



Legacy of excellence: The life and contributions of Dale Ralph Calder, eminent cnidarian taxonomist (1941–2022)

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Dale Ralph Calder (Figures 1, 2) was born on April 16, 1941, in St. Stephen, New Brunswick, Canada, to Mr. and Mrs. Wilfred Calder. He grew up on Deer Island in the Bay of Fundy. His formative education was undertaken at the United Baptist Bible Training School in Moncton, New Brunswick, culminating in his graduation in June 1960 (Calder 1966).

In September 1960, Calder commenced his tertiary education at Acadia University in Wolfville, Nova Scotia, attaining his Bachelor of Science with Honors (B.Sc. Hons) in Biology in August 1964. During this time, he was mentored by Professor John Sherman Bleakney, a naturalist of considerable breadth who researched diverse vertebrate and invertebrate groups across varied habitats, including caves and infralittoral zones, pioneering the use of SCUBA diving in such studies (Daborn 2021). Bleakney guided Calder in the biospeleology of Nova Scotia's caves (Calder & Bleakney 1965, 1967) and influenced his research on the marine fauna of the Bay of Fundy. More than five decades later, Calder honored Bleakney by naming the hydrozoan species *Eudendrium bleakneyi* Calder, 2017, from the Bay of Fundy, describing him as “an esteemed mentor who contributed greatly to the content of this work” (Calder 2017: 31; see also Daborn 2021).

In 1964, Calder relocated to the USA to pursue a master's degree in Marine Science at the College of William & Mary in Williamsburg, Virginia. Under the tutelage of Morris L. Brehmer, he earned his *Artium Magister* (A.M.) degree in 1966. His thesis was on the ecology of marine invertebrate fouling in Chesapeake Bay, in Hampton Roads, Virginia, where one of the most abundant organisms was the hydrozoan *Thuiaria argentea* (Linnaeus, 1758) (Calder 1966). This marked the commencement of his journey in medusozoan research, to becoming among the most respected of medusozoan researchers.

Continuing under the supervision of Brehmer, Calder pursued his doctoral studies at the same institution, acquiring his Doctor of Philosophy (Ph.D.) in Marine Science in 1968. His dissertation centered on the taxonomy of hydroids in southern Chesapeake Bay, documenting 55 species, including 43 hydroids and 32 medusae, and encompassed biogeographic and ecological analyses, phenological insights, and life history data for four select species (Calder 1968). Notably, his acknowledgments showed his contact with prominent cnidarian scholars of the era, such as Sears Crowell, Indiana University; P.L. Kramp and K.W. Petersen, Universitetets Zoologiske Museum, Copenhagen, Denmark; N.A.H. Millard, Zoology Department, University of Cape Town, South Africa; and W.J. Rees, British Museum (Natural History), London, England. Calder's work soon elevated him to the esteemed ranks of these cnidariologists. This early research on hydroids marked his primary area of concentration for the duration of Calder's career; while his numerous works encompassed the systematics of various cnidarian taxa and their morphology, biogeography, life cycles, and ecology, he is best known for his contributions to hydrozoan taxonomy and systematics as a hydroid taxonomist.



Dale Ralph Calder.

Dale Ralph Calder

FIGURE 1. Dale Calder at the Royal Ontario Museum (likely in 1990–1992) and his signature (from his master’s thesis, in 1966).

Upon completing his doctorate in August 1968, Dale returned briefly to Canada for a post-doctoral tenure at the Invertebrate Section of the National Museum of Natural Sciences (now Canadian Museum of Nature) in Ottawa, Ontario. His subsequent publications on Medusozoa, predominantly derived from his research in Virginia, focused on freshwater and brackish hydromedusae, species now recognized as introductions. This period was also marked by his contribution to *Nature* on the discovery of the hydromedusa *Maeotias inexpectata* Ostroumoff, 1896 [now *Maeotias marginata* (Modeer, 1791)] in North America (Calder & Burrell 1969).

The period following his post-doctoral work was a time of increasing professional stability for Calder. Once again, he left for the United States in September 1969, to take up appointments as Associate Marine Scientist at the Virginia Institute of Marine Science in Gloucester Point and Assistant Professor at the William & Mary School of Marine Science in Williamsburg, Virginia, both positions continuing until August 1973. Additionally, between July 1970 and August 1973, he served as Assistant Professor in the Department of Biology at the University of Virginia, Charlottesville. It was during this period that he conducted his initial formal research on Scyphozoa, particularly focusing on the study of nematocysts (Calder 1971, 1972a) and life cycles (Calder 1972b, 1973), as well as taxonomic and faunistic surveys of planktonic and benthic Hydrozoa and Scyphozoa.

In September 1973, Calder moved further south to Charleston, South Carolina, where he served as Associate Marine Scientist (Benthic Ecology) at the Marine Resources Research Institute, South Carolina Wildlife and Marine Resources Department. In June 1974, he also took on the role of Adjunct Assistant Professor in the Department of Biology at the College of Charleston. His research interests continued to include taxonomy/faunistics (e.g., Calder 1975) and the ecology of hydroids (e.g., Calder 1976a), as well as studies on the life cycle (e.g., Calder 1974a) and cnidome (Calder 1974b, 1977) of Scyphozoa. A significant contribution during this period was Calder & Peters (1975), in which he utilized cnidome data from *Chiropsalmus quadrumanus* to discuss the systematic status of the Cubomedusae, concluding that the cnidome, “together with differences in morphology and life history, supports the conclusion that the Cubomedusae are outside the mainstream of scyphozoan phylogeny and should be separated from the remaining orders of the class. While it is possible that a new class, the Cubozoa, should be recognized for the sea wasps (Werner 1973), a more conservative change in classification would involve recognizing two subclasses of Scyphozoa, one for the Cubomedusae and one for the remaining four orders of the class.” Calder departed from both positions in August 1981 and returned to his native country.



FIGURE 2. Dale Calder in Victoria, Canada in 2017, on a visit to work on the C.M. Fraser hydroid collection at the Royal BC Museum. Photo: Henry Choong.



FIGURE 3. *Zyzyzus warreni*, a species originally described by Calder (1988), which was subsequently renamed in his honor as *Zyzyzus calderi* Petersen, 1990, but is currently accepted again under its original name, *i.e.*, *Zyzyzus warreni* Calder, 1988. Photo: Alvaro Migotto.

Back in Canada in September 1981, Calder was appointed as Associate Curator, Invertebrate Zoology at the Royal Ontario Museum (ROM), Department of Natural History, in Toronto, later becoming Senior Curator. From December 1983 onwards, he also served as Associate Professor in the Department of Ecology and Evolutionary Biology at the University of Toronto.

Calder's research also included assessing environmental impacts, authoring and co-authoring various technical reports, including reports for the United States Army Engineers (e.g., Van Dolah *et al.* 1984). Gradually, his work on Scyphozoa became less frequent (e.g., Calder 1982, 1983, 2009a), and his focus shifted primarily towards hydroids.

His faunistic works, based on extensive and meticulous studies of multiple collections (e.g., Calder 1988, 1991a, 1997 for Bermuda; Calder & Vervoort 1998 for the North Mid-Atlantic Ridge; Calder 2010, 2020 and Calder & Faucci 2021 for the Hawaiian archipelago; Calder 2017 for Bay of Fundy; Calder 2019 for Florida, among many others), reached the highest level of quality, provided him broad global perspectives, and became seminal references for students in the field. Beyond his taxonomic contributions, it is important to highlight that Calder also produced significant collaborative works in ecology and biogeography, which brought some unique insights to the group (e.g., Calder 1990, 1991b, 1992, 1993, 1998).

From 1983 to 2021 Calder authored names for 55 taxa. This includes one scyphozoan subclass (Coronamedusae Calder, 2009a) and a variety of hydroids: two families (one anthoathecate and one leptothecate), nine genera (four anthoathecates and five leptothecates), 42 species (14 anthoathecates and 28 leptothecates), and one leptothecate subspecies. These are just a few examples of the numerous contributions which are part of Calder's immense legacy in the field of hydrozoan taxonomy and systematics.

Four taxa bear the honor of being named after Dale Calder: the anthoathecates *Zyzyzus calderi* Petersen, 1990 (currently accepted as *Zyzyzus warreni* Calder, 1988) and *Hydractinia calderi* Bouillon, Medel & Peña Cantero,

1997 (currently accepted as *Hydractinia proboscidea* (Hincks, 1868)); as well as the leptothecates *Halecium calderi* Galea, 2010 and *Sertularella calderi* Galea, 2013.

Another remarkable contribution from Calder to the scientific community was his meticulously crafted historical biographies of cnidariologists. These biographies, set within the context of the scientific developments in the field, were rich and detailed, providing insights into the lives and works of notable figures such as John McCrady (Stephens & Calder 1992); Samuel L. Clarke (Calder & Stephens 1997); Charles Cleveland Nutting (Calder 2004); Alfred Goldsborough Mayor (Stephens & Calder 2006); Thomas Hincks (Calder 2009b); Charles Wesley Hargitt (Calder 2009c); Jesse Walter Fewkes (Stephens & Calder 2010); Gustav Heinrich Kirchenpauer (Calder & Brinckmann-Voss 2011); Harry Beal Torrey (Calder 2013); Axel Elof Jäderholm (Calder 2014); George James Allman (Calder 2015); contributions to expeditions in Brazil (Grohmann *et al.* 2016); Addison Emery Verrill (Calder & Drew 2020); and Laura Roscoe Thornely (Calder 2021).

As taxonomists, we are accustomed to thinking of these researchers in the context of their academic works, but Calder's biographies brought a human component to their lives and careers. Rather than simply summarizing and listing their works, Calder's historical research exhibited his life-long willingness and desire to always dig deeper and to go further in his scholarship. This is reflected in an anecdote relative to his and Lester Stephens' book on the famous marine biologist Alfred Goldsborough Mayor. In May 2004, Calder and James Carlton took part in a field expedition sampling San Francisco Bay (California) float (pontoon) fouling communities. One evening, over the elegant dinners that characterized such field work (pizza), Calder casually mentioned that he and Stephens had recently completed their book manuscript on Mayor's life and career, but, very disappointingly, had been unable to track down any living family members, despite a good deal of effort trying to do so. To Calder's delight and amazement, Carlton mentioned that he knew where Mayor's descendants were: In 1999, one of Carlton's students had casually mentioned to him that her great-grandfather was a famous marine biologist, and wondered if Carlton knew the name Alfred Goldsborough Mayor (to which Carlton replied that he did indeed know). It turned out that her grandfather, Mayor's son Brantz, was still alive in his 90s, living in New England, but the family was unsure of what to do with the trunks of Alfred's papers, manuscripts, and photographs in the family attic (throw absolutely nothing away, Carlton said). Stopping production of their book, and only slightly more than one month later, Calder and Stephens found themselves sitting in the Mayors' living room in New Hampshire, talking with Brantz (then 98) and his wife Ana, who generously gave Calder and Stephens full access to their archives.

Calder produced at least 139 publications comprising over 5,000 pages. He collaborated with 100 co-authors, primarily from the United States and Canada, but also from Brazil, England, Japan, Mexico, the Netherlands, and Spain, among others. His most frequent co-authors were Choong, Knott, and Van Dolah (with 8 publications); Boothe Jr., Carlton, and Stephens (6); (8); Bearden, Brinckmann-Voss, Marques, and Migotto (4); Chapman and Vervoort (3). The most common themes of his contributions included taxonomy/faunistics (in 83 publications), ecology (27), environmental impacts (14), and biographies/history (14) (Table 1), mostly related to Hydrozoa (in 96 publications), general benthos (18), and Scyphozoa (14). The majority of his work was conducted with materials from the Eastern United States (in 54 publications), followed by Bermuda (13), the Pacific coast of the USA and Canada (10), the Atlantic coast of Canada (6), Hawaiian Islands (5), Belize (4), and Northern Canada, Gulf of Mexico, Galapagos Islands, Brazil, and Japan (3). However, Calder worked with faunal materials from more than 29 countries/regions, and 21 of his works had a broad geographical scope.

TABLE 1. Themes included in the 139 publications authored/co-authored by Dale Calder. # publications = number of publications.

Theme	# publications
Taxonomy/faunistics/nomenclature	83
Ecology/biogeography	27
Fisheries/environmental impacts	14
Biography/historical	13
Life cycles	8
Nematocysts	6
Speleology	4

TABLE 2. Taxa included in the 139 publications authored/co-authored by Dale Calder. # publications = number of publications.

Taxon	# publications
Hydrozoa	97
benthos	18
Scyphozoa	14
Cnidaria	6
Arthropoda	6
Cubozoa	5
Ctenophora	1
Asciacea	1
Mollusca	1

TABLE 3. Countries and regions included in the 139 publications authored/co-authored by Dale Calder. # publications = number of publications.

Country / region	# publications
Eastern USA	54
Broad/global	21
Bermuda	13
Western Canada	10
Western USA	10
Eastern Canada	6
Hawaii	5
Belize	4
Canada (terrestrial)	3
Northern Canada	3
Gulf of Mexico	3
Galapagos Islands	3
Brazil	3
Japan	3
Eastern Mexico	2
Caribbean	1
Peru	1
Pacific Colombia	1
Ecuador	1
Pacific Central America	1
Pacific Costa Rica	1
Western Mexico	1
Caribbean Panama	1
Mid-Atlantic Ridge	1
Sweden	1
South Africa	1
New Caledonia	1
Guam	1
Northern Marianas Islands	1
Arctic Sea	1

A careful and thorough systematist, Calder's expertise in taxonomy, his appreciation for understanding the history of hydroid studies, his meticulous attention to detail in taxonomic work, his absolute care in all aspects of zoological nomenclature, and his altruism in always being willing to assist his colleagues were qualities that undoubtedly led to his appointment as a Commissioner of the International Commission on Zoological Nomenclature from November 2000 to June 2006. In this role, he contributed significantly beyond his specific field of study of medusozoan taxonomy and systematics.

Similarly, Calder's academic and personal qualities made him one of the finest reviewers in the field of cnidarian taxonomy and one of the inaugural editors of the journal *Zootaxa*, where he served from 2005 to 2013. In these roles, he set an exceptional example of how to conduct collaborative and healthy science. His dedication and consideration for his colleagues were unparalleled—he consistently elevated the quality of submitted articles, assisted in taxonomic, nomenclatural, and linguistic aspects, and tirelessly reviewed extensive manuscripts. As a reviewer, he frequently went beyond his already-rigorous evaluation of manuscripts, particularly those of students or younger authors, mainly from non-anglophone countries, offering gentle guidance and encouragement that invariably resulted in much-improved publications. Later, even as his health declined and made it difficult for him to complete his own projects, he never refused to review a manuscript or to provide advice. His efforts undoubtedly stimulated cnidarian study and raised the field's standard through his example, knowledge, generosity, and integrity.

In December 2002, Calder concluded his affiliation with the University of Toronto. Subsequently, he became Curator Emeritus at the Royal Ontario Museum after taking early retirement in December 2003 for family reasons. Calder's first spouse, Elizabeth Mae Secord, passed away in 2004. He remarried in 2008 to Rae Ding. Post-retirement, he and his family developed a routine of traveling south to Florida each northern winter. However, far from slowing down, Calder remained active in research after retirement; freed from curatorial, administrative, and other museum duties, he could concentrate on hydrozoan work.

On May 6, 2011, Calder received the Distinguished Alumni Award from Crandall University (previously the United Baptist Bible Training School, where, as we have noted, he attended in the late 1950s). The religious aspect of Calder's upbringing played an important part in his life; in 1990 he co-edited a book on the history of the Ebenezer/Renforth Church in Etobicoke, Ontario, Canada, where he lived (Allen & Calder 1990).

2011 was also the year of the catastrophic earthquake and tsunami in northern Japan which resulted in the release of a large amount of anthropogenic debris into the Pacific Ocean. Calder's expertise in hydroid taxonomy contributed to the understanding of successful transoceanic transport of coastal marine organisms and communities following this tragic event (Choong & Calder 2013; Calder *et al.* 2014; Choong *et al.* 2018).

Throughout his career, Calder was keenly aware of the importance of the preservation and curation of type specimens and other vouchers, their current taxonomic status, as well as ensuring accessibility of available specimens and associated information, particularly via museums. In August 2016, Calder was invited to be a Research Associate at the Royal British Columbia Museum in Victoria, Canada (RBCM). This appointment facilitated the continuation of his collaborative research with Henry Choong, which had originated at the Royal Ontario Museum. Their joint study at the ROM had focused on an extensive collection of hydroids from Canada's west coast, encompassing contributions from hydroid scholars Anita Brinckmann-Voss and Charles Maclean Fraser. The RBCM houses a significant segment of Fraser's collection. A year after Choong's appointment as Curator of Invertebrates at the RBCM, Calder undertook a scholarly visit to the RBCM collections in 2017. This visit was specifically dedicated to examining the Fraser Hydroid Collection there, which consists of nearly 1,000 microscope slides and fluid-preserved specimens. The culmination of this work was the publication of a comprehensive account detailing the families, genera, and species of hydroids established by Fraser and the designation of lectotypes for the material, exclusive of those from the Allan Hancock Expeditions (Calder & Choong 2018). During this trip, Calder also visited the esteemed Canadian hydroid researcher, Anita Brinckmann-Voss. This meeting, poignant in its timing, was their final encounter as Brinckmann-Voss's health was in decline. She passed away shortly thereafter.

It is evident from the analysis of his academic output that, even in retirement, he continued to undertake research, review manuscripts, and assist taxonomists of all generations with his unparalleled dedication, graciousness, and modesty. Calder himself stated on his ResearchGate¹ page that he continued his projects on "taxonomic studies on hydroids of the Cocos Islands, Costa Rica, with colleagues from the USA, Ecuador, and Costa Rica; and an account on intertidal hydroids of Newfoundland and southern Labrador, Canada, as sole investigator. However, my health is now in decline." Sadly, he was unable to complete the latter work.

1 <https://www.researchgate.net/profile/Dale-Calder>

Beyond his invaluable contributions to medusozoan taxonomy and systematics, Calder was a true gentleman; always gracious, patient, and generous with students, colleagues, and others with whom he interacted during his career. These distinguished qualities enabled him to mentor a succession of young scholars from 1970 until approximately 2000. During this period, Calder supervised at least 18 graduate students, encompassing Master of Arts (M.A.), Master of Science (M.Sc.), and two Doctor of Philosophy (Ph.D.) students, serving as a co-supervisor for one. At the University of Toronto, he was a member of 14 examining committees for postgraduate degrees, predominantly within the field of Zoology. Over the decades, Calder also always responded to countless requests to identify hydroids from many hundreds of correspondents around the world.

Dale Calder passed away on June 4, 2022 at the age of 81, in Toronto. Only two weeks earlier, Dale was corresponding with Jim Carlton; Dale was concerned that Calder *et al.* (2022) would be “open access” (OA) and was working to ensure that the OA fee would be paid by the Royal Ontario Museum (it was). Shortly before Calder passed away, Henry Choong travelled to Toronto and hoped to visit him. Sadly, due to the lingering COVID situation and the fragile state of his health at the time, that was not possible. However, they had a telephone conversation, which turned out to be their last. As was characteristic of Calder, he apologized for inconveniencing Choong. That was characteristic of the person Calder was: self-effacing and always thinking of others before himself.

Known for his reserved and modest demeanor, Calder was revered as an educator, a gentleman, and an accomplished scholar. His enduring legacy is carried on by his wife Rae, his daughter Annina, and two daughters from his union with Elizabeth, Nancy Catton and Andrea Calder. He is greatly missed, personally and professionally, by family, friends, and colleagues, and the void left by his passing in community undertaking hydrozoan studies is immense.

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Taxa described by Dale Calder in **bold**

Hydrozoa

Anthoathecata

Bougainvilliidae

***Bougainvillia aberrans* Calder, 1993**

Corynidae

***Coryne sargassicola* Calder, 1988**

Eudendriidae

***Eudendrium bathyalis* Marques & Calder, 2000**

***Eudendrium bermudense* Calder, 1988**

***Eudendrium bleakneyi* Calder, 2017**

Hydractiniidae

***Hydractinia galeai* Calder & Watling, 2021**

***Latebrahydra* Calder & Watling, 2021**

***Latebrahydra schulzei* Calder & Watling, 2021**

***Stylactaria mar* Gasca & Calder, 1993 accepted as *Hydractinia mar* (Gasca & Calder, 1993)**

***Stylactaria munita* Calder, 2010 accepted as *Hydractinia munita* (Calder, 2010)**

Oceaniidae

Rhizodendrium Calder, 1988 accepted as *Rhizogeton* Agassiz, 1862

Rhizodendrium sterreri Calder, 1988 accepted as *Rhizogeton sterreri* (Calder, 1988)

Turritopsoides Calder, 1988

Turritopsoides brehmeri Calder, 1988

Similiclavidae Calder, Choong & McDaniel, 2015

Similiclava Calder, Choong & McDaniel, 2015

Similiclava nivea Calder, Choong & McDaniel, 2015

Tubulariidae

Zyzyzus rubusidaeus Brinckmann-Voss & Calder, 2013

Zyzyzus warreni Calder, 1988

Leptothecata

Campanulariidae

Clytia joycei Calder, 2019

Clytia noliformis (McCrary, 1859) sensu Calder, 1991

Campanulinidae

Plicatotheca Calder & Vervoort, 1986

Plicatotheca anitae Calder & Vervoort, 1986

Racemoramus Calder, 2012 accepted as *Earleria* Collins, Ross, Genzano & Mianzan, 2006

Eirenidae

Tima nigroannulata Calder, Crow, Ikeda, Adachi, Yamamoto, Harrington, Holland, 2021

Haleciidae

Halecium lightbourni Calder, 1991

Halecium permodicum Calder, 2017

Halecium praeparvum Calder, 2017

Halecium profundum Calder & Vervoort, 1998

Halopterididae

Halopteris longibrachia Calder & Faucci, 2021

Halopteris violae Calder, Mallinson, Collins & Hickman, 2003

Hebellidae

Hebellopsis communis Calder, 1991 accepted as *Anthohebella communis* (Calder, 1991)

[also *Hebella communis* (Calder, 1991) accepted as *Anthohebella communis* (Calder, 1991)]

Kirchenpaueriidae

Kirchenpaueria galapagensis (Calder, Mallinson, Collins & Hickman, 2003)

Lafoeidae

Lafoea intorta Calder, 2013

Plumaleciidae Choong & Calder, 2018

Plumulariidae

Cladacanthella Calder, 1997

Monotheca gibbosa Calder & Faucci, 2021

Nemertesia anomala Calder, Vervoort & Hochberg, 2009 accepted as *Nemertesia californica* Ramil & Vervoort, 2006

Nemertesia hancocki Calder, Vervoort & Hochberg, 2009—taxon inquirendum

Plumularia billardi Ansín Agís, Ramil & Calder, 2016

Plumularia galapagensis Calder, Mallinson, Collins & Hickman, 2003 accepted as *Kirchenpaueria galapagensis* (Calder, Mallinson, Collins & Hickman, 2003)

Schizoplumularia Ansín Agís, Ramil & Calder, 2016

Schizoplumularia elegans Ansín Agís, Ramil & Calder, 2016

Schizoplumularia geniculata Ansín Agís, Ramil & Calder, 2016

Schizoplumularia vervoorti Ansín Agís, Ramil & Calder, 2016

Sertularellidae

Sertularella affinicostata Calder & Faucci, 2021

Sertularella gayi unituba Calder, 1991 accepted as *Sertularella conica* Allman, 1877

Sertularella maureenae Choong, Calder & Brinckmann-Voss, 2012

Sertulariidae

Salacia fraseri Calder, 1991

Sertularia vervoorti Migotto & Calder, 1998

Thyroscyphidae

Symmetrosyphus Calder, 1986

Thyroscyphus balei Calder, 1983 accepted as *Thyroscyphus macrocyttarus* (Lamouroux, 1826)

Zygophylacidae

Zygophylax echinata Calder & Vervoort, 1998

Scyphozoa

Coronamedusae Calder, 2009

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