

ICHTHYOSAURS FROM THE LOWER LIAS (LOWER JURASSIC) OF BANWELL, SOMERSET



M.A. TAYLOR¹ AND R.D. CLARK²

Taylor, M.A. and Clark, R.D. 2016. Ichthyosaurs from the Lower Lias (Lower Jurassic) of Banwell, Somerset. *Geoscience in South-West England*, **14**, 59–71.

Two Lower Jurassic ichthyosaurs, lost in a 1940s air raid, are identified from archival records and surviving 19th century plaster casts distributed by their owner, the Bristol Institution for the Advancement of Science, Literature and the Arts. One was the type specimen of *Ichthyosaurus latimanus* Owen, 1840. The other, initially labelled *Ichthyosaurus intermedius* Conybeare, 1822, was the first ichthyosaur in which remains of the soft tissue of the tail fin were identified, confirming Richard Owen's earlier prediction. Unfortunately Owen's published account conflated the two specimens, apparently by the erroneous transposition of a passage of text. Owen possibly regarded the second specimen as the type of *I. intermedius*. In 1889 Richard Lydekker referred it to *Ichthyosaurus conybearei* Lydekker, 1888. For unknown reasons, he caused further confusion by suppressing the fact that both ichthyosaur specimens came from Banwell. Banwell is shown to have been a minor but significant source of Lower Lias fossil vertebrates, and also the type locality of the fish *Tetragonolepis monilifer* Agassiz, 1837, apparently from quarries in the lowermost Jurassic beds at Knightcott. The Bristol Institution assisted Edward Wilson (1808–1888) to obtain at least some of the West Country marine reptiles which his brother Dr Thomas Bellerby Wilson (1807–1865) donated to the Academy of Natural Sciences of Philadelphia, U.S.A. The Institution made casts of those specimens, and provided casts of its own ichthyosaurs, probably through the energy of its curator Samuel Stutchbury (1798–1859) in particular. The scientific, historical and cultural values of such casts are discussed.

¹ School of Museum Studies, University of Leicester; and Department of Natural Sciences,
National Museums Scotland, Chambers Street, Edinburgh EH1 1JF, U.K.
(E-mail: mat22@le.ac.uk)

² Bradford on Avon Museum, Bridge Street, Bradford on Avon, Wiltshire BA15 1BY, U.K.
(E-mail: rogerdclark@btinternet.com)

Keywords: Ichthyosauria, Reptilia, Lower Jurassic, Knightcott, Banwell, Somerset, Bristol Institution, plaster casts

INTRODUCTION

From the 1820s onwards, the Bristol Institution for the Advancement of Science, Literature and the Arts, and its successor the Bristol City Museum, amassed an important collection of West Country Mesozoic fossil vertebrates, which was largely destroyed during an air raid in 1940 (Wallis, 1977 Ms.; Taylor and Torrens, 1987; Taylor, 1994; Benton, 2012). The major plesiosaur specimens had fortunately been photographed (Swinton, 1948), but not the ichthyosaurs, which had, unfortunately, seldom been illustrated in publications. Plaster casts of those reptiles are potentially an important record, if surviving examples can be located. In this paper we identify surviving plaster casts of two lost Bristol ichthyosaurs, and attempt a conclusive resolution of the persistent confusion in the literature over their anatomy, taxonomy and provenance. We show that Banwell, almost completely neglected in the literature, was a minor but significant Lower Lias vertebrate locality. We also show that certain ichthyosaurs were cast in Bristol before they were exported to the Academy of Natural Sciences in Philadelphia, U.S.A. Finally, we consider the significance of those casts, and similar casts more generally. This emends and extends previously published information (Torrens and Taylor, 1990; Spamer and Daeschler, 1995; Spamer *et al.*, 1995; Massare and Lomax, 2016).

Methodology and Repositories

A recurring problem in research of this kind is the common failure of early nineteenth-century museums to allocate unique numbers to specimens, making it hard to identify the specimens unambiguously in contemporary documentation. Such numbers were often allocated retrospectively, decades later, as with the two Bristol ichthyosaurs. It is fairly certain which formal Bristol City Museum and Art Gallery numbers were applied to which ichthyosaurs, but this cannot now be independently confirmed. We simply term the main subjects of this paper Ichthyosaurs A and B, to avoid risk of circular argument.

During the 19th century, the county of Somerset, also called Somersetshire, covered a greater area than the modern Somerset unitary authority. It included Banwell and Bleadon, now in North Somerset unitary authority, and Saltford, now in Bath & North East Somerset unitary authority.

Owen (1840a) used Imperial units of length. A foot is equal to twelve inches; an inch is about 2.54 cm. For smaller measurements, Owen used the 'line'. Depending on the user, this un-standardised unit could be 1/10, 1/12, 1/24, or 1/40 inch, or 1 mm. The numerous fractional measurements in Owen (1840a) reach but do not exceed 10 lines, so he must have used the botanists' line of 1/12 inch.

Repository abbreviations: ACNMW, Amgueddfa Cymru – National Museum Wales, Cathays Park, Cardiff CF10 3NP; ANSP,

Academy of Natural Sciences, 1900 Benjamin Franklin Parkway, Philadelphia, PA 19103, USA; BCL, Bristol Central Library (Bristol Libraries), College Green, Bristol BS1 5TL; BGS, British Geological Survey, Nicker Hill, Keyworth, Nottinghamshire NG12 5GG; BIASLA, Bristol Institution for the Advancement of Science, Literature and the Arts, collections later transferred to Bristol City Museum, now BRSMG, and archives mostly in BRO accession 32079, but with microfiche copies of some items in BRSMG Geology Archive; BMNH, British Museum (Natural History), now NHMUK; BNSS, Bournemouth Natural Science Society, 39 Christchurch Road, Bournemouth, Dorset BH1 3NS; BRLSI, Bath Royal Literary and Scientific Institution, 16–18 Queen Square, Bath BA1 2HN; BRO, Bristol Record Office, 'B' Bond Warehouse, Smeaton Road, Bristol BS1 6XN; BRSMG, City of Bristol Museum and Art Gallery, Queen's Road, Bristol BS8 1RL; CHLGM, Cheltenham Art Gallery and Museum, Clarence Street, Cheltenham GL50 3JT; GSL, Geological Society of London, Burlington House, Piccadilly, London W1J 0BD; NHMUK, Natural History Museum, Cromwell Road, London SW7 5BD; OUMNH, Geological Collections, Oxford University Museum of Natural History, Parks Road, Oxford OX1 3PW; ROM, Royal Ontario Museum, 100 Queen's Park, Toronto, ON M5S 2C6, Canada; SHC, Somerset Heritage Centre, Brunel Way, Norton Fitzwarren, Taunton TA2 6SF; SRO, Somerset Records Office, in SHC; TTNM, Somerset Museums Service, in SHC.

ICHTHYOSAUR A

Ichthyosaur A is an ichthyosaur with its head and one forefin relatively undisturbed, but with a badly disrupted body and tail. It is best documented from cast ANSP 17426, which bears a painted and apparently original inscription, "ICHTHYOSAURUS

latimanus (Owen), Lias, Somersetshire. Original in the Bristol Institution" (Figure 1a). Spamer and Daeschler (1995, pp. 435–436, fig. 29a, b) outlined the provenance of this cast, figuring it (and, indirectly, its parent specimen) for the first time (see also Spamer *et al.*, 1995, pp. 12–13fn., 133–135). It must be the "valuable" cast of "*Ichthyosaurus latimanus*", the original "in the Bristol Institution", donated in 1847 by "Dr Wilson" (Anon., 1847c, p. 213).

A second cast is OUMNH J.10343/p (Figure 1b), of unrecorded provenance except for an old, hand-scripted, label, "*ICHTHYOSAURUS lati-manus, Somersetsbire*" (Eliza Howlett, *pers. comm.*, 2012). This cast is differently executed from ANSP 17426, with more prominent mould lines, less plaster around the snout, and a better quality but plain wooden frame with a single moulding on the inner edge.

A third cast, NHMUK PV OR 1064 (not NHMUK PV R1064, which is a different specimen), was "Presented by the Council of the Bristol Philosophical Institute", i.e., BIASLA, to the British Museum in 1832 (Lydekker, 1889, pp. 43–44). Its identity is confirmed by Lydekker's description: the "*skull and left pectoral limb are well preserved; but the vertebral column is broken up*". Lydekker attributed it to *Ichthyosaurus communis* Conybeare, 1822. This cast was not located on recent visits (Judy Massare, *pers. comm.*, 2014).

A fourth cast, BNSS 30489, of the anterior portion (including head and forelimb) of the skeleton only, was given to BNSS in 1994 by Justin Delair; it had been salvaged in 1973 from the dissolution of the Frome "*Literary Institute*" (specimen label; Ray Chapman, *pers. comm.*, 2016). The Frome Literary and Scientific Institution was established in 1844–1845, so, if it soon started collecting objects, this timing would be right for the Bristol Institution to provide the cast (Anon., 1844, 1845).



Figure 1. Casts of Ichthyosaur A. **1a**, partial view of ANSP 17426, with painted original label "*ICHTHYOSAURUS lati-manus* (Owen)". © Academy of Natural Sciences of Philadelphia. **1b**, OUMNH J.10343/p, with apparently original label "*Ichthyosaurus lati-manus, Somersetsbire*". Dimensions of visible cast: 149 cm long x 47.5 cm broad, measured on inner edges of wooden frame. © Oxford University Museum of Natural History.

ICHTHYOSAUR B

Ichthyosaur B has a skull and a vertebral column more or less in original sequence, but lacks the mandible, while the pelvic fins lie beside the disrupted ribs, near the normal position of the absent pectoral fins. One surviving cast is CHLGM 1931:11a (Figure 2a; documentation and correspondence in BRSMG Geology Files 458 and PUR 1, including copies of some documents in CHLGM archives). It was bought from a “second-hand dealer’s shop” – i.e., probably a junk shop – in Cheltenham in 1931 for £2 10s (nominally £2.50 today) (letters from D.W. Herdman, CHLGM Director, to W.E. Swinton (1900–1994), Curator of Fossil Amphibians, Reptiles and Birds at BMNH, and T.W. Woodhead, Director of the Tolson Memorial Museum, Huddersfield, both 16th February 1931). Swinton identified it as *Ichthyosaurus conybeari* Lydekker, 1888, and this was confirmed by F.S. Wallis (1895–1979), Keeper of Geology at BRSMG, doubtless by comparison with the original specimen in BRSMG (correspondence between D.W. Herdman, CHLGM Director, Swinton, and Wallis, 16th and 17th February and 5th March 1931 and 1st, 2nd and 3rd November 1932). The cast was put on display at Cheltenham, but was later taken off show, certainly years before MAT saw it in 1984. It was conserved at BRSMG by David Hill in 1990 and put on display again at Cheltenham (Peter Crowther, *pers. comm.*, 1990).

This cast was probably originally acquired by the landowner and magistrate Purnell B. Purnell (1791–1866) of Stancombe Park, between Bristol and Cheltenham (Torrens and Taylor, 1990, p. 200; Taylor, 2014). It matches the description of one of four casts of “*fossil saurians*” known to have been sold to Purnell for £16 by the BIASLA in 1847. As Samuel Stutchbury (1798–1859), Curator of the BIASLA (Crane, 1983), told Purnell, this last cast was “*much jumbled about yet is very interesting as belonging to a species of which that is an unique example*” (letter, 20th July 1847, Letters Out book 290; Curator’s Reports books for 31st August 1847; extracts in BRSMG Geology File PUR1). Purnell had a fine private collection, mostly of

antiquities and art but with some natural science material (references in Taylor, 2014). This is not surprising, as an interest in archaeology frequently crossed over into geology at this time (Torrens, 1998). In 1855, the Cotteswold Naturalists’ Field Club visited Stancombe Park, seeing amongst other things kangaroos and llamas in the grounds, and Purnell’s purpose-built private museum building, though the geological material was perhaps kept in the main house. Before and after a “*hearty and well-provided breakfast, in which Ladies were allowed to participate, some of the treasures of that Gentleman’s collection were thrown open to inspection [...]. Although [Purnell was] not a professed geologist, rare specimens varying from all the specimens in his neighbourhood to the Mammalian Crag, invited the attention of the geologists of the party*” (T.B.L. Baker, 1860, pp. iii–iv). Certainly, the casts of Banwell reptiles from the Lower Lias would fit naturally with local fossils from the same strata in the Vale of Severn.

Interestingly, Purnell’s uncle was the noted surgeon and anatomist Sir Astley Cooper (1768–1841), but Taylor (2014) was unable to ascertain whether Purnell inherited Cooper’s fine ichthyosaur bought from Mary Anning (1799–1847) of Lyme Regis, or what happened to Purnell’s geological material, apart from a few vaguely described large framed fossils in the huge sale of Purnell’s collection at Sotheby’s in 1872. Further research has been inconclusive. Sherborn (1940, p. 111) says that Christie’s, London, sold a collection of unspecified natural science material made by “*B.P. Purnell*” in 1871, but we have been unable to trace this in newspapers, and Chalmers-Hunt *et al.* (1976) lists no sales under the Purnell name other than that in 1872. Perhaps this 1871 sale was anonymous, or simply Sherborn’s error for the 1872 sale (which did include taxidermy). Other possible fates for the fossils were destruction in the fire which destroyed part of the house in 1886 (Anon., 1886), or incorporation into a grotto in the grounds, although a later description suggests that in fact so few fossils were involved in the grotto as to make no great difference to the problem (Jones, 1974, pp. 247–250). Perhaps the geological material was sold to a dealer by separate contract, before the



Figure 2. Casts of Ichthyosaur B. **2a**, CHLGM 1931:11a. Photograph by M.A. Taylor; © Area Museum Council for the South West and courtesy Cheltenham Art Gallery and Museum. **2b**, OUMNH J.10342/p, with apparently original label “*Ichthyosaurus intermedius*, Somersetsbire”. This version of the cast shows a coracoid and probable phalanges lying near the snout, and a probable coprolitic mass near the shoulder region, all absent from the CHLGM cast. Dimensions of visible cast: 188.5 cm long x 47cm broad, measured on inner edges of wooden frame. © Oxford University Museum of Natural History.

main auction. That might well explain why only a few fossils in frames were sold at the auction; such framed items tended to get separated very easily from the main part of a geological collection, because they were awkward to handle at best, and often fixed to the wall (e.g., BRLSI, Copp *et al.*, 2000, p. 15). They were thus easily left behind, and then forgotten, so to speak, as part of the wallpaper. Perhaps the ichthyosaur cast (and its companions, discussed elsewhere in this paper) also remained in Stancombe Park till the auction there of “*furniture and effects*” in September 1929, following the sale of the house and estate (Anon., 1929a, b, c, 1930). This timing certainly fits with the cast’s January 1931 emergence in a Cheltenham junk shop, and better than the known main dispersals of several local collections (Cheltenham Literary and Philosophical Institution, ca. 1860, and Cheltenham College, and Cheltenham Ladies’ College, both later than 1931; Torrens and Taylor, 1990).

A second, and variant, cast exists in Oxford, OUMNH J.10342/p (Figure 2b). Its provenance is unrecorded but the hand-scripted label reading “*ICHTHYOSAURUS intermedius*. Somersetshire” is in the same style as its fellow cast of Ichthyosaur A, OUMNH J.10343/p, a style which is not otherwise used in the OUMNH collection (Eliza Howlett, *pers. comm.*, 2012). The mounting is also of the same style as the other cast, with a similar plain frame with a single moulding, so perhaps the two came to Oxford together. It differs from the Cheltenham cast in showing an isolated coracoid and phalanges lying near the snout, and what might be a coprolitic mass near the thorax.

A third extant cast, NHMUK PV OR 1065 (not related to NHMUK PV R1065), was given to the British Museum in 1839 “by the Council of the Bristol Philosophical Institute”, i.e., BIASLA (Lydekker, 1889, pp. 53–54). Like the Oxford cast, it has a coracoid and phalanges near the snout, but unlike it, omits the coprolitic mass.

A fourth example must have been the “valuable” cast of “*Ic[h]thyosaurus intermedius*”, of an original “in the Bristol Institution”, donated to the ANSP in 1847 by “Dr Wilson” (Anon., 1847c, p. 213). It has not been found in the ANSP in recent years (Ted Daeschler, *pers. comm.*, 2012).

RICHARD OWEN MUDDLES THE TWO ICHTHYOSAURS

During the 1830s, the anatomist Richard Owen (1804–1892) examined Ichthyosaurs A and B, amongst many others, for the first part of his “*Report on British Fossil Reptiles*”, delivered at the meeting of the British Association for the Advancement of Science in 1839. Unfortunately, despite a second visit to the BIASLA in 1839 just before presenting his spoken paper (R.S. Owen, 1894, vol. 1, p. 160), Owen conflated ichthyosaurs A and B in the published version (Owen, 1840a). Comparison of Owen’s text with the OUMNH casts, allowing for minor errors of orientation and measurement, and loss of definition in the cast, strongly suggests that a paragraph dealing with Ichthyosaur B, and perhaps one or two other comments, were erroneously inserted into the section on Ichthyosaur A, which, as Spamer *et al.* (1995, p. 134) note, matches A in large part. We repeat Owen’s passage here, giving our comments in square brackets, and reproducing the text suggested as applicable to Ichthyosaur A in *italic* alone, but that to Ichthyosaur B in bold italic (Owen, 1840a, pp. 123–124) :

“Ichthyosaurus latimanus, O. [i.e., Owen]

This species resembles the Ichthyosaurus communis in the ventricose, subobtuse character of the teeth, of which I have counted twenty-nine on one side of both jaws [it is hard to count them reliably in the cast of Ichthyosaur A, but the number is in the range of 23–36; irrelevant to Ichthyosaur B which lacks a mandible].

The articular surfaces of the vertebrae are only concave in the middle third part of their transverse diameter; the rest of

the surface to the circumference is flat [clearly visible in Ichthyosaur A; in so far as it is present, this feature is not nearly so obvious in Ichthyosaur B in which the centra are mostly in articulation]. *They are stouter in the pelvic region than in the Ich. communis. The chief difference between this species and the Ich. communis obtains in the relative sizes of their anterior paddles. In an Ich. latimanus of six feet ten inches in length* [presumably Ichthyosaur A, but an apparent error, discussed below], *and an Ich. communis five feet two inches in length, the following were the respective dimensions of the bones of the anterior paddle:* [these paddle dimensions are omitted here; they generally match Ichthyosaur A well but are almost completely irrelevant to Ichthyosaur B in which those elements listed are absent or obscured, except for one coracoid, which is almost as good a match as that of A]

The clavicle was also proportionally powerful in the Ich. grandipes, and measured six inches eight lines in length [an only approximate match for Ichthyosaur B; the maximum visible length in Ichthyosaur A seems to be just less than 3”].

The head is relatively shorter in the Ich. latimanus than in the Ich. communis; in the present specimen the lower jaw measures one foot four inches [matching Ichthyosaur A; irrelevant to Ichthyosaur B which lacks a mandible], *while in the Ich. communis above cited the lower jaw measured one foot five inches.*

In the nearly complete but dislocated skeleton in the museum of the Philosophical Institution at Bristol, on which the present species is founded, I counted 114 vertebrae [113–116 in ichthyosaur B, but 90 or so at most in A]; ***the terminal vertebrae of the tail*** [clearly visible in Ichthyosaur B but disrupted and partly missing in A] ***presenting the compressed character indicative, as before noticed, of the former existence of a vertical tegumentary fin. Parts of the carbonized integument are preserved on the slab of lias on which this interesting fossil reposes; there is a broad patch about four inches beyond the last caudal vertebrae, being the first evidence I have yet met with of the actual presence of the caudal fin*** [not evident on the known casts of Ichthyosaur B which seem to be truncated too close to the skeleton, but certainly possible as it is known from other examples in the Lower Lias (Martill, 1985)]. ***The traces of tegument in the abdominal region are smoother than those figured in Dr Buckland’s Bridgewater Treatise*** [Buckland’s figure (1836, vol. 2, p. 22, plate 10, figs A1–4) shows parts of a specimen from Barrow upon Soar, Leicestershire. Owen’s sentence probably refers to Ichthyosaur B, though it is hard to be sure without access to the original specimens, as the casts vary in how they are painted. There are areas of blackish paint in OUMNH and NHMUK casts of Ichthyosaur B, though not in the CHLGM cast (Fig. 2). The OUMNH cast in particular has a concentrated area just to the rear of the current location of the displaced hindlimbs. Possibly this in fact represents a blackened mass of stomach contents].

If, as I have conceived, the pectoral fin and the massive sterno-coracoid arch relate to occasional reptation [crawling] on the sea-shore, it may be inferred from the partial flattening of the articular surfaces of the vertebrae, in a species characterized by a greater size and strength of the fore paddles, that it was more terrestrial or littoral in its habits than the ordinary Ichthyosauri.”

Owen’s figure for overall length was “*six feet ten inches*”, or 82”. Ichthyosaur B is about 80.5” long at most along the head and vertebral column, so this is not particularly accurate, though much closer than the 70” for Ichthyosaur A, insofar as that last can be measured with such a disrupted skeleton. Yet Owen at once goes on to give the measurements of the forelimb of Ichthyosaur A. Perhaps he muddled the two reptiles, or erroneously noted the length of A as 6’ 10” rather

than the correct 5' 10".

The binomen "Ich. grandipes" is another sign of hurried work. It cannot be a direct reference to *Ichthyosaurus grandipes* Sharpe, 1830, because Owen, in this same *Report*, synonymised *I. grandipes* with *Ichthyosaurus* (now *Leptonectes*) *tenuirostris* Conybeare, 1822, which is very different from the specimen in question (Owen, 1840a, p. 117). Probably, Owen originally gave the seemingly new ichthyosaur the specific epithet of *grandipes*, from the obvious Latin roots for great + foot, in his manuscript, forgetting Sharpe's priority. He later changed it to *I. latimanus*, from the roots for broad + hand, but failed to correct his MS completely.

We have not located the "Ich. communis" used by Owen for comparative measurements. It was probably not at the Bristol Institution, judging from the original *Catalogue of Fossil Reptiles* (BRSMG Geology MS. No. 14), and there is no obvious candidate in Owen's *Report* (Owen, 1840).

Owen included a problematical revision of his 1840 account of *I. latimanus* in his Palaeontographical Society *Monograph on the Lias Reptiles*, in a part published in 1881 (Owen, 1861–1881, pp. 126–127, and opposite title page, and plates 22, figs 7, 8, 13, 14; 33, figs 2, 7; also published as Owen, 1849–1884, vol. 3, pp. 83–85, vol. 4, pls 19 and 29). A seeming improvement was that he now wrote about Ichthyosaurs A and B separately. However, Owen failed to state where ichthyosaur A was located, and still gave the anomalous length. Also, it is not clear how he could refer ichthyosaur B (whose Bristol repository he did give) to *I. latimanus* on his diagnosis, either in 1840 or in this later paper. One key character was the large size of the pectoral paddle. This was now modified to the ratio of sizes of the pectoral and pelvic paddles, yet neither Ichthyosaur A nor B has both in the same specimen, except for a very partially visible pelvic paddle or paddles in A (though it is possible that Owen was using the visible femur in A as a surrogate for paddle size; Judy Massare, *pers. comm.*, 2016). His other character, of proportionately shorter and thicker jaws than *I. communis*, is hard to use in Ichthyosaur B, where the mandible is lacking. The reader is not left confident that Owen wasn't still muddled, or, worse, reluctant to admit his error.

Owen's conflation of 1840 was first pointed out in print by Richard Lydekker (1849–1915) of the BMNH (Lydekker, 1888). In his synoptic catalogue of the Museum's fossil reptiles, Lydekker (1889, pp. 43–44, 53–55) now referred NHMUK PV OR 1065, i.e., the cast of Ichthyosaur B, to his species *Ichthyosaurus conybeari* Lydekker, 1888, using it to complement his initial description. Lydekker also noted that "[i]t appears that Owen's *Ichthyosaurus latimanus* is based on a description of the present specimen [Ichthyosaur B] mixed up with [...] No. 1064," i.e., Ichthyosaur A which Lydekker referred to *I. communis* Conybeare, 1822. McGowan (1974, pp. 13–14) was, understandably, unable to make sense of Owen's account of *I. latimanus*. Massare and Lomax (2016, p. 2) reviewed the taxonomy of *I. conybeari* and the problems caused by Owen's muddle, and concluded that no features in Ichthyosaur B justified Lydekker's referral to that species.

Even before Lydekker's paper, however, Owen's error had long been recorded in the BRSMG curatorial archives. Geology MS. No. 14, *Catalogue of Fossil Reptiles*, is in the handwriting of Robert Etheridge (1819–1903) who was Curator from 1850 to 1857 (Anon., 1904) and who evidently compiled it from prior listings, adding his own initialled comments. Unfortunately, neither Owen, nor Lydekker, nor even the later Bristol curator Wilson (1890), published Bristol Institution/Museum specimen numbers. However, in the Etheridge listing, Fossil no. 25 (on one numbering system), a "nearly complete but much dislocated" skeleton of "Ichthyosaurus latimanus", must be Ichthyosaur A, for Etheridge commented that Owen "has by mistake referred the tegumentary remains belonging to *I. intermedius* No. 6 to this specimen". This No. 6 was evidently Ichthyosaur B: "Ichthyosaurus intermedius [...] exhibits the whole of the spinal column. The lower jaw is wanting and also the anterior Paddles. Length. 6 ft 8 in", matching our measurement (if not Owen's). Etheridge also noted Owen's

confusion. In August 1935, Wallis allocated Ichthyosaurs A and B the new numbers BRSMG Cb2464 and Cb2462 respectively, judging from the brief descriptions in the BRSMG *Cb* register, and the names given (*I. latimanus* and *I. intermedius* respectively).

If the 1840 description of Ichthyosaur B was in the wrong place, where did Owen intend to put it? Probably in the section for *Ichthyosaurus intermedius* Conybeare, 1822. This is the name consistently applied to Ichthyosaur B and its casts in contemporary documentation, published and archival, and specimen labels, doubtless arising from Conybeare's or Owen's examinations of the specimen. The misplaced text does indeed fit naturally into the section dealing with *I. intermedius* in Owen (1840a, pp. 110–112), completing a discussion of the vertebral column before the narrative returns to the mandible (main text in italic, inserted text in bold italic):

"There are 103 vertebrae in Mr. Johnson's fine skeleton of this species from Charmouth, but the series is not complete. In a beautiful skeleton of the Ich. intermedius from the lias of Lyme Regis, in the collection of Miss Conybeare, the tail exhibits the usual fracture or bend, which takes place at the 78th vertebra. In the nearly complete but dislocated skeleton in the museum of the Philosophical Institution at Bristol, on which the present species is founded, I counted 114 vertebrae; the terminal vertebrae of the tail presenting the compressed character indicative, as before noticed, of the former existence of a vertical tegumentary fin. Parts of the carbonized integument are preserved on the slab of lias on which this interesting fossil reposes; there is a broad patch about four inches beyond the last caudal vertebrae, being the first evidence I have yet met with of the actual presence of the caudal fin. The traces of tegument in the abdominal region are smoother than those figured in Dr Buckland's Bridgewater Treatise.

In the lower jaw the surangular is continued further forwards than the angular [...]."

This furthermore implies that Owen regarded, or intended to designate, Ichthyosaur B as the type specimen of *Ichthyosaurus intermedius* Conybeare, 1822. However, Conybeare (1822) never designated a type. Certainly the Bristol Institution contained some of the specimens used by William D. Conybeare (1787–1857) when he wrote his classic papers of the 1820s. Moreover, Conybeare was seemingly in contact with Owen, providing him with some material during the preparation of the *Report* (Owen, 1840a, p. 103 fn.). However, a plainly different specimen from the Lias of Lyme Regis, then (1822) in the collection of Conybeare's collaborator Henry De la Beche (1796–1855), is usually regarded as the type, if only because its head was partly figured by Conybeare (1822, p. XVII and plate explanation; trunk figured by Home, 1819, pl. XIV; Maisch, 1997, p. 4). It was later donated to the Geological Society of London (Anon., 1829, p. [26]; Blake, 1902, p. 1, appendix, p. iv, as "type"). In 1911 the GSL transferred its "British" specimens to the Museum of Practical Geology (now BGS). But what must be this ichthyosaur was in a selection of specimens retained by GSL, and it cannot now be located in GSL or BGS (Anon., 1911; Torrens, 2008; Paul Shepherd, *pers. comm.*, 2014, pace Moore *et al.*, 1991, p. 84; Caroline Lam, *pers. comm.*, 2015). Of course, not too much reliance should be placed on Owen's apparent statement that Ichthyosaur B is the type of *I. intermedius*. It could simply be an accidental result of later editing of the text. However, this issue should be revisited if further evidence emerges.

BANWELL AS A LOWER LIAS LOCALITY

The BRSMG registers clearly state that Ichthyosaurs A and B came from Banwell in Somerset. However, Lydekker (1889, pp. 43, 55) ascribed Ichthyosaur A to Lyme Regis in Dorset, and Ichthyosaur B to Saltford in Somerset, between Bath and Bristol.

It is not clear why he did so. Perhaps Lydekker, unable to find reference to Banwell as a reptile locality, assumed that there had been confusion with the famous Quaternary locality of Banwell Cave, or that Banwell referred to the *home* of the collector (discussed below). Or he misread Owen (1861–1881, p. 127) who gave Saltford and the “*Penarth Beds (Rhaetic) of Glamorganshire*” in Wales as “*among the localities of Ichthyosaurus latimanus*”. A further possibility is confusion, perhaps by Owen, with other BIASLA specimens, especially an ichthyosaur donated by the engineer Isambard Kingdom Brunel (1806–1859), from the excavations for his new Great Western Railway in the Lower Lias at Saltford (register entry, BRSMG Cb2471; such a conflation is seen, perhaps coincidentally, in the label for BNSS 30489).

In a listing of type fossils in the Bristol collection, Wilson (1890, pp. 364–365) simply noted that the locality was “doubtful” for Ichthyosaurus B, and reinstated Banwell for Ichthyosaurus A. The matter resurfaced in 1931–1932 with the finding of the Cheltenham cast, Wallis telling Herdman that according to Swinton “*the evidence for changing the locality from Banwell to Saltford is now lost in the mists of antiquity & there is small chance of new evidence coming to light*”. Wallis seemingly tried to compare the matrix on Ichthyosaurus B with others in the collection: “*though that evidence is far from being conclusive it would appear that Saltford is more probable than Banwell*” but “*we have simply labelled it Somerset*” (letters, Wallis to Herdman, 1st and 3rd November 1932, BRSMG archives cited earlier). It is hard to know how reliable this conclusion is, given the variable lithology of limestones, shales and mudstones typical of the Lower Lias of Somerset, and possible lateral facies changes at Banwell, close up against the Mendip Island.

In any case, there seems no good reason to reject the locality of Banwell. Banwell is admittedly not noted as a Jurassic locality in the vertebrate palaeontological literature, one exception being the listing by Benton and Spencer (1995, p. 104). But that is perhaps because Banwell is so far from the main Lower Lias outcrops (Desmond Donovan, *pers. comm.*, 2012). In fact, several independent lines of evidence, some contemporary, show that Banwell yielded Lower Lias vertebrates from the 1830s at least. In the county topographical literature, Phelps (1836–1839, vol. I, p. 30) mentions Banwell as one Somerset locality for “*fine specimens of the Saurian tribe*” (see also Knight, 1902, cited below). A fossil fish from the Lias of Banwell, in the collection of Dr Fox of Bristol, was published as the type specimen of *Tetragonolepis monilifer* Agassiz, 1837 in *Poissons fossiles* (Agassiz, 1833–1843, vol. 2, p. 212, plate 21a, figs 2–5; Figure 3). As well as the specimens discussed above, the Bristol Institution is known to have “*purchased*” other ichthyosaurs from Banwell: BRSMG Geology MS. No. 14, *Catalogue of Fossil Reptiles*, lists nos. 7, *Ichthyosaurus intermedius*, a partial skeleton with a “*radial bone of Plesiosaurus*” on the same slab (later apparently numbered Cb2467); 18, *I. tenuirostris*, a nearly complete skeleton; 21, *I. acutirostris*, most of a disrupted skeleton (Cb2478); and 33/A, *I. tenuirostris*, an apparently nearly complete skeleton (Cb2470). All were presumably destroyed in the 1940 air raid, apart from 18 which was apparently destroyed in 1922 because of pyrite oxidation (annotation to entry 29 in later *Catalogue of Fossil Reptiles*, Geol. Ms. 23). A further report of plesiosaur remains came when William Beard (1772–1868), manager of the Quaternary bone caves at Banwell, recorded payments to Isaac and Samuel Horle of 2s 6d [nominally = 12.5p] “*for bringing up to the Bishops Cottage the head of the Plageasaurus from the*

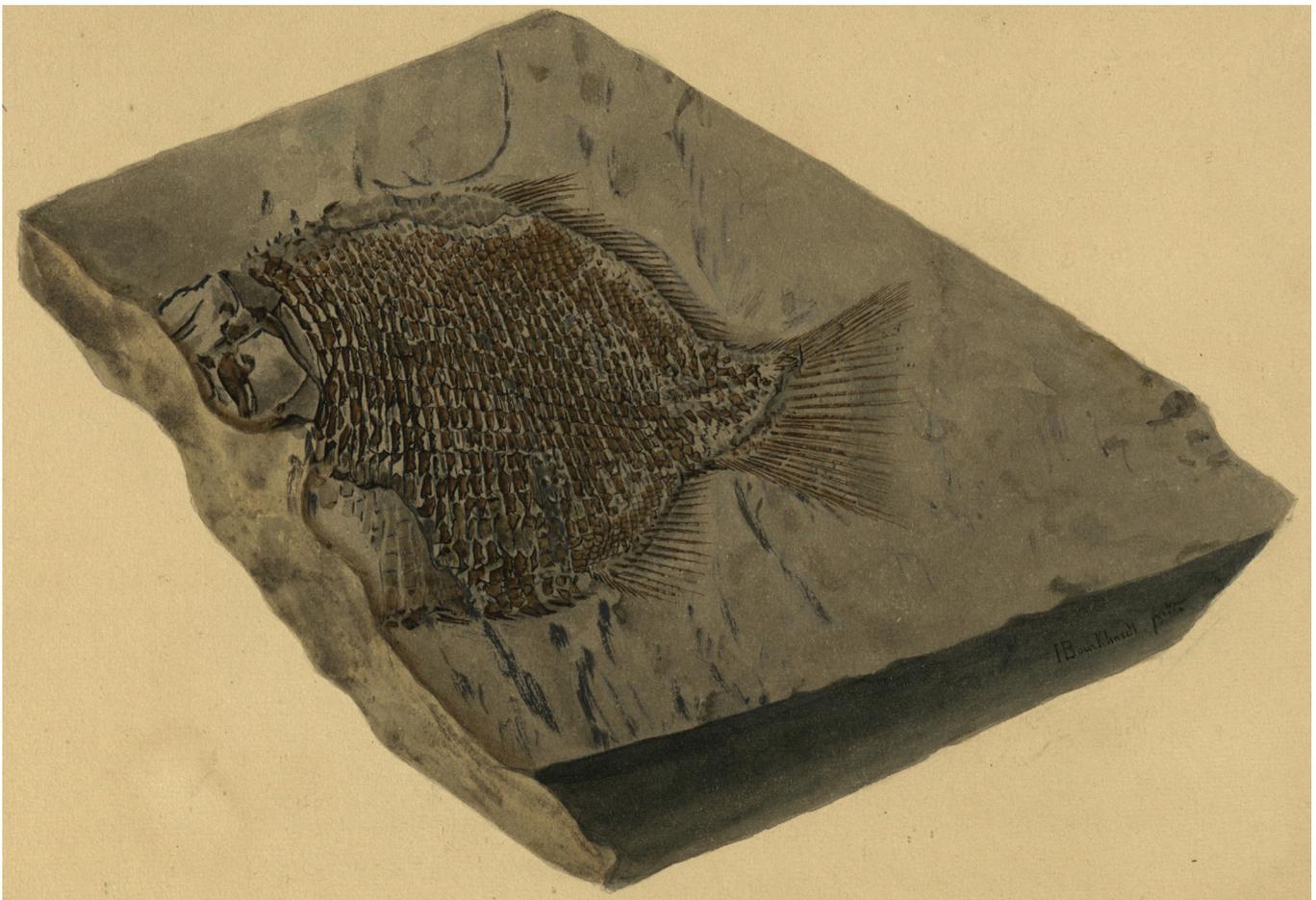


Figure 3. Watercolour of the fossil fish *Tetragonolepis monilifer* Agassiz, 1837 from the Lias of Banwell, by Jacques Bourbhardt, and the original of the plate in Agassiz (1833–1843, vol. 2, Tab. 21a, fig. 2). It was presumably painted in 1834–1835, after a visit by Louis Agassiz (1807–1873) to examine collections of fossil fishes in the Bristol area in 1834 (Anon., 1836a, p. 52; 1836b, p. 21; Taylor and Torrens, 1987, p. 143). GSL archives, LDGSL/613/2/54/3. © and reproduced courtesy of the Geological Society of London. Specimen now BRSMG C4733.

Quarry” on 11th February 1832, and the same again to Samuel Horle and John Harris for bringing him the “*Head of an Ichthyosaurus*” on 9th March 1833 (John Chapman, *pers. comm.*, 2012; David Bromwich, *pers. comm.*, 2016; account book, SHC D\P\ban\23\25). These payments seem rather low to be actual purchases, and might, rather, have been for extracting or carting the unprepared and heavy fossils. The head of “*Plageosaurus*” must be *Plesiosaurus*, and, if accurately identified, a rare find whose fate is unknown (the crocodilian *Pelagosaurus* does occur in the Lias of Somerset, but not in the Lower Lias, and was named only in 1841; Pierce and Benton, 2006).

The actual source quarries appear to have been at Knightcott, near Banwell, as Clark (in Spamer *et al.*, 1995) suggested for Ichthyosaur A. Knight (1902, p. 452) noted the use of Knightcott lias in a building constructed around 1835–1840, and mentioned a range of fossils in the Wolverhill-Knightcott area (*op. cit.*, pp. 457–458, 462; reptiles, fish, and bivalves such as “*Ostrea liassica* [...] *Lima gigantea*; together with numerous poor ammonites of the species planorbis”). This, in general, suggests the Pre-planorbis beds and Planorbis biozone of the lowermost Lias, in older terminology, i.e. the Wilmcote Limestone Member of current terminology (Bristow and Donovan, 2016). A few quarries are recorded in the north and south of the Lias outlier. They may or may not have been those in operation in the early nineteenth century. Quarries in the lowermost Lias, at least at Street, tended to move across the landscape rather than down into it as the shallow beds of the desired freestones were worked out, and orchards were apt to be planted in the old quarries, now sunken fields overlying the unwanted rubble. Near Knightcott, two quarries are shown on the 1:2 500 Ordnance Survey map published 1885, at approximate modern National Grid References ST381596 and ST388597. They map on the undifferentiated Langport Member + Blue Lias of current British Geological Survey data, not far from the upper boundary with the Charmouth Mudstone Formation outlier north of Knightcott (EDINA Digimap, accessed 12th June 2012). A mid-twentieth century Geological Survey sheet memoir records limestones and shales in a section, perhaps a quarry, at ST38366006, and limestone and shales in an old quarry at ST387600 (Green and Welch, 1965, pp. 98–99); significantly, this last was near a limekiln marked on the 1885 map. The base of the Charmouth Mudstone or “*Lower Lias Clay*” is mapped close to the latter site. The memoir noted “*typical basin facies*” of Blue Lias, with *Psiloceras* (Green and Welch, 1965, pp. 98–99). It is likely that the Blue Lias facies here is developed only in the “*Pre-planorbis beds*” and Planorbis subzone (Desmond Donovan, *pers. comm.*, 2012). Presumably the reptiles came from this facies, and can be dated to the same lowermost Jurassic age as those from the more famous locality of (and around) Street, currently ascribed to the Wilmcote Limestone Member (Benson *et al.*, 2015; Bristow and Donovan, 2016).

The actual occurrence of Banwell fossils is surely understated, as some would simply have been labelled “*Somerset*” or “*Somersetshire*”, as with the ichthyosaur casts described here. Nevertheless, rather few fossil reptiles are known from Banwell; a systematic survey of British museums found only the BRSMG specimens noted above (Benton and Spencer, 1995; Michael Benton, *pers. comm.*, 2016). This suggests that quarrying was on a small scale (or of short duration). Far less ground does seem to have been quarried than at Street, so one would expect fewer fossils from Banwell, even if the number of reptiles per unit area was not that different. However, another possible factor is that the fossil market was only intermittently active at Banwell – i.e., with collectors and dealers maintaining contacts with the quarry workers and making it worth their while to set aside any reptiles that they found. This raises the question of whether and when Banwell had a particular link with the Bristol Institution, and there is some evidence for this.

The lord of the manor of Banwell was the Bishop of Bath and Wells. George Law (1761–1845) became the Bishop in 1824,

and followed his predecessor Dr Richard Beadon (1737–1824) in his enthusiasm for the famous Quaternary bone caves at Banwell. Law built pleasure grounds and a “*cottage*” (Bishop’s Cottage, mentioned in the extract from Beard’s notebook above, and later called The Caves) at Banwell Hill (Irwin and Richards, 1996; Sharp, 2004; Bromwich, 2010; John Chapman, *pers. comm.*, 2012). The parish church’s links with Bristol suggest some likely connections with the Bristol Institution, quite apart from geographical closeness. The Reverend Dr Francis Randolph F.G.S. (1752–1831), a Prebendary of Bristol Cathedral, was Vicar of Banwell from 1809 to 1831 amongst various pluralistic preferments (Norgate and Major, 2004; CCEd, <http://theclergydatabase.org.uk/> accessed 26th April 2016). He was elected to the Geological Society of London on 18th December 1824, though does not seem to have been particularly active in the Society, for he did not publish (Caroline Lam, *pers. comm.*, 2016). The Society did not then record reasons for election, but the timing suggests a link to Randolph’s role in the development of the Banwell bone caves, for it was in September 1824 that he employed the miners Isaac Coleman and John Webb to drive an adit to improve access to the Stalactite Cave, leading to the serendipitous discovery of the Bone Cave that month (Irwin and Richards, 1996). The living of Banwell was in the gift of the Dean and Chapter of Bristol. This Dean was Henry Beeke F.G.S. (1751–1837), a geologist himself and a founder member and Vice-President of the BIASLA, helping to pay for its first major fossil, a fine Lyme Regis ichthyosaur from Mary Anning ([Carpenter], 1836, p. xi; Taylor and Torrens, 1987). The mineral beekite is named for him. Bishop Law himself was made an Honorary Member of the BIASLA in 1828, perhaps through Randolph (BRO 32079).

We assume that it was the quarry lessors and/or workers who sold the fossils to the Bristol Institution and to other purchasers such as Bishop Law and the Wilson brothers (see below). The BRSMG registers throw no light on the matter, as they routinely fail to record the vendors of the Banwell specimens, no doubt because vendors were not then thought to deserve personal recognition, in contrast to donors (cf., the treatment of Anning: Taylor and Torrens, 1987). But if the quarry operators had leased the mineral rights, then the fossils would fall to them in the first instance. It is always possible, of course, that the Bishop had made some special reservation of fossils, and/or sold them to the Bristol Institution, rather than gain public kudos as a donor, but there is no evidence for this. Perhaps Bishop Law, and Randolph, simply encouraged the Bishop’s tenants to look out for specimens and to sell them to the Institution. Any such relationship, however, might not have survived Randolph’s death in 1831 and Law’s in 1845, while Stutchbury’s resignation in 1850 (Crane, 1983) cannot have helped.

We considered whether Lydekker assumed that Banwell was the owner’s residence rather than the actual findspot, but there seems no reason to do so. Law did of course have his holiday home at Banwell, perhaps with some local Lias fossils in it, but his main geological museum was in the Undercroft in his episcopal palace at Wells (Phelps, 1836–1839, vol. II, p. 94; Bromwich, 2010; John Rackham, *pers. comm.*, 2010). Any Lias fossils might however have formed part of the various natural science and antiquarian collections amassed by Law and his relatives, which were advertised for sale at auction at the Bishop’s house at Banwell in 1860, and mostly bought by one Mr Whereat of Weston-super-Mare (Anon., 1860a, b).

The Reverend David Williams (1792–1850) lived in the area, and is noted for his fossil-collecting activities, but he was rector not of Banwell but the nearby parish of Bleadon (W. Baker, 1853; Woolrich, 2004; Benton, 2012). Much of his collection, and indeed Beard’s, is at TTNCM, but no Banwell Lias fossils are known in that museum, from these collectors or any others (Dennis Parsons, *pers. comm.*, 2015).

Another Somerset collector was Thomas Hawkins (1810–1889), resident rather further away, near Glastonbury (Taylor, 2005; O’Connor, 2007). Hawkins is infamous for his

dubious attitude to specimen integrity (Taylor, 2005; Benson *et al.*, 2015, supplemental material). However, so far as is known, this is a problem with the physical specimens rather than their provenance data. He is not known to have ascribed any of his specimens to Banwell, and there is no obvious reason, even in Hawkins's distorted mental world, why he should provide a false location of Banwell when he was happy to retain, for known specimens, the provenances of Street and Lyme Regis, which he evidently considered adequately prestigious. Hawkins did visit Banwell. His hyper-Miltonian epic poem *The Christiad* has a long description of the run-up to the Biblical Deluge, with worsening weather conditions driving the great cats and bears to shelter in the caves where their remains were later discovered, such as those on Mendip. It briefly digresses into a recollection of fireside chats about cave fossils with Bishop Law in his "villa", evidently Banwell Cottage, an identification corroborated by the mention of Edmund Goodenough (1785–1845), Dean of Wells 1831–1845 (Hawkins, 1853, p. 344; Barker and Curthoys, 2004; Bromwich, 2010; Ralph O'Connor, *pers. comm.*, 2010; David Bromwich, *pers. comm.*, 2016). Interestingly, given that the Liassic sites at Banwell are of course seaward of the bone caves, the epic goes on to portray the seas belching "hideously crabb'd/ Monsters, and reptiles, over all the land" in the build-up to the Deluge's climax (Hawkins, 1853, p. 347). But Hawkins's poem was no geological treatise, and the flexibility given by poetical licence makes it impossible to be sure whether Hawkins was thinking of Liassic marine reptiles at all, never mind those from Somerset or even Banwell.

We re-attribute Ichthyosaurs A and B to Banwell, given the evidence, and in the absence of any explanation for Lydekker's decision.

THE PHILADELPHIA CONNECTION

The Bristol casts of Ichthyosaurs A and B in ANSP were just two of the many gifts of natural science material by Dr Thomas Bellerby Wilson (1807–1865) to the Academy of Natural Sciences in Philadelphia, U.S.A. (Anon., 1847c, 1865; Day, 1984). Wilson donated other fossil vertebrates from the West Country, such as two ichthyosaurs from "Glastonbury" (but more likely nearby Street or Edgarley) and an ichthyosaur and a plesiosaur from Lyme Regis, all in 1847, another ichthyosaur in 1848, and material of *Thecodontosaurus* from Bristol (Anon., 1847b, 1848; Galton, 2007; Benton, 2012). No wonder that "Every visitor to the Museum is astonished by the perfectly preserved remains of ichtheosauri and pleseosauri. Millions of years have rolled away since they played in the ocean, and here we think we see their bones fresh from a recent burial," as a committee of entomologists misspelt it (Anon., 1865, pp.

12–13). Unfortunately, the ANSP ichthyosaur skeletons were not originally numbered, no original labels survive, and few details were given in the contemporary annual reports. The problem of matching the original reports to extant ANSP specimens is beyond the scope of this paper, but we can show that the ANSP received ichthyosaurs from Somerset and perhaps Banwell as well as the casts discussed above, and, conversely, that casts of some of those specimens were made by the Bristol Institution or its curator Stutchbury.

Wilson's gifts to the ANSP were often gathered with the help of his brother Edward Wilson (1808–1888) of Lydstep House and then Hean Castle near Tenby in South Wales, who acted as his agent, buying up European natural history specimens and collections (Anon., 1865; Watson, 1909, pp. 1–3). Edward was better placed than might seem the case today, for Bristol was still a transatlantic port, and Tenby was on a coastal steamer route from London via Bristol, convenient for both goods and passengers. *The Oxford Dictionary of National Biography* conflates this Edward with his own and Thomas's father also called Edward (died 1843) (Savours, 2011), but his identity is confirmed by the combination of Anon. (1888), Watson (1909, pp. 1–3), and his entry in the *England & Wales, National Probate Calendar (Index of Wills and Administrations)*, which shows that he died on 24th January 1888 and that probate was granted on 23rd March 1888 to a son, one Edward T. Wilson M.D. of Cheltenham. This was Dr Edward T. Wilson F.R.C.P. (ca. 1833–1918), a Cheltenham medic and father of Edward A. Wilson (1872–1912), who famously died with Scott on their trek back from the South Pole. These two latter Wilsons were active in local natural science societies in the Cheltenham area, and some of their geological specimens are, apparently coincidentally, in CHLGM, like the ichthyosaur cast discussed above (Torrens and Taylor, 1990). The homonymous BRSMG curator Edward Wilson (1848–1898) is not known to be related.

As well as the casts and the 1847 specimens, it has been suggested that Edward Wilson acquired two more ichthyosaurs from Banwell for, ultimately, the ANSP in 1848 (Clark in Spamer *et al.*, 1995, p. 135). Further work now shows that Wilson did obtain two ichthyosaurs that year, but only one seems to have gone to the ANSP, and there is no specific evidence for their findspots being Banwell or even in Somerset. In 1848, Stutchbury, the BIASLA's curator, helped "Mr Edward Wilson [...] in the purchase of two fine ichthyosauri, [and] he was permitted by that gentleman to obtain moulds of each; one of these is an undescribed species, and the other is a remarkably perfect example of *ichthyosaurus intermedius*; casts of those saurians have been carefully coloured, and now adorn the walls of the large room" at the Bristol Institution (Anon., 1849; BIASLA Curator's periodic report for 30th November 1848,



Figure 4. ANSP 15766, almost certainly the "very perfect specimen of *Ichthyosaurus intermedius*" obtained by E. Wilson with the assistance of Samuel Stutchbury of the Bristol Institution, and donated by T. B. Wilson to the ANSP in 1848. Now the holotype of *Ichthyosaurus somersetensis* Lomax and Massare, 2016. © Academy of Natural Sciences of Philadelphia. Length approximately 2.26 m along skull and vertebral column.

BRSMG archives). It makes sense to find Stutchbury helping, for he was evidently active in acquiring fossil vertebrates from various localities in Somerset and the Bristol area (e.g., Anon., 1836b, p. 21; Anon. 1841; Benton, 2012), and his contacts would have been useful to Wilson. Also, Stutchbury was evidently able to organise the preparation and casting of large fossil reptiles, as exemplified by the “*Plesiosaurus*” *megacephalus* discussed below. It is not clear whether Stutchbury’s arrangement with Wilson was an official agreement involving the Institution, or if the Institution simply benefited from their private cooperation. It is also unclear what Edward Wilson did with the two 1848 ichthyosaurs. The printed reports of the ANSP list only one such reptile from Thomas Wilson after the 1847 batch, evidently that in Stutchbury’s report: a “*very perfect specimen of Ichthyosaurus intermedius*” deposited on 21 November 1848 (Anon., 1848). The obvious surviving candidate in the ANSP collection, on grounds of taxonomic identification and quality, is the superb ANSP 15766, now the holotype of *Ichthyosaurus somersetensis* Lomax and Massare, 2016 (Figure 4; Lomax and Massare, 2016, pp. 4–5, 13–16). This identification is strengthened by the survival of a cast, BRLSI M3580, in the collection of the Bath Royal Literary and Scientific Institution not far from Bristol (Lomax and Massare, 2016; presently housed in ACNMW). This cast was photographed sometime around 1860–1890 in the array of wall-mounted marine reptiles in the Moore Room, which housed the collection of Charles

Moore (1815–1881) (Williams, 2008, p. 50; Dean Lomax and Judy Massare, *pers. comm.*, 2016). There is no mention in the BRLSI’s printed acquisition reports of such a cast before Moore’s involvement with the BRLSI began in 1853 (Copp *et al.*, 2000; Matt Williams, *pers. comm.*, 2016). So Moore probably bought it privately from the BIASLA (or its Bristol Museum successor).

Stutchbury and Wilson had seemingly already come to a similar agreement over casts in 1847. McGowan (1990) discussed ANSP 17307, a specimen of *Leptonectes tenuirostris* Conybeare, 1822, and had modern glass-reinforced resin casts made (ANSP 20668, and another in ROM). However, it had already been replicated by plaster casting, apparently on the British side of the Atlantic, for Wallis drew a cast in BRSMG before its destruction in the 1940 air raid (Figures 5a, b). Wallis retrospectively catalogued this Bristol cast in August 1935 as BRSMG Cb2486, without giving a locality. (The drawing is undated, leaving a residual possibility that Wallis made it after 1940, from a cast somewhere else, and a small uncertainty in his assignment of the 1930s registration number.) Wallis cross-referenced the cast to “*Old Collection*” numbers O.C. 34(101). Etheridge’s catalogue (BRSMG Geol. Ms. 14) has nothing under 101 but has 34/B as “*Ichthyosaurus communis (cast of). The original of this very fine specimen was sent to America to Edu^d Wilson Esq.*” The apparently single ichthyosaur of 1848 is accounted for above, so this specimen must be one of the 1847 batch. The overall length from tip of rostrum to end of tail is

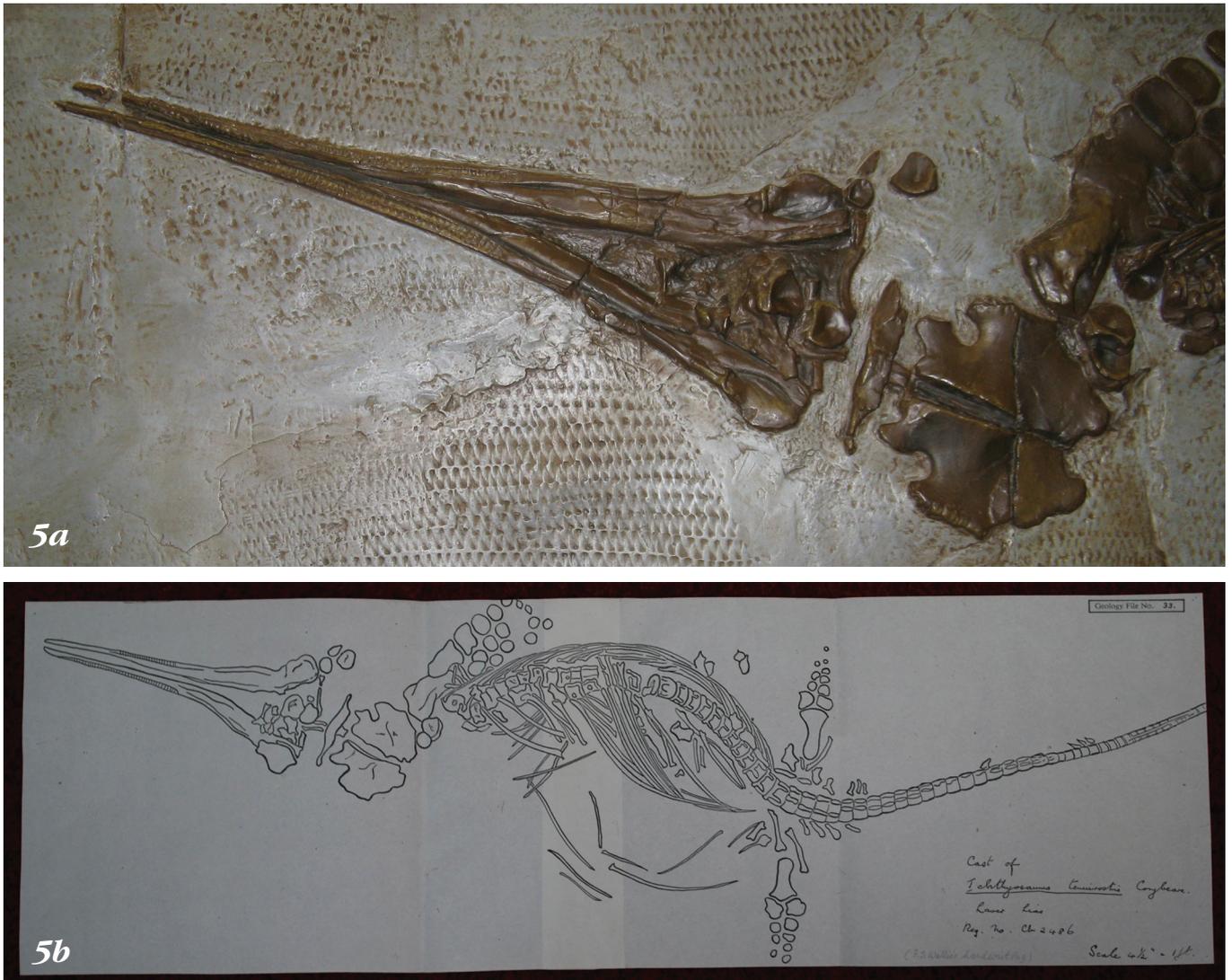


Figure 5. **5a**, ANSP 20668, modern GRP cast of ANSP 17307 *Leptonectes tenuirostris* (detail showing head and shoulder girdle). Mandible approximately 50.0 cm long as seen. © Judy Massare, courtesy of the Academy of Natural Sciences of Philadelphia. **5b**, BRSMG Cb2486, plaster cast of the same specimen, scaled sketch by F. S. Wallis, presumably ca. 1935–1940 (BRSMG Geol File 33); cast presumed destroyed in air raid, 1940. © Bristol Culture.

either 91" in a straight line, or about 98" along the mid-line as best can be estimated in the somewhat disrupted skeleton (Ted Daeschler, *pers. comm.* 2016; Judy Massare and Dean Lomax, *pers. comm.* 2016). This is entirely consistent with the specimen being one of the two 1847 ichthyosaurs from Glastonbury, an "*Ichthyosaurus tenuirostris, measuring 8 feet, 4 inches*", i.e. 100", or an "*Ichthyosaurus ---, 7 feet 7 inches*", i.e. 91" (Anon., 1847, p. 195). The taxonomic identity strongly favours the former, but this conclusion must be provisional till the provenances of all ANSP ichthyosaurs are reviewed.

Were casts made of any other specimens sent to ANSP? An initial examination of Etheridge's register, and a version by a later curator, Adolph Leipner (Geol. Ms. 23), showed no obvious candidates. However, it is possible a cast was overlooked, for in August 1935 Wallis also registered BRSMG Cb2468, a cast of *Ichthyosaurus communis*, stating that the "*Original is now in America*", without giving a locality or horizon, or an Old Collection number, as if he had found the specimen unregistered in store. We cannot presently say whether this original was one of the other ANSP specimens, the untraced 1848 specimen now in some other museum, or something completely different.

CONCLUSION AND DISCUSSION: THE SIGNIFICANCE OF PLASTER CASTS OF FOSSIL REPTILES

We do not offer a full scientific and taxonomic assessment, and in particular, we do not formally comment on the validity of any taxa involved, as a review of *Ichthyosaurus* species is being carried out by Judy Massare and Dean Lomax (*pers. comm.*, 2016), some of which has now been published (Lomax and Massare, 2016; Massare and Lomax, 2016). However, several conclusions may be drawn:

1. Surviving casts of ichthyosaurs A and possibly B have plastotype status, and both have figured status (the latter in the present paper).
2. Ichthyosaur A was Owen's intended type specimen of *Ichthyosaurus latimanus* Owen, 1840, though Owen's muddle with Ichthyosaur B raises obvious implications for the validity of the taxon if the two ichthyosaurs are not conspecific.
3. Ichthyosaur B, illustrated here (from its cast) for the first time, is historically interesting for its role in one of Owen's palaeontological tours-de-force, as the earliest reported example of soft-tissue preservation in the ichthyosaurian tail fin. In Owen's view, it confirmed his previous prediction that ichthyosaurs had a tail fin from skeletal evidence alone, especially the frequent kink in the tail, which he attributed to the presence of an eel-like tail fin, and its taphonomic effects (Owen, 1840b, originally read in March 1838).
4. Owen seemingly recognised Ichthyosaur B as a type specimen, probably of *Ichthyosaurus intermedius* Conybeare, 1822. However, this should only be considered indicative in the absence of further evidence.
5. Ichthyosaur B was used in the fuller description of *Ichthyosaurus conybeari* Lydekker, 1888, though this referral was rejected by Massare and Lomax (2016).
6. The specimens, and some other ichthyosaurs, came from the Lower Lias, and probably the basal Hettangian, of Banwell. Banwell is shown to be a genuine, though probably not prolific, locality for Lower Liassic vertebrates.

A clearer understanding of those ichthyosaurs is plainly useful for future scientific and historical work. Such fossils' significance to the heritage of Somerset and Bristol has been discussed elsewhere (cf., Taylor, 2014). It is, however, worth exploring the importance of their plaster casts, often made from rigid multiple-piece plaster moulds (Sullivan 2016), and today almost completely replaced by lighter and tougher casts made

in glass-reinforced plastics from flexible rubber moulds. Plaster casts have historically been seen as lower priority in many museums, because of their perceived inferior status as copies. Their unhelpful combination of bulk and fragility means that they deteriorate rapidly and visibly under abuse or in poor storage. Such large and tatty lumps of plaster, the white showing through any chip and scrape in the paint, were apt to be obvious targets for disposal in the next financial or space crisis. It is to the credit of some museums in this study, such as Cheltenham, that they did not dispose of their casts (Torrens and Taylor, 1990). For plaster casts of fossil marine reptiles are interesting (Taylor, 1997; Knell, 2000; Wyse Jackson, 2004; Rieppel, 2015; Sullivan, 2016; cf., antiquities and architecture, Frederiksen and Marchand, 2010; Foster, 2014; Lenaghan, 2014). They were means of transmitting scientific information. They enabled museums to display scarce objects of which they could not obtain originals. They were also a medium of exchange for specimens, prestige, goodwill and, as seen here, cash. Viscount Cole, later Earl of Enniskillen (1807–1886), distributed casts of his specimens, and the vainglorious Thomas Hawkins had his own specimens cast (Wyse Jackson, 2004).

We have shown that the Bristol Institution distributed a wider range of casts than had previously been realised. Further research in archives at Bristol and elsewhere might well throw more light. We can already add that, for instance, casts of the anterior part of a newly discovered "*Ichthyosaurus*" – presumably duplicates of BNSS 30489 – were sent to the "Institutions" at Swansea and Ludlow in 1835, but recent inquiries have failed to locate them (curator's report, August 1835, *Bristol Institution. Miscellaneous Papers. Part II*, BCL 26066, Restricted Access, SR72; Ludlow Museum records; Daniel Lockett, *pers. comm.*, 2012; Emma Williams, *pers. comm.*, 2015). The BRSMG archives note two ichthyosaur casts apparently going to Glasgow in 1841. Perhaps they were of Ichthyosaurs A and B. The obvious recipient would be either the Hunterian Museum or the Andersonian Institution (surviving collections now in Glasgow Life). However, no casts have been traced in either (Ann Ainsworth, *pers. comm.*, 2016; Neil Clark, *pers. comm.*, 2016; Maggie Reilly, *pers. comm.*, 2016). And, as well as a cast of Ichthyosaur B, Purnell of Stancombe Park received a cast of another ichthyosaur, presumably but not certainly Ichthyosaur A, in his job lot of four casts of 'saurians' (Stutchbury to Purnell, 20th July 1847, BIASLA Letters Out book 290; Curator's Reports books for 31st August 1847; extracts in BRSMG Geology File PUR1). The third and fourth casts sent to Purnell were the "*Head and Paddle of the Plesiosaurus*". This must have been the Bristol Institution's magnificent new *Plesiosaurus megacephalus* Stutchbury, 1846 (now *Atychoadracon megacephalus*), from the Lower Lias of Street-on-the-Fosse, Somerset. Copies of its head and limb certainly went to various museums (Smith, 2015; for instance, BMNH, Lydekker, 1889, pp. 166–167; GSL, Anon., 1847a, p. viii, whence presumably those now in BGS, Moore *et al.*, 1991, p. 135; Louise Neep, *pers. comm.*, 2012; BMNH and Royal College of Surgeons of England, BIASLA Curator's periodic report, 18th October 1851; Trinity College Dublin, Wyse Jackson, 2004 and William Sanders to Samuel Haughton, 14th August 1858, BIASLA Letters Out book 300, extracts in BRSMG Geology File PUR1). In return, the Institution received casts: a *Megatherium* head from the BMNH, and leg bones of three species of moa (*Dinornis* spp.) from the College of Surgeons.

The evidence we present here shows that the Institution and its Bristol Museum successor were involved in the casting of fossil marine reptiles from at least 1832 into the late 1840s, with a little in the 1850s. It is probably no coincidence that Stutchbury was curator from 1831 to 1850 (Crane, 1983). There was a later burst of activity at Bristol in the 1880s relating to the fine plesiosaur now named *Attenborosaurus conybeari* (Sollas, 1881), but this seemingly partly stemmed from Sollas's personal interest in the specimen (Wyse Jackson, 2004). It remains to be seen whether the decline in activity after mid-century reflected any increasing availability of commercial casts from dealers such as Henry A. Ward (cf., Rieppel, 2015).

The casting work was probably not done by the museum staff, then much smaller than nowadays, but contracted out to external specialists accustomed to the difficult technique of casting statuary and artwork with rigid plaster piece-moulds. There might however be other options, depending on the specimen: waste-moulding, in which the mould was necessarily destroyed to release the cast, or even a kind of peel moulding, using the residual flexibility of wet plaster to peel the mould off before it set, or a combination of the two (Sullivan 2016; Greg Sullivan, *pers. comm.* 2016). At one extreme, one might draw upon the élite fine art trade and its supporting workshops. In London, the fashionable portrait sculptor Francis Chantrey F.G.S. (1781–1841) was a keen amateur geologist and mineralogist, as shown by a fascinating paper by Sullivan (2016). Chantrey, for instance, made a piece-mould of Anning's first complete plesiosaur in 1824, to produce casts of it; although this latter work would have been at least partly done by his staff, he had himself started his career as a plaster worker's apprentice, and made his name as a sculptor with a series of busts of Radical politicians for sale in series of plaster copies (Taylor, 1997, pp. xxvii–xxviii; Sullivan, 2010, 2016). The Bristol Institution would have been well connected with this kind of high-class fine art trade, and not just through its wealthy members. One of its founding aims was the "*Exhibition of [...] Statues, [and] Casts*". In the 1820s, for instance, it acquired the famous sculpture *Eve at the Fountain* by the noted Bristol-born sculptor Edward Hodges Baily (1788–1867). Baily also carved the allegorical frieze over the doorway of the Institution's 1820s building, which itself housed a substantial collection of casts of ancient Greek sculptures ([Carpenter], 1836, pp. iii, ix–x; Eustace, 2005; Taylor, 1994, fig. 1). Intriguingly, Baily's nephew, the geologist William H. Baily (1819–1888), was Stutchbury's assistant from 1837 to 1844, but his own talents appear to have lain in drawing and lithography rather than sculpture (Blanford, 1889; Eustace, 2005). In any case his term of service only covered some of the period in question – though his family connections might well have been useful. At the other extreme were itinerant Italian plaster workers, who often came from Lucca. Thomas Hawkins engaged a "trusty Lucchese" to mount a specimen at his home near Street in the 1830s, which suggests how he obtained the casts of his specimens (Hawkins, 1834, p. 13; Taylor, 1997, p. xxvii).

The possibility of contracting-out is also highly relevant to the problem of having one's fossil reptiles prepared, given the expertise of sculptors and masons with working stone (Taylor, 1997; Sullivan, 2016). Stutchbury obtained an ichthyosaur for the Institution from a Somerset quarry, but it evidently needed significant preparation "*under his direction*" (Anon., 1841). This perhaps implies that the work was carried out in the museum, but leaves open whether it was done by his assistant Baily or an outside contractor.

A seeming anomaly is that, by modern standards, the two Bristol ichthyosaurs which are the main subjects of this paper are relatively poor specimens, being incomplete and disarticulated. This is interesting. It implies that these specimens were chosen for casting because they were scientifically important, or this was a time when ichthyosaur skeletons were still relatively scarce, or both. The choice would normally be restricted to what was available in the Bristol Institution, unless later they had special permission to distribute copies of Wilson's reptiles. So it is slightly puzzling that no cast seems to have been made of the Institution's fine *I. communis* and *I. tenuirostris* from Lyme – the former apparently the basis for Conybeare's classic reconstruction of the ichthyosaur skeleton (Conybeare, 1824, pl. 49; Taylor and Torrens, 1987, p. 139). Or were casts of them made and, perhaps, exist unrecognised?

For all those reasons, the plaster ichthyosaurs described here are important evidence for 19th Century palaeontology, and its networks. They record Somerset's and Bristol's heritage, and help research on those reptiles, for the casts transmit scientific information through time just as they did across space. Still, the existence of a few casts cannot remedy the loss of so much of the Bristol collection in 1940, and casts are never as good as the

originals, as Smith (2015) shows for the Bristol "*Plesiosaurus megacephalus*". One also thinks of the awful story of the proto-English "*Pitdown Man*" complete with cricket bat. His unmasking as a hoax was considerably delayed by the holding institution's insistence that researchers handle casts rather than the actual specimens (Donovan, 2016). But, as Smith, and Spamer *et al.* (1995), both show, casts provide valuable evidence of what had been there, both in the museum and in the specimens' source localities.

ACKNOWLEDGEMENTS

This paper stems from our previous employment at the Area Museum Council for the South West (MAT) and BRSMG (RDC). We thank Stephen Locke, then Director of the Area Museum Council for the South West, and George Breeze, then Director of Cheltenham Art Gallery and Museum, for supporting the survey of the geological collection at Cheltenham which led to the finding of their ichthyosaur cast, and ultimately its identification. We relied on the exemplary sectional archival and filing system created and maintained by our former BRSMG colleagues Micky Curtis, Mike Crane, Peter Crowther and Roger Vaughan. We are most grateful to Dean Lomax and Judy Massare for detailed information on ichthyosaur specimens and their ongoing research into *Ichthyosaurus* taxonomy, and for help in finding and identifying casts and obtaining photographs, and to Mike Benton and two other referees. We thank Steve Howe and Tom Sharpe (ACNMW), Ted Daeschler (ANSP), John Chapman (Banwell Caves Heritage Group), John Rackham (Bath and Wells diocesan archives), Dawn Dyer (BCL), Ray Chapman (BNSS), Matt Williams (BRLSI), Roger Vaughan, Isla Gladstone, and Deborah Hutchinson (BRSMG), Louise Neep and Paul Shepherd (BGS), Gaynor Andrews and Helen Brown (CHLGM), Caroline Lam (GSL), Ann Ainsworth (Glasgow Museums Resource Centre, Glasgow Life), Neil Clark and Maggie Reilly (Hunterian Museum, University of Glasgow), Daniel Lockett (Ludlow Museum Resource Centre), Angela Milner and Sandra Chapman (NHMUK), Phil Powell and Eliza Howlett (OUMNH), David Bromwich (Somerset Archaeological and Natural History Society) and Emma Williams (Swansea Museum) for access to collections, specimen and archival information, and photographs. We thank Roger Benson, Desmond Donovan, Mark Evans, Sally Foster, Julia Lenaghan, David Martill, Leslie Noë, Ralph O'Connor, Tim Palmer, Adam Smith, Hugh Torrens and Len Vear for discussion and information. MAT acknowledges the support of the libraries of National Museums Scotland and the University of Leicester.

REFERENCES

- AGASSIZ, J.L.R. 1833–1843. *Recherches sur les poissons fossiles*. 10 volumes. Petitpierre, Neuchâtel.
- ANONYMOUS 1829. A list of donations to the Library, to the collection of maps, plans, sections, and models; and to the cabinet of minerals, belonging to the Geological Society. *Transactions of the Geological Society of London* (2) 2, 407–432.
- ANONYMOUS 1836a. *Recherches sur les Poissons fossiles*, par L. Agassiz, 4^{trième} livraison, 1835 [...]. *West of England Journal of Science and Literature*, 1, 250–253.
- ANONYMOUS 1836b. *Bristol Institution. Proceedings of the thirteenth annual meeting held February 11th 1836, with the report of the committee [...] for the year 1836 [...]*. Bristol Institution for the Advancement of Science, Literature and the Arts, Bristol.
- ANONYMOUS 1841. Philosophical Institution, Park-street. *Bristol Times and Mirror* 13th February, 2.
- ANONYMOUS 1844. "A desideratum long felt [...]." *Salisbury and Winchester Journal*, 16th November, 3.
- ANONYMOUS 1845. Frome. *Salisbury and Winchester Journal*, 1st February, 3.
- ANONYMOUS 1847a. Geological Society of London. Annual General Meeting, Feb. 19, 1847. Report of the Council. *Quarterly Journal of the Geological Society*, 3, i–xviii.

- ANONYMOUS 1847b. Stated meeting, April 20, 1847. *Proceedings of the Academy of Natural Sciences of Philadelphia*, **3**, 195–198.
- ANONYMOUS 1847c. Stated meeting, June 1, 1847. *Proceedings of the Academy of Natural Sciences of Philadelphia*, **3**, 213–216.
- ANONYMOUS 1848. Donations to Museum in November and December. *Proceedings of the Academy of Natural Sciences of Philadelphia*, **4**, 137–138.
- ANONYMOUS 1849. Bristol Institution. *Bristol Mercury*, **17th February**, 6.
- ANONYMOUS 1860a. The Caves, Banwell. *Bristol Times and Mirror*, **22nd September**, 1.
- ANONYMOUS 1860b. The Caves. *Taunton Courier and Western Advertiser*, **3rd October**, 5.
- ANONYMOUS 1865. *A memoir of Thomas Bellerby Wilson, M.D., prepared in pursuance of a resolution of the Entomological Society of Philadelphia, by a committee*. Entomological Society [of Philadelphia], [Philadelphia].
- ANONYMOUS, 1886. Serious fire at Stancombe Park. *Bristol Mercury*, **16th August**, 3.
- ANONYMOUS, 1888. Deaths. *Western Gazette*, **3rd February**, 1.
- ANONYMOUS 1904. Obituary. Robert Etheridge, F.R.S.L. & E., F.G.S. Born December 3, 1819. Died December 18, 1903. *Geological Magazine*, (5) **1**, 42–49.
- ANONYMOUS 1911. [Special General Meeting]. *Quarterly Journal of the Geological Society*, **67**, cii–ciii.
- ANONYMOUS 1929a. Gloucestershire. *The Times*, **29th June**, 25.
- ANONYMOUS 1929b. Sales by auction. By direction of the personal representative of the late Mrs Purnell-Edwards, Stancombe Park [...]. *The Times*, **24th August**, 20.
- ANONYMOUS 1929c. Contents of Stancombe Park. *The Times*, **11th September**, 15.
- ANONYMOUS 1930. The estate market. Newstead in 1815. A Yorkshire sale. *The Times*, **1st March**, 4.
- BAKER, T.B.L. 1860. Address read to the Cotteswold Naturalists' Club, at their Winter Meeting, held at the Royal Agricultural College, Cirencester, January 30th, 1856. *Proceedings of the Cotteswold Naturalists' Field Club*, **2**, i–v.
- BAKER, W. 1853. The evening meeting [the Williams Museum]. *Proceedings of the Somersetshire Archaeological and Natural History Society*, for **1852**, 5–8.
- BARKER, G.F.R. and CURTHOYS, M.C. 2004. Goodenough, Edmund (1785–1845). *Oxford dictionary of national biography*, online edition. <http://www.oxforddnb.com/view/article/10965>, last accessed 14th November 2016.
- BENSON, R.B.J., EVANS, M. and TAYLOR, M.A. 2015. The anatomy of *Stratesaurus* (Reptilia, Plesiosauria) from the lowermost Jurassic of Somerset, United Kingdom. *Journal of Vertebrate Paleontology*, **35** (4), e933739. doi: 10.1080/02724634.2014.933739
- BENTON, M.J. 2012. Naming the Bristol dinosaur, *Thecodontosaurus*: politics and science in the 1830s. *Proceedings of the Geologists' Association, London*, **123**, 766–778.
- BENTON, M.J. and SPENCER, P.S. 1995. *Fossil reptiles of Great Britain*. Geological Conservation Review Series **10**, Chapman and Hall, London.
- BLAKE, J.F. 1902. *List of the type and figured specimens recognised by C. D. Sherborn, F.G.S., in the collections of the Geological Society of London, verified and arranged, with additions [...]*. Geological Society, London.
- BLANFORD, W.T. 1889. William Hellier Baily. *Quarterly Journal of the Geological Society of London*, **45**, 39–41.
- BRISTOW, C.R. and DONOVAN, D.T. 2015. The litho- and biostratigraphy of the Lias Group of the Glastonbury-Shepton Mallet area, Somerset. *Geoscience in South-West England*, **13**, 377–391.
- BROMWICH, D. 2010. Some visitors to Banwell bone cave. *Proceedings of the Somerset Archaeological and Natural History Society*, **154**, 1–10.
- BUCKLAND, W. 1836. *Geology and mineralogy considered with reference to natural theology*. 2 volumes. Pickering, London.
- [CARPENTER, L.] 1836. A memoir of the Bristol Institution. *Annual Report of the Bristol Institution for the Advancement of Science, Literature and the Arts*, for **1835**, i–xvi [anonymous, see Taylor and Torrens (1987, p. 147) for authorship; also published as a separate pamphlet].
- CHALMERS-HUNT, J.M. (Ed.) 1976. *Natural history auctions 1700–1972: a register of sales in the British Isles*. Sotheby Parke Bernet, London.
- CONYBEARE, W.D. 1822. Additional notices on the fossil genera *Ichthyosaurus* and *Plesiosaurus*. *Transactions of the Geological Society of London*, (2) **1**, 103–123.
- CONYBEARE, W.D. 1824. On the discovery of an almost perfect skeleton of the *Plesiosaurus*. *Transactions of the Geological Society of London*, (2) **1**, 382–389.
- COPP, C.J.T., TAYLOR, M.A. and THACKRAY, J.C. 2000. Charles Moore (1814–1881), Somerset geologist. *Proceedings of the Somerset Archaeological and Natural History Society*, **140**, 1–36.
- CRANE, M.D. 1983. Samuel Stutchbury (1798–1859), naturalist and geologist. *Notes and Records of the Royal Society of London*, **37**, 189–200.
- DAY, W.H. 1984. T. B. Wilson, MD., a founder and benefactor of the American Entomological Society, and his family: our first Newark, Delaware-Philadelphia connection. *Entomological News*, **95**, 137–147.
- DONOVAN, S.K. 2016. The triumph of the Dawsonian method. *Proceedings of the Geologists' Association, London*, **127**, 101–106.
- EUSTACE, K. 2005. Baily, Edward Hodges (1788–1867). *Oxford dictionary of national biography*, online edition. <http://www.oxforddnb.com/view/article/1076>, accessed 17th November 2016.
- FOSTER, S. 2014. Circulating agency: the V&A, Scotland and the multiplication of plaster casts of “Celtic crosses”. *Journal of the History of Collections*, **27**, 73–96.
- FREDERIKSEN, R. and MARCHAND E. (eds). 2010. *Plaster casts. Making, collecting, and displaying from Classical Antiquity to the present*. Walter de Gruyter, Berlin.
- GALTON, P.M. 2007. Notes on the remains of archosaurian reptiles, mostly basal sauropodomorph dinosaurs, from the 1834 fissure fill (Rhaetian, Upper Triassic) at Clifton in Bristol, southwest England. *Revue de Paléobiologie, Genève*, **26**, 505–591.
- GREEN, G.W. and WELCH, F.B.A. 1965. Geology of the country around Wells and Cheddar. *Memoir of the Geological Survey of Great Britain*, Sheet 280 (England and Wales). Geological Survey of Great Britain.
- HAWKINS, T. 1834. *Memoirs of Ichthyosauri and Plesiosauri, extinct monsters of the ancient earth*. 2nd edition. Relfe and Fletcher, London.
- HAWKINS, T. 1853. *The Christiad*. Privately published, London.
- HOME, E. 1819. Reasons for giving the name Proteo-Saurus to the fossil skeleton which has been described. *Philosophical Transactions of the Royal Society*, **109**, 212–216.
- IRWIN, D.J. and RICHARDS, C. 1996. Banwell Bone and Stalactite Caves 1757–1826. *Proceedings of the University of Bristol Spelaeological Society*, **20**, 201–213.
- JONES, B. 1974. *Follies and Grottoes*. 2nd edition. Constable, London.
- KNELL, S.J. 2000. *The culture of English geology, 1815–1851. A science revealed through its collecting*. Ashgate, Aldershot.
- KNIGHT, F.A. 1902. *The Sea-Board of Mendip. An account of the history, archaeology and natural history [...]*. Dent, London.
- LENAGHAN, J. 2014. The cast collection of John Sanders, architect, at the Royal Academy. *Journal of the History of Collections*, **26**, 193–205.
- LOMAX, D.R. and MASSARE, J.A. 2016. Two new species of *Ichthyosaurus* from the lowermost Jurassic (Hettangian) of Somerset, England. *Papers in Palaeontology*, **2016**, 1–20. doi: 10.1002/spp2.1065
- LYDEKKER, R. 1888. Note on the classification of the Ichthyopterygia (with a notice of two new species). *Geological Magazine*, (3) **5**, 309–314.
- LYDEKKER, R. 1889. *Catalogue of the fossil Reptilia and Amphibia in the British Museum (Natural History), Cromwell Road, S.W. Part II. Containing the Orders Ichthyopterygia and Sauropterygia*. British Museum (Natural History), London.
- MAISCH, M.W. 1997. The cranial osteology of *Ichthyosaurus intermedius* CONYBEARE, 1822 from the Lias of Great Britain. *Stuttgarter Beiträge zur Naturkunde*, **B258**, 1–27.
- MARTILL, D.M. 1985. An ichthyosaur with preserved soft tissue from the Sinemurian of southern England. *Palaeontology*, **38**, 897–903.
- MASSARE, J.A. and LOMAX, D.R. 2016. A new specimen of *Ichthyosaurus conybeari* (Reptilia, Ichthyosauria) from Watchet, Somerset, England, U.K., and a reexamination of the species. *Journal of Vertebrate Paleontology*, **36** (5), e1163264. doi: 10.1080/02724634.2016.1163264
- McGOWAN, C. 1974. A revision of the latipinnate ichthyosaurs of the Lower Jurassic of England (Reptilia: Ichthyosauria). *Life Sciences Contributions Royal Ontario Museum*, **100**, 1–30.
- McGOWAN, C. 1990. Problematic ichthyosaurs from Southwest England: a question of authenticity. *Journal of Vertebrate Paleontology*, **10**, 72–79.
- MOORE, D.T., THACKRAY, J.C. and MORGAN, D.L. 1991. A short history of the Museum of the Geological Society of London, 1807–1911, with a catalogue of the British and Irish accessions, and notes on surviving collections. *Bulletin of the British Museum (Natural History)*, Historical Series, **19**, 51–160.

- NORGATE, G. Le G. and MAJOR, E. 2004. Randolph, Francis (1752–1831). *Oxford dictionary of national biography*, online edition. <http://www.oxforddnb.com/view/article/23118>, last accessed 31st March 2016.
- O'CONNOR, R. 2007. *The Earth on show. Fossils and the poetics of popular science, 1802–1856*. University of Chicago Press, Chicago.
- OWEN, R. 1840a. Report on British fossil reptiles [part 1]. *Annual Report of the British Association for the Advancement of Science*, for 1839, Reports of Researches in Science, 43–126.
- OWEN, R. 1840b. Note on the dislocation of the tail at a certain point observable in the skeleton of many Ichthyosauri. *Transactions of the Geological Society of London*, (2) 5, 511–514.
- OWEN, R. 1849–1884. *A history of British fossil reptiles*. 4 volumes. Cassell, London.
- OWEN, R. 1861–1881. A monograph of the fossil Reptilia of the Liassic formations. Part third. *Plesiosaurus, Dimorphodon and Ichthyosaurus*. *Monographs of the Palaeontographical Society*.
- OWEN, R.S. 1894. *The life of Richard Owen* [...]. 2 volumes. Murray, London.
- PHELPS, W. 1836–1839. *The history and antiquities of Somersetsbire; being a general and parochial survey* [...]. 4 volumes. Nichols, London [this work's organization and dating were idiosyncratic, but at least some copies have Volume I with 1836 on the title page, and Volume II with 1839].
- PIERCE, S.E. and BENTON, M.J. 2006. *Pelagosaurus typus* Bronn, 1841 (Mesoeucrocodylia: Thalattosuchia) from the Upper Lias (Toarcian, Lower Jurassic) of Somerset, England. *Journal of Vertebrate Paleontology*, 26, 621–635.
- RIEPEL, L. 2015. Plaster cast publishing in nineteenth-century paleontology. *History of Science*, 53, 456–491.
- SAVOURS, A. 2011. Wilson, Edward Adrian (1872–1912). *Oxford Dictionary of National Biography*, online edition. <http://www.oxforddnb.com/view/article/36952>, last accessed 21st November 2016.
- SHARP, R. 2004. Law, George Henry (1761–1845). *Oxford dictionary of national biography*, online edition. <http://www.oxforddnb.com/view/article/16144>, last accessed 13th April 2016.
- SHARPE, D. 1830. Description of a new species of *Ichthyosaurus*. *Proceedings of the Geological Society of London*, 1, 221–222.
- SHERBORN, C.D. 1940. *Where is the – Collection?* Privately published, Cambridge.
- SMITH, A.S. 2015. Reassessment of “*Plesiosaurus*” megacephalus (Sauropterygia: Plesiosauria) from the Triassic-Jurassic boundary, UK. *Palaeontologia electronica*, 18, 1.20A, 1–19; palaeo-electronica.org/content/2015/1146-plesiosaurus-megacephalus.
- SOLLAS, W.J. 1881. On a new species of *Plesiosaurus* (*P. conybeari*) from the Lower Lias of Charmouth; with observations on *P. macrocephalus*, Stutchbury, and *P. brachycephalus*, Owen. *Quarterly Journal of the Geological Society, London*, 37, 440–480.
- SPAMER, E.E. and DAESCHLER, E. 1995. Previously unfigured type specimens of fossil fish, reptiles, and mammals in the Academy of Natural Sciences of Philadelphia. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 146, 429–458.
- SPAMER, E.E., DAESCHLER, E. and VOSTREYS-SHAPIRO, L.G. 1995. A study of fossil vertebrate types in the Academy of Natural Sciences of Philadelphia. Taxonomic, systematic and historical perspectives. *Academy of Natural Sciences of Philadelphia, Special Publication*, 16, 1–435.
- STUTCHBURY, S. 1846. Description of a new species of *Plesiosaurus*, in the Museum of the Bristol Institution. *Quarterly Journal of the Geological Society, London*, 2, 411–417.
- SULLIVAN, M.G. 2010. Chantrey and the original models. In: FREDERIKSEN, R. and MARCHAND, E. (eds), *Plaster casts. Making, collecting, and displaying from Classical Antiquity to the present*. Walter de Gruyter, Berlin, 289–306.
- SULLIVAN, M.G. 2016. A sculptural gift and the history of the Earth. Sir Francis Chantrey, William Buckland, and the geological milieu. *Journal of the History of Collections*. doi: 10.1093/jhc/fhv046
- SWINTON, W.E. 1948. Plesiosaurs in the City Museum, Bristol. *Proceedings of the Bristol Naturalists' Society*, 27, 343–360.
- TAYLOR, M.A. 1994. The plesiosaur's birthplace: the Bristol Institution and its contribution to vertebrate palaeontology. *Zoological Journal of the Linnean Society*, 112, 179–196.
- TAYLOR, M.A. 1997. Before the dinosaur: the historical significance of the fossil marine reptiles. In: CALLAWAY, J.M. and NICHOLLS, E.L. (eds), *Ancient marine reptiles*. Academic Press, San Diego, xix–xlvi.
- TAYLOR, M.A. 2005. Hawkins, Thomas (1810–1889). *Oxford dictionary of national biography*, online edition. <http://www.oxforddnb.com/view/article/12682>, last accessed 13th April 2016.
- TAYLOR, M.A. 2014. Rediscovery of an *Ichthyosaurus breviceps* Owen, 1881 sold by Mary Anning (1799–1847) to the surgeon Astley Cooper (1768–1841) and figured by William Buckland (1784–1856) in his Bridgewater Treatise. *Geoscience in South-West England*, 13, 321–327.
- TAYLOR, M.A. and TORRENS, H.S. 1987. Saleswoman to a new science: Mary Anning and the fossil fish *Squaloraja*. *Proceedings of the Dorset Natural History and Archaeological Society*, 108, 135–148.
- TORRENS, H.S. 1998. Geology and the natural sciences: some contributions to archaeology in Britain 1780–1850. In: BRAND, V. (Ed.), *The study of the past in the Victorian age. Oxbow Monographs*, 73, 35–59.
- TORRENS, H.S. 2008. A saw for a jaw. *Geoscientist*, 18 (12), 18–21.
- TORRENS, H.S. and TAYLOR, M.A. 1990. Geological collectors and museums in Cheltenham 1810–1988: a case history and its lessons. *Geological Curator*, 5, 175–213.
- WALLIS, F.S. 1977 Ms. *Wallis's recollections of Bristol Museum* [interview recorded and transcribed by CRANE, M.D. and COPP, C.J.T.], BRSMG Geology Ms. 76.
- WATSON, C.M. 1909. *The life of Major-General Sir Charles William Wilson Royal Engineers K.C.B., K.C.M.G., F.R.S., D.C.L., LL.D., M.E.* Murray, London.
- WILLIAMS, M. 2008. Of canals and quarries: the Bath geologists. In: WALLIS, P. (Ed.), *Innovation and discovery: Bath and the rise of science*. Bath Royal Literary and Scientific Institution and The William Herschel Society, Bath, 42–54.
- WILSON, E. 1890. Fossil types in the Bristol Museum. *Geological Magazine*, (3) 7, 363–372.
- WOOLRICH, A.P. 2004. Williams, David (1792–1850). *Oxford dictionary of national biography*, online edition. <http://www.oxforddnb.com/view/article/29495>, last accessed 13th April 2016.
- WYSE JACKSON, P. 2004. Thomas Hawkins, Lord Cole, William Sollas and all: casts of Lower Jurassic marine reptiles in the Geological Museum, Trinity College, Dublin, Ireland. *Geological Curator*, 8, 11–18.

NOTE ADDED IN PROOF

Another cast of Ichthyosaur A (whole animal) is at Derby Museum and Art Gallery (The Strand, Derby DE1 1BS) (Dean Lomax, *pers. comm.* 2016). Spencer Bailey (Derby Museum; *pers. comm.* 2016) kindly states that it is labelled “*Ichthyosaurus latimanus* (Owen) from the Lias Somersetsbire. The original specimen in the Bristol Institution. Presented by H. Riley, Esq, M.D.”, but that it might have been given to the museum in Burton-on-Trent, and only later transferred to Derby. Dr Henry Riley (1797–1848), of *Thecodontosaurus* fame, was active in the Bristol Institution (Taylor and Torrens, 1987; Taylor, 1994; Benton, 2012). Presumably, Riley paid for this cast, reminding us that the donor of a cast need not be the owner of the original – an important point when tracing provenances.

New publications relevant to the present paper are: Massare and Lomax (2017, *in press*); Taylor (2016), with further illustrations, especially of BNSS 30489; and Taylor and Evans (2016).

MASSARE, J. A. and LOMAX, D. R. 2017 *in press*. A taxonomic reassessment of *Ichthyosaurus communis* and *I. intermedius* and a revised diagnosis for the genus. *Journal of Systematic Palaeontology*, 15 pp. doi: 10.1080/14772019.2017.1291116.

TAYLOR, M.A. 2016. 19th Century plaster casts of Lower Jurassic ichthyosaurs and plesiosaurs in the Bristol Institution for the Advancement of Science, Literature and the Arts, and the Academy of Natural Sciences, Philadelphia. *The Geological Curator*, 10, 277–281.

TAYLOR, M.A. and EVANS, M. 2016. A plesiosaur from the Lower Lias of Watchet, Somerset, in the collection of the Reverend David Williams F.G.S. (1792–1850) and its casts. *The Geological Curator*, 10, 269–272.