Invasive Species Fact sheet

Dikerogammarus villosus (Sowinsky, 1894)

September 2011

Dikerogammarus villosus (Environment Agency, 2010)

Description

Dikerogammarus villosus (Dv), more commonly known as the Killer Shrimp, is a highly invasive shrimp. It can be considerably larger than our native shrimps, growing up to 30mm in length and usually has a striped appearance, although it can be uniform in colour. The species is listed in the Top 100 worst alien species in Europe (http://www.europe-aliens.org/speciesTheWorst.do).

Distribution

Native to the Black Sea, Dv has spread over western Europe in the last 15 years and was discovered at Grafham Water, Cambridgeshire September 2010, and then Cardiff Bay, and Eglyws Nunydd reservoir (Port Talbot) Wales November 2010.

Ecology

Dv live for about one year, the largest specimens seen in spring, following slower growth rates over winter. Females have approximately 3 broods with and have an average of 150 eggs per brood (under optimal conditions this number can be up to 350). They can reach sexual maturity early, in

approximately 6 weeks. Juveniles are often found within algae, away from adults and are thought to be herbivorous during the early developmental stages.

Dv is able to tolerate a range of environmental conditions. It can endure a wide range of temperatures (up to 23oC) and salinities (up to approx. 20‰); however, at the extremes of these ranges, breeding does not occur. It is also able to tolerate a wide range of flow speeds. Dv does not colonise fast flowing waters, taking advantage of the moderate to slow flow speeds in marginal areas but it takes advantage of the high velocities to drift to new locations.

Dv is nocturnal, spending the daylight hours occupying niches in cobble/pebble substrate (unless they are in exceptionally high abundance, when they will be seen during the day in the water column). It is a very mobile species and therefore dependent on good oxygen levels, as a result it is rarely found at depth. It can swim at up to 2kmh-1 and will move over large distances to get to food sources, which it is able to locate due to its good sense of smell.

Feeding Behaviour

Dv is omnivorous, able to exploit a wide food base including macroalgae, microalgae (from cleaning stones and through filter feeding), basal threads of zebra mussels, all invertebrates (including fast moving species), fish eggs and fish fry. It even recycles its own faeces. It has well developed hairs on the second antennae which act like Velcro to hold prey and also form a kind of vortex effect to draw in small prey items. Hairs are also present on the claws which act as a form of basket to hold the prey items. To tackle larger prey (sizes up to 40mm), it uses its whole body like a claw to manipulate the prey item.

In its natural range, Dv is preyed upon by a species of goby which is highly specialised for getting into crevices between rocks. Evidence has been provided by anglers from Grafham Water to show that the Brown Trout, Rainbow Trout and Perch are preying on Dv. It is predicted that the Dv in Grafham Water may become progressively smaller over time to avoid predation (Dr. D. Platvoet, pers. comm.).

Habitat

Dv is known to prefer rocky substrate, especially rock armour where it takes advantage of the crevices to avoid predation during the daylight hours. It will often spend time locating a suitable hole in which to shelter, that it fits into snugly. Dv is not found in soft clay substrates or watercourses with reed margins. It is also not found in pristine waters that are low in nutrients. Dv has the potential to spread anywhere in Britain that has suitable habitat.

Dv is very strongly linked with the invasive zebra mussel (Dreissena polymorpha) in its home range and it is thought that they may have co-evolved. The characteristic stripes of Dv are very similar to those of the zebra mussel. Dv have been observed in high abundance at Grafham Water in zebra mussel beds.

Study Results

The Environment Agency Biology Lab at Brampton, Huntingdon, have undertaken various studies and the findings are as follows:

Drying tests

In an early study we learnt that Dv could survive for up to 5 days in a outdoor store on a damp fishing net. Through a second study, in cooler weather conditions, we established that Dv could survive (as anticipated) for longer. On a damp folded net Dv survived for 7 days, in a small plastic crevice they survived for 10 days and within a crease of a damp folded wader, Dv survived for 15 days. This test

also established that Dv died within 48 hours of the retaining surface becoming dry. These tests clearly demonstrated Dvs ability to survive out of water for approximately a week if kept in moist conditions and that it was vital for kit to be thoroughly dried and ideally have a period of at least 48 hours between becoming completely dry and subsequent re-use.

Freezing tests

We tested Dvs ability to survive out of water in sub-zero air temperatures and we discovered that Dv could survive for short periods (up to 3 hours) in temperatures as low as -15oC.

Substrate test

As part of a biosecurity measure we needed to establish whether Dv would bury themselves or try to penetrate through a pipe filled with sand. Observations showed that no individuals penetrated or buried themselves in the sand.

Disinfectant trials

We tested five common disinfectant cleaning products to determine their effectiveness for the public to adopt as biosecurity measures to kill Dv on clothing/equipment. Although some of the products proved effective in killing Dv, the exposure time was too long for use by the public.