

Sacculina

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Sacculina is a genus of barnacles that is a parasitic castrator of crabs. They belong to a group called *Rhizocephala*. The adults bear no resemblance to the barnacles that cover ships and piers; they are recognised as barnacles because their larval forms are like other members of the barnacle class Cirripedia. Depending on the location, the prevalence of this unusual crustacean parasite in its crab host can be as high as 50%.^[2] They are a part of a group of infamous species that are body snatching parasites that infect crustaceans and crayfish.^[3]

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Habitat

They live in a marine environment. During the span of their larval stage they are pelagic but as they form into an adult they live as an adult in crabs. They primarily host the *green crab* which is native to the Eastern Atlantic Ocean but these crabs have spread to to other bodies of waters but isn't believed *Sacculina* has migrated along with them to these places too.^[4]

Anatomy

The body of this adult parasite can be divided into two parts: one part is called the "externa" where a bulbous reproductive organ of the parasite sticks out of the abdomen of the host. Then the other part is called the "interna" which is inside the host's body. This part is composed of root like dendrils that wrap themselves around the host's organs which gives its group name already known as Rhizocephala meaning "root-head". Through microCT scans, these roots have been discovered to wrap around certain organs of the body with most around the hepatopancreas which is found in crustaceans. This area is primarily for sucking up nutrients which would understandable why most concentrate in that region. In a similar specie called *Briarosaccus* roots were seen extending to the brain and central nervous system which could help explain how parasites like these can manipulate their hosts behavior.

Sacculina



Sacculina carcini (highlighted) attached to a female *Liocarcinus holsatus*

Scientific classification

Kingdom:	Animalia
Phylum:	Arthropoda
Subphylum:	Crustacea
Class:	Maxillopoda
Order:	Cirripedia
Family:	Sacculinidae
Genus:	<i>Sacculina</i>
	Thompson, 1836

Type species

Sacculina carcini
Thompson, 1836^[1]

Life cycle

The female *Sacculina* larva finds a crab and walks on it until it finds a joint. It then molts into a form called a **kentrogon**, which injects its soft body into the crab while its shell falls off. The *Sacculina* grows in the crab, emerging as a sac, known as an *externa*, on the underside of the crab's rear thorax, where the crab's eggs would be incubated.

After this invasion of the *Sacculina*, the crab is now unable to perform the normal function of molting. This results in a loss of nutrition for the crab, and impairs its overall growth. The natural ability of regrowing a severed claw that is commonly used for defense purposes is therefore lost after the infestation of *Sacculina*.

The male *Sacculina* looks for a female *Sacculina* adult on the underside of a crab. He then implants himself into her body and starts fertilizing her eggs. The crab (male or female) then cares for the eggs as if they were its own, having been rendered infertile by the parasite.

When a female *Sacculina* is implanted in a male crab it will interfere with the crab's hormonal balance. This sterilizes it and changes the bodily layout of the crab to resemble that of a female crab by widening and flattening its abdomen, among other things. The female *Sacculina* then forces the crab's body to release hormones, causing it to act like a female crab, even to the point of performing female mating dances.

Although all energy otherwise expended on reproduction is directed to the *Sacculina*, the crab develops a nurturing behavior typical of a female crab. The natural hatching process of a crab consists of the female finding a high rock and grooming its brood pouch on its abdomen and releasing the fertilized eggs in the water through a bobbing motion. The female crab stirs the water with her claw to aid the flow of the water. When the hatching parasite eggs of the *Sacculina* are ready to emerge from the brood pouch of *Sacculina*, the crab performs a similar process. The crab shoots them out through pulses creating a large cloud of parasites. The crab then uses the familiar technique of stirring the water to aid in flow.^[5]

Life Span

They are primarily host dependent so their life span matches that of their hosts. Crabs usually have a life span anywhere from 1 to 2 years.^[6]

Biological Control Agents

Sacculina has been suggested to be used as a type of biological control agent to help reduce the populations of the invasive Green Crab. This is controversial because the Sacculina can also use native crab species as their host.^[7]

Species

More than 100 species of *Sacculina* are currently recognised:^[8]

- *Sacculina abyssicola*
- *Sacculina actaeae* Guérin-Gavinet, 1911
- *Sacculina aculeata* Boschma, 1928
- *Sacculina ales* Kossmann, 1872

- *Sacculina americana* Reinhard, 1955
- *Sacculina amplituba* Phillips, 1978
- *Sacculina anceps* Boschma, 1931
- *Sacculina angulata* Van Kampen & Boschma, 1925
- *Sacculina anomala* Boschma, 1933
- *Sacculina atlantica* Boschma, 1927
- *Sacculina beauforti* Boschma
- *Sacculina bicuspidata* Boschma, 1931
- *Sacculina bipunctata* Kossmann, 1872
- *Sacculina boschmai* Reinhard, 1955
- *Sacculina bourdoni* Boschma, 1960
- *Sacculina brevispina* Van Kampen & Boschma, 1925
- *Sacculina bucculenta* Boschma, 1933
- *Sacculina caelata* Boschma, 1931
- *Sacculina calappae* Van Kampen & Boschma, 1925
- *Sacculina calva* Boschma, 1933
- *Sacculina captiva* Kossmann, 1872
- *Sacculina carcini* Thompson, 1836
- *Sacculina carpiliae* Guérin-Gavinet, 1911
- *Sacculina cartieri* Kossmann, 1872
- *Sacculina cavolinii* Kossmann, 1872
- *Sacculina comosa* Boschma, 1931
- *Sacculina compressa* Boschma, 1931
- *Sacculina confragosa* Boschma, 1933
- *Sacculina cordata* Shiino, 1943
- *Sacculina curvata* Boschma, 1933
- *Sacculina dayi* Boschma, 1958
- *Sacculina duracina* Boschma, 1933
- *Sacculina echinulata* Van Kampen & Boschma, 1925
- *Sacculina elongata* Boschma, 1933
- *Sacculina eriphiae* Smith, 1906
- *Sacculina exarcuata* Kossmann, 1872
- *Sacculina flacca* Boschma, 1931
- *Sacculina flexuosa* Kossmann, 1872
- *Sacculina gerbei* Giard in Bonnier, 1887
- *Sacculina ghanensis* Boschma, 1971
- *Sacculina gibba* Boschma, 1933
- *Sacculina gibbsi* (Hesse, 1867)
- *Sacculina glabra* Van Kampen & Boschma, 1925
- *Sacculina globularis* Boschma, 1970
- *Sacculina gonoplaxae* Guérin-Gavinet, 1911
- *Sacculina gordonae* Boschma, 1933
- *Sacculina gracilis* Boschma, 1931
- *Sacculina granifera* Boschma, 1973
- *Sacculina granulosa* Boschma, 1931
- *Sacculina guineensis* Boschma, 1971
- *Sacculina herbstiae* Kossmann, 1872

- *Sacculina hirsuta* Boschma, 1925
- *Sacculina hirta* Boschma, 1933
- *Sacculina hispida* Boschma, 1928
- *Sacculina hystrix* Van Kampen & Boschma, 1925
- *Sacculina imberbis* Shiino
- *Sacculina inconstans* Boschma, 1952
- *Sacculina infirma* Boschma, 1953
- *Sacculina inflata* Leuckart, 1859
- *Sacculina insueta* Boschma
- *Sacculina irrorata* Boschma, 1934
- *Sacculina lata* Boschma, 1933
- *Sacculina leopoldi* Boschma, 1931
- *Sacculina leptodiae* Guérin-Gavinet, 1911
- *Sacculina leptothrix* Boschma, 1933
- *Sacculina lobata* Boschma, 1965
- *Sacculina loricata* Boschma, 1955
- *Sacculina margaritifera* Kossmann, 1872
- *Sacculina micracantha* Boschma, 1931
- *Sacculina microthrix* Boschma, 1931
- *Sacculina muricata* Boschma, 1931
- *Sacculina nectocarci* Gurney, Rybakov, Høeg & Kuris, 2006
- *Sacculina nigra* Shiino
- *Sacculina nodosa* Boschma, 1931
- *Sacculina oblonga* Lützen & Yamaguchi, 1999
- *Sacculina ornatula* Boschma, 1951
- *Sacculina papposa* Van Kampen & Boschma, 1925
- *Sacculina pertenuis* Boschma, 1933
- *Sacculina phacelothrix* Boschma, 1931
- *Sacculina pilosa* Kossmann, 1872
- *Sacculina pilosella* Van Kampen & Boschma, 1925
- *Sacculina pisiformis* Kossmann, 1872
- *Sacculina pistillata* Boschma, 1952
- *Sacculina pomum* Kossmann, 1872
- *Sacculina pugettiae* Shiino, 1943
- *Sacculina pulchella* Boschma, 1933
- *Sacculina punctata* Boschma, 1934
- *Sacculina pustulata* Boschma, 1925
- *Sacculina rathbunae* Boschma, 1933
- *Sacculina reinhardi* Boschma, 1955
- *Sacculina reniformis* Boschma, 1933
- *Sacculina robusta* Boschma
- *Sacculina rotundata* Miers, 1880
- *Sacculina rugosa* Van Kampen & Boschma, 1925
- *Sacculina scabra* Boschma, 1931
- *Sacculina schmitti* Boschma, 1933
- *Sacculina semistriata* Van Kampen & Boschma, 1925
- *Sacculina senta* Boschma, 1933

- *Sacculina serenei* Boschma, 1954
- *Sacculina setosa* Van Kampen & Boschma, 1925
- *Sacculina sinensis* Boschma, 1933
- *Sacculina spectabilis* Boschma, 1948
- *Sacculina spinosa* Van Kampen & Boschma, 1925
- *Sacculina striata* Boschma, 1931
- *Sacculina sulcata* Van Kampen & Boschma, 1925
- *Sacculina teres* Boschma, 1933
- *Sacculina teretiuscula* Boschma, 1931
- *Sacculina ternatensis* Boschma, 1950
- *Sacculina tessellata* Boschma, 1925
- *Sacculina triangularis* Anderson, 1862
- *Sacculina vankampeni* Boschma, 1931
- *Sacculina verrucosa* Van Kampen & Boschma, 1925
- *Sacculina vieta* Boschma, 1933
- *Sacculina weberi* Boschma, 1931
- *Sacculina yatsui* Boschma, 1936
- *Sacculina zariquieyi* Boschma, 1947

References

1. H. Boschma (1955). "The described species of the family Sacculinidae" (PDF). *Zoologische Verhandelingen*. **27** (1): 1–76.
2. Ross Piper (2007), *Extraordinary Animals: An Encyclopedia of Curious and Unusual Animals*, Greenwood Press. ISBN 0-313-33922-8
3. ://dailyparasite.blogspot.com/2016/10/peltogaster-sp.html
4. [Today I Found Out| <http://www.todayifoundout.com/index.php/2013/10/parasitic-sacculina-bends-host-will/>]
5. Carl Zimmer (2000), *Parasite Rex: Inside the Bizarre World of Nature's Most Dangerous Creatures*, Free Press. ISBN 0-7432-0011-X
6. [Animal Diversity|http://animaldiversity.org/accounts/Sacculina_carcini/]
7. "The Parasitic Sacculina That Bends Its Host to Its Own Will". *Today I Found Out*. 2013-10-07. Retrieved 2016-12-04.
8. Geoff Boxshall (2012). "*Sacculina* Thompson, 1836". World Register of Marine Species. Retrieved October 21, 2012.

External links

- Zimmer, Carl (August 2000). "Do Parasites Rule the World?". Discover.



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