

2. *Campostoma anomalum* – UF 113778 (BU 343) (5).

3. *Cyprinella lutrensis* (= *Notropis lutrensis*) – UF 113496 (BU 251) (31); USNM 37940 (4). "Common, as it is elsewhere in western Kansas."

4. *Hybognathus placitus* (= *Hybognathus nuchalis*) – UF 113762 (BU 18) (4). "A number of good specimens of this widely-distributed species were obtained."

5. *Luxilus cornutus* (= *Notropis megalops*) – UF 113781 (BU 86) (3); USNM 38235 (1). "Several small specimens and one with a total length of 5¼ inches."

6. *Macrhybopsis storeriana* (= *Hybopsis storerianus*) – USNM 37938 (1). This specimen catalogued (apparently erroneously) as being from Wallace, Kansas (see subsequent discussion). "In the Saline collection are several specimens that appear to belong to the above-named species."

7. *Nocomis biguttatus* (= *Hybopsis biguttatus*) – BU 76 not located and presumed lost. "Numerous large specimens are found in the collection." See earlier discussion of this species under collection from Lenora.

8. *Notropis stramineus missuriensis* (= *Notropis deliciosus*) – UF 133562 (BU 24, BU 34) (27).

9. *Notropis topeka* (= *Notropis aeneolus*) – UF 133564 (BU 75) (one paratopotype of *Notropis aeneolus*); USNM 37945 (holotype of *Notropis aeneolus*). Two additional specimens were reported by Hay from this locality, but these have not been located. Source of original description of *Notropis aeneolus*.

10. *Phenacobius mirabilis* – UF 165625 (BU 104) (three dried).

11. *Pimephales notatus* – UF 113799 (BU 29) (2).

12. *Pimephales promelas* (= *Pimephales promelas confertus*) – USNM 37961 (5). BU 327 not located and presumed lost.

13. *Semotilus atromaculatus* – UF 167079 (BU 328) (10).

Family Catostomidae

14. *Carpiodes carpio* (= *Ictiobus velifer*) – BU 317 not located and presumed lost. See earlier remarks under Concordia collection.

15. *Catostomus commersonii* (= *Catostomus teres*) – UF 115496 (no BU number) (1); USNM 38234 (1).

Family Ictaluridae

16. *Ameiurus melas* (= *Amiurus melas*) – UF 133566 (BU 169) (3). "Common."

17. *Ictalurus punctatus* – USNM 38231 (1). BU 186 not located and presumed lost.

Family Fundulidae

18. *Fundulus kansae* (= *Fundulus zebrinus*) – UF 133839 (BU 355) (14). "Very abundant." See earlier comments under Lenora collections regarding re-elevation of *Fundulus kansae* to full species.

Family Centrarchidae

19. *Lepomis cyanellus* – USNM 37946 (1). BU 378 not located and presumed lost. "Several fine specimens were secured."

20. *Lepomis humilis* – UF 133563 (BU 384) (16); USNM 37933 (3).

Family Percidae

21. *Etheostoma spectabile pulchellum* (= *Etheostoma lepidum*) – No voucher specimens located. "Numerous specimens .... were secured."

22. *Etheostoma nigrum* (= *Boleosoma olmstedi*) – UF 133567 (BU 151) (6).

KANSAS: Smoky Hill River, at Wallace, Wallace County. Hay 1887:252–253.

As discussed by Cross (1967:93), one specimen of *Macrhybopsis storeriana*, attributed to Hay and supposedly from Wallace, is catalogued in the National Museum of Natural History (USNM 37938). Hay (1887:250) did not list this species from Wallace, but did report several specimens from WaKeeney, farther downstream in the Kansas River system. Metcalf (1966:196) confirmed identity of the USNM individual as *M. storeriana*. No specimens of *M. storeriana* from WaKeeney are present in the USNM collection. Cross (1967:92) did not include the alleged Wallace record on his Kansas distribution map of *M. storeriana*, but did map the record from WaKeeney. Both Cross and Metcalf assumed that supposed occurrence of the species at Wallace is in error and is based on transposition of locality data for the remaining WaKeeney specimen.

Family Cyprinidae

1. *Campostoma anomalum* – UF 115501 (BU 6) (3).

2. *Cyprinella lutrensis* (= *Notropis lutrensis*) – UF 115530 (BU 25) (6); USNM 37960 (1). "Abundant."

3. *Hybognathus hankinsoni* (= *Hybognathus nuchalis*) – USNM 38237 (2). Specimens reidentified by C.L. Hubbs in 1940.

3a. *Hybognathus hankinsoni* × *Notropis heterolepis* (= *Notropis germanus*) – USNM 37949 (1). Hubbs (1951a) determined hybrid origin of specimen.

4. *Hybognathus placitus* (= *Hybognathus nuchalis*) – UF 115500 (BU 11) (2). Identification based on presence of a pointed dorsal fin in both specimens, the primary character used by Cross (1967:70–71) for distinguishing this species from *Hybognathus hankinsoni* (which has a rounded dorsal fin). The specimens are too descaled and flaccid to permit other confirmatory characters (e.g., scale counts) to be used.

5. *Luxilus cornutus* (= *Notropis megalops*) – UF 113760 (BU 85) (11).

6. *Nocomis biguttatus* (= *Hybopsis biguttatus*) – USNM 37948 (1). See earlier discussion of this species under Lenora collection.

7. *Notropis heterolepis* (= *Notropis germanus* [= *Notropis heterolepis* × *Hybognathus hankinsoni*]) – USNM 37949. Presence of *Notropis heterolepis* at this locality based solely on this hybrid individual, identified by Hubbs (1951a). Also see above.

8. *Notropis stramineus missuriensis* (= *Notropis deliciosus*) – UF 133551 (BU 59) (10); USNM 37947 (1). "Common."

9. *Notropis topeka* (= *Notropis aeneolus*) – UF 113791 (BU 74) (1 paratype of *Notropis aeneolus*); USNM 37934 (one paratype of *Notropis aeneolus*).

10. *Phenacobius mirabilis* – BU 106 not located and presumed lost.

11. *Pimephales promelas* (= *Pimephales promelas confertus*) – UF 133553 (BU 16) (5).

12. *Semotilus atromaculatus* – UF 133552 (BU 93) (2); USNM 37952 (two lost).

Family Catostomidae

13. *Catostomus commersonii* (= *Catostomus teres*) – USNM 37935 (1). "Apparently abundant."

Family Ictaluridae

14. *Ameiurus melas* (= *Amiurus melas*) – UF 173463 (BU 165) (2).

15. *Noturus flavus* – UF 113785 (BU 172) (1).

Family Fundulidae

16. *Fundulus kansae* (= *Fundulus zebrinus*) – USNM 37957 (4). BU 356 not located and presumed lost. "Very abundant in the vicinity of Wallace."

Family Centrarchidae

17. *Lepomis humilis* – USNM 37937 (2). BU 138 not located and presumed lost.

18. *Lepomis cyanellus* – UF 115531 (BU 135) (1); USNM 37953 (1).

Family Percidae

19. *Etheostoma spectabile pulchellum* (= *Etheostoma lepidum*) – UF 113786 (BU 150) (five dried); USNM 37944 (2).

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