

ROBERT H. COWIE - CURRICULUM VITAE

Name: Robert Hulin Cowie

Address: Pacific Biosciences Research Center
University of Hawaii
3050 Maile Way, Gilmore 408
Honolulu
Hawaii 96822
USA

Telephone: (808) 956 4909

E-mail: cowie@hawaii.edu

Date of Birth: 29 January 1954

Place of birth: Cheshire, U.K.

Degrees: B.A. (Cambridge), M.A. (Cambridge), Ph.D. (Liverpool)

Nationality: British, naturalized U.S. citizen (dual citizenship)

14 November 2018

EDUCATION

B.A. 1972-1975, University of Cambridge (Natural Sciences: Zoology) (Honours) (M.A. taken 1979)

Ph.D. 1976-1982, University of Liverpool (Zoology). Advisor: Prof. A.J. Cain

Postdoctoral 1982-1985, Dept. of Genetics and Biometry, University College London. Advisor: Dr. J.S. Jones

PROFESSIONAL APPOINTMENTS

- 2001- Research Professor (Associate 2001-2006), Pacific Biosciences Research Center, University of Hawaii
- 2001- Graduate Faculty, Ecology, Evolution and Conservation Biology Graduate Program, University of Hawaii
- 2001- Graduate faculty, Zoology Graduate Program, University of Hawaii
- 2007-2013 Chair, Ecology, Evolution and Conservation Biology Graduate Program, University of Hawaii
- 1990-2001 Research Biologist (Associate 1990-1999), Department of Natural Sciences, Bishop Museum, Honolulu
- 1985-1989 Head, Termite Ecology & Control Section, Overseas Development Natural Resources Institute, UK
- 1982-1985 Postdoctoral researcher, Department of Genetics & Biometry, University College London, UK
- 1975-1982 Research assistant, Department of Zoology, University of Liverpool, UK

AFFILIATE, HONORARY AND OTHER POSITIONS

- 2005- Visiting Professor/Curator, Muséum national d'Histoire naturelle, Paris, France
- 2001- Research Affiliate, Bishop Museum, Honolulu
- 2016 Visiting Foreign Expert, China Jiliang University
- 2006 Foreign Specialist Research Fellow, Forestry and Forest Products Research Institute, Tsukuba, Japan
- 1992-2001 Affiliate Graduate Faculty, Ecology, Evolution and Conservation Biology Graduate Program, University of Hawaii
- 1991-2001 Affiliate Graduate Faculty, Zoology Graduate Program, University of Hawaii
- 1985-1988 Honorary Research Fellow, Department of Genetics & Biometry, University College London, UK

MAJOR GRANTS AND CONTRACTS (since 1992)

- 2018 Hawaii Department of Health, PI (\$38,735). Training and education of Department of Health (DOH) staff on the various snails/slugs of public health concern in the state of Hawaii.
- 2018 U.S. Department of Agriculture, Farm Bill, Collaborator (\$70,000). Invasive terrestrial mollusk survey in Hawaii.
- 2017 National Science Foundation, Senior personnel (\$479,877). Revisionary systematics of the highly threatened Achatinellidae: an integrative phylogenetic approach.
- 2016 National Science Foundation, Senior personnel (\$495,633; PI of University of Hawaii portion). Housing, databasing, digitizing and accessibility upgrades to the largest Pacific Island land snail collection (Bishop Museum).
- 2014 US Fish and Wildlife Service, Co-PI (\$106,047, University of Hawaii portion \$71,997). Hawaiian land snails extinction prevention: assessing a vanishing fauna.
- 2014 Japan Society for the Promotion of Science, Postdoctoral Advisor (\$107,600). Clarification of the invading process of freshwater apple snails in the genus *Pomacea*.
- 2013 National Science Foundation, Co-PI (\$25,000). Hawaiian land snail biodiversity: systematics, phylogenetics and conservation status of a vanishing fauna. ROA (Research Opportunity Award) Supplement.
- 2013 National Science Foundation, PI (\$6,250). REVSYS: A revision of New World Ampullariidae: an emerging model system in evolutionary biology and systematics training. REU (Research Experience for Undergraduates) Supplement.
- 2012 US Department of Agriculture, Co-PI (\$109,955). Post-harvest management of slugs and snails potentially carrying rat lungworm (*Angiostrongylus cantonensis*) on Hawaii's farms and gardens.
- 2012 National Science Foundation, PI (\$19,815). REVSYS: A revision of New World Ampullariidae: an emerging model system in evolutionary biology and systematics training. ROA (Research Opportunity Award) Supplement.

- 2012 National Science Foundation, PI (\$7,500). REVSYS: A revision of New World Ampullariidae: an emerging model system in evolutionary biology and systematics training. REU (Research Experience for Undergraduates) Supplement.
- 2012 National Science Foundation, Co-PI (\$7,500). Hawaiian land snail biodiversity: systematics, phylogenetics and conservation status of a vanishing fauna. REU (Research Experience for Undergraduates) Supplement.
- 2011 National Science Foundation, Co-PI (\$150,000, University of Hawaii portion \$77,877). Collaborative Research: U.S.-Uruguay-Brazil: IRES AMPLIFIED: Ampullariidae Model using Phylogeography, Laboratory Integration with Field Investigations into Ecology and Diversity.
- 2011 US Army Garrison Oahu, PI (\$49,684). Alien snail control.
- 2011 National Science Foundation, Co-PI (\$650,000). Hawaiian land snail biodiversity: systematics, phylogenetics and conservation status of a vanishing fauna.
- 2011 National Science Foundation, PI (\$7,500). REVSYS: A revision of New World Ampullariidae: an emerging model system in evolutionary biology and systematics training. REU (Research Experience for Undergraduates) Supplement.
- 2011 US Department of Agriculture, PI (\$48,000). Understanding and managing health risks associated with the nematode *Angiostrongylus cantonensis* – the rat lungworm.
- 2010 US Army Garrison Oahu. Co-PI (\$58,813). Assessment of the current distribution, potential for continued spread, and population density of *Oxychilus alliarius* on Oahu, Hawaii.
- 2010 National Science Foundation, PI (\$499,999). REVSYS: A revision of New World Ampullariidae: an emerging model system in evolutionary biology and systematics training.
- 2009 US Department of Agriculture, PI (\$64,624). Invasive alien species of terrestrial snails and slugs in Hawaii (year 6).
- 2008 Japan Society for the Promotion of Science, Postdoctoral Advisor (\$100,990). Impacts of alien ants and flatworms on native land snails in the Hawaiian Islands.
- 2008 US Department of Agriculture, PI (\$72,999). Invasive alien species of terrestrial snails and slugs in Hawaii (year 5).
- 2007 US Department of the Interior, PI (\$33,193). Feeding ecology, microhabitat utilization, population size estimates, and possible control of the introduced predatory snail *Euglandina rosea* on Oahu (year 3).
- 2007 National Science Foundation EPSCoR REAP, Co-PI (\$29,325). Phylogeography of the endemic Hawaiian achatinellid land snails.
- 2007 National Science Foundation, PI (\$11,980). Dissertation research: Ecosystem services provided by terrestrial Mollusca in Hawaiian rainforests.
- 2007 US Department of Agriculture, PI (\$63,778). Invasive alien species of terrestrial snails and slugs in Hawaii (year 4).
- 2006 US Department of the Interior, PI (\$45,892). Feeding ecology, microhabitat utilization, population size estimates, and possible control of the introduced predatory snail *Euglandina rosea* on Oahu (year 2).
- 2006 US Department of Agriculture, PI (\$54,187). Invasive alien species of terrestrial snails and slugs in Hawaii (year 3).
- 2005 US Department of the Interior, PI (\$27,613). Feeding ecology, microhabitat utilization, population size estimates, and possible control of the introduced predatory snail *Euglandina rosea* on Oahu (year 1).
- 2005 US Department of Agriculture, PI (\$35,000). Invasive alien species of terrestrial snails and slugs in Hawaii (year 2).
- 2004 US Department of Agriculture, PI (\$35,000). Invasive alien species of terrestrial snails and slugs in Hawaii (year 1).
- 2004 US Department of Agriculture, PI (\$22,000). Economic impacts of apple snails on taro culture in Hawaii.
- 2003 National Science Foundation, PI (\$400,086). Revision and phylogeography of Pacific island succineid land snails.
- 2002 US Department of Agriculture, PI (\$118,329). Identity and origins of apple snail pests.
- 2002 State of Hawaii, PI (\$95,580). Development of a Safe Harbor Agreement in conjunction with restoration of Waahila Ridge, Oahu.
- 1999 CH2MHill, Co-PI (\$15,480). Invertebrate survey—Wa‘ahila Ridge powerline installation EIS.
- 1999 Okamoto, Inc., Co-PI (\$45,025). Invertebrate survey—Stainback Highway.
- 1999 New Moon Corporation, PI (\$17,009). Environmental assessment—Bond Historic District, Kohala.
- 1998 US Geological Service, PI (\$18,705). Evaluation of development impacts to endangered snails (American Samoa).

1998 Okamoto, Inc., Co-PI (\$92,000). Invertebrate survey—New Hawai‘i Island Correctional Facility EIS.
 1997 National Science Foundation , PI (\$96,606). Non-marine Mollusca of Samoa.
 1997 US Geological Service, PI (\$30,768). The land snails of the National Park of American Samoa.
 1996 National Science Foundation , PI (\$265,829). Rehousing Bishop Museum’s marine shell collection in acid-free conditions.
 1996 Wil Chee Planning, Co-PI (\$147,541). Impacts of Construction of the Palau Compact Road: survey of the non-marine fauna of the island of Babeldaob.
 1996 Rust Environment and Infrastructure, Co-PI (\$95,330). Saddle Road Project: assessment of the impacts on invertebrates (land snails, insects, and other arthropods).
 1995 National Biological Service (now part of USGS), PI (\$42,000). A database of non-indigenous land and freshwater molluscs in Hawaii.
 1992 National Science Foundation , PI (\$493,445). Rehousing Bishop Museum’s land snail collections.
 1992 The Nature Conservancy, PI (\$44,975). Land snail survey of the Pohakuloa Training Area, Hawaii.
 Also, I have received numerous small grants and contracts (under \$10,000 each; total c. \$70,000), most in relation to snails as agricultural pests, for surveys of snails in relation to development projects, and for identification and analysis of snail shells from archaeological sites.

AWARDS AND RECOGNITION

Ph.D. dissertation won the 1982 Annual Award of the Malacological Society of London
 Recognized by the University of Hawaii as a 2003-2004 leading researcher

MEMBERSHIP IN PROFESSIONAL ORGANIZATIONS

American Malacological Society, Malacological Society of Australasia, Malacological Society of London, Pacific Science Association, Unitas Malacologica, Western Society of Malacologists.

Formerly British Ecological Society, Conchological Society of Great Britain and Ireland, Genetical Society, International Society for the Study of Social Insects, Society for the Study of Evolution, Sigma Xi, Systematics Association.

RESEARCH

Statement of research interests

The over-arching theme of my research is to understand the origins and determinants of non-marine biodiversity, both native and alien, primarily in the Pacific. Systematics provides the essential framework and conservation underlies most aspects of the research, which integrates a range of subdisciplines and approaches, including taxonomy, phylogenetics, genetic diversity, biogeography, invasion biology, ecology and climate change. A developing direction is an integrated understanding of an emerging parasitic disease vectored primarily by alien species. The four main focuses are:

- **Biodiversity** – Ecological determinants and evolutionary origins of the immense native Pacific island diversity. Systematics of Hawaiian land snails and of freshwater apple snails.
- **Invasion biology** – Spread and impacts, invasion dynamics and origins, both phylogenetic and anthropogenic, of alien species, primarily in the Pacific.
- **Conservation ecology** – Ecology, behavior and status of native Pacific island land snails.
- **Emerging disease ecology** – Eosinophilic meningitis in humans caused by *Angiostrongylus cantonensis*, the rat lungworm, specifically aspects involving the snail intermediate hosts. Taxonomy of metastrongylid nematodes.

Invited research presentations

- Mahosot Hospital (Vientiane, Laos, 2017)
- 48th Anniversary of the Department of Parasitology, Siriraj Hospital International Conference, *Angiostrongylus* and Angiostrongyliasis (Bangkok, Thailand, 2017 [2 presentations])
- International Association for Food Protection (Tampa, Florida, 2017)
- University of Bristol (UK, 2017)
- China Jiliang University (Hangzhou, China, 2016)
- Mollusks in Peril Forum (Sanibel, 2016)
- Nara Women’s University (Nara, Japan, 2014)
- University of Oklahoma (Norman, 2013)
- World Congress of Malacology (Ponta Delgada, 2013, Phuket, 2010, Vienna, 2001)
- 11th International Congress on Medical and Applied Malacology (Rio de Janeiro, 2012 [plenary presentation and invited regular presentation])

- Instituto Oswaldo Cruz (Rio de Janeiro, 2012)
- The Wildlife Society (Waikoloa, 2011)
- Direccion Nacional de Recursos Acuaticos (Montevideo, 2010)
- AAAS (Hawaii, 2008)
- University of Nottingham (2008)
- Japanese Ecological Society (Niigata, 2006)
- American Malacological Society (Ann Arbor, 2003, Sanibel, 2004)
- 1 Simpósio Nacional de Coleções Científicas (Rio de Janeiro, 2005)
- Universidade Federal de Mato Grosso do Sul (Campo Grande, 2005)
- Sociedade Brasileira de Malacologia (Rio de Janeiro, 2004)
- Malacological Society of Japan (Yamaguchi, 2000)
- Society for Conservation Biology (Sydney, 1998)

Invited workshop participation

- Third international workshop on rat lungworms (Guangzhou, China, 2013)
- Rat lungworm disease - a scientific workshop (Honolulu, Hawaii, 2011)
- 4th International workshop on the biology of Ampullariidae (San Miguel de Tucumán, Argentina, 2010)
- Forestry and Forest Products Research Institute: Introduced species in Ogasawara (Tsukuba, Japan, 2006)
- Invasive species in the Galápagos: technical advisory group (Galápagos Islands, Ecuador, 2006)
- Asia-Pacific Economic Cooperation: Management of the golden apple snail (Taiwan, 2004)
- US Department of Agriculture: Apple snails and other alien snails (Sacramento, California, 2001)
- National Science Foundation: Biotic Surveys and Inventories (Orcas Island, Washington, 2000)
- Committee for Conservation of Natural Resources of Nagashima: The nature of Nagashima (Japan, 2000)
- Global Invasive Species Program: Invasion pathways (Edgewater, Maryland, 1999)
- World Wildlife Fund: biodiversity and conservation of the Galápagos (Galápagos Islands, Ecuador, 1999)
- International Rice Research Institute: Ecology and management of the golden apple snail (Thailand, 1997)

Expedition and overseas research experience

- 1976 Kenya, Tanzania - termite ecology and distribution (Oxford University)
- 1983, 1984 Spain, Andorra, France - land snail ecology and population genetics
- 1985 France - grasshopper hybrid zone
- 1986, 1987 Ethiopia - termites in crops, forestry and rangeland; training in termite biology/control
- 1986-1989 Sudan - termite ecology and control (University of Khartoum)
- 1987, 1988 Yemen - termites in crops
- 1989 Zimbabwe - termites in crops
- 1989 Malawi - soil pests of crops
- 1992 Samoa [then Western Samoa] - land snail biodiversity
- 1992, 1998, 2001, 2008 American Samoa - land snail biodiversity, research and training, endangered species
- 1995 Cambodia - invasive apple snails as rice pests
- 1996 Palau - land snail biodiversity
- 2004, 2005, 2012 Brasil - freshwater snail systematics/phylogenetics
- 2008, 2009 UK - land snail population genetics
- 2017 Laos - invasive apple snails as vectors of *Angiostrongylus cantonensis* (rat lungworm)

I have also traveled widely in Europe, Turkey, Egypt, India, the Philippines, Japan, Thailand, Taiwan, China, Australia, New Zealand, Argentina, Uruguay, Russia and USA. I have undertaken overseas museum research in France, UK, Australia and Uruguay.

INSTRUCTION

Courses taught

- Zoology field course (University of Liverpool, 1976-82 [every year])
- Environmental Biology field course (University of Liverpool, 1978)
- Population Genetics field course (in Spain) (University College London, 1984-5)
- Termite Biology and Control (in Ethiopia) (ODNRI, 1987)
- Advanced Systematics and Evolution (ZOOL 691I) (University of Hawaii, 1995-9 [8 consecutive semesters])
- Biological Invasions (ZOOL 691E) (University of Hawaii, 1996)
- Proposal Writing (ZOOL 691E) (University of Hawaii, 2003, 2006)
- Mechanisms of Evolution (ZOOL 719) (University of Hawaii, 2005)
- Foundations of Ecology (ZOOL 739) (University of Hawaii, 2009, 2017)

Guest lectures

- Evolutionary Biology (University College London, 1983)
- Ecological Genetics (University College London, 1984)
- Pest Management (Imperial College London, Silwood Park, 1986)
- Applied Entomology (Imperial College London, Silwood Park, 1987)
- Storage of Durable Agricultural Products in the Tropics (ODNRI, 1988)
- Environmental Studies (University College Cardiff, 1988)
- Biogeography (ZOOL 485) (University of Hawaii, 1996)
- Invasion Biology (BOT 651) (University of Hawaii, 1997, 1999, 2001, 2003, 2005, 2007, 2009)
- Conservation Biology (BOT/ZOOL/NREM 690) (University of Hawaii, 1997, 1999, 2002, 2003, 2012, 2016, 2018)
- Ecology, Evolution and Conservation in Hawaii (ZOOL 750) (University of Hawaii, 1998)
- Focus on Agriculture (Ag 194) (distance learning on public tv; University of Hawaii, Hilo, 1999)
- Natural History of the Hawaiian Islands (BOT/ZOOL 450) (University of Hawaii, 2001-13 [except 2007])
- Foundations in Plant and Environmental Protection Services (PEPS 690) (University of Hawaii, 2002)
- Biocontrol of Invasives (PEPS 422) (University of Hawaii, 2002)
- Invasive Pest Species (PEPS 345) (University of Hawaii, 2004, 2006, 2008, 2010, 2012, 2014, 2016)
- Environmental Problem Solving (NREM 491) (University of Hawaii, 2005)
- Biology of the Invertebrates (ZOOL 475/475L) (University of Hawaii, 2005, 2006, 2007, 2008, 2017 [2 lectures])
- Interdisciplinary Studies (IS650/651) (University of Hawaii, 2007)
- Grant Writing and Your Career in Science (BOT 698) (University of Hawaii, 2010)
- Foundations of Conservation and Natural Resources (NREM 691) (University of Hawaii, 2010)
- Introduction to Research (HON 495) (University of Hawaii, 2010)
- Infectious Disease Micro I (TRMD 603) (University of Hawaii, 2011)
- Scientific Skills (ZOOL 691C) (University of Hawaii, 2016, 2017 [2 lectures])

Students and postdoctoral researchers

- Undergraduate student (University of Liverpool):
L.R. Noble, 1980-1
- Undergraduate student (University College London):
D. Johnson, 1984-5
- Undergraduate students (University of Hawaii):

S. Arnasson, 2007-2008	M. Liebergesell, 2015	C.T. Tran, 2005-2007
J. Bedrosian, 2007-2008	C. Mekonnen, 2014	J. Turner, 2015
C.L. Brown, 2006	D. Ressler, 2011-2014	K. Van Putten, 2015
K.L. Coleman, 2011-2012	S. Rind, 2015	B. Wilson, 2012
D. Dailey, 2014	E. Rivera, 2017	M. Wood, 2009
T. Durkan, 2011-2012	E. Rogers, 2012-2013	C. Yee, 2011-2012
J.R. Kim, 2008-2009	K. Roque, 2014-2015	E. Yokote, 2013-2014
A. Kong, 2011-2013	T.J. Skelton, 2008-2010	
J. Léon, 2012-2014	T. Takebayashi, 2011-2012	
- Graduate students (ODNRI/University of London):
H.I.J. Black, Ph.D., 1986-9
J.W.M. Logan, M.Sc., 1985-9
M.J. Pearce, Ph.D., 1985-9
- Graduate students (University of Hawaii)
D.K. Britton, 1998-2000 (transferred to and gained Ph.D. from the University of Texas at Arlington, US Fish & Wildlife Service)
R. Callan, 2002-3 (transferred to and gained Ph.D. from the University of Georgia, Assistant Professor SUNY-ESF)
P.A. Curry, graduated 2012, M.S. Zoology (Leibniz Centre for Tropical Marine Research, Bremen, Germany)
D.A. Gary, graduated 2015, M.S. Zoology (Oahu Army Natural Resources Program)
K.A. Hayes, graduated 2009, Ph.D. Zoology (Director, Pacific Center for Molecular Biodiversity, Bishop Museum)
A.F. Johnson, 2007-8 (transferred to and gained M.S. from Washington State University, Research Associate University of Idaho)
J.R. Kim, graduated 2013, M.S. Zoology (Research Specialist, Bishop Museum, Honolulu)

- W.M. Meyer, graduated 2009, Ph.D. Zoology (Associate Professor Pomona College)
- R.A. Riggs, graduated 2016, M.S. Zoology (U.S. Fish & Wildlife Service)
- R.L. Rollins, expected graduation 2019, M.S. Zoology
- R.J. Rundell, graduated 2001, M.S. Zoology (Associate Professor SUNY-ESF)
- R.M. Sommer, expected graduation 2018, M.S. Zoology
- Graduate student committees (University of Hawaii)
 - J. Birch, graduated 2011, Ph.D. Botany
 - R. DeFelice, 1998-2003, Zoology (withdrew from Ph.D. program)
 - P.A. deMoura, 2009-2012, Zoology (withdrew from Ph.D. program)
 - L.L.Z. Durand, 2000, Botany (withdrew from Ph.D. program)
 - J.E. Garb, graduated 1998, M.S. Zoology
 - L. Gutierrez, graduated 2000, Ph.D. Zoology
 - L. Hadway, graduated 1998, M.S. Zoology
 - W. Haines, 2004-2006, M.S. Entomology (transferred to Ph.D. program)
 - A.T. Handler, graduated 2005, M.S. Zoology
 - A.L. Heddle, graduated 1998, M.S. Zoology
 - S. Joe, graduated 2006, M.S. Botany
 - E. Johnston, expected graduation 2018, Ph.D. Botany
 - S. Kennedy-Gold, expected graduation 2018, M.S. Zoology
 - T. Koehler, graduated 2007, M.S. Botany
 - K. Leung, graduated 2015, M.S. Entomology
 - C. Lohr, graduated 2012, Ph.D. Natural Resources and Environmental Management
 - M. Lurie, graduated 2015, Ph.D. Botany
 - T. Male, graduated 2001, Ph.D. Zoology
 - M. Pejhanmehr, expected graduation 2020, Ph.D. Botany
 - G. Roberts, graduated 2001, Ph.D. Zoology
 - L. Rodman, graduated 2004, Ph.D. Zoology
 - R. Screen, expected graduation 2018, Ph.D. Zoology
 - S. Shaw, 2009-2012, Botany (withdrew from Ph.D. program)
 - B.D. Smith, 1996-2000, Zoology (withdrew from Ph.D. program)
 - J. Taylor, graduated 2007, M.S. Natural Resources and Environmental Management
 - K. Tice, graduated 2009, M.S. Zoology
 - A.Y. Yoshinaga, 2008-2015, Botany (withdrew from Ph.D. program)
- Visiting graduate student
 - L. Lach (Cornell University), graduated 2004, Ph.D.
- Postdoctoral and visiting researchers (University of Hawaii)
 - B.S. Holland, 2003-2007
 - S. Sugiura, 2008-2010
 - K.A. Hayes, 2010-2013
 - N.W. Yeung, 2010-2015
 - C. Régnier, 2012
 - K. Matsukura, 2014-2016
 - Q. Yang, 2015

SERVICE

Professional organization activities

- Council, Malacological Society of London: 1983-1986
- Director, Hawaiian Malacological Society: 1992-1995 (President: 1993, 1994)
- Mollusc Specialist Group, International Union for Conservation of Nature: 1994-present
- American Malacological Society Conservation Committee: 1994-2016 (Chair: 1995-2004)
- Council of Systematic Malacologists (Councilor, Western U.S.): 1995-1998
- Council, American Malacological Society: 1997-1999
- Invasive Species Specialist Group, International Union for Conservation of Nature: 1998-present
- President, Sigma Xi, University of Hawaii Chapter: 2005-2008

Editorial activities

- Editor, *Newsletter of the IUCN/SSC Mollusc Specialist Group*: 1994-present
- Associate Editor, *Biodiversity and Conservation*: 2006-present (Editorial Board 2003-present)
- Associate Editor, *Diversity and Distributions*: 2007-present (Editorial Board 2003-present)
- Associate Editor, *Biological Invasions*: 2009-present
- Associate Editor, *Malacologia*: 2016-present (Editorial Board 1991-present)
- Assistant Editor, *Journal of Conchology*, and *Conchological Society Special Publications*: 1979-1980
- Guest Editor, *PLoS Neglected Tropical Diseases*: 2017
- Editorial Board, *Malacological Review*: 1991-present
- Editorial Board, *Journal of Medical and Applied Malacology*: 1991-present
- Editorial Board, *Journal of the Malacozoological Association of Yamaguchi, Japan*: 1997-2008
- Editorial Board, *Oryx*: 1998-2016
- Editorial Board, *The Nautilus*: 2001-present
- Editorial Board, *Zoological Science*: 2003-2009
- Editorial Board, *American Malacological Bulletin*: 2003-present
- Editorial Board, *Pacific Science*: 2004-present
- Editorial Board, *Sherbornia*: 2014-present
- Science Advisor, *Hawaiian Shell News*: 1990-1997

Symposium/Conference/Workshop/Forum organization/editing

- Co-convenor, “Foodborne parasites in organic and conventional agricultural practices: food safety issues that can affect your mind”, International Association for Food Protection, Tampa, Florida, 2017
- Scientific Advisory Committee “Mollusks in Peril Forum”, Sanibel, Florida, 2016
- Co-organized the “Third International Workshop on Rat Lungworms”, Guangzhou, China, 2013
- Organized and edited the proceedings of “Rat lungworm disease: an international workshop”, Honolulu, 2011 (published in the *Hawaii Journal of Medicine and Public Health*)
- Co-edited the Proceedings of the Asia-Pacific Economic Cooperation workshop on the “Management of the golden apple snail”, Taiwan, 2004 (published as a stand-alone proceedings volume)
- Organized and edited the proceedings of a symposium on “Non-marine alien mollusks – the future is a foreign ecosystem”, American Malacological Society, Ann Arbor, 2003 (published in *American Malacological Bulletin*)
- Society for Conservation Biology 2001 meeting (Hilo, Hawaii), Scientific Program Committee
- Organized and edited the proceedings of a symposium on the “Impact of alien species on island ecosystems”, 17th Pacific Science Congress, Honolulu, 1991 (published in *Pacific Science*)
- Co-organized and edited the proceedings of the “1st International Symposium on fungus-growing termites and the tropical environment”, Nairobi, Kenya, 1987 (published in *Sociobiology*)

Advisory panels/group

- State of Hawaii, Governor’s Task Force on Rat Lungworm Disease: 2016-present
- Technical Advisory Group, \$43 million UNDP project on “Invasive species in the Galápagos”: 2003-2007
- NSF grant proposal review panelist: 1996, 1997, 2012, 2013, 2016, 2017

University of Hawaii

- Ecology, Evolution and Conservation Biology graduate program, admissions committee (1995-7, 2016-17; Chair, 1996-7)
- Ecology, Evolution and Conservation Biology graduate program, curriculum committee (1997-8, 2013-15, 2017-18)
- Ecology, Evolution and Conservation Biology graduate program, grants committee (1998-2006; Chair, 2000-6)
- Ecology, Evolution and Conservation Biology graduate program, webmaster (2012-present)
- Zoology graduate program, diagnostic examination committee (1997, 1999, 2001, 2006)
- Zoology graduate program, ad hoc committee on admissions (2002)
- University of Hawaii Hilo / University of Hawaii Manoa NSF EPSCoR grant working group (2002-2006)
- Zoology graduate program, admissions committee (2003, 2004, 2013, 2014, 2017)
- Pacific Biosciences Research Center, departmental personnel committee (2004-present, Chair, 2006-7, 2011-12)
- Tenure and promotion review committee (2007, 2011, 2015)
- Department of Botany, faculty search committee (2008)
- Manoa Faculty Senate, Committee on Administration and Budget (2009-2014, vice-chair 2010-11)
- Pacific Biosciences Research Center, senior faculty/staff team (2009-2015)
- Zoology graduate program, Graduate Instruction Committee (2011)
- Pacific Biosciences Research Center, faculty search committee (2013-2014)

- Pacific Biosciences Research Center, director search committee (2014)
- Zoology graduate program, ad hoc graduate program revision committee (2015-2018)

Extramural grant proposals reviewed (18 agencies)

- American Philosophical Society, Australian Research Council, British Ecological Society, Environment and Conservation Fund (Hong Kong), Hawaiian Malacological Society, National Geographic Society, National Research Foundation (South Africa), National Science Foundation, Natural Environment Research Council (UK), Natural Sciences and Engineering Research Council (Canada), Netbiome, Netherlands Organization for Scientific Research, Pennsylvania Department of Conservation and Natural Resources, Research Grants Council (Hong Kong), Sea Grant College Program, Smithsonian Institution Office of Fellowships and Grants, U.S. Civilian Research and Development Foundation, U.S. Fish and Wildlife Service

Journal articles reviewed (149 journals, approx. 30 articles per year)

- Acta Ethologica, Acta Oecologica, African Journal of Ecology, African Zoology, American Malacological Bulletin, American Naturalist, Animal Behaviour, Animal Conservation, Annals of Applied Biology, Annals of Botany, Anthropocene, Aquatic Conservation, Aquatic Ecology, Aquatic Invasions, Aquatic Sciences, Archiv für Molluskenkunde, Australian Journal of Experimental Agriculture, Biochemical Genetics, Biocontrol Science and Technology, Biodiversity and Conservation, Bioinvasions Records, Biological Agriculture and Horticulture, Biological Conservation, Biological Invasions, Biological Journal of the Linnean Society, Biology Letters, Biota Neotropica, Biotropica, Bishop Museum Occasional Papers, BMC Evolutionary Biology, Bulletin of Entomological Research, Bulletin of the Museum of Comparative Zoology, Caribbean Journal of Science, Check List, Cladistics, Clinical Infectious Diseases, Conservation Biology, Conservation Genetics, Contributions to Zoology, Crop Protection, Current Biology, Diversity and Distributions, East African Agriculture and Forestry Journal, Ecologia Mediterranea, Ecological Entomology, Ecological Indicators, Ecological Research, Emerging Infectious Diseases, Endangered Species Research, Epidemiology and Infection, Estuaries and Coasts, Evolution, Freshwater Biology, Geography Compass, Geology, Global Change Biology, Global Ecology and Biogeography, Hawaii Journal of Medicine and Public Health, Heredity, Hydrobiologia, Iberus, Insects, Insect Science and its Application, Integrative & Comparative Biology, International Journal of Zoology, Invertebrate Biology, Invertebrate Reproduction and Development, Invertebrate Systematics, Journal of Animal Ecology, Journal of Applied Ecology, Journal of Arid Environments, Journal of Biogeography, Journal of Conchology, Journal of Experimental Biology, Journal of Experimental Zoology, Journal of Helminthology, Journal of Heredity, Journal of the Malacozoological Association of Yamaguchi, Journal of the Marine Biological Association, Journal of Medical and Applied Malacology, Journal of Molluscan Studies, Journal of Natural History, Journal of the North American Benthological Society, Journal of Parasitology, Journal of Pest Science, Journal of Soil Science, Journal of Thermal Biology, Journal of Tropical Ecology, Journal of Wildlife Diseases, Journal of Zoology, Limnologica, Malacologia, Malacological Review, Management of Biological Invasions, Mitteilungen aus dem Museum für Naturkunde in Berlin (Zoologische Reihe), Molecular Ecology, Molecular Phylogenetics and Evolution, Molluscan Research, Natural Areas Journal, Nature Communications, Nemouria, Neobiota, Oecologia, Oryx, Pacific Science, Pakistan Journal of Agricultural Sciences, Palaeogeography–Palaeoclimatology–Palaeoecology, Paleobiology, Paleontological Research, Parasites and Vectors, Pedobiologia, PeerJ, Pesticide Science, PLoS Neglected Tropical Diseases, PLoS One, Population Ecology, Proceedings of the Academy of Natural Sciences of Philadelphia, Proceedings of the Biological Society of Washington, Proceedings of the National Academy of Sciences, Proceedings of the Royal Society of London B, Quaternary Research, Qatar University Science Journal, Revista Científica UDO Agrícola, Ruthenica, Sociobiology, Soil Biology and Biochemistry, South Pacific Journal of Natural and Applied Sciences, Subterranean Biology, Symbiosis, Systematics and Biodiversity, The Festivus, The Nautilus, The Veliger, Trends in Ecology and Evolution, Tropical Pest Management, Tuhinga: Records of the Museum of New Zealand Te Papa Tongarewa, Turkish Journal of Zoology, Waterbirds, Western North American Naturalist, Wetlands, Zookeys, Zoological Journal of the Linnean Society, Zoologia, Zoologia Neocaledonica, Zoologica Scripta, Zoological Science, Zoological Studies, Zoosystema, Zootaxa.

Ph.D. Dissertations reviewed as external examiner

- University of Tasmania (2003)
- University of Adelaide (2003)
- University of Nottingham (2008, 2009)
- University of the West Indies, Mona (2008)
- Muséum nationale d'Histoire naturelle, Paris (2011)
- Pontificia Universidade Católica do Rio Grande do Sul, Porto Alegre (2015)
- LaTrobe University (2015)
- National University of Singapore (2016)

- Massey University (2017)
- Extramural tenure and promotion reviews**
- Bucknell University (2008, 2017)
- Iowa State University (2010)
- University of Hawaii, Hilo (2013)
- Tel Aviv University (2015)
- University of Oklahoma (2016)
- Hong Kong Baptist University (2016)

PUBLICATIONS

Books (5)

- Joshi, R.C., **Cowie, R.H.** & Sebastian, L.S. (eds.) 2017. *Biology and Management of Invasive Apple Snails*. Philippine Rice Research Institute, Muñoz, Nueva Ecija. xvii + 405 p.
- Cowie, R.H.**, Rundell, R.J. & Yeung, N.W. 2017. *Samoan Land Snails and Slugs – An Identification Guide*. Department of Marine and Wildlife Resources, American Samoa Government. viii + 71 p.
- Cowie, R.[H.]** 2014. *Journey to a Waterfall. A Biologist in Africa*. Lulu, Raleigh. x + 279 p.
- Staples, G.W. & **Cowie, R.H.** (eds.) 2001. *Hawai'i's Invasive species. A guide to invasive plants and animals in the Hawaiian Islands*. Mutual Publishing & Bishop Museum Press, Honolulu. xii + 116 p.
- Cowie, R.H.**, Evenhuis, N.L. & Christensen, C.C. 1995. *Catalog of the native land and freshwater molluscs of the Hawaiian Islands*. Backhuys Publishers, Leiden. vi + 248 pp.

Journal articles (124)

- Yang, Q., Liu, S., He, C., **Cowie, R.H.**, Yu, X. & Hayes, K.A. In press. Invisible apple snail invasions: importance of continued vigilance and rigorous taxonomic assessments. *Pest Management Science*.
- Norder, S.J., Proios, K.V., Whittaker, R.J., Alonso, M.R., Borges, P.A.V., Borregaard, M.K., **Cowie, R.H.**, Florens, F.B.V., de Frias Martins, A.M., Ibáñez, M., Kissling, W.D., de Nascimento, L., Otto, R., Parent, C.E., Rigal, F., Warren, B.H., Fernández-Palacios, J.M., van Loon, E.E., Triantis, K.A., & Rijdsdijk, K.F. In press. Beyond the last glacial maximum: island endemism is best explained by long-lasting archipelago configurations. *Global Ecology and Biogeography*.
- Kim, J.R., Wong, T.W., Curry, P.A., Yeung, N.W., Hayes, K.A. & **Cowie, R.H.** 2018. Modelling the distribution in Hawaii of *Angiostrongylus cantonensis* (rat lungworm) in its gastropod hosts. *Parasitology* On-line early.
- Cowie, R.H.**, Hayes, K.A., Kim, J.R., Bustamente, K.M. & Yeung, N.W. 2018. *Parmarion martensi* Simroth, 1893 (Gastropoda: Ariophantidae), an intermediate host of *Angiostrongylus cantonensis* (rat lungworm), on Maui. *Bishop Museum Occasional Papers* 123: 7-10.
- Cowie, R.H.**, Strong, E.E., Rosenberg, G. & Hayes, K.A. 2017. Types of Ampullariidae (Mollusca: Gastropoda) in the Academy of Natural Sciences of Philadelphia. *Proceedings of the Academy of Natural Sciences of Philadelphia* 165(1): 175-194.
- Cowie, R.H.** 2017. *Angiostrongylus cantonensis*: agent of a sometimes fatal globally emerging infectious disease (rat lungworm disease). *ACS Chemical Neuroscience* 8(10): 2102-2104.
- Yeung, N.W., **Cowie R.H.**, Hayes, K.A. & Strong, E.E. 2017. Type specimens of Hawaiian land snails in the Smithsonian Institution, National Museum of Natural History, with lectotype designations. *Smithsonian Contributions to Zoology* 647: i-v, 1-34.
- Cowie, R.H.**, Régnier, C., Fontaine, B. & Bouchet, P. 2017. Measuring the Sixth Extinction: what do mollusks tell us? *The Nautilus* 131(1): 3-41.
- Chiba, S. & **Cowie, R.H.** 2016. Evolution and extinction of land snails on oceanic islands. *Annual Review of Ecology, Evolution, and Systematics* 47: 123-141.
- Cowie, R.H.**, Héros, V., Yeung, N.W. & Hayes, K.A. 2016. Annotated catalogue of types of Hawaiian land and freshwater snails (Mollusca: Gastropoda) in the Muséum national d'Histoire naturelle, Paris, with lectotype designations. Addendum: lectotype designation for *Lymnaea affinis* Souleyet, 1852. *Zoosystema* 38(3): 389-391.
- Cowie, R.H.**, Héros, V., Yeung, N.W. & Hayes, K.A. 2016. Annotated catalogue of types of Hawaiian land and freshwater snails (Mollusca: Gastropoda) in the Muséum national d'Histoire naturelle, Paris, with lectotype designations. *Zoosystema* 38(2): 245-266.
- Curry, P.A., Yeung, N.W., Hayes, K.A., Meyer, W.M., III, Taylor, A.D. & **Cowie, R.H.** 2016. Rapid range expansion of an invasive predatory snail, *Oxychilus alliarius* (Miller 1822), and its impact on endemic Hawaiian land snails. *Biological Invasions* 18(6): 1769-1780.

- Kim, J.R., Hayes, K.A., Yeung, N.W. & **Cowie, R.H.** 2016. Identity and distribution of introduced slugs (Veronicellidae) in the Hawaiian and Samoan Islands. *Pacific Science* 70(4): 477-493.
- Matsukura, K., Hayes, K.A. & **Cowie, R.H.** 2016. Eleven microsatellite loci for two invasive freshwater apple snails, *Pomacea canaliculata* and *P. maculata* (Ampullariidae). *Biological Invasions* 18(12): 3397-3400.
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- Cowie, R.H.** 2015. The recent apple snails of Africa and Asia (Mollusca: Gastropoda: Ampullariidae: *Afropomus*, *Forbesopomus*, *Lanistes*, *Pila*, *Saulea*): a nomenclatural and type catalogue. The apple snails of the Americas: addenda and corrigenda. *Zootaxa* 3940(1): 1-92.
- Cowie, R.H.**, Hayes, K.A. & Strong, E.E. 2015. Types of Ampullariidae (Mollusca: Gastropoda) in the U.S. National Museum of Natural History, Smithsonian Institution, with lectotype designations. *Smithsonian Contributions to Zoology* 645: [i-iii], 1-13.
- Hayes, K.A. . . . [31 others] . . . & **Cowie, R.H.** 2015. Insights from an integrated view of the biology of apple snails (Caenogastropoda: Ampullariidae). *Malacologia* 58(1-2): 245-302.
- Régnier, C., Achaz, G., Lambert, A., **Cowie, R.H.**, Bouchet, P. & Fontaine, B. 2015. Mass extinction in poorly known taxa. *Proceedings of the National Academy of Sciences* 112(25): 7761-7766.
- Régnier, C., Bouchet, P., Hayes, K.A., Yeung, N.W., Christensen, C.C., Chung, D.J.D., Fontaine, B. & **Cowie, R.H.** 2015. Extinction in a hyperdiverse endemic Hawaiian land snail family and implications for the underestimation of invertebrate extinction. *Conservation Biology* 29(6): 1715-1723.
- Kim, J.R., Hayes, K.A., Yeung, N.W. & **Cowie, R.H.** 2014. Diverse gastropod hosts of *Angiostrongylus cantonensis*, the rat lungworm, globally and with a focus on the Hawaiian Islands. *PLoS ONE* 9(5): e94969.
- Cowie, R.H.** 2013. Biology, systematics, life cycle, and distribution of *Angiostrongylus cantonensis*, the cause of rat lungworm disease. *Hawaii Journal of Medicine and Public Health* 72(6) Supplement 2: 6-9.
- Cowie, R.H.** 2013. Pathways for transmission of angiostrongyliasis and the risk of disease associated with them. *Hawaii Journal of Medicine and Public Health* 72(6) Supplement 2: 70-74.
- Durkan, T.H., Yeung, N.W., Meyer, W.M., III, Hayes, K.A. & **Cowie, R.H.** 2013. Evaluating the efficacy of land snail survey techniques in Hawaii: implications for conservation throughout the Pacific. *Biodiversity and Conservation* 22: 3223-3232.
- Hawksworth, D.L. & **Cowie, R.H.** 2013. The discovery of historically extinct, but hitherto undescribed, species: an under-appreciated element in extinction-rate assessments. *Biodiversity and Conservation* 22: 2429-2432.
- Meyer, W.M., III, Ostertag, R. & **Cowie, R.H.** 2013. Influence of terrestrial molluscs on litter decomposition and nutrient release in a Hawaiian rain forest. *Biotropica* 45(6): 719-727. [editor's choice]
- Yeung, N.W., Hayes, K.A. & **Cowie, R.H.** 2013. Effects of washing produce contaminated with the snail and slug hosts of *Angiostrongylus cantonensis* with three common household solutions. *Hawaii Journal of Medicine and Public Health* 72(6) Supplement 2: 83-86.
- Cowie, R.H.** & Héros, V. 2012. Annotated catalogue of the types of Ampullariidae (Mollusca: Gastropoda) in the Muséum national d'Histoire naturelle, Paris, with lectotype designations. *Zoosystema* 34(4): 793-824.
- Cowie, R.H.**, Hollyer, J.R., da Silva, A.J., Hollingsworth, R.G., Dixon, M.D., Eamsobhana, P. *et al.* 2012. Workshop on research priorities for management and treatment of angiostrongyliasis. *Emerging Infectious Diseases* 18(12): [Internet]. December 2012.
- Hayes, K.A., **Cowie, R.H.**, Thiengo, S.C. & Strong, E.E. 2012. Comparing apples with apples: clarifying the identities of two highly invasive Neotropical Ampullariidae (Caenogastropoda). *Zoological Journal of the Linnean Society* 166: 723-753.
- Hayes, K.A., Yeung, N.W., Kim, J.R. & **Cowie, R.H.** 2012. New records of alien Gastropoda in the Hawaiian Islands: 1996-2010. *Bishop Museum Occasional Papers* 112: 21-28.
- Cowie, R.H.** 2011. *Cornu* Born, 1778 (Mollusca: Gastropoda: Pulmonata: Helicidae): request for a ruling on the availability of the generic name. *Bulletin of Zoological Nomenclature* 68(2): 97-104.
- Meyer, W.M., III & **Cowie, R.H.** 2011. Distribution, movement, and micro-habitat use of the introduced predatory snail *Euglandina rosea* in Hawaii: implications for management. *Invertebrate Biology* 130(4): 325-333.
- Meyer, W.M., III, Ostertag, R. & **Cowie, R.H.** 2011. Macro-invertebrates accelerate litter decomposition and nutrient release in a Hawaiian rainforest. *Soil Biology and Biochemistry* 43: 206-211.
- Sugiura, S., Holland B.S. & **Cowie, R.H.** 2011. Predatory behaviour of newly-hatched *Euglandina rosea*. *Journal of Molluscan Studies* 77: 101-102.

- Meyer, W.M., III & **Cowie, R.H.** 2010. Feeding preference of two introduced predatory snails and their conservation implications. *Malacologia* 53(1): 135-144.
- Meyer, W.M., III & **Cowie, R.H.** 2010. Invasive temperate species are a threat to tropical island biodiversity. *Biotropica* 42(6): 732-738.
- Wood, K.R. & **Cowie, R.H.** 2010. Land snail records for Mokapu Islet, Moloka'i, Hawaiian Islands. *Bishop Museum Occasional Papers* 108: 53-54.
- Cowie, R.H.**, Dillon, R.T., Jr., Robinson, D.G. & Smith, J.W. 2009. Alien non-marine snails and slugs of priority quarantine importance in the United States: a preliminary risk assessment. *American Malacological Bulletin* 27(1/2): 113-132.
- Hayes, K.A., **Cowie, R.H.** & Thiengo, S.C. 2009. A global phylogeny of apple snails: Gondwanan origin, generic relationships and the influence of outgroup choice (Caenogastropoda: Ampullariidae). *Biological Journal of the Linnean Society* 98: 61-76.
- Hayes, K.A., **Cowie, R.H.**, Jørgensen, A., Schultheiß, R., Albrecht, C. & Thiengo, S.C. 2009. Molluscan models in evolutionary biology: apple snails (Gastropoda: Ampullariidae) as a system for addressing fundamental questions. *American Malacological Bulletin* 27(1/2): 47-58. [invited; cover illustration]
- Holland, B.S. & **Cowie, R.H.** 2009. Land snail models in island biogeography: a tale of two snails. *American Malacological Bulletin* 27(1/2): 59-68. [invited]
- Cowie, R.H.** & Holland, B.S. 2008. Molecular biogeography and diversification of the endemic terrestrial fauna of the Hawaiian Islands. *Philosophical Transactions of the Royal Society of London B* 363(1508): 3363-3376.
- Cowie, R.H.** & Wood, K.R. 2008. The land snails of the island of Lehua, Hawaiian Islands. *Bishop Museum Occasional Papers* 100: 50-52.
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- Gruner, D.S., Gotelli, N.J., Price, J.P. & **Cowie, R.H.** 2008. Does species diversity drive speciation: a reassessment with the Hawaiian biota. *Ecography* 31(2): 279-285.
- Hayes, K.A., Joshi, R.C., Thiengo, S.C. & **Cowie, R.H.** 2008. Out of South America: multiple origins of non-native apple snails in Asia. *Diversity and Distributions* 14(4): 701-712 [cover illustration].
- Holland, B.S., Christensen, C.C., Hayes, K.A. & **Cowie, R.H.** 2008. Biocontrol in Hawaii: a response to Messing (2007). *Proceedings of the Hawaiian Entomological Society* 40: 81-83.
- Tran, C.T., Hayes, K.A. & **Cowie, R.H.** 2008. Lack of mitochondrial DNA diversity in invasive apple snails (Ampullariidae) in Hawaii. *Malacologia* 50(1-2): 351-357.
- Cowie, R.H.**, Hayes, K.A., Tran, C.T. & Levin, P. 2007. Distribution of the invasive apple snail *Pomacea canaliculata* (Lamarck) in the Hawaiian Islands (Gastropoda: Ampullariidae). *Bishop Museum Occasional Papers* 96: 48-51.
- Hayes, K.A., Tran, C.T. & **Cowie, R.H.** 2007. New records of alien Mollusca in the Hawaiian Islands: nonmarine snails and slugs (Gastropoda) associated with the horticultural trade. *Bishop Museum Occasional Papers* 96: 54-63.
- Holland, B.S. & **Cowie, R.H.** 2007. A geographic mosaic of passive dispersal: population structure in the endemic Hawaiian amber snail *Succinea caduca* (Mighels, 1845). *Molecular Ecology* 16(12): 2422-2435 [cover illustration].
- Rawlings, T.A., Hayes, K.A., **Cowie, R.H.** & Collins, T.M. 2007. The identity, distribution, and impacts of non-native apple snails in the continental United States. *BMC Evolutionary Biology* 7: 97 [14 p.] [published on line doi:10.1186/1471-2148-7-97; designated as 'highly accessed'].
- Thiengo, S.C., Faraco, F.A., Salgado, N.C., **Cowie, R.H.** & Fernandez, M.A. 2007. Rapid spread of an invasive snail in South America: the giant African snail, *Achatina fulica*, in Brasil. *Biological Invasions* 9: 693-702.
- Cowie, R.H.** & Holland B.S. 2006. Dispersal is fundamental to biogeography and the evolution of biodiversity on oceanic islands. *Journal of Biogeography* 33: 193-198 [guest editorial].
- Holland, B.S. & **Cowie, R.H.** 2006. New island records of an endemic Hawaiian land snail species, *Succinea caduca* Mighels (Gastropoda: Pulmonata: Succineidae). *Bishop Museum Occasional Papers* 88: 58-60.
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- Cowie, R.H.** 2004. Disappearing snails and alien invasions: the biodiversity/conservation interface in the Pacific. *Journal of Conchology Special Publications* 3: 23-37.
- Cowie, R.H.** & Grant-Mackie, J.A. 2004. The land snail fauna of the Mé Auré cave (WMD007), Moindou, New Caledonia: human introductions and faunal change. *Pacific Science* 58(3): 447-460.

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