Watersipora subtorquata **System:** Marine

Kingdom	Phylum	Class	Order	Family
Animalia	Ectoprocta	Gymnolaemata	Cheilostomata	Watersiporidae

Common name

Synonym

Similar species *Watersipora arcuata, Watersipora edmondsoni, Watersipora subovoidea, Watersipora new sp.*

Summary Watersipora subtorquata (d'Orbigny, 1852) is a loosely encrusting bryozoan. It is tolerant to copper based anitfouling coatings and is infamous for fouling ships hulls and facilitating the fouling and spread of other marine invasives. Watersipora subtorquata is considered cosmopolitan and widely invasive among cool temperate water ports. Preventative measures are the only practical means of control at this time.

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Species Description
Watersipora subtorquata colonies are bright orange to red with variable amounts of black and may be flat or foliose, developing in to a lobed mass up to 25cm in height. Individual zooids are composed of soft polypide tissue and a rigid rectangular or coffin-shaped zooecium. The zooecium are 0.3-0.7 mm wide and 0.75-1.5 mm in height radiating from the founding zooid. Its inner and older parts of the colony turn dark or black, while the outer growing edges are usually orange or red. Zooids have a u-shaped crown of 19-24 ciliated, orange translucent tentacles, called a lophohpore, which is extended through its aperture to feed. *W. Subtorquata* lacks spines, avicularia, and ovicells common to many bryozoans. An identifiable characteristic is its black, sinusoid aperture, having a convex proximal border (Cohen 2005).

Notes
Watersipora subtorquata has a convoluted taxonomy and history. Subsequently, its native range is presently unknown. Previously, bryozoans with the described physical attributes and sinusoid aperture of \"*W. subtorquata*\" were referred to with several names that ended up converging on an unclear \"*Watersipora subtorquata*\" complex (Gordon 1989). Recent DNA testing and sampling has defined *W. subtorquata* and differentiated it as a separate species from closely related *W. subovoidea* (=*cucullata*), *W. edmondsoni*, and a new, unnamed, *Watersipora* species (Mackie *et al*. 2006). All of which have at one time been included in the \"*W. subtorquata*\" complex. Comments in the distribution section denote details on which populations been sampled, tested, and concluded to be *W. subtorquata*. Further sampling and testing will be required to define the actual range of *W. subtorquata* and other *Watersipora* spp.
\r\n*W. subtorquata* is still thought to be a cosmopolitan species and the northwest Pacific is thought to be its most likely origin.
\r\n*W. subtorquata* may have been previously referred to or recorded as many different names including: *Cellepora subtorquata*, *Escharina torquata*, *Watersipora subovoidea*, *Dakaria subovoidea*, *Cellepora ovoidea*, *Watersipora cucullata*, *Lepralia cucullata*, *Watersipora atrofusca*, *Lepralia atrofusca*, *Schizoporella atrofusca*, *Watersipora aterrima*, and *Watersipora edmondsoni*. *Watersipora subtorquata* is also very similar to *Watersipora arcuata*, which is reliably differentiated by its aperture upon examination by light microscope (Banta 1969). While virtually morphologically cryptic species appear to be present (Geller *et al*. 2006), efforts have been made to reconcile the use of morphometrics and colony color in the field with genetic definition of lineages, which to date has been carried out using the mitochondrial gene COI (Ryland *et al*. in prep.).

Lifecycle Stages
Watersipora subtorquata lecithotrophic larvae are brooded inside zooecia and released upon maturation. They only spend a few hours to one day in this free swimming state as they lack the necessary mouth and digestive tract to sustain themselves. They settle to a substrate and metamorphose into a primary zooid. This zooid buds in to a colony capable of hermaphroditic, sexual reproduction of new larvae.

Habitat Description
Watersipora subtorquata is most common to lower intertidal and shallow subtidal areas. It is known to inhabit salinities of 25-49 parts per thousand, temperatures of 12-28°C, and depths to the tens of meters. It grows on a wide range of substrates including rocks, shells, debris, docks, kelp, ship hulls, pilings, pontoons, and other bryozoans. Since they are an early successional species, they are especially efficient at colonizing artificial structures as they are they are new surfaces (Keough and Ross 1999; Cohen, 2005; Glasby *et al*. 2007).

Reproduction
Watersipora subtorquata is hermaphroditic, sexual self-fertilizing bryozoan which broods its larvae inside its zooecia. Its free swimming, crimson lecithotrophic larvae lack a mouth and digestive tract. They must settle to a substrate within a day of release, usually only after a few hours, where they metamorphose into a zooid. This primary zooid then replicates asexually, budding into a colony.

Nutrition
It is a suspension feeder which feeds on microscopic plankton and organic material, which it sweeps in to its mouth with its ciliated tentacles (lophophore) (Cohen, 2005).

General Impacts
Watersipora subtorquata is an abundant fouling organism. It is tolerant to copper based antifouling biocides so it facilitates the spread of other invasives by providing a non-toxic surface for other fouling species to settle. This trait is known from observation to occur in multiple species in the genus, including *Watersipora arcuata* (formerly, like *W. subtorquata*, referred to as *W. cucullata*) (Wisely 1958, Allen 1959)
A study in which a ship's hull was coated with three antifouling paints resulted in 64% of its surface covered with *W. subtorquata* within 16 weeks and 22 other species occurring exclusively on top of *W. subtorquata* colonies (Floerl *et al*. 2004).
In addition to its facultative interaction of spreading other non-indigenous species, *W. subtorquata* has its own competitive interactions with native bryozoans and community structures. It is the most common intertidal bryozoan in many areas of introduction. *W. subtorquata* along with *Bugula neritina* is considered the most common introduced species in harbors and estuaries in the context of hull fouling. In fact, its resistance to antifouling toxins that can collect in ports may give it an advantage over native biota. *W. subtorquata* has also demonstrated the ability to lie dormant in overly toxic conditions and recover as conditions improve. In Australia it is declared a medium priority pest (Floerl *et al*. 2004; Hayes *et al*. 2005; Mackie *et al*. 2006; Piola and Johnston, 2006).

Management Info
Preventative measures: Preventative measures are the only current practical means controlling *Watersipora subtorquata* populations. Alternative methods of antifouling are necessary to prevent *W. subtorquata* and other antifouling resistant species from spreading and facilitating the spread of others via vessel hulls. The problem of ballast water fouling is being addressed by programs such as the GloBallast Water Management Programme but solutions to prevent hull fouling are much needed. Hull fouling prevention strategies combined with analysis of maritime activity is very much necessary to stop the spread of marine invasives. Physical removal or chemical treatment of nonindigenous aquatic *Watersipora subtorquata* is not yet a cost effective option. Since its populations are usually fairly widespread, local population controls are deemed ineffective. (Biosecurity New Zealand, 2005; Hayes *et al*. 2005; GloBallast, undated).

Principal source: Cohen, A. N. 2005. *Watersipora subtorquata* (d'Orbigny, 1952). Guide to exotic species of San Francisco Bay. San Francisco Estuary Institute, Oakland, CA,.
Geller, J, Mackie, J., Schroeder, G., and Gerhinger, D. 2008. Distribution of highly invasove bryozoans belonging to a cryprtic species complex in the genus *Watersipora* determined by DNA sequences. Final Report to California Department of Fish and Game, Moss Landing Marine Laboratories, Moss Landing, CA.
Mackie, J.A., Keough, M.J., and Christidis, L. 2006. Invasion patterns inferred from cytochrome oxidase I sequences in three bryozoans, *Bulga neritina*, *Watersipora subtorquata*, and *Watersipora arcuata*. Marine Biology. Vol. 149: 285-295.
Boyd, M.J. 2002. Appendix B: Non-indigenous marine species of Humbolbt Bay, California, A report to the California Department of Fish and Game. A Survey of non-indigenous species in the coastal and estuarine wawters of California. CA Department of Fish and Game.

Compiler: National Biological Information Infrastructure (NBII) & IUCN/SSC Invasive Species Specialist Group (ISSG)

Review: Dr. Josh Mackie, Invertebrate Zoology and Molecular Ecology Lab. Moss Landing Marine Laboratories. California USA

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ALIEN RANGE

[1] AMERICAN SAMOA
[6] AUSTRALIA
[1] ATLANTIC - WESTERN CENTRAL
[1] BERMUDA

[1] BRAZIL
[1] ECUADOR
[1] FRANCE
[1] INDIAN - OCEAN WESTERN
[1] JAPAN
[1] MEXICO
[1] PACIFIC - EASTERN CENTRAL
[1] SRI LANKA
[23] UNITED STATES
[1] WEST AFRICA
[1] CAPE VERDE
[1] EGYPT
[1] INDIA
[1] INDONESIA
[1] MEDITERRANEAN & BLACK SEA
[1] NEW ZEALAND
[1] SOUTH AFRICA
[2] UNITED KINGDOM
[1] VENEZUELA
[1] WEST INDIES

BIBLIOGRAPHY

25 references found for **Watersipora subtorquata**

Managment information

Australian Museum Business Services (AMBS), 2002. Port Survey for Introduced Marine Species – Sydney Harbour.
Summary: Available from: http://www.md.go.th/marine_knowledge/ballast_water_pdf1/final_report1-n.pdf [Accessed 12 March 2010]

Biosecurity New Zealand. 2005. Port of Nelson baseline survey for non-indigenous species (Research Project ZBS2000/04). Biosecurity New Zealand Technical Paper NO. 2005/02. ISBN: 0-478-07925-7.
Summary: This report of nonindigenous marine species in New Zealand gives a brief description of *Watersipora subtorquata* and preventative management information.
Available from: http://www.biosecurity.govt.nz/files/pests-diseases/marine/2005-02-port-of-nelson.pdf [Accessed 8 January 2008].

Hayes, K, Sliwa, C., Migus, S., McEnnulty, and Dunstan, P. 2005. National priority pests: Part II Ranking of Australian marine pests. CSIRO Marin Research. Australian Government Department of Environment and Heritage, Parkes ACT, 2600, Australia. ISBN: 1876996803.
Summary: A publication regarding marine pests in Australia citing *Watersipora subtorquata* as a medium priority
Available from: http://www.marine.csiro.au/crimp/reports/PrioritypestsFinalreport.pdf [Accessed 11 January 2008].

General information

Anderson, C. M., and M. G. Haygood. 2007. a-Proteobacterial Symbionts of Marine Bryozoans in the Genus *Watersipora*. Applied and Environmental Microbiology 73:303-311.

Banta, W. C. 1969. *Watersipora arcuata*, a new species in the *subovoidea-cucullata-nigra* complex (Bryozoa, Cheilstomata). Bulletin of the Southern Californian Academy of Sciences 68:96-102.

Boyd, M.J. 2002. Appendix B: Non-indigenous marine species of Humbolbt Bay, California, A report to the California Department of Fish and Game. A Survey of non-indigenous species in the coastal and estuarine waters of California. CA Department of Fish and Game.
Summary: This nonindigenious species report concerns Humboldt Bay, United States and provides distribution and synonym information on *Watersipora subtorquata*.
Available from: http://www.dfg.ca.gov/ospr/report/exotic/h_bay_appendix_b.pdf [Accessed 10 January 2008].

Cohen, A. N. 2005. *Watersipora subtorquata* (d Orbigny, 1952). Guide to exotic species of San Francisco Bay. San Francisco Estuary Institute, Oakland, CA, www.exoticsguide.org.
Summary: This is a very informative profile of *Watersipora subtorquata* providing a wide range of information on it and its distribution.
Available from: http://www.exoticsguide.org/species_pages/w_subtorquata.html [Accessed 8 January 2008]

Cohen, A.N. and J.T. Carlton. 1995. Nonindigenous aquatic species in a United States estuary: a case study of the biological invasions of the San Francisco Bay and Delta, U.S. Fish and Wildlife Service and National Sea Grant College Program (Connecticut Sea Grant) 246 pp. + app.–s
Summary: A report of marine invasives in the San Francisco Bay which includes *Watersipora subtorquata*. [Provided by Author 15 January 2008]

Floerl, O., Pool, T.K., and Inglis, G.J. 2004. Positive interactions between nonindigenous species facilitate transport by human vectors. Ecological Society of America. Ecological Applications. Vol. 14, No. 6: 1724-1736.
Summary: This journal article examines to facilitative interactions between nonindigenous species, including fouling species *Watersipora subtorquata* and its resistance to anti-fouling toxins and its role as a substrate for other nonindigenous species.
Available from: http://www.esajournals.org/perlserv/?request=res-loc&uri=urn%3Aap%3Apdf%3Adoi%3A10.1890%2F03-5399 [Accessed 9 January 2008]

Geller, J, Mackie, J., Schroeder, G., and Gerhinger, D., 2008. Distribution of highly invasive bryozoans belonging to a cryptic species complex in the genus *Watersipora* determined by DNA sequences. Final Report to California Department of Fish and Game, Moss Landing Marine Laboratories, Moss Landing, CA.
Summary: This study clears up some uncertainty associated with the *Watersipora* genus and contains detailed sampling and genetic testing in California. [Provided by Joshua Mackie I February 2008]

Glasby, T.M, Connell, S.D., Holloway, M.G., and Hewitt, C.L. 2007. Nonindigenous biota on artificial structures: could habitat creation facilitate biological invasions? Marine Biology. Vol. 151: 887-895.
Summary: An article that investigates certain marine species propensity to grow on artificial structures and offers information on *Watersipora subtorquata*

Global Ballast Water Management Programme. undated. GloBallast Programme. www.globallast.imo.org.
Summary: A program established to address the problem of ballast water fouling and it role in spreading nonindigenous marine species
Available from: http://globallast.imo.org/index.asp [Accessed 15 January 2008]

Gordon, D. P. 1989. The marine fauna of New Zealand: Bryozoa: Gymnolaemata (Cheilostomatida Ascophorina) from the western South Island continental shelf and slope. Memoirs of the New Zealand Oceanographic Institute 97:1-158.
Gordon, D. P., and S. H. Mawatari. 1992. Atlas of marine-fouling bryozoa of New Zealand ports and harbours. Miscellaneous Publications N.Z. Oceanographic Institute 107:1-52.
Mackie, J.A., Keough, M.J., and Christidis, L. 2006. Invasion patterns inferred from cytochrome oxidase I sequences in three bryozoans, *Bugula neritina*, *Watersipora subtorquata*, and *Watersipora arcuata*. Marine Biology. Vol. 149: 285-295.
Summary: This article uses genetic analysis to examine the invasion patterns of bryozoans.
Page, H.M., Dugan, J.E., Culver, C.S., and Hoesterey, J.C. 2006. Exotic invertebrate species on offshore oil platforms. Marine Ecology Progress Series. Vol. 32: 101-107.
Summary: A publication regarding invertebrates on offshore oil platforms and the possibility of using that as an invasional stepping stone.
Piola, R.F. and Johnston, E.L. 2006. Differential resistance to extended copper exposure in four introduced bryozoans. Marine Ecology Progress Series. Vol. 311: 103-114.
Summary: An examination of the effects of copper, the common effective component in antifouling coatings, on bryozoans. Offering insights to *Watersipora subtorquata s* invasive potential.
Available from: http://www.int-res.com/abstracts/meps/v311/p103-114/ [Accessed 18 January 2008].
Pollard, D.A. and Pethebridge, R.L. 2002. Report on Port of Botany Bay introduced marine pest species survey. Report to Sydney Ports Corporation. NSW Fisheries Office of Conservation. NSW Fisheries Final Report Series. No. 40. ISSN: 1440-3544.
Summary: A report on marine pests in Botany Bay, Australia with information regarding the introduction of Watersipora subtorquata in Australia.
Available from: http://www.dpi.nsw.gov.au/__data/assets/pdf_file/0003/139683/Botany-Bay.pdf [Accessed 9 January 2008].
Ryland, J. S. 1974. Bryozoa in the Great Barrier Reef Province. Pages 341-348 in Second International Coral Reef Symposium (Proceedings). Great Barrier Reef Committee, Brisbane.
Ryland, J. S., H. de Blauwe, R. Lord, and J. Mackie. submitted manuscript. Recent discoveries of alien *Watersipora* (Bryozoa) in Western Europe.
Soule, D. F., and J. D. Soule. 1968. Bryozoan fouling organisms from Oahu, Hawaii, with a new species of *Watersipora*. Bulletin of the Southern California Academy of Sciences 64:203-218.
Stafford, H. and Willan, R. C. 2007. Is it a pest? Introduced and naturalise marine animal species of Torres Strait Northern Australia. Queensland Department of Primary Industries and Fisheries, Cairns.
Summary: This book offers some information on *Watersipora subtorquata* and its introductions.
Available from: http://www.rrrc.org.au/publications/downloads/Torres-Strait-Marine-Pest-Handbook.pdf [Accessed 8 January 2008]
Winston, J. E., and B. F. Heimberg. 1986. Bryozoans from Bali, Lombock and Komodo. American Museum Novitates 2847:1-49.
Wisely, B. 1958. The settling and some experimental reactions of a bryozoan larva *Watersipora cucullata* (Busk). Australian Journal of Marine and Freshwater Research 9:362-371.
Wyatt, A. S. J., Hewitt, C.L., Walker, D. I., and ward, T.J. 2005. Marine introductions in the Shark Bay World Heritage Property, Western Australia: a preliminary assessment. Diversity and Distributions. Vol. 11: 33-44.
Summary: This article examines marine invaders of Shark Bay.