

Phylum Tardigrada (Water Bears)

~900 sp.; 2 fossil species

tiny, highly specialized animals

<1.2 mm long; most .3-.5 mm

seldom encountered unless looked for

most live in temporary water films on mosses and lichens on trees, stones or forest floor (limnoterrestrial)

some live in freshwaters

some on bottom of detritus or aquatic algae or mosses

also a few marine forms

short, barrel-shaped body with distinct head and 4 pairs of short knob-like legs

most species are cosmopolitan

easily dispersed by wind

many are cosmopolitan

→ easily dispersed by wind

2 known fossil tardigrades have been described from Cretaceous amber

Animals: Phylum Tardigrada, Ziser Lecture Notes, 2011.11

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bodies are short, plump and cylindrical

5 apparent body segments

4 pairs of stubby unjointed legs

each leg with 4 claws

Body Wall

body covered by **cuticle** secreted by epidermis

smooth or ornamented

in some cuticle is divided into segment-like plates

cuticle contains **chitin** and is periodically **shed**

musculature of separate muscle bands is arthropod-like

contain both **smooth** and **striated muscles**

the number of cells that comprise the epidermis is constant within a species

→ used to help identify species

Movement

move slowly crawling on 4 pairs of telescopic legs

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using hooks to grab substrate

1st 3 prs → to move forward

4th pair → to move backwards

has both a **pseudocoelom** and a small **coelom**

Feeding & Digestion

most tardigrades feed on plant or algae cells

→ use a pair of **stylets** to pierce cell (nematode-like)

then suck out fluids with muscular **pharynx**

others feed on detritus in soil

some are predators and consume body fluids of nematodes and other soil animals

no **circulatory** or **respiratory system**

most of body is a hemocoel

respiration mainly through body wall

Excretion

some tardigrades have malpighian tubules branching from intestines (arthropod trait)

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Nervous System

nervous system is arthropod-like

relatively large brain

two ventral nerve cords

segmental ganglia

have pair of **eyespot**s

most have sensory bristles and spines especially on head

Reproduction & Development

reproduction is typically from late fall to early spring

most are dioecious with single gonad

in some species males are unknown and reproduction is probably by **parthenogenesis**

1-30 eggs are laid at a time

eggs are sometimes left behind in the shed cuticle as the females emerge

direct development less than 2 weeks

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tardigrades apparently can live up to 60 years

Cryptobiosis (suspended animation)

tardigrades are typically active only a few months out of the year

similar to some nematodes and rotifers

can enter state of **cryptobiosis**

water content goes from 85% to 3%

body becomes barrel-shaped

can remain dormant 4 to 7 years

tardigrades may rank as the **most resilient animals**

active or in cryptobiosis tardigrades have survived:

without water for 120 years
temperatures as high as 304°F (151°C)
temperatures near "absolute zero" -458°F (-272°C)
doses of X-rays and gamma rays that are lethal to almost all other life forms
lack of oxygen
preservatives (eg. absolute alcohol, ether)
exposure to vacuum of space for 10 days
pressures 6 times that at the bottom of the ocean (6000 x's pressure at sea level)

takes 4 minutes to 7 hours to revive from cryptobiotic state