

Killer Shrimp - *Dikerogammarus villosus*

An amphipod native to the Ponto-Caspian region, *Dikerogammarus villosus* has recently invaded and spread throughout western Europe. Its populations have caused in significant ecological disruption, including reduced biodiversity and local species extinction. Although not yet known from North America, there is major concern about the potential environmental impact of this amphipod should it be introduced.

Taxonomy

Phylum	▪ Arthropoda
Class	▪ Crustacea
Order	▪ Amphipoda
Family	▪ Gammaridae

General Biology

Morphology

- Bodies are laterally compressed (e.g., flattened from side to side), curled, and semi-transparent (Fig. 1)
- Body length of up to 30 mm, which is relatively large for a freshwater amphipod
- Body consists of head, thorax, and abdomen (Fig. 1)
- Prominent features on head are two pairs of antennae, one pair of eyes, and mouthparts (Fig. 1)
- Mandibles (a type of mouthpart) of *D. villosus* are relatively large and powerful, thus giving it a very effective mechanism for predation
- Thorax consists of seven segments (Fig. 1)
 - Each thoracic segment contains a pair of walking legs
 - First two pairs of walking legs are modified to assist with grasping of food
 - First four pairs of walking legs extend downwards and forwards
 - Last three pairs of walking legs extend downwards and backwards
 - Females have extra branches located on the walking legs which create a space used to shelter and incubate eggs
- Abdomen consists of six segments (Fig. 1)
 - Abdominal section is divided into two parts, each containing three segments
 - First set of abdominal segments contains three pairs of brush-like limbs called pleopods
 - Second set of abdominal segments contain three pairs of shorter and immobile, rod-like limbs called uropods

Behavior

- Kills its prey by biting and shredding them
- Much more deadly predator than native amphipods (partially due to its much larger and more powerful mouthparts)
- Attacks and eliminates other gammarid species
- Colonizes a wide variety of substrates, is capable of adapting to a wide range of habitats, and is able to survive fluctuations in temperature, salinity, and oxygen levels

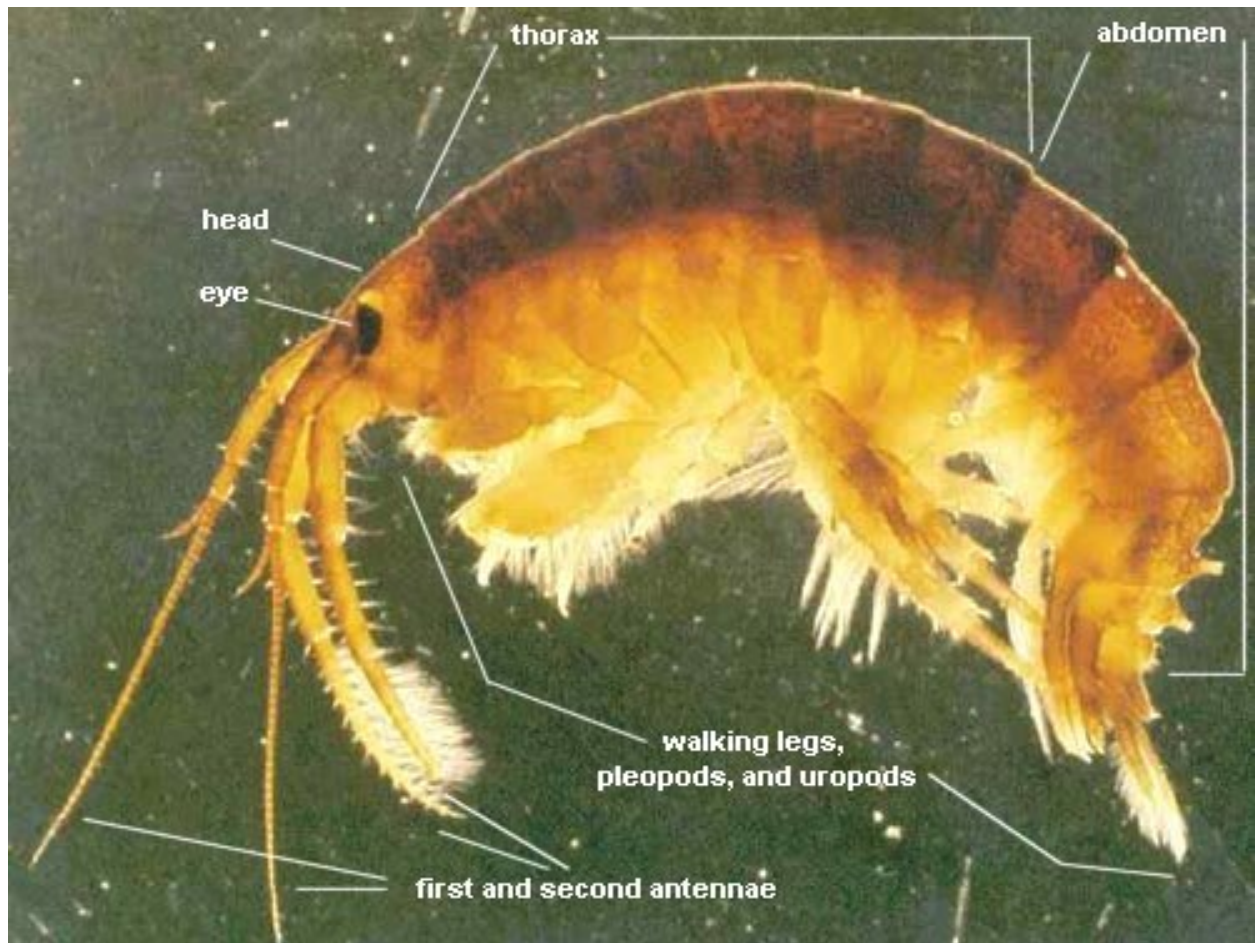


Fig. 1 *Dikerogammarus villosus*.¹

Identification

Distinguishing Characteristics

- Total body length of up to 30 mm (relatively large for a freshwater amphipod)
- May appear striped or uniform in coloration pattern (Fig. 2)
- Mandibles are relatively large
- Behavior is particularly vicious and destructive, killing and maiming unselectively

¹ http://wabau.kww.bauing.tu-darmstadt.de/forschu/projekte/Elbe/Faunistische_Highlights.html

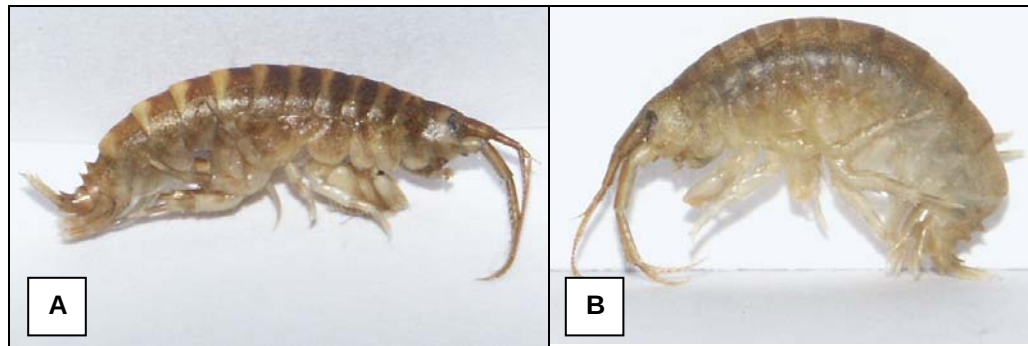


Fig. 2 Polymorphic coloration pattern of *D. villosus*: striped (A) and uniform (B) exoskeleton patterns².

Life Cycle

Juveniles

- Newly released young resembling adults, but microscopic in size
- As with other arthropods, develop an exoskeleton, molting several times as they increase in size

Adults

- Sexual maturity reached at 6 mm in length
- Populations are predominantly female
- Exceptionally high growth rates (e.g., 1.3–2.9 mm per month during the winter and 2.0–2.6 mm over a two week period in spring)

Reproduction

- Reproduce sexually, high fecundity
- Reproduction occurs year round
- During mating, male carries smaller female on his back (i.e., amplexus)
- Female can carry approximately 50 fertilized eggs and releases them into the ventral brood chamber, where they are incubated and develop

Habitat Characteristics

Preferred Environment

- Fresh and brackish waters
- Lakes, rivers, and canals
- Able to colonize all types of fastened banks, sheet-pile walls, and especially mats of algae near or on the water surface
- Following invasion of the River Rhine, *D. villosus* became the dominant species on stone substrates where it out-competed other species including *Gammarus tigrinus* (a strongly competitive species native to North American waters)

Temperature

- Eurythermic (i.e., tolerant to wide range of temperature changes)
- Optimal metabolic temperatures are between 20-23°C
- Upper thermal limits between 30-35°C

Oxygen

- Tolerant of low dissolved oxygen
- Highest oxygen consumption occurred at 20°C

Salinity

- Prefers fresh and brackish waters (0‰-10‰ salinities)
- Able to adapt to salinities of 20‰
- Intolerant of salinities >24‰

² Simon Devin, Université de Metz, France

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Web Sites

http://www.geocities.com/fadjar_z/Jones/jones7.htm

Selective Pollination - Donald Forsha Jones (1928) Chapter 7

http://www.guardian.co.uk/uk_news/story/0,3604,417246,00.html

Guardian Unlimited - Pink Peril threatens native species in Britain's rivers

<http://www.glerl.noaa.gov>

NOAA, Great Lakes Environmental Research Laboratory

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