

Obituary: Philip Roy Pugh

25 June 1944 - 24 November 2021

Philip Pugh was an Emeritus Fellow at the National Oceanography Centre, Southampton, having retired in 2004. Phil specialised in the taxonomy of siphonophores. When Phil first started at the UK National Institute of Oceanography (NIO), approximately 130 valid species of siphonophores were known. Presently, this total stands at 190, and Phil described 45 new species (24% of known species), 11 genera, one subfamily, and four families, with several species descriptions in progress when he died. He described more species of siphonophores than anyone who has ever lived - an incredible achievement. His reviews and taxonomic syntheses were extremely important as they brought order to several confused siphonophore families, stimulating further discovery. He had an Antarctic siphonophore named after him, *Sphaeronectes pughi* Grossmann, Lindsay & Fuentes, 2012, which wouldn't have been identified without his work. Phil also named a siphonophore, *Parerenna emilyae* Pugh, 2001, for his daughter Emily, and *Nectadamas richardi* Pugh, 1992, for his son Richard, who died in infancy.

Stimulated by pioneering work on geographic succession of decapods in relation to ocean circulation, the NIO initiated a programme to investigate the vertical structure of Atlantic deep-sea communities at 10 degree latitude intervals, with sample collections between October 1969 and May 1972. The biology group was expanded to work on this material, bringing in Phil in 1971 (as well as NOC Emeritus Fellows Mike Thurston, to work on amphipods, and Howard Roe, for copepods). When Phil joined the NIO, he worked primarily on phytoplankton, developing a new fluorometer in collaboration with Mike Fasham and Chelsea Instruments Ltd. This was for the quantification of chlorophyll in surface waters while the ship was underway, but Phil also adapted the method for vertical profiling of large volumes of seawater in the upper 100m of the water column using a gigantic hose pipe.

Phil began work on a specific group of cnidarians, known as siphonophores, and these became the focus of his life's work. The only famous siphonophore is the Portuguese Man O' War, which differs from the majority of other species, which are nektonic. Phil described the relatively well-known attached siphonophore, *Thermopalia taraxaca* Pugh, 1983, the Galapagos Dandelion, first seen during the original discovery of hydrothermal vents (1977) and collected during the 1979 Galapagos Rift Expedition. Species from this family are unusual in attaching themselves to the seafloor, floating above the bottom like tethered hot-air balloons.

Initially, Phil identified the specimens collected by the NIO (which became the Institute of Oceanographic Sciences in 1972) Rectangular Midwater Trawls (RMT) opening/closing net system. The siphonophores were an important part of the RMT net collections but no one was working on them in 1971. The RMT net was not ideal for siphonophores as it broke up these fragile gelatinous zooplankton into a myriad of pieces (some species are comprised of hundreds, possibly thousands of individual zooids).

Phil accompanied Mike Fasham on a trip to Woods Hole Oceanographic Institution (WHOI) in 1978 and met both Richard Harbison and Richard's assistant, Vicki McAlister, who were using

SCUBA diving techniques to collect animals *in situ* in the top 30m of the water column. This led to an invitation, in 1979, to participate on one of Richard's cruises off the Bahamas, and Phil became aware of the true splendour of a complete siphonophore specimen. Phil and Vicki were married in 1980.

In 1984, Dr Harbison obtained a grant to use one of the Harbor Branch Oceanographic Institution's (HBOI) submersibles, Johnson-Sea-Link (JSL) I and II, in the *Tongue of the Ocean*, The Bahamas. Phil was fortunate to be invited on that cruise and to be allowed to be the observer on several dives. The submersible was well equipped for collecting animals and many siphonophore specimens were collected. The commonest of these was a species first described in 1879, in the Mediterranean, and never recorded since.

Dr Harbison invited Phil on several more cruises using either SCUBA diving or the HBOI submersibles and, thus, Phil was able to build up a unique collection of siphonophores including many that were new to science. On his last JSL cruise, in 1989, Phil met up with a young PhD student, Steve Haddock, who later was to be employed by the Monterey Bay Aquarium Research Institute (MBARI). MBARI has two Remotely Operated Vehicles (ROVs) that can be equipped with same collecting devices as were on the JSL submersibles, and so were ideal for collecting specimens in mid-water. In the early 2000s Dr Haddock offered Phil a place on one of his cruises and he eventually accepted the opportunity in 2003. This was an even greater revelation than using the submersibles, and in his retirement, up until 2010, Phil financed himself to go on a further nine of Dr Haddock's cruises. This resulted in the collection of over 1200 specimens of siphonophores, on top of the 500 JSL specimens and the 500+ SCUBA collected ones. As these specimens were collected during cruises funded by U.S. agencies, they were recently deposited in the Peabody Museum of Natural History, at Yale University.

Phil's research was transformed after 2002, when Larry Madin invited both Phil and Casey Dunn to join a cruise on the RV *Oceanus*. Phil's ongoing mentorship of Casey was a transformative force in his studies, research, and career. This new collaboration between Phil, Steve Haddock and Casey Dunn resulted in the first use of new molecular techniques to study siphonophores and was published in 2005. Casey recalls how exciting it was to work with Phil to take what was known about siphonophore diversity and place it in this new phylogenetic context. In his later research, Phil embraced the combined use of morphological and molecular taxonomy.

Phil made a significant, but unsung, contribution to the Ocean Biogeographical Information System (OBIS) by collating a large database of North Atlantic midwater biological data collected by the Institute of Oceanographic Sciences in the 1960s to 1980s. The Midwater Database at the time contributed to one third of all OBIS records. It has been a significant contribution by NOC to the long-term data stewardship of the oceans. The then Director of NOC, Professor Howard Roe, planned the donation, but it was Phil that made it happen.

In 2018, Phil published an observation of a siphonophore in deep waters off Angola that hit the global press for its resemblance to a satirical deity, the 'Flying Spaghetti Monster'. He provided lots of information to eager journalists and he was delighted to see that his work even featured in the widely syndicated "Sherman's Lagoon" newspaper cartoon strip.

During his long career at NIO/IOS/SOC and NOC, Phil took part in over 50 research expeditions, published more than 100 papers and reports, and described 66 taxa new to science, becoming the world authority on his beloved siphonophores (a title he retains to this day). He was a much-loved character, who like all taxonomists continued his work long after retirement. He will be greatly missed by all those who knew him and worked closely with him. He leaves behind his loving wife Vicki, his daughter Emily, son-in law James, and granddaughter, Nina.

The charity BLISS was very important to Phil and Vicki, and if you would like to remember Phil, then please consider providing a donation to the charity through the following page:

<http://bliss.epwebsites.co.uk/donate>

There is a video of Phil describing his encounters with siphonophores [here](#)



Phil Pugh

Career Summary

1962-1965	Undergraduate in Department of Zoology, University of Southampton. Obtained 1 st Class Honours Degree.
1965-1968	NERC Postgraduate studentship in Oceanography Department, University of Southampton. Obtained Ph.D. in 1969 titled "Studies on the sinking rates of <i>Coscinodiscus eccentricus</i> Ehrenberg, with special reference to changes in its biochemical composition." Supervisor Dr. A.P. M. Lockwood.
1969-1971	NERC Postgraduate fellowship at Queen Elizabeth College, University of London.
1971-1979	Senior Scientific Officer at National Institute of Oceanography (NIO), later Institute of Oceanographic Sciences (IOS).
1979- June 30 th 2004	Principal Scientific Officer at Institute of Oceanographic Sciences, later Southampton Oceanography Centre (SOC), and then National Oceanography Centre (NOC).
1 st July 2004 - 2021	Honorary Research Fellow (HRF) at NOC

Publications

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Species described

1.	134.	<i>Rosacea flaccida</i>	Biggs, Pugh & Carré 1978	BW
2.	136.	<i>Angelopsis euryale</i>	Pugh 1983	OT
3.	137.	<i>Thermopalia taraxaca</i>	Pugh 1983	SUB/ROV
4.	138.	<i>Craseoa lathetica</i>	Pugh & Harbison 1987	SUB/ROV
5.	139.	<i>Mistoprayina fragosa</i>	Pugh & Harbison 1987	SUB/ROV
6.	140.	<i>Prayola urinatrix</i>	Pugh & Harbison 1987	SUB
7.	142.	<i>Halistemma transliratum</i>	Pugh & Youngbluth 1988a	SUB/RMT
8.	143.	<i>Rosacea repanda</i>	Pugh & Youngbluth 1988b	SUB
9.	144.	<i>Rosacea limbata</i>	Pugh & Youngbluth 1988b	SUB
10.	145.	<i>Nectadamas richardi</i>	Pugh 1992a	RMT
11.	146.	<i>Desmophyes haematogaster</i>	Pugh 1992b	SUB/ROV
12.	148.	<i>Clausophyes laetmata</i>	Pugh & Pagès 1993	MN
13.	149.	<i>Clausophyes tropica</i>	Pugh 1995	RMT
14.	150.	<i>Archangelopsis jagoa</i>	Hissmann, Schauer & Pugh, 1995	SUB
15.	152.	<i>Bargmannia amoena</i>	Pugh, 1999	SUB/ROV
16.	153.	<i>Bargmannia gigas</i>	Pugh, 1999	RMT
17.	154.	<i>Erenna laciniata</i>	Pugh, 2001	SUB/ROV
18.	155.	<i>Erenna cornuta</i>	Pugh, 2001	SUB/ROV
19.	156.	<i>Parerenna emilyae</i>	Pugh, 2001	SUB
20.	157.	<i>Rosacea arabiana</i>	Pugh, 2002	RMT
21.	158.	<i>Forskalia asymmetrica</i>	Pugh, 2003	SUB/ROV
22.	159.	<i>Forskalia saccula</i>	Pugh, 2003	SUB
23.	160.	<i>Physophora gilmeri</i>	Pugh, 2005	SUB/ROV
24.	164.	<i>Marrus claudanielis</i>	Dunn, Pugh & Haddock, 2005	SUB/ROV
25.	165.	<i>Gymnoprara lapislazula</i>	Haddock, Dunn & Pugh, 2005	ROV
26.	166.	<i>Lilyopsis fluoracantha</i>	Haddock, Dunn & Pugh, 2005	ROV
27.	168.	<i>Resomia ornicephala</i>	Pugh & Haddock, 2009	ROV
28.	169.	<i>Resomia persica</i>	Pugh & Haddock, 2009	ROV
29.	170.	<i>Resomia dunni</i>	Pugh & Haddock, 2009	ROV
30.	171.	<i>Sphaeronectes christiansonae</i>	Pugh, 2009	ROV

31.	172.	<i>Sphaeronectes haddocki</i>	Pugh, 2009	ROV
32.	173.	<i>Sphaeronectes tiburona</i>	Pugh, 2009	ROV
33.	176.	<i>Apolemia lanosa</i>	Siebert, Pugh, Dunn & Haddock, 2013	ROV
34.	177.	<i>Apolemia rubriversa</i>	Siebert, Pugh, Dunn & Haddock, 2013	ROV
35.	178.	<i>Halistemma maculatum</i>	Pugh & Baxter, 2014	SUB
36.	180.	<i>Cordagalma abyssorum</i>	Pugh, 2016	ROV
37.	181.	<i>Cordagalma rugosum</i>	Pugh, 2016	ROV
38.	182.	<i>Cordagalma bimaculatum</i>	Pugh, 2016	SUB/ROV
39.	183.	<i>Cordagalma isocarrei</i>	Pugh, 2016	ROV
40.	184.	<i>Cardianecta parchelion</i>	Pugh, 2016	SUB
41.	185	<i>Erenna insidiator</i>	Pugh & Haddock, 2016	ROV
42.	186	<i>Erenna sirena</i>	Pugh & Haddock, 2016	ROV
43.	187	<i>Tottonophyes enigmatica</i>	Pugh, Dunn & Haddock, 2018	ROV
44.	188	<i>Bargmannia stenotes</i>	Pugh, 2019	ROV
45.	189	<i>Bargmannia profunda</i>	Pugh, 2019	ROV

Cruises

1. - 16 April 1971.	53°N. Discovery Cruise 39
2. 4 February – 16 April 1972	11, 18 & 30 °N. Discovery Cruise 45
3. 17 February – 28 March	32°N transect and Bermuda. Discovery Cruise 52
4. 30 March – 16 May 1974	44°N 13°W. Discovery Cruise 61
5. 17 July - 13 August 1974	GATE Discovery Cruise 64
6. 15 August – 29 August. 1974	8°N Discovery Cruise 65
7. 31 November - 15 December 1974	Repeat 9 & 10 Discovery Cruise 66
8. ? January – 18 February 1975	Meteor upwelling cruise.
9. 18 February – 18 March 1975	Upwelling Discovery Cruise 69.
10. c. 15-21 July 1975	Pingree Sarsia Cruise 1.
11. 9-23 March 1976	Pingree Sarsia Cruise 2.
12. ?	Pingree Sarsia Cruise 3
13. ?	Pingree Sarsia Cruise 4
14. 15 July – 31 August 1976	Herring Discovery Cruise 77.
15. 21 March - 3 May 1977	Upwelling Cruise Discovery 82.
16. 4 April – 23 May 1978	PSB Discovery Cruise 92.
17. 30 January - 4 April 1979	Antarctic Discovery Cruise 100.
18. 10 April – 23 April 1979	Fasham Challenger Cruise 79/5
19. c. 16 June – 16 July 1979	Harbison GW Pierce Sargasso Sea BWP 1
20. 16 October – 20 November 1980	Azores Discovery Cruise 114
21. 9 May – 1 June 1981	Azores Front Discovery Cruise 120
22. 5 June – 26 June 1981	Azore Front 2 Discovery Cruise 121
23. 2 May – 26 May 1982.	Guinea Basin Discovery Cruise 128.
24. c. 12 July – 4 August 1983	Harbison Atlantis Brazil BWP 2
25. 27 March – 24 April 1984	Stratification Discovery Cruise 146.
26. c. 12 October – 5 November 1984	Sea Diver/Cape Florida JSL Bahamas Cruise 1

27. 18 June – 9 July 1985	GME prelim Discovery Cruise 156.
28. c. 19 May – 18 June 1986	Harbison Oceanus 176 Canaries BWP 3
29. 30 August – 3 September 1986	Harbison Sea Link JSL Canyons Cruise 1
30. -7 September 1989	Harbison Sea Link JSL Canyons Cruise 2 (aborted)
31. 23 June - 7 July 1987	BIOTRANS Discovery Cruise 175
32. c. 1-10 August 1987	Harbison Sea Link JSL Canyons Cruise 3
33. c. 26 August – 5 September 1987	Harbison JSL Dry Tortugas Cruise
34. c.1 – 13 August 1988	Harbison Sea Link JSL Bahamas Cruise 2
35. c.1 – 20 November 1989	Harbison JSL Bahamas Cruise Cruise 3
36. c. 4 – 26 April 1991	Widder Albarán Sea JSL Cruise
37. 23 June – 3 July 1993	Poseidon Cruise.
38. 11 April – 7 May 1994	PSB Charles Darwin Cruise 85.
39. 3 August – 22 August 1994	Arabian Sea Discovery Cruise 209
40. 30 December 1996 - 17 Jan 1997	Alborán Sea Discovery Cruise 224.
41. 11 - ? November 2001	Madin Oceanus Cruise BWP with Casey
42. 17 – 22 July 2003	Haddock MBARI Western Flyer Cruise 1
43. 21 – 20 May 2004	Haddock MBARI Western Flyer Cruise 2
44. 4 – 11 October 2004	Haddock MBARI Western Flyer Cruise 3
45. 5- 11 April 2005	Haddock MBARI Western Flyer Cruise 4
46. 10-18 May 2006	Haddock MBARI Western Flyer Cruise 5
47. 27 July – 2 August 2007	Haddock MBARI Western Flyer Cruise 6
48. 27 November – 3 December 2007	Haddock MBARI Western Flyer Cruise 7
49. 36 May – 2 June 2009	Haddock MBARI Western Flyer Cruise 8
50. 29 March – 1 May 2010	Haddock MBARI Western Flyer Cruise 9
51. 3 May 2010	Haddock MBARI Point Lobos Cruise.