

THE ICHTHYOLOGY DEPARTMENT OF THE ACADEMY OF NATURAL SCIENCES (ANSP)
EXECUTIVE SUMMARY OF CALENDAR YEAR 2022

Overview.—Ichthyology is home to one of the most important collections of preserved fishes in the world, with an estimated 1.6 million specimens representing more than 15,000 species. The collection is particularly rich in catfishes (Order Siluriformes), minnows (Cypriniformes) and eels (Anguilliformes). Geographically, its strengths include freshwater species of North and South America and marine species of the Atlantic and Indian Oceans. In 2022, geographical coverage was estimated (*see table*) for a manuscript led by Kirk Johnson (Smithsonian Institution) on the so-called “Global Natural History Collection.”

ANSP also has one of the world’s largest collections of fish types with 2,795 primary and 17,293 secondary type specimens representing 1,855 and 2,032 species and subspecies, respectively (3,075 total). Specimens aside, staff have assembled and curate a diverse collection of ~18,000 frozen tissue samples of thousands of fish species primarily from the U.S. and South America.

Versions of the ANSP fish database are searchable online via: [FishNet2](#) (v.2011), [SpeciesLink](#) (v.2015), [GBIF](#) (v.2015), [iDigBio](#) (v.2016), and the [collection website](#) (v.2014).

Region	Scale	est. # specimens
North America	6	100,001-1,000,000
North Atlantic	6	100,001-1,000,000
Asia Temperate	5	10,000-100,000
Asia Tropical	5	10,000-100,000
South America	5	10,000-100,000
North Pacific	5	10,000-100,000
South Pacific	5	10,000-100,000
Indian	5	10,000-100,000
Europe	4	1,001-10,000
Africa	4	1,001-10,000
South Atlantic	4	1,001-10,000
Southern	3	101-1,000
Australasia	2	11-100
Pacific	2	11-100
Arctic Marine	1	1-10
Antarctic	0	0

Staff and Associates.—In 2022, The Academy supported three full-time staff in the Ichthyology Department: Drs. Mark Sabaj and Mariangeles Arce H. (both Collection Manager III) and Kyle Luckenbill (Academy Curatorial Assistant and Imaging Specialist; Academy Scientific Publications Production Editor). Mark also served as Managing Editor of Academy Scientific Publications (2018 to present). Dr. John Lundberg has been Curator Emeritus in Ichthyology since his retirement in 2013.

Ichthyology sponsors ten ANSP Research Associates: Dr. Tiago Carvalho (Pontificia Universidad Javeriana, Bogotá), Dr. Kerin Claeson (Philadelphia College of Osteopathic Medicine), Dr. Cecile Gama, Collection Manager of Fishes at Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá (IEPA), Brazil, Daniel Fromm (Cherry Hill, NJ), Dr. Eileen Grogan (St. Joseph's U), Dr. Michael Hardman (Finland), Dr. Katriina Ilves (Canadian Museum of Nature, Ottawa), Dr. Scott Schaefer (American Museum of Natural History), Dr. John Sullivan (NCBI), and Dr. Jacqueline Webb (U of Rhode Island).

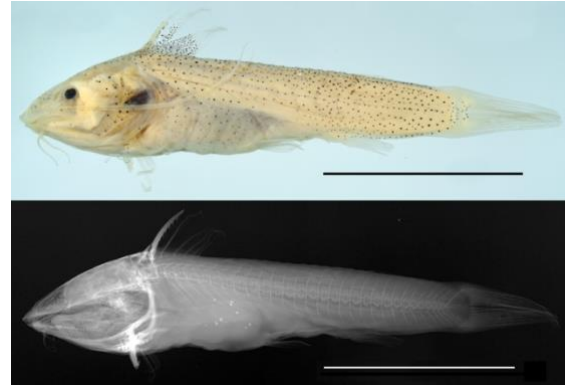
Students.—Ichthyology hosted one Drexel Co-op, Robert Colson, who accepted a volunteer (unpaid) position for the Fall/Winter 2022-2023 cycle (22 Sep 2022 to 23 March 2023). Robert is working on site in the fish collection and off site on the Catalog of Fishes of Colombia, an international collaboration led by Mariangeles and funded by GBIF in 2021. Ichthyology has hosted 12 volunteer co-ops through 20 rotations since 2013.

Former Drexel Co-op Lauren Tuffy, who became a paid student employee (funded by Roland Wall) in Sep 2021, continued working as such until the end of March 2022. In the summer of 2022 (after graduation), Lauren began working as a Fish and Wildlife Technician for the U.S. Fish and Wildlife Service (Region 1) and helped assess the health of threatened and endangered sport fishes around Long Island. Although she lost a phone and was nearly dragged overboard when her foot got caught in a net, she enjoyed working on a boat. Lauren became an Environmental Education Assistant for USFWS in December 2022, and in January 2023, she applied to the M.S. Program in [Marine Science at Stony Brook University](#).

During the summer, Mark and Kyle participated in the 2022 EngWINS program, first as recipients of mentor/diversity training and then as mentors for Philadelphia high school students Gabriella Christie (G.

Washington Carver) and Zenix Nathania (Central). The EngWINS program is developing the capabilities of working engineers and faculty (among others) to serve as mentors in an ongoing initiative to develop interest, self-efficacy and persistence in engineering careers among urban high school women in grades 9–12 (100% low income; 85% minoritized youth). The program is funded by a \$1.2 million NSF grant awarded to PI Jacqueline Genovesi (VP of Academy’s Center for STEAM Equity) and Co-PIs Sharon Walker (Dean of Drexel’s College of Engineering), Nancy Peter (Director of the McKinney Center for STEM Education) and Ayana Allen-Handy (Associate Professor, Drexel School of Education). Mark and Kyle have mentored a total of 14 WINS summer interns since 2011. The WINS Program celebrated its 40th Anniversary in June!

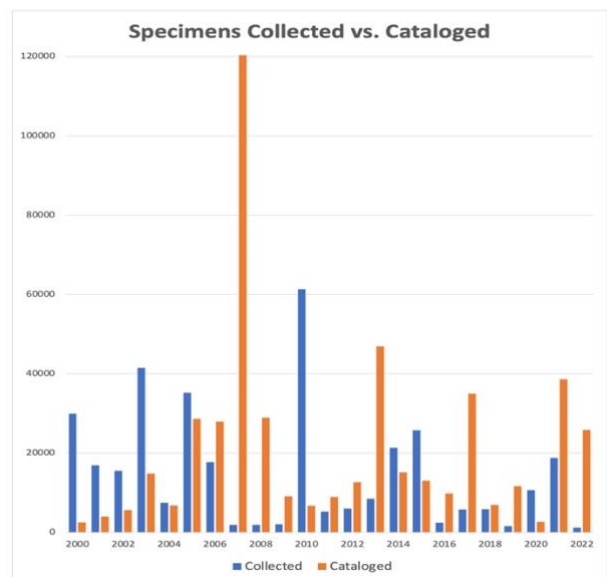
Caroline Putnam, a senior at the Germantown Friends School (and star point guard on their basketball team), interned with Mark for the month of January 2023. For her senior project, Caroline photographed and took data on various species of *Gelanoglanis*, a genus of miniature catfish described in 1980 by former ANSP Curator of Fishes Jim Böhlke. Using Ichthyology’s new digital X-ray system, Caroline compiled the most complete dataset on vertebral counts for *Gelanoglanis*. The photo and radiograph are of the holotype of *G. stroudi*, ANSP 142937 (scale bar = 1 cm).

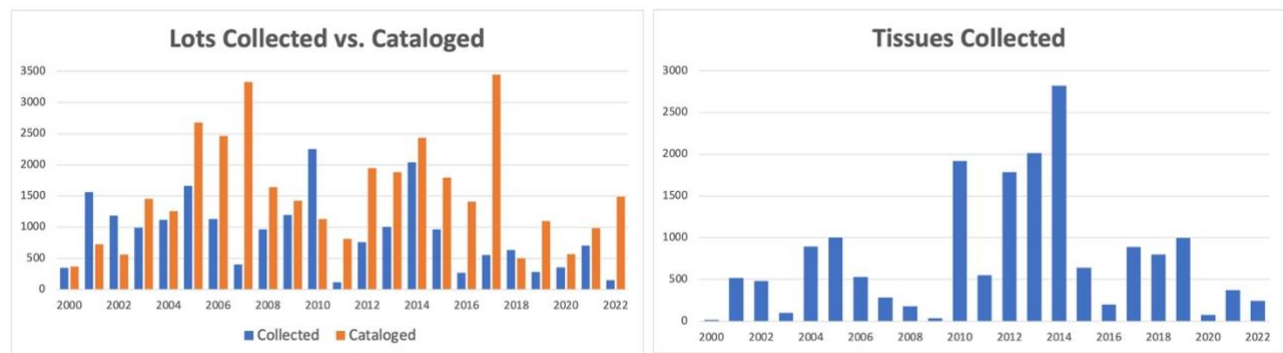


Collections Growth.—A total of 25,845* specimens in 1,492 lots plus 244 tissue samples were cataloged into the collection in 2022 (*includes 18 previously cataloged specimens transferred to new lots). Of those, 1201 specimens (5%) in 150 lots (10%) were collected in 2022. The remainder were cataloged from backlog or specimens newly received in 2022.

With respect to specimens/lots/tissues collected in 2022 (*table below*), annual growth was light and fell well short of 10- and 22-year averages. Adding fishes cataloged from backlog (i.e., those collected before 2022), the total annual growth was moderate with cataloged specimens exceeding 10- and 22-year averages, and cataloged lots falling slightly short of those averages.

year	specimens collected	specimens cataloged	lots collected	lots cataloged	~ tissues collected
2000	29930	2481	348	368	15
2001	16906	4008	1562	729	518
2002	15538	5606	1181	558	480
2003	41496	14795	993	1457	99
2004	7487	6796	1115	1257	891
2005	35170	28594	1660	2679	1000
2006	17661	27945	1130	2462	532
2007	1876	166951	398	3329	284
2008	1908	28938	965	1644	181
2009	2019	9105	1195	1422	38
2010	61325	6721	2250	1133	1921
2011	5233	8938	115	812	553
2012	5983	12657	757	1944	1786
2013	8437	46868	1007	1881	2013
2014	21308	15131	2038	2428	2819
2015	25732	13026	962	1793	640
2016	2411	9754	268	1408	199
2017	5771	34995	552	3444	888
2018	5861	6948	630	501	797
2019	1564	11606	279	1099	995
2020	10670	2634	356	569	76
2021	18794	38576	707	984	375
2022	1201	25845	150	1492	244
10 yr avg	10175	20538	695	1560	905
22 yr avg	14969	22996	896	1539	754





The most interesting accession of 2022 was a collection received in August from Marco Endruweit, Research Associate at Kunming Institute of Zoology, China. The collection included 1220 specimens (192 lots) of predominantly freshwater fishes of from China, Philippines, and Vietnam. Most of the specimens are of the family Gobiidae with others belonging to Adrianichthyidae, Belontiidae, Channidae, Cichlidae, Cyprinidae, Eleotridae, Mastacembelidae, Moronidae, Mugilidae and Synbranchidae. Co-op Robert Colson helped Mark inventory and catalog the fishes into the ANSP collection.

Other major accessions involved fishes collected by Patrick Center staff during surveys of the Holston River in 2010 (545 specimens, 153 lots), Susquehanna River in 2007/2017 (724 specimens, 38 lots), and Neches River in 2021 (17812 specimens, 457 lots). ANSP Ichthyology regularly catalogs PCER fishes into the collection for the cost of jars, and sometimes with help from paid co-ops funded by PCER (otherwise with volunteer co-ops). Both Lauren Tuffy and Robert Colson helped with the 2022 accessions of PCER fishes and Robert admits to enjoying the tasks of labelling and shuffling jars of dead fishes (*see page 11*).

Another accession of note involved fishes received from Stephen J. Walsh. The fishes (mostly achenipterids, all from Venezuela) were formerly deposited at UNELLEZ in Guanare (MCNG Fish Collection) and had been on loan to Walsh for decades. Given the status of MCNG (abandoned) and Venezuela (collapsed), the fishes (112 specimens, 42 lots) were cataloged into the ANSP collection for safekeeping.

The ANSP type collection welcomed the addition of three new holotypes: cichlid [Astronotus mikoljii Lozano et al. 2022](#), catfish [Paracanthopoma satanica de Pinna & Dagosta 2022](#) and knifefish [Sternopygus sabaji Torgersen & Albert 2022](#). Two additional holotypes were based on ANSP specimens: [Synbranchus royal Sabaj, Arce H. and Sousa 2022](#) and [Ctenogobius apogonus Pezold 2022](#). The latter was transferred to MCP and the former will be transferred to INPA upon its return from CAS where it has been on loan to Tyson Roberts since 2015. As an aside, the holotype of *P. satanica* has been on loan to Mário de Pinna since 2001.

Mark discovered two syntypes (ANSP 8672) in the general collection. Though reduced to guts, bones and bits of skin and flesh (*photo*), the two “specimens” are accompanied by a label indicating “*Solea*, Schuylkill, D. Harlan.” Based on this, they appear to be the same two specimens used by Constantine Samuel Rafinesque (1783–1840) to describe a new genus and species of flatfish, *Trinectes scabra*. Rafinesque (1832) noted that his first specimen of *Trinectes scabra* was provided by Dr. Harlan who “could make nothing of it, and called it a Flounder” and further asserted that Dr. H. gave him the specimen to “describe, name, figure and keep.” Rafinesque credited “M. Carr” as the “true discoverer” since Carr caught another specimen which Dr. Harlan allegedly stole.



[Eschmeyer's Catalog of Fishes](#) credits 395 fish names to Rafinesque and only three of those names are confidently tied to extant types: *Nerophis vittata* Rafinesque 1810 (BMNH 1853.11.12.185, one syntype) and *Exoglossum vittatum* Rafinesque 1818 and *E. lesurianum* Rafinesque 1818, unneeded replacement names for *Cyprinus maxillingua* Lesueur 1817 (both based on ANSP 1375, two syntypes). Despite their dismal condition, the hogchoker specimens are rare examples of Rafinesque types. Speaking of Rafinesque, botanist Léon Camille Marius Croizat (1948) judged him a “lunatic” and described his work as “precisely piffle and rubbish” in an article he published under the pseudonym “Henricus Quatre.” Croizat defined a lunatic as someone who “lives in a world of his own, works in certain ways because he has to assuage certain of his own cravings, sees what nobody else can see, for he has visions of his own and, in so many words, is dead before his age.”

Based on a January 2023 inventory, ANSP has 2795 primary type specimens representing 1855 fish names.

ANSP	lots	specimens	species	Counts include	Counts do not include
Primary types					
Holotypes	1480	1480	1480	3 lots/specimens as questionable holotypes; 1 lot/specimen that is also neotype of another species	16 holotypes cataloged as missing; 2 holotypes transferred to other museums; 13 MS holotypes
Lectotypes	116	116	116	—	1 lectotype cataloged as missing
Neotypes	11	11	12	2 species represented by the same lot/specimen	1 lot/specimen that is also the holotype of another species
Syntypes	295	1188	247	3 species represented by the same 2 syntypes	16 syntype lots cataloged as missing; 12 species represented only by missing syntypes
TOTALS	1902	2795	1855	holotype/neotype specimen counted as 1	missing/transferred specimens; MS types; 12 species represented only by missing syntypes
Secondary types					
Paratypes	3851	17293	2032	6 of 8 specimens in ANSP 120449; 15 lots (64 specimens) cataloged as questionable paratypes; 21 of 23 paratypes representing two different species counted as 23 specimens in two lots (ANSP 69417 & 69420)	82 lots cataloged as missing/transferred; 145 lots (~1052 specimens) of MS types
TOTALS	5753	20088	3075	see above	see above

Visitors.—Ichthyology hosted a total of 203 visitors (including 12 researchers) in 2022. Researchers included Brazilian doctoral students Fernanda Rocha from Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS) working on guitarfishes, *Rhinobatos* (travel and lodging supported by the Böhlke Memorial Fund), Aleidy Galindo also from PUCRS and working on *Sternopygus*, and Crithian Conde from Universidade Estadual Paulista working on erythrinids (lodging supported by BMF); Jake Wilson, doctoral student at Johns Hopkins University School of Medicine; and Dr. Harutaka Hata of the National Museum of Nature and Science, Japan. Mark’s former doctoral advisor Dr. Larry Page (University of Florida) along with Dr. Patrick Ciccotto (Warren Wilson College) and Thai ichthyologist Weerapongse “Pong” Tangjitjaroen visited the collection in December to study Asian cypriniforms. Dr. Pedro Rizzato (U. São Paulo) also visited in December to study catfishes.



Early in 2022, the Brazilian Federal Agency CAPES awarded a six-month scholarship to Malu Araújo Almeida (*photo*), doctoral student advised by Flávio Bockmann (Universidade São Paulo, Ribeirão Preto). With help from Helen Pham, ANSP Manager of Research and Administration, Malu secured her J-Visa to begin working in the department in October 2022. Her thesis is on the sensory canals of catfishes, and she has newly discovered characters to support various branches on the catfish tree of life. Malu is staying at Mark's home as she did in 2018 during her first trip to ANSP with support from the Böhlke Memorial Fund.



Late in 2022, Dr. Gabriel de Souza da Costa e Silva received funding from the Bolsa Estágio de Pesquisa no Exterior (BEPE) program (FAPESP 2021/12979-8) to begin a one-year post-doc with Mark. Advised by Dr. Claudio Oliveira, Gabriel received his master's and Ph.D. from the Universidade Estadual Paulista Júlio de Mesquita Filho (UNESP) in 2012 and 2016, respectively, and has completed post-docs at UNESP and Universidade Estadual de Londrina. He will use ultraconserved elements (UCEs) to investigate relationships among the genera and families of catfishes. Dr. Silva and his wife Lais Reia will arrive in March 2023 and stay at Mark's home. Again, Helen Pham was incredibly helpful while navigating Drexel's visa paperwork for Lais and Gabriel.

Service.—Service is broadly separated into two categories, Extra-departmental and Extracurricular. Extra-departmental service is tracked via the Fish Collection database (for specimen loans) and CM Notebook (database in use since Aug 2000). CM Notebook generally tracks staff responses to internal and external requests for collections-related data and/or staff expertise and participation (e.g., outreach activities). Extracurricular service includes volunteer participation on committees (ANSP and external) as well as other services to the professional community (e.g., reviews for scientific journals).

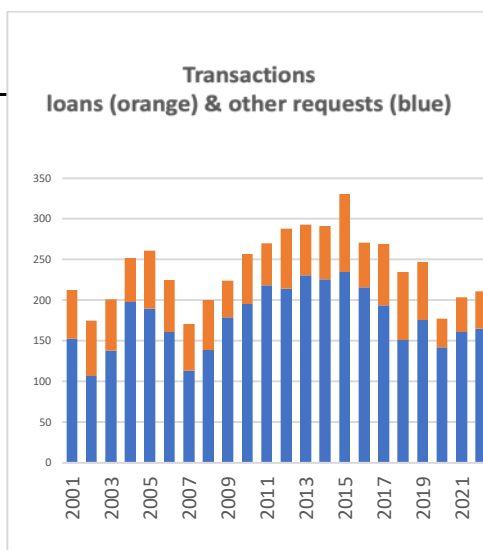
Service (Extra-departmental).—Ichthyology fulfilled 32 specimen and 14 tissue loan requests in 2022. Both numbers are similar to 2021, and slightly up from 2020, but remain below the 10-year average of 42 specimen and 22 tissue loans (*see table on page 6*).

As noted in last year's report, the ANSP Fish Collection, from 2010 to 2019, fulfilled ~80% of the loan activity (specimen plus tissue loans) of the Smithsonian's Fish Collection (largest in the world) with <25% of the staff (2.5 at ANSP vs. ~11 at USNM). This rises to 90% if one includes 2020–21 since the Smithsonian shut down loan activities in those years.

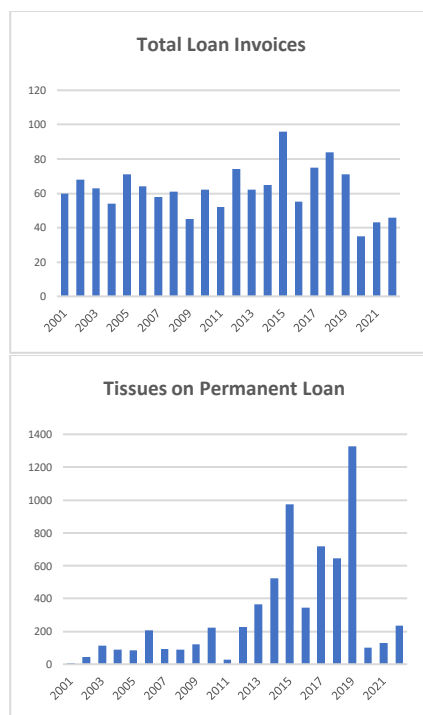
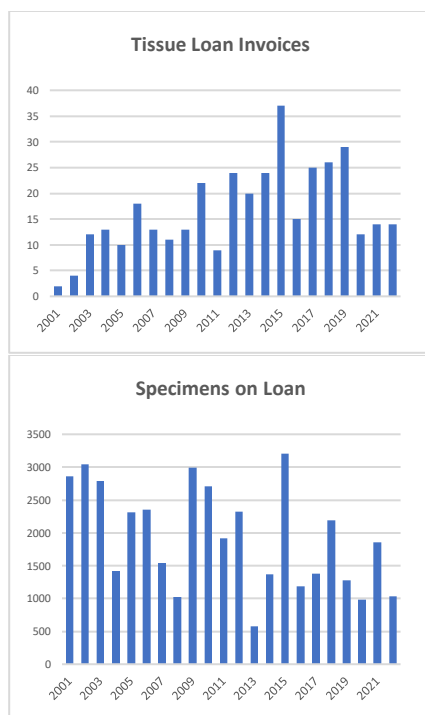
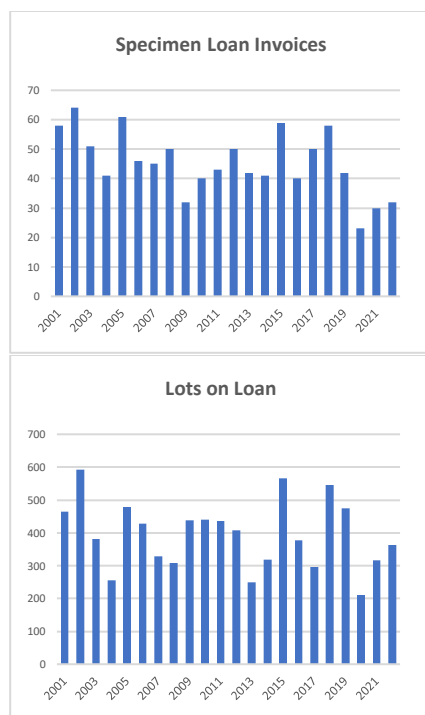
In 2021, Mariangeles began a major recall of outgoing loans that are overdue for return to ANSP. A total of 3,406 specimens from 170 lots listed on 13 invoices was returned to ANSP in 2022. Two-thirds of those returned specimens had been in a Patrick Center lab since 1996! Mariangeles continues to handle without a hitch nearly all outgoing loans and incoming returns

Mariangeles also handles returns of specimens that were loaned to ANSP Ichthyology. In 2022, she closed loans from CAS to Larry Page for Mark Sabaj (1999), from AUM to Mark Sabaj (1999, 2006, 2010, 2012), from MZUSP to John Lundberg (2007), from IAvH to Mark Sabaj for Tyson Roberts at CAS (2019) and from SIO to Eugenia Böhlke (19??). Boundless satisfaction comes from seeing specimens returned to their rightful shelves in the so-called "Global Natural History Collection."

year	specimen loan invoices	A: tissue loan invoices	total loan invoices	lots sent on loan	specimens sent on loan*	tissues sent on loan	B: cm notebook invoices [total]	cm notebook invoices [B - A]
2001	58	2	60	465	2859	9	155	153
2002	64	4	68	592	3041	43	111	107
2003	51	12	63	381	2786	113	150	138
2004	41	13	54	255	1424	90	211	198
2005	61	10	71	478	2315	85	200	190
2006	46	18	64	428	2351	208	179	161
2007	45	13	58	328	1538	91	126	113
2008	50	11	61	308	1021	89	150	139
2009	32	13	45	439	2988	120	192	179
2010	40	22	62	440	2713	223	217	195
2011	43	9	52	437	1914	27	227	218
2012*	50	24	74	407	2323	225	238	214
2013	42	20	62	250	572	366	251	231
2014	41	24	65	318	1364	522	250	226
2015	59	37	96	566	3208	973	272	235
2016	40	15	55	378	1181	346	231	216
2017	50	25	75	297	1380	716	219	194
2018	58	26	84	546	2192	644	177	151
2019	42	29	71	474	1276	1326	205	176
2020	23	12	35	211	979	100	154	142
2021	30	14	43	316	1860	130	175	161
2022	32	13	46	362	1035	235	179	166
10 yr avg	42	22	63	372	1505	536	211	190
22 yr avg	45	17	62	394	1924	304	194	177



Other requests include extra-departmental requests fulfilled for photographs, radiographs, identifications, counts/measures, catalog numbers, record searches/releases, incoming/outgoing gifts, returns/transfers of loans to ANSP, library research, general expertise, outreach (tours, lectures, public programs, interviews, etc.) and institutional advancement/marketing.



Apart from outgoing loans and incoming returns, Ichthyology staff responded to a total of 165 other extra-departmental requests (all recorded in CM Notebook). This is slightly up from 2021 (161) but below the 10-year (190) and 22-year (177) averages. About 22% of all requests come from ANSP/Drexel (up from 14% in 2021) vs. 77% from external sources. Compared to 2019, 2021 and 2022 saw a bump in the percentage of external requests for data, photos, X-rays, identifications, etc. (*see table on page 7*). The 2021 dip in internal requests is due in part to Mark's service as CSBE Interim/Acting Director for the first half of 2021 (i.e., requests involving his duties as director were not recorded in CM Notebook).

Categories	2019		2021		2022	
	Requests	% Total Requests	Requests	% Total Requests	Requests	% Total Requests
Internal (ANSP/Drexel)	50	20%	29	14%	48	23%
PCER (incl. Accessions)	4	2%	2	1%	4	2%
Education, Exhibits, Public Programs	13	5%	10	5%	12	6%
BEES	8	3%	2	1%	4	2%
Communications, IA, Marketing	20	8%	11	5%	20	9%
other	5	2%	4	2%	8	4%
External	197	80%	174	86%	163	77%
Specimen loans	42	17%	30	21%	32	15%
Tissue loans	29	12%	14	7%	13	6%
Data, photos, X-rays, identifications, etc.	89	36%	105	52%	99	47%
Specimen loan returns and transfers	26	11%	11	5%	7	3%
Accessions/Deaccessions	9	4%	10	5%	7	3%
Other (incl. Sci Pubs)	2	1%	4	2%	5	2%
TOTAL REQUESTS	247		203		211	

In 2022, a total of 206 digital images (188 specimen photos plus 18 radiographs) were prepared and/or provided in response to 40 requests from internal and external users. Included in that total were images of at least 145 specimens. A total of 17,040 digital images (including X-rays) are cataloged into the Fish Database with the original and edited image files organized by ANSP catalog number on the Academy server Unity IV. Kyle Luckenbill skillfully stickhandles most requests for specimen images as well image cataloging.

Service (Extracurricular).—In 2022, Mariangeles served on the search committee for the new VP Director of Research & Collections. An offer was made to the top candidate, Dr. Nico Franz (Arizona State University), who declined. The offer made to the second candidate, Dr. James Lendemer (New York Botanical Garden), also was declined. James stated that his decision was much a personal one and in no way a reflection on the Academy's collections, faculty, and staff all of which he holds in the highest regard. The search continues.

Mark continued his service as the 18th Secretary of the American Society of Ichthyologists and Herpetologists (ASIH), a professional society with 1,267 student and professional members worldwide (as of Dec 2022). Henry W. Fowler, ANSP Curator of Fishes from 1902 to 1965, co-founded the ASIH in 1915. Mark is expected to volunteer his service as ASIH Secretary until 31 Dec 2025. Mark also peer-reviewed manuscripts for Neotropical Ichthyology (2) and the Zoological Journal of the Linnean Society (1).

Research.—In 2022, Mariangeles Arce H., Mark Sabaj and Emeritus Curator John Lundberg were co-authors on two peer-reviewed papers, one popular article and one report.

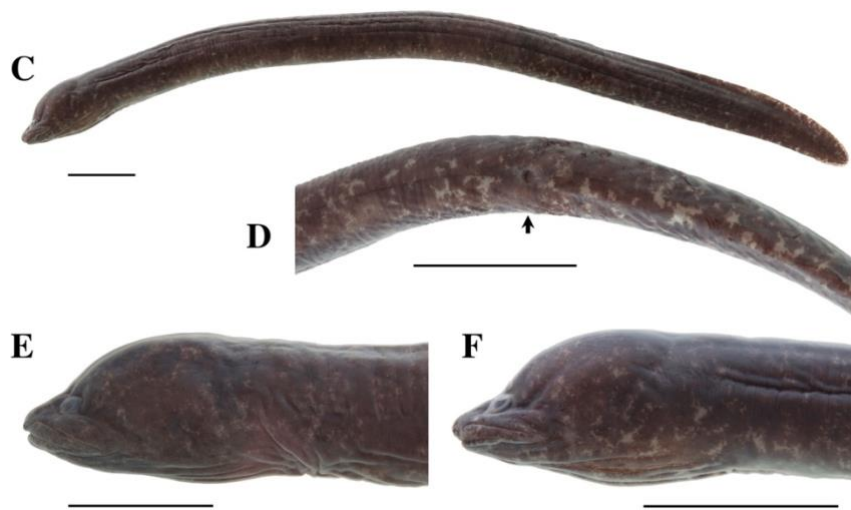
Sabaj, M.H., M. Arce H., D. Donahue, A. Cramer and L.M. Sousa. 2022. *Synbranchus* of the Middle to Lower Xingu Basin, Brazil, with the description of a new rheophilic species, *S. royal* (Synbranchiformes: Synbranchidae). Proceedings of the Academy of Natural Sciences of Philadelphia 166: 1–23. using ultraconserved elements (Teleostei, Siluriformes). Zoologica Scripta. <https://doi.org/10.1635/053.166.0119>

Sabaj, M.H. 2022. The Fish [*Acanthonus armatus*] With the Fishy Name [bony-eared assfish]. The Academy of Natural Sciences of Drexel University website [posted 31 March 2022]. <https://www.anspblog.org/the-fish-with-the-fishy-name/>

Sabaj, M.H. 2022. Summary of the Meetings [100th annual meeting of the American Society of Ichthyologists and Herpetologists, 21–27 July 2021]. *Ichthyology & Herpetology* 110(1): 187–196. <https://doi.org/10.1643/t2022004>

Taphorn, D.C., E. Liverpool, N.K. Lujan, C. DoNascimento, D.D. Hemraj, W.G.R. Crampton, M.A. Kolmann, J.P. Fontenelle, L.S. de Souza, D.C. Werneke, M. Ram, D.D. Bloom, B.L. Sidlauskas, E. Holm, **J.G. Lundberg, M.H. Sabaj**, C. Bernard, J.W. Armbruster & H. López-Fernández. 2022. Annotated checklist of the primarily freshwater fishes of Guyana. *Proceedings of the Academy of Natural Sciences of Philadelphia* 168(1): 1–95. <https://doi.org/10.1635/053.166.0119>

Mark, Mariangeles and Leandro Sousa described a new species of swamp eel (*Synbranchus*) that occurs in rapids, not swamps. *Synbranchus royal* is distinguished in part by its large head, like a crown (*photo*) and is named after American ichthyologist Tyson Royal Roberts (1940–) who with a little help from his friends and colleagues has examined more *Synbranchus* specimens than all other ichthyologists combined. Unlike other swamp eels, *S. royal* is restricted to rocky rapids in the main channels of the rio Xingu upstream of its departure from the Brazilian Shield. One might call it a maverick (like Tyson).



Mercado Mayorista Pesquero, Peru, 2008

The new synbranchid was discovered by the authors during field expeditions conducted by the iXingu Project, an international project funded by the National Science Foundation (NSF DEB–1257813). Co-authors on the publication (but not the species name) include Devon Donahue and Amanda Cramer, two Drexel co-ops who worked in Ichthyology from 2014–2016 and helped collect and analyze the DNA data used to help distinguish the species as new. Drs. Flávio Lima and John Sullivan served as reviewers of the MS.

Upon receiving the news, Tyson replied “I really don't know what to say about the article just received from you. Revising my monograph to include the information in it will be just about impossible without much additional information...Why were vertebral counts not included in the description of *S. royal*?... Please send radiographs with a pin inserted vertically into the vent of the three ANSP paratypes of *S. royal*.” Since the specimens in question have been on loan to Tyson since 2015, his request was unfulfilled. In a follow-up email Tyson wrote “I have no problem with you and your colleagues describing a species of *Synbranchus* but wish you had consulted me about it. Thank you for naming it after me.”

Mark and John Lundberg were among the team of 19 co-authors from five counties who published the first comprehensive list of Guyana's freshwater fishes, totaling some 657 species-level taxa. The peer-reviewed article was published in the 168th volume of the Proceedings of the Academy of Natural Sciences of Philadelphia. Mariangeles Arce H. handled the submission and Kyle Luckenbill and Mark handled the production layout. Drs. Flávio Lima and Fernando Dagosta served as reviewers of the MS.

In September, Mark gave two presentations at the 24th Brazilian Meeting of Ichthyology ([XXIV Encontro Brasileiro de Ictiologia](#)) in Gramado, Brazil. One was a talk on relationships in the thorny catfish family Doradidae (co-authored with Mariangeles Arce H.) and the other was a poster presentation on a new species of *Leporinus* (headstander) from Amapá State, Brazil (co-authors José Birindelli and Academy Research Associate Cecile Gama). Travel to the conference was supported in part by a donation to the department from Dan and Patricia Fromm in February 2022.



On December 5th, Mariangeles deftly organized and hosted Academy Research Day held in the Academy auditorium. CEO Scott Cooper encouraged all staff to attend and provided the opening remarks. Two sessions each featured five 8-minute talks by researchers in CSBE (Ted Daeschler, Tanya Livshultz, Alejandra Martinez-Melo, Marina Potapova, Gary Rosenberg and Mark Sabaj), PCER (Tanya Dapkey, Michelle Gannon, Timothy Maguire and David Velinsky) and the Center for STEAM Equity (Jacqueline Genovesi, presented by Kimberly Godfrey). Each session was followed by 20 minutes of questions and answers with the speakers on stage. Chairman of the Board David E. Griffith gave heartfelt closing remarks. Research Day was well attended and received by Academy staff and students.

Fieldwork.—Trips to the Dominican Republic, Amapá, Brazil, and northwestern USA account for most of the specimens collected and preserved in 2022.

Academy Research Associate Dan Fromm and Mark spent three productive days collecting in the Dominican Republic from May 31 to June 2. In search of poeciliids, they netted and preserved a total of 421 specimens (31 lots) representing ~15 species from nine separate sites in the southwestern part of the country. They also looked for sulfidic springs reported in the literature and managed to pinpoint a particularly small and obscure one 2.5 km southwest of Las Yayas de Viajama (18°35'35"N, 70°57'01"W). Though devoid of native fishes, the small shallow seep surprisingly supported a healthy population of guppies (*Poecilia reticulata*) despite measuring 0.3 ppm for sulfide. Mark's participation on the trip was supported by the Fromms' donation.



En route to the annual Joint Meeting of Ichthyologists and Herpetologists in Spokane, Washington, Mark and Cecile (and their kids Gabriela, Sofia and Paula) collected fishes in Wisconsin, Minnesota, South Dakota, Montana, Idaho and Kansas. Among the 357 specimens (37 lots) added to the collection are the Academy's first of sculpins *Cottus beldingi* and *C. rhotheus*. The trip was a success except for the loss of a rental caravan (its engine flooded during a torrential downpour in Billings).

Mark also collected fishes with Cecile in Amapá, Brazil. They tried to catch fresh specimens and photos of the aforementioned new *Leporinus* discovered by José Birindelli in Cecile's collection (IEPA). Although they struck out on *Leporinus*, Mark returned with 373 specimens (67 lots) from various streams in Amapá State. Photos of the trip's sites and fishes are posted on Facebook: [Vila Nova](#), [Balneário do Curiaú](#), and [Fazendina](#).

Funding & Proposals.—In 2023, Mariangeles and Mark will collaborate with Ornithologists Nate Rice and Jason Weckstein on a proposal to NSF to establish a liquid-nitrogen storage facility at ANSP for frozen tissues of birds and fishes.

Ichthyology Budget.—Although the Department Head has trouble making sense of numbers not directly associated with dead fish, it is clear that the department spends a significant portion of its annual non-labor budget (22–52%) on shipping specimens. Also, based on FY22 spending, copier charges went up by a whopping 100%.

Ichthyology Operations (9556-111001) and Salaries FY2019-2022.

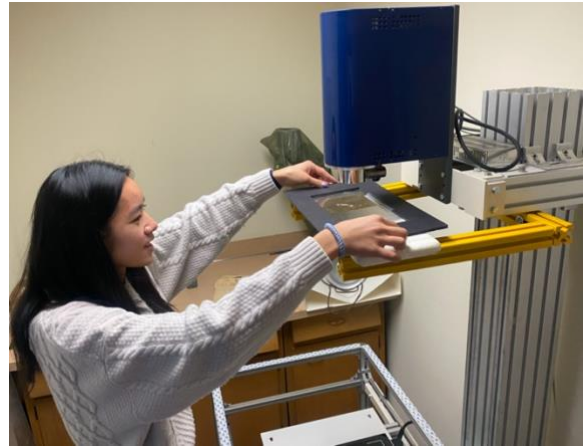
FISCAL YEAR	2019	2020	2021	2022	% 2019 spending	% 2020 spending	% 2021 spending	% 2022 spending
Books/Articles	20	0	0	0	0%	0%	0%	0%
Computer/Software	180	90	180	2,392	2%	1%	3%	29%
Copier	22	11	1	2	0%	0%	0%	0%
Equipment Related	0	266	130	0	0%	0%	0%	0%
HR	0	83	0	34	0%	1%	0%	0%
Licenses/Memberships	183	60	213	75	2%	1%	4%	1%
Miscellaneous	2,015	-773	1,277	747	20%	-11%	22%	9%
Shipping	2,213	1,806	3,054	2,883	22%	26%	52%	35%
Supplies	2,925	3,858	402	1,347	29%	54%	7%	16%
Telecommunications	338	339	337	338	3%	5%	6%	4%
Travel - Domestic	258	351	226	153	3%	5%	4%	2%
Travel - International	1,980	989	0	160	20%	14%	0%	2%
Funds Transfer	0	0	0	50	0%	0%	0%	1%
TOTALS - ICH Operations	10,134	7,080	5,820	8,181				
TOTALS - ICH Salaries	100,389	102,738	118,085	207,387				
Net Assets Released from Restricted Endowments	-75,182	-71,066	-82,060	-82,631				
BOTTOM LINE	\$35,341	\$38,752	\$41,845	\$132,937				

Böhlke Memorial Fund.—As of 30 June 2022, the Böhlke Memorial Fund had \$7,293 available for spending (i.e., without touching the principal account). Based on a 7% draw for FY2023, the principal will add another ~\$4,500 to the fund. The draw will be gradually reduced to 5% in FY2027, reducing the annual addition to the fund to an estimated \$3,300. The Böhlke Memorial Fund was established in 1991 and has since granted ~\$70,000 to ~100 researchers (primarily students) to visit ANSP and/or conduct research on ANSP fishes. Anyone interested in applying (or donating) to the Böhlke Memorial Fund is welcome to contact Mark Sabaj at mhs58@drexel.edu.

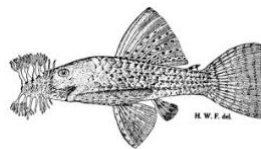
New Digital X-Ray System.—After at least 10 years of service, Ichthyology’s digital X-ray system finally gave out in 2019. The cost of a replacement system was quoted at \$71,160 by Kodex, Inc. of Nutley, NJ. The new system was installed in December 2022 and the technician boasted that the digital images may contain up to 44,000 shades of gray. Kyle developed a nifty user’s guide and began training sessions in January 2023 with Caroline Putnam being the first to take advantage of the new system (*photo on page 11*). Despite persistent questioning, I still have no idea to what account the \$71K was charged, but am thankful for the results.

The Microfocus Digital X-Ray System includes five components that were tied into the existing stand:

1. PXS10-16W X-Ray Source (130 kVp tube, 0.356mA, 16 Watts)
2. Aluminum Mounting Plate
3. duraSCAN1417 NDI-NDT Flat Panel X-Ray Detector (14 x 17-inch active area)
4. Dell Vostro Desktop Computer with image acquisition/processing software
5. LCD Image Display Monitor



Drexel Co-op Robert Colson labelling the Endruweit Accession



—Mark Sabaj, 31 Jan 2023

ACADEMY OF NATURAL SCIENCES SCIENTIFIC PUBLICATIONS
EXECUTIVE SUMMARY OF CALENDAR YEAR 2022

Overview.—The Ichthyology Department has been responsible for publishing the Academy’s academic journal, *Proceedings of the Academy of Natural Sciences of Philadelphia* (PANSP), since 2007. Established in 1841, the *Proceedings* is the longest running serial on natural history and the environment published in the Americas. The department’s responsibility was self-expanded to include *Special Publications* in 2020.

Staff.—In 2022, **Mark Sabaj** served as Managing Editor and **Kyle Luckenbill** served as Production Editor, posts they have held since 2018 and 2007, respectively. In 2021-22, **Paul Callomon** volunteered his copyediting services to a catalog of marine snails (Fasciolariidae). Also in 2022, **Mariangeles Arce H.** handled the submission and reviews of the Guyana fishes MS submitted by Taphorn et al.

Activities.—The highlight of 2022 was the printing of ANSP Special Publication 25: Catalogue of the marine gastropod family Fasciolariidae fossil and recent (313 pages). The work was authored by Malacology Research Associate Dr. Martin A. Snyder and represents a full update and taxonomic revision of his 2003 first edition (ANSP Special Publication 21). Paul Callomon copyedited the catalogue, Kyle Luckenbill assisted the page layout, and Mark Sabaj handled the submission and peer-review process. Sheridan printed 300 copies of the catalog for \$5,850 plus \$296 for shipping to the Academy dock (costs covered by Malacology).

In 2022, Sci Pubs also published four papers (146 pages) in *Proceedings* volumes 166 (1), 167 (2) and 168 (1).

1. Halley, M.R. 2022. Rediscovery of the holotype of the American Goshawk, *Accipiter gentilis atricapillus* (Wilson, 1812), and a commentary about Alexander Wilson's contributions to the Peale Museum. *Proceedings of the Academy of Natural Sciences of Philadelphia* 167(1): 253–260. <https://doi.org/10.1635/053.167.0114>
2. Sabaj, M.H., M. Arce H., D. Donahue, A. Cramer and L.M. Sousa. 2022. *Synbranchus* of the Middle to Lower Xingu Basin, Brazil, with the description of a new rheophilic species, *S. royal* (Synbranchiformes: Synbranchidae). *Proceedings of the Academy of Natural Sciences of Philadelphia* 166: 1–23. <https://doi.org/10.1635/053.166.0119>
3. Downs, J.P., and E.B. Daeschler. 2022. Second species of *Langlieria* (Tristichopteridae, Sarcopterygii) from the Upper Devonian Catskill Formation of Pennsylvania, U.S.A., and a new phylogenetic consideration of Tristichopteridae. *Proceedings of the Academy of Natural Sciences of Philadelphia* 167(1): 261–280. <https://doi.org/10.1635/053.167.0115>
4. Taphorn, D.C., E. Liverpool, N.K. Lujan, C. DoNascimento, D.D. Hemraj, W.G.R. Crampton, M.A. Kolmann, J.P. Fontenelle, L.S. de Souza, D.C. Werneke, M. Ram, D.D. Bloom, B.L. Sidlauskas, E. Holm, J.G. Lundberg, M.H. Sabaj, C. Bernard, J.W. Armbruster & H. López-Fernández. 2022. Annotated checklist of the primarily freshwater fishes of Guyana. *Proceedings of the Academy of Natural Sciences of Philadelphia* 168(1): 1–95. <https://doi.org/10.1635/053.168.0101>

External reviews of the articles were generously provided by Robert Peck and Nathan Rice (1), Flávio Lima and John Sullivan (2), Erik Ahlberg and Gael Clement (3), and Flávio Lima and Fernando Dagosta (4). Philippe Bouchet, William G. Lyons and Gary Rosenberg provided thoughtful reviews of the Snyder snail catalog.

The total number of MSS received in 2022 was seven, matching 2021 but below the 9.9 average for the past 13 years (see below). The total number of MSS published was five, matching 2021 but also below the 9.2 average since 2010. The total number of pages published by the Academy in 2022 was 459, well above the 231-page average since 2010. The high number of pages published in 2022 was due to Snyder’s 313-page catalog. Although fewer papers are being published in the *Proceedings*, the total number of pages published by the Academy remains high due to the two *Special Publications* published in 2021 and 2022, respectively.

The [Impact Factor](#) of the *Proceedings* was a respectable 0.733 in 2021, but below the record setting value of 1.67 in 2020 (see below). The Academy received a total of \$22,265 in revenue from BioOne and JSTOR in 2022, just below the record-setting value of \$22,839 in 2021.

As an aside, one might note that the four articles were published in three separate volumes (166, 167, 168) in 2022. Volume 166 was launched in 2017 in is dedicated to papers on the rio Xingu. The volume currently contains 14 papers for a total of 337 pages (four manuscripts submitted to volume 166 were rejected). We hope to finish this volume in 2023 with one or two final papers.

Volume 167 was launched in 2019 and contains 15 papers for a total of 273 pages. Three manuscripts submitted to volume 167 were rejected, and another submission was reviewed and accepted, but abandoned by the authors (Batomalague and Rosenberg) during the revision process. Volume 168 was launched in 2022 and currently contains three papers for a total of 122 pages.

Having two different volumes “open” concurrently is not good practice. It’s doable because articles are published first online and thereby date to their online availability (vs. print availability), and because BioOne allows for concurrently open online volumes. The last time the Academy printed the *Proceedings* was in 2018 (volume 165) at a cost of \$7,870. Although volume 167 is ready for the printers, the task and cost of shipping the volume to library exchange partners have not been permanently assigned. From time to time, the Ichthyology Department responds to exchange requests by mailing out printed *Proceedings* and/or *Special Publications*. But the department is not interested in assuming full responsibility for managing exchanges with the Academy’s library partners. In the past, that responsibility fell to the Academy Library.

BioOne & JSTOR.—Articles published in the *Proceedings of the Academy of Natural Sciences of Philadelphia* are available online via BioOne (nonprofit publisher of scientific research) and JSTOR (digital library). JSTOR serves 276 issues corresponding to volumes 1 to 165 published from 1841 to 2016. BioOne serves 18 issues corresponding to volumes 151 to 168 published from 2001 to present. Over the past four years (2019–2022), the Academy received annually \$21,039 to \$22,839 in revenue from BioOne and JSTOR combined (see below).

BioOne and The Academy of Natural Sciences of Philadelphia (“Publisher”) completed a new Electronic Licensing Agreement in 2022 that became effective in 2023 for the *Proceedings*. Mark received and reviewed the new ELA, then handed his suggestions over to Meghan Bucci who ran it through Drexel’s legal counsel. The ELA was officially signed by Lisa Miller on 6 October 2022.

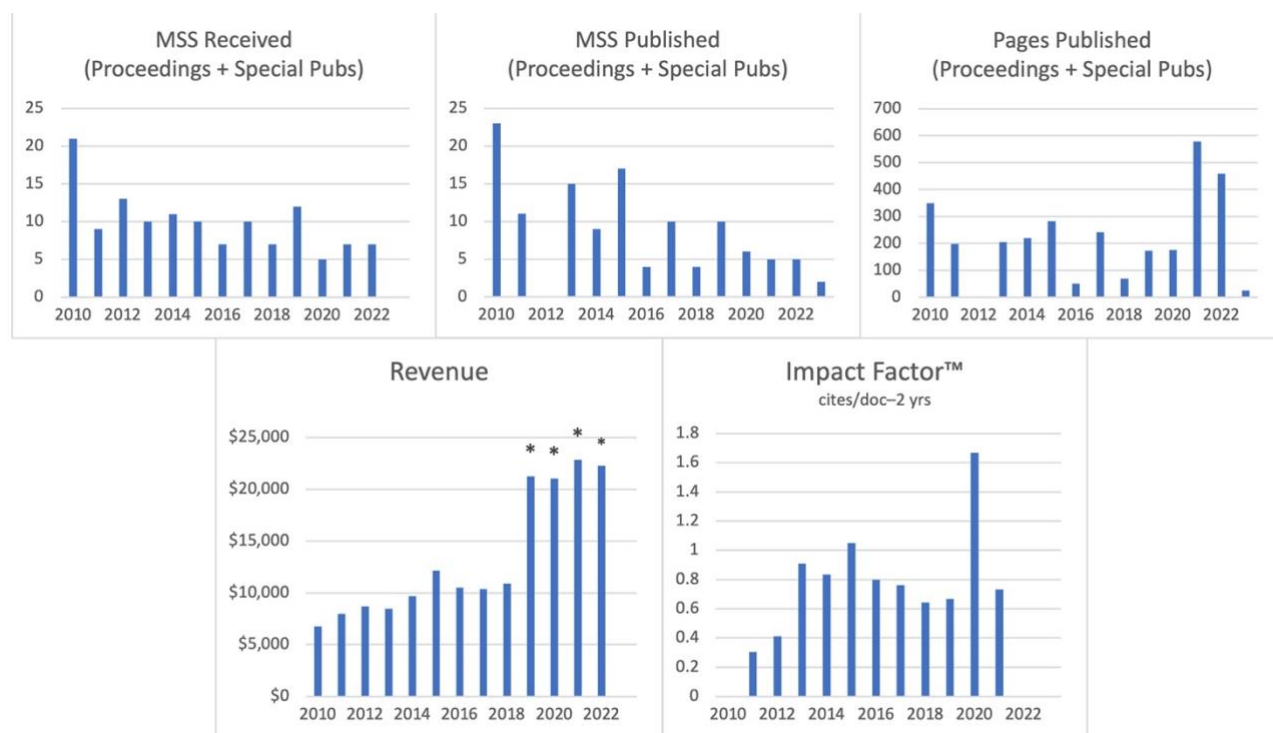
The new agreement changes the way BioOne calculates revenue shared among publishers. It applies to content hosted by BioOne for ANSP, specifically *Proceedings* volumes dating back to 2001 (vol. 151). The ELA identifies the *Proceedings* as exclusive to BioOne, but that is true only for volumes 166 onwards since JSTOR serves online *Proceedings* volumes 1 (1841) to 165 (2016). For “exclusive publications,” the new ELA stipulates that “the title’s current contents are not available for institutional sale via any other publisher or aggregator” and that exclusive publications “may be eligible for a greater share of the Surplus Sharing pool, if distributed in a given year.” The impact of the ELA on ANSP’s annual revenue share from BioOne (\$11,794–\$13,483 annually 2019–2022) is unknown. Other outcomes of the ELA include:

1. ANSP elects to establish a per-article full-text download price of \$10.
2. ANSP does not elect to participate in the fee-based licensing and copyright compliance services performed by the Copyright Clearance Center® (CCC).
3. BioOne is allowed to register DOIs on behalf of ANSP, at no cost to ANSP.

In 2022, JSTOR’s legal counsel reviewed all post-1927 archival journal content on its platform to determine which creative works are in the “public domain” according to U.S. copyright laws. According to those laws and JSTOR, *Proceedings* published from 1978–2016 (containing 553 articles) remain copyright protected and thus available (via JSTOR) only to subscribers. *Proceedings* published before 1978 (7,090 articles) are now in the public domain and freely accessible to anyone via JSTOR or otherwise. As a result, 764 articles published in the *Proceedings* from 1927–1977 are now freely available via JSTOR. The impact this will have on the Academy’s revenue share from JSTOR (\$9,205–\$9,475 annually 2019–2022) is unknown.

The Academy of Natural Sciences of Philadelphia Scientific Publications

Year	Manuscripts Received			Manuscripts Published			Pages Published			Revenue	Impact Factor™ cites/doc-2 yrs
	Proc. ANSP	Special Pubs	Total	Proc. ANSP	Special Pubs	Total	Proc. ANSP	Special Pubs	Total	Proc. ANSP only	
2010	21	0	21	23	0	23	349	0	349	\$6,757	0
2011	9	0	9	11	0	11	198	0	198	\$7,990	0.304
2012	13	0	13	0	0	0	0	0	0	\$8,696	0.412
2013	10	0	10	15	0	15	205	0	205	\$8,475	0.909
2014	11	0	11	9	0	9	219	0	219	\$9,660	0.833
2015	10	0	10	17	0	17	283	0	283	\$12,130	1.048
2016	7	0	7	4	0	4	51	0	51	\$10,526	0.8
2017	10	0	10	10	0	10	241	0	241	\$10,376	0.762
2018	7	0	7	4	0	4	69	0	69	\$10,884	0.643
2019	12	0	12	10	0	10	173	0	173	\$21,264	0.667
2020	4	1	5	6	0	6	176	0	176	\$21,039	1.667
2021	5	2	7	4	1	5	71	508	579	\$22,839	0.733
2022	5	2	7	4	1	5	146	313	459	\$22,265	—
2023	0	0	0	2	0	2	26	0	26	—	—



*Includes revenue from BioONE & JSTOR
(JSTOR revenue unknown for previous years)

<https://www.scimagojr.com/journalsearch.php?q=18721&tip=sid>

—Mark Sabaj, 14 April 2023