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Edward Phelps Allis: discovery of his anatomical illustrations

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The anatomical illustrations for the scientific papers of Edward Phelps Allis, one of the foremost comparative anatomists and evolutionary morphologists in the early twentieth century, have been discovered at the Museum of Comparative Zoology, Harvard University. The discovered work includes many unpublished illustrations, large numbers of color drawings of serial sections of primitive actinopterygian fishes, and complete series of figures for several papers (rough copies, final drawings and proofs), clearly showing the progress of the investigations. A summary of the published and unpublished material is provided. All illustrations have been deposited in the archives of the Museum of Comparative Zoology Library.

KEY WORDS——E. P. Allis–vertebrate morphology – illustrations.

CONTENTS

Introduction 285
Background 286
The illustrations and other materials 288
Illustrations of serial sections 288
Figures for published papers 288
Unpublished illustrations 290
Acknowledgements 290
References. 290

INTRODUCTION

Edward Phelps Allis (1851–1947) was one of the foremost comparative anatomists and evolutionary morphologists in the early twentieth century. The quality and quantity of his contributions to vertebrate morphology rank him with E. S. Goodrich in the importance of his discoveries about the homologies and evolution of vertebrate structural systems. Indeed, his work on the evolution of the vertebrate muscular system, nostrils, blood vascular system, and nerves still forms the basis for current controversies and the examination of problems in vertebrate evolution (see Jarvik, 1980; Lauder, 1980; Rosen *et al.*, 1981; Winterbottom, 1974).

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The scientific work of E. P. Allis has long been noted for its accuracy of description and the extremely high quality and precision of anatomical detail included in the illustrations. The papers on the anatomy of the head of *Amia* (Allis, 1897), *Scomber* (Allis, 1903b), the mail-cheeked fishes (Allis, 1909), *Polypterus* (Allis, 1922), and *Chlamydoselachus* (Allis, 1923) include a large number of lithographs which are still by far the best reference on lower vertebrate cranial anatomy. Other papers include (in both color and black and white) diagrammatic views of arterial and nerve patterns in all major groups of lower vertebrates.

In 1979, a large number of original illustrations for the Allis papers were discovered in the A. S. Romer library at the Museum of Comparative Zoology, Harvard University. These illustrations include a large number of unpublished figures as well as many rough sketches, final illustrations, and proofs from several papers. I will provide a brief background to the illustrations before summarizing the illustrations that were discovered. These papers will be of interest to historians of science and to ichthyologists and comparative anatomists, both because of the unpublished work and incomplete drawings that contain considerable new anatomical information, and because of the insights into the research methodology of an important scientific investigator at the turn of the century.

BACKGROUND

Edward Phelps Allis started his biological researches rather late in life (at age 34) when, with no previous biological training, he founded a small laboratory in Milwaukee to allow himself to pursue some general investigations into biology. (Dornfeld, 1956 provides an excellent summary of the "Allis Lake Laboratory" and a complete bibliography of E. P. Allis. The following account is based on Dornfeld's paper and on two interviews with the son of E. P. Allis, Dr W. P. Allis, in Cambridge, Massachusetts, 1980.) Allis enlisted the aid of several biologists to assist in his training, including C. O. Whitman, and by 1886 had seriously begun his investigations into the anatomy of *Amia calva*. The major paper on *Amia* anatomy was published in the *Journal of Morphology*, which Allis helped found in 1887, with a large number of superb lithographs by a Japanese artist, Jujiro Nomura (Allis, 1897).

In 1889, for reasons of health, Allis travelled to Europe and settled permanently in the Palais Carnolés in Mentone, France. Nomura followed shortly and all of Allis' work after 1893 (some 80 publications) was conducted in Southern France.

E. P. Allis did very little of his own dissection after 1900 and all final illustrations were performed by J. Nomura, although other artists and assistants were employed from time to time. These included John Henry, W. F. Allen, G. Wannovsky, L. Malthers, J. Dewitz, and G. E. Nicholls. After 1919 Allis' eyesight began to fail (Dornfeld, 1956:139) and perhaps not coincidentally, only two of the remaining 21 papers he would publish after 1923 were illustrated (with black and white figures only).

Allis continued to work in his house in Mentone until the Italian Army invaded Southern France in 1940. About 1943, the German army removed Allis' extensive personal library of books and reprints to German Universities, presumably to replace volumes lost to Allied bombings, but left most illustrations behind. After the war, William P. Allis, then a professor of Physics at the Massachusetts Institute

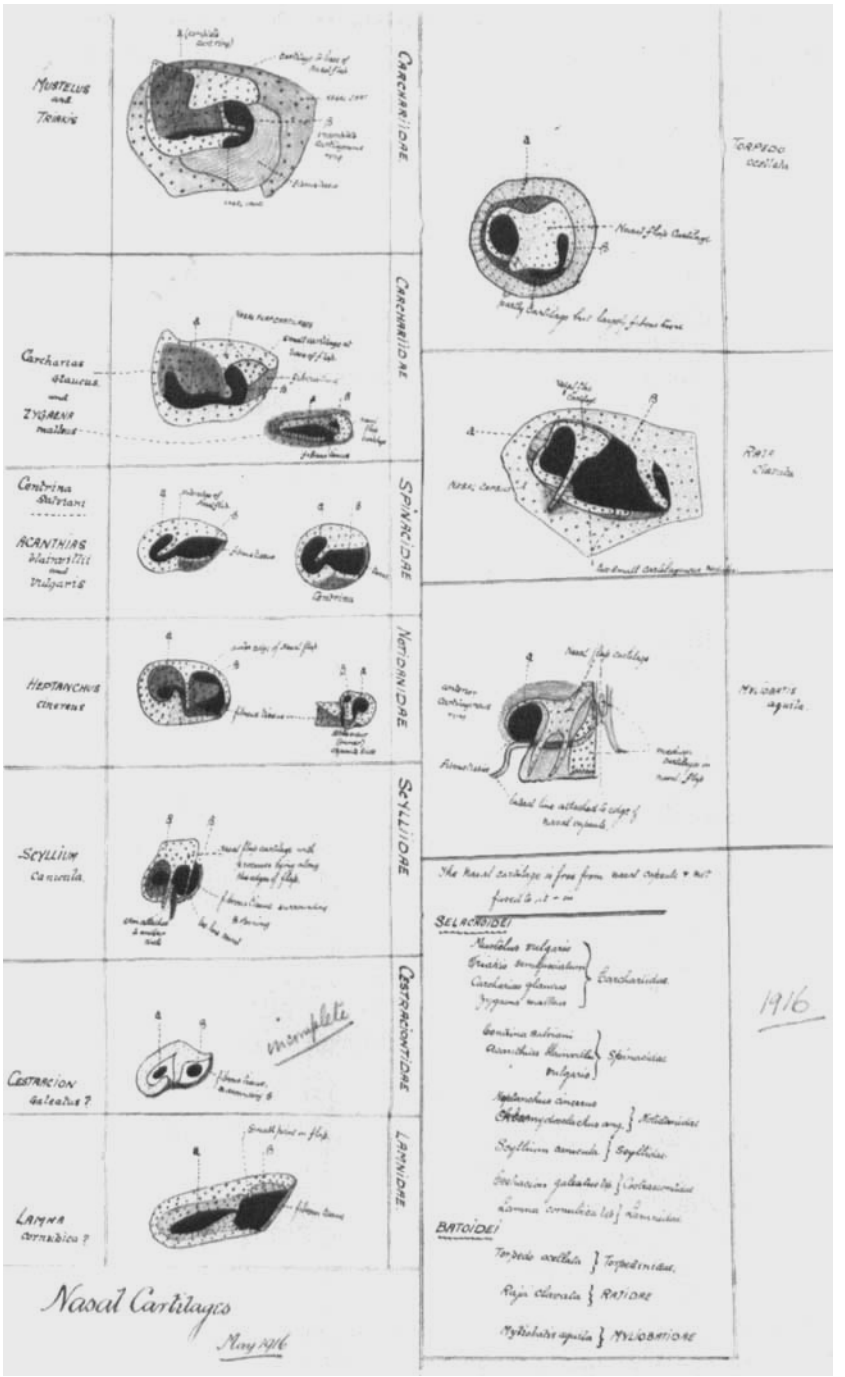


Figure 1. Photograph of one page of a working set of illustrations of elasmobranch nasal cartilages drawn by Mr John Henry for E. P. Allis in 1916. The original is in color. This drawing was done in preparation for work published in Allis (1916, 1919a). Courtesy of the Museum of Comparative Zoology, Harvard University.

of Technology, returned to Mentone and in 1948 shipped the remaining illustrations back to Cambridge, Massachusetts. In 1949 or 1950, they were given by William Allis to A. S. Romer who deposited them in the back of a large wooden cabinet in his office.

THE ILLUSTRATIONS AND OTHER MATERIALS

Many of the illustrations are complete figures by J. Nomura but most represent rough drawings with handwritten notes describing anatomical features, or noting comparisons with previous work or other illustrations (see Figs 1, 2). Nearly all of the rough working drawings are in color and many have one or more overlays to show the more superficial layers *in situ*. Several of the working drawings were done on the back of carbon copies of earlier manuscript drafts, nearly all of which bear handwritten corrections by E. P. Allis, or on old file cards from his reprint library. The most impressive feature of the illustrations is the level of detail and high quality of even the roughest sketches. Illustrations for several of the early Allis papers are not represented in this collection and presumably were lost in the disruption of the laboratory during the war. I list the most important illustrations under three categories: (1) detailed drawings (in color) of serial sections, each section drawn on a separate sheet of paper; (2) rough sketches, finished figures, and proofs for published papers; and (3) unpublished illustrations. Dates indicate the date, if any, on the illustration, and I have attempted to identify the published paper for which drawings were intended.

Illustrations of serial sections

(1) *Polyodon spathula* and *folium*, 1908–1910, by Allen, unpublished.

(2) *Scorpaena*, 13/12/'04, preliminary drawings for Allis (1919b).

(3) *Hiodon*, as well as *Cottus*, *Sygnathus*, and *Catostomus*. Published in Allis (1919b).

(4) *Cottus*, 10/7/'05, rough drawings for Allis (1919b).

(5) *Bdelostoma*, 1902 and 1903, rough drawings for Allis (1903c).

(6) *Amia calva*, 1914, sketches for Allis (1919a, 1919a,c).

(7) *Polypterus*, over 100 pages of detailed serial section drawings with labels.

Figures for published papers

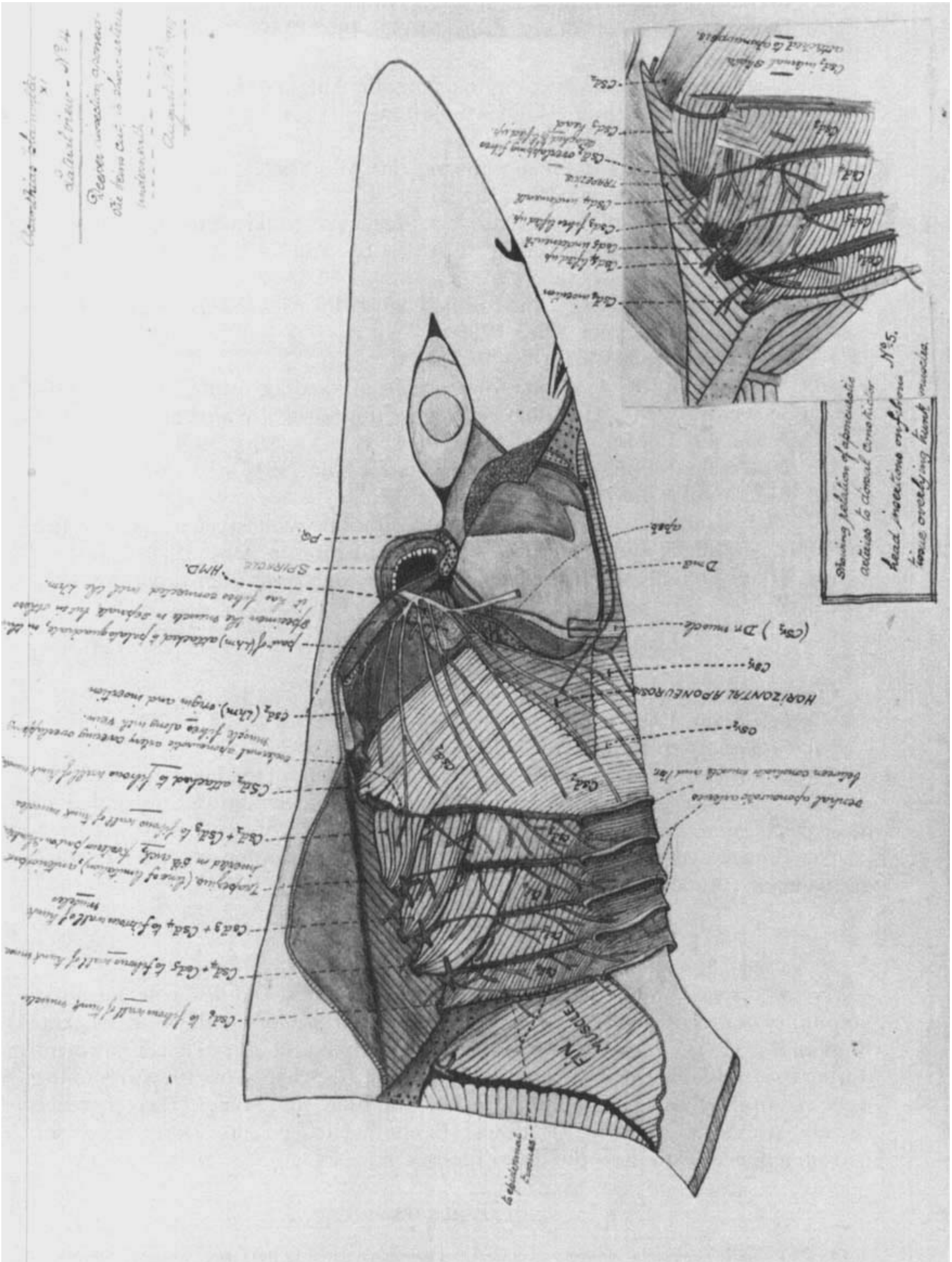
(1) Numerous sketches and final illustrations for Allis (1904). Includes figures of *Scomber*, *Coregonus*, *Esox*, *Alepocephalus*, *Perca*, *Conger*, *Gadus*, *Acipenser*, *Lepisosteus*, and numerous Ostariophysi.

(2) Branchial arteries of *Gadus* and *Salmo*, 1911, by J. Henry, for Allis' extensive series of papers on pseudobranchial and carotid arteries in fishes (e.g. Allis, 1908a, b, 1912a,b,c).

(3) Part of page proofs and figure proofs and original illustrations submitted to printer for Allis (1919a).

(4) Rough drawings for Allis (1909): *Cottus*, *Trigla*.

Figure 2. *Acanthias blainvillii*. One of a series of rough color illustrations drawn in 1919 by Mr John Henry for E. P. Allis (ultimately redrawn by J. Nomura for use in Allis, 1920). Courtesy of the Museum of Comparative Zoology, Harvard University.


SPIRACLE
HMD.
HORIZONTAL APONEUROSIS
FIN MUSCLE
No. 5.

(5) Preparatory figures, final figures, and proofs for Allis (1903a).

(6) Rough sketches of *Silurus, Gadus,* 1892, 1893, 1896; probably for Allis (1904).

(7) Final figures with instructions to printer for Allis (1909). Some preliminary drawings for Plates I and II (*Scorpaena*), V (*Trigla*), and VII and VIII (*Dactylopterus*).

(8) Final illustrations (some are missing) for Allis (1922).

(9) Chimaera figures, for Allis (1912a, 1917b).

(10) Rough color drawings for Allis (1920). Figure 2 taken from this series.

(11) Rough color figures for Allis (1916, 1919a), and for text of Allis (1917a). Figure 1 taken from this series.

(12) *Scyllium.* Series of rough and finished figures for Allis (1917c, 1918, 1919a).

(13) *Polyodon,* sketches for Allis (1911).

(14) *Polypterus,* sketches for Allis (1919c).

(15) Nearly complete set of final illustrations marked for printer by E. P. Allis (1903b). Several rough preliminary figures for this paper are also present.

(16) Proofs, final illustrations, and rough sketches for Allis (1901).

(17) Proofs, final illustrations, and sketches for Allis (1916).

(18) Rough color illustrations for Allis (1912c).

(19) *Raja.* Rough sketches, final color illustrations with labeled overlays (by Nomura), and black and white proofs of the ten figures in Allis (1918).

(20) Many preliminary and some final figures, one page from proofs for Allis (1923).

Unpublished illustrations

(1) *Amiurus,* selected skull bones and canals.

(2) *Lepisosteus,* 1904, excellent finished pencil sketches of the head.

(3) *Ceratodus forsteri,* parts of skull.

(4) *Gymnarchus,* an excellent color series of dissections of the head musculature.

(5) *Polypterus ornatipinnus.* Numerous excellent finished illustrations similar to those of *Polypterus bichir* published in Allis (1922).

(6) *Polyodon,* completed and partially completed illustrations of arteries, veins, and general cranial anatomy.

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