

The Killer Shrimp!!!

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8th April 2011

based on presentations from:

- Mark Diamond, EA
- Dr Ian Hirst, EA
- Genevieve Madgwick, NE

<2 mm – 3 cm
often striped, but polymorphic



Patrick Steinmann



Michal Grabowski

Dikerogammarus villosus

- Native to South-Eastern Europe (Ponto-Caspian)
- Omnivore
- Prominent predatory traits:
 - Unusually powerful mouthparts – bites, kills & shreds prey
 - Strong & developed antennae – to help catch prey
 - Fast action to ambush prey
 - Strong claws
- Prey items up to 40mm; feeding non-specific
- Usually 3 reproductive peaks per year
- Reaches sexual maturity early
- High fecundity

Identification



Dikerogammarus villosus



Identification of *Dikerogammarus* and other British Freshwater Shrimps

This identification sheet is derived from the FBA's publication, *Guide to Freshwater Invertebrates* which will be available in 2013 as a tribute to T.T. Macan.

Dikerogammarus villosus (often referred to as the killer shrimp) is an amphipod native to south-eastern Europe, which has recently spread to western Europe. In September 2010 it was found in Grafham Water, Cambridgeshire.

If you find *Dikerogammarus*, please send a photo and details of location to alert_nonnative@ceh.ac.uk.

Identification

Size and colour are useful aids to identification, but the projections on the urosome are definitive.

Maximum body length:

Crangonyx pseudogracilis: 10 mm

Gammarus species: 20 mm

Dikerogammarus villosus: 30 mm

Body colour:

Crangonyx pseudogracilis: Bluish-white (when live)

Gammarus species: Striped or uniform

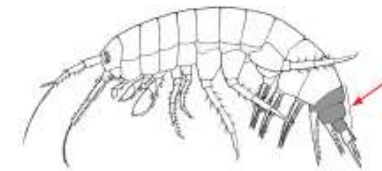
Dikerogammarus villosus: Striped or uniform

Features on urosome:

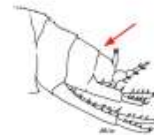
Crangonyx pseudogracilis: Urosome generally smooth (short fine setae may be present)

Gammarus species: Dorsal setae or spines present on all three segments

Dikerogammarus species: Urosome segments 1 and 2 each with a dorsal projection



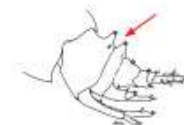
Gammarus with urosome highlighted.



Crangonyx pseudogracilis



Gammarus spp.



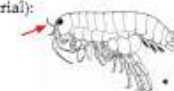
Dikerogammarus villosus

Other Amphipoda found in fresh water

Orchestia coximana (semi-terrestrial):

Very short first pair of antenna (arrowed)

Max length: 20 mm



Coriphium species (brackish water):

Enlarged second antenna (arrowed)

Max length: 9 mm



Niphargus species (mostly subterranean):

Eyeless. Gnathopod hands (arrowed) about as broad as long

Max length: 15 mm



Crangonyx subterraneus (subterranean):

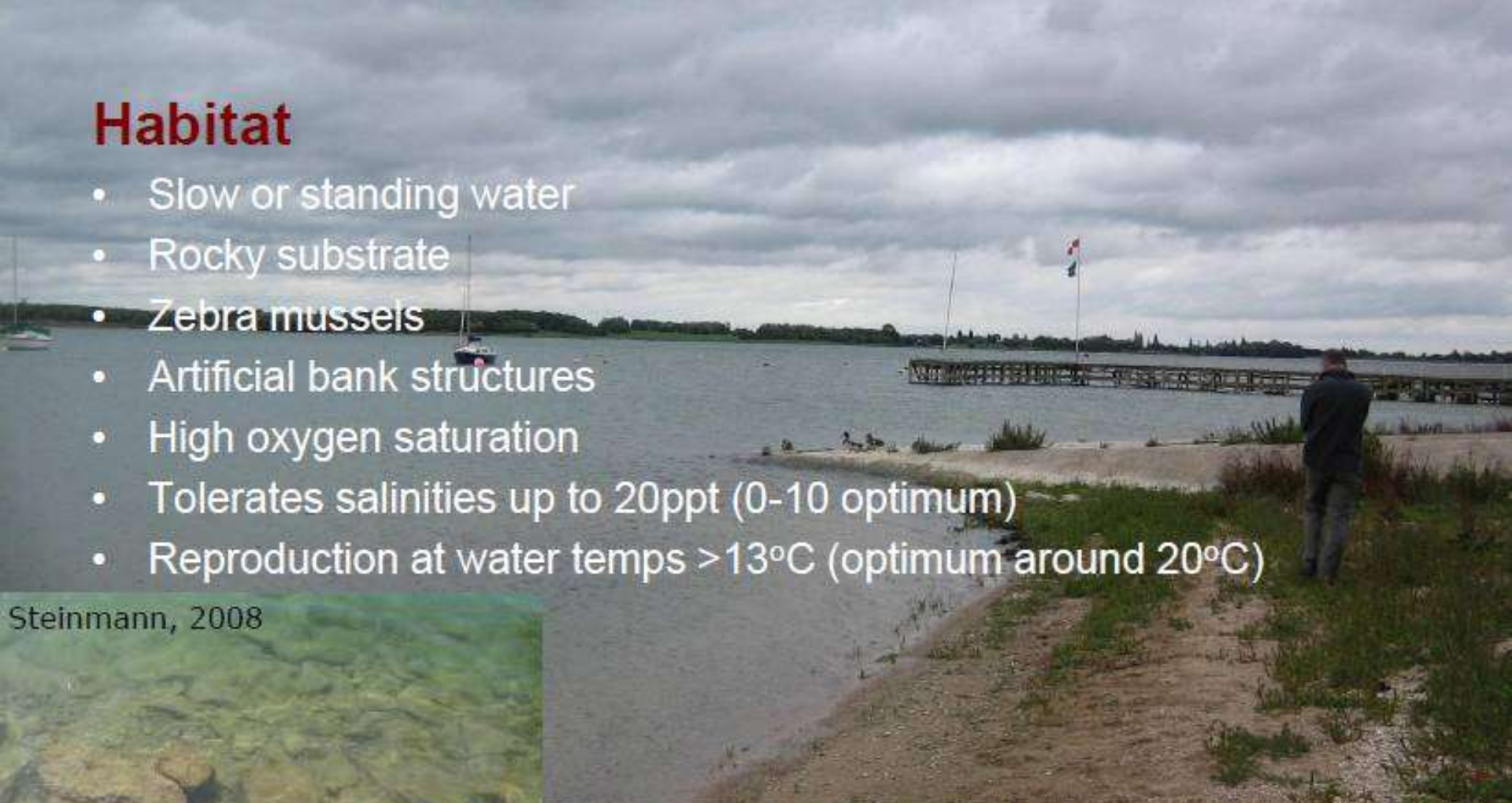
Eyeless. Gnathopod hands (arrowed) longer than broad

Max length: 6 mm



Habitat

- Slow or standing water
- Rocky substrate
- Zebra mussels
- Artificial bank structures
- High oxygen saturation
- Tolerates salinities up to 20ppt (0-10 optimum)
- Reproduction at water temps $>13^{\circ}\text{C}$ (optimum around 20°C)



Invasion history



- Invaded Western Europe via the Danube
- Opening of the Danube-Main-Rhine canal in 1992
- Now invasive in Germany, Italy, Netherlands, France, Switzerland, Belgium, Hungary & Czech Republic
- In Rhine spread at 124 km per year downstream (30-40 km year upstream).
- Can survive incomplete saline ballast water exchange



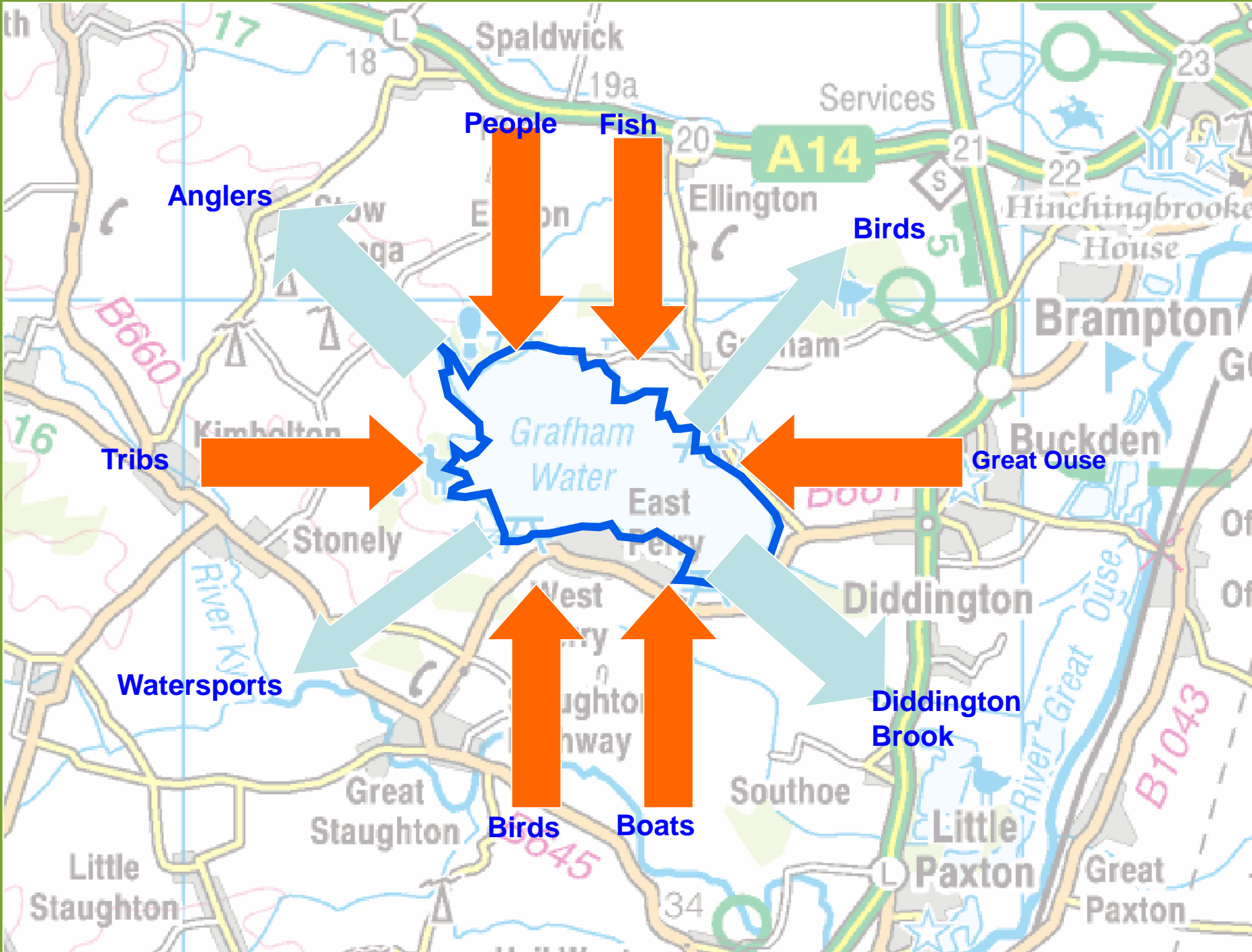
Summary of Impacts

- Reduction in invertebrate biodiversity
- Complete exclusion of native gammarids in suitable habitats
- Local species extinction
- Reduced shredding – nutrient dynamics consequences?
- Simplified & less resilient food chains
- Change in fish diets (as demonstrated in Lake Constance)
- Food chain consequences?
- Loss of GES & favourable conservation status
- BAP species (e.g. White-clawed crayfish, spined loach, vendace?)

Timeline in UK

- Angler brought samples to EA on 3 Sept 2010 from Grafham Water - provisional ID was *Dikerogammarus villosus*
- ID confirmed by Dr Dirk Platvoet, University of Amsterdam the following week
- Found in two waters in South Wales. Cardiff Bay, and Eglwys Nunydd reservoir in Port Talbot





People

Fish

Anglers

Birds

Tribes

Great Ouse

Watersports

Birds

Boats

Diddington
Brook

What are we doing?

GB Programme Board initiated **Rapid Response Strategy**

Short term (Sept – Christmas):

EA local operations group  Cross organisational technical group

- Containment & local monitoring
- Communications to public & stakeholders
- Technical advice for operations group & Defra
- Go ahead from minister for wider work programme

Medium - long term (now!):

Task Force (Defra, WAG, EA, NE, CCW)

Implementation plan to prevent spread:

- Communications plan:
 - Targeted national & local campaign
- Monitoring at high risk sites:
 - Establish extent of distribution
- R&D:
 - What biosecurity works?
 - Is eradication possible?
 - Likely spread & impacts
 - How can we stop it re-invading?
- Added protection at conservation sites
- Proactive measures to prevent further introductions

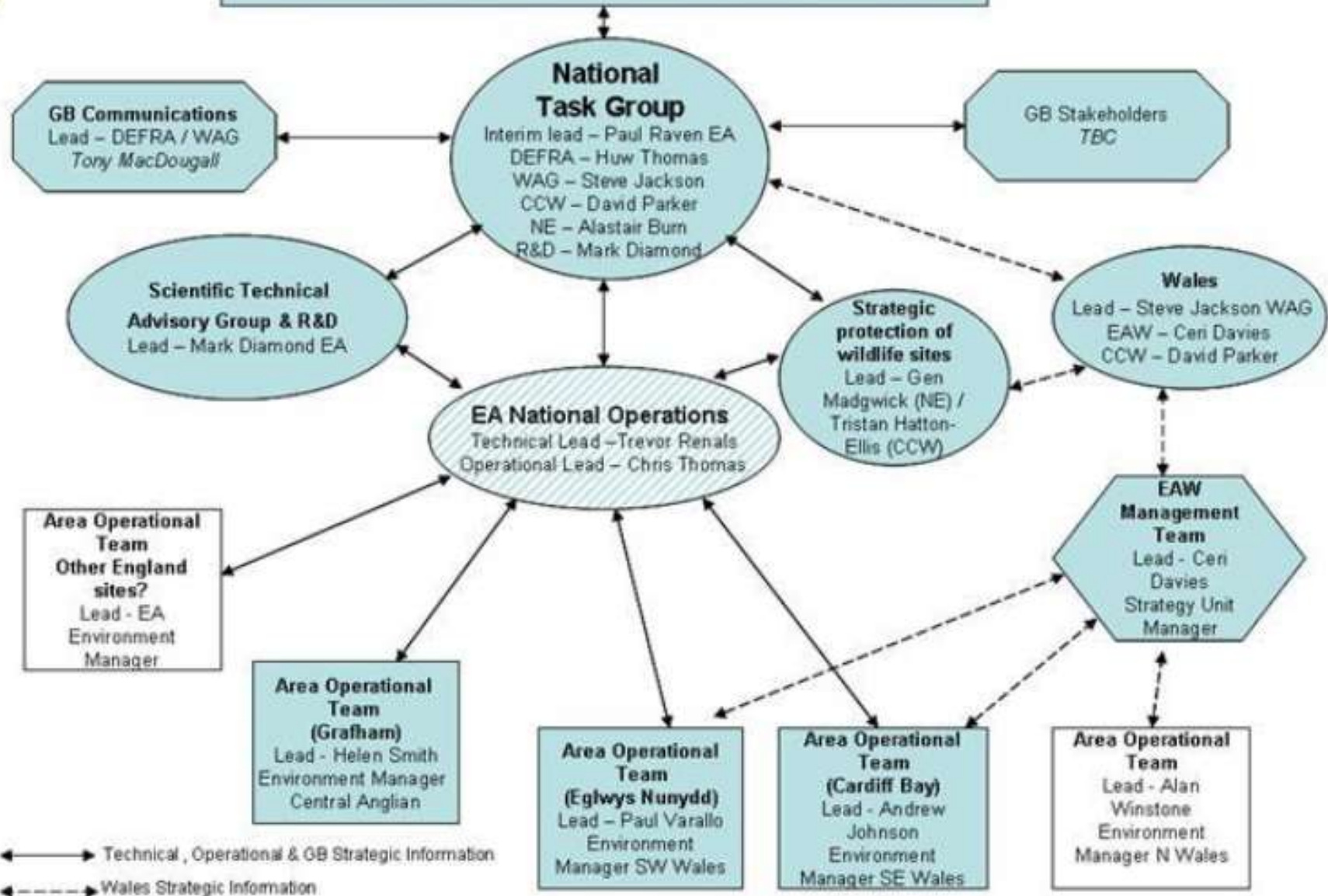


Project groups



GB Invasive Non-Native Species Programme Board

Figure 1



Biosecurity: what have we learnt ?

- ➔ Very difficult to remove from the sampling net due to their “Velcro-like” antenna and very spiny/hairy gnathopods.
- ➔ They cling onto neoprene chest waders and find refuge inside the folds.



Biosecurity: what have we learnt ?

- ➔ Drying test on damp net (October) - max survival time of 5 days in outdoor store.
- ➔ Drying test at colder temps. (Jan, temps 1-10 C)
 - ➔ damp net survival = 7 days,
 - ➔ Plastic groove 9 days
 - ➔ folded wader 15days.
- ➔ Freezing test #1 – upturned bucket lid left outside overnight temp range -1 C to +2 C, only 4 out of 30 died
- ➔ Freezing test #2 –Freezer, average temp of -15 C, survival 2-3 hrs.
- ➔ Takes up to 48hrs to die after media has dried out.



Biosecurity: what have we learnt ?

- ⇒ Household disinfectants/washing powders test
 - ⇒ pine disinfectant survival time 47 mins for 20 shrimps tested.
- ⇒ Virkon S at 1% - moribund in 10 seconds, submerged
- ⇒ Virkon aquatic at 1% - moribund within 30 seconds, submerged.
- ⇒ Immersing equipment in Virkon for 2 mins and/or ensuring stuff is completely dry for 48hrs. We use a drying room set at a highish temperature (around 25-30 C).
- ⇒ A quick spray with Virkon is very unlikely to kill it

Gratham Water - Best Practice

- ➔ Signage and guidance on-site
- ➔ One point of access, with supervision
- ➔ All equipment that enters site should be clean and have been dry for 48hrs
- ➔ Minimise contact with water
- ➔ After use equipment should be thoroughly washed and thoroughly dry for 48 hrs before being used elsewhere
- ➔ Independent post-biosecurity check



Gratham Water - Best Practice

- ⇒ Jet-washing greatly reduces the numbers of shrimp
- ⇒ Small shrimps are hard to see(!)
- ⇒ The residual risk from boats and trailers is low after supervised biosecurity
- ⇒ Nets, bass bags and neoprene stocking and boot waders need particular attention
- ⇒ Disinfectant needed

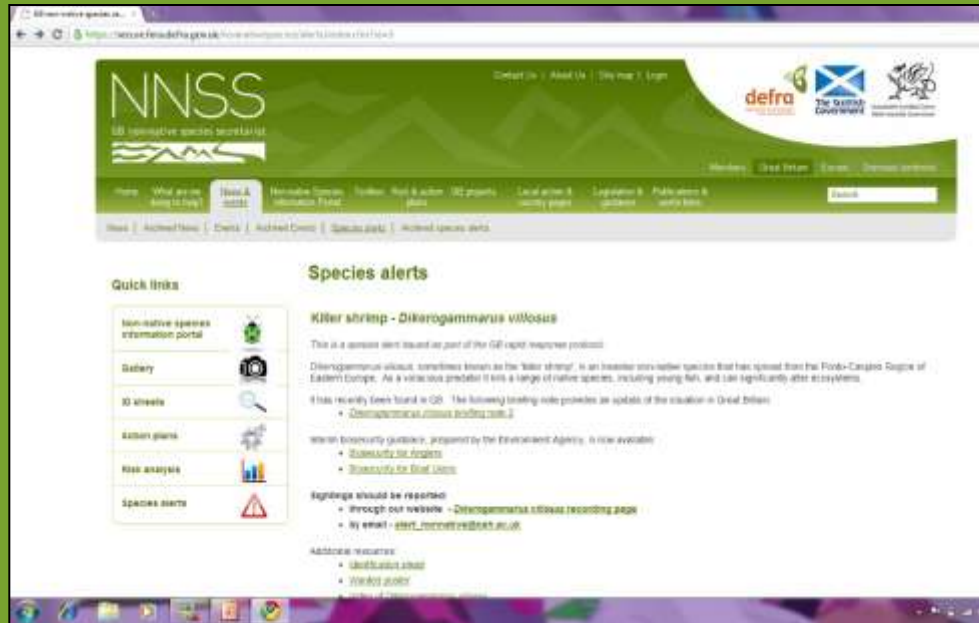


On-going work

- ⇒ Containment
- ⇒ Maintain bio-security
- ⇒ 80 other sites considered at risk all negative
- ⇒ Kick-sampling and trap-sampling ongoing of high risk sites across the country



More Information:



www.nonnativespecies.org



Invasive Species Alert!

KILLER SHRIMP

Dikerogammarus villosus

What is it?

A highly invasive non-native species that has spread from the Ponto-Caspian Region of Eastern Europe. As a voracious predator it kills a range of native species, including young fish, and significantly alters ecosystems. The first known outbreak of this species was found in Grafton Water on 3 September 2010.



How do you identify it?

- > Total body length of up to 30 mm (large for a freshwater amphipod).
- > May appear striped or uniform in coloration pattern.
- > Mandibles are relatively large.
- > Behaviour is particularly voracious and destructive.



What is the urgency?

> This is the first known outbreak in Great Britain. It is vital that we try to stop its spread to new locations. It can be spread inadvertently by people. By following the guidance below you can help to keep it contained.

Help stop the spread of this species by:

- > Inspecting and cleaning boats and kit before and after use.
- > Inspecting and cleaning launching trailers.
- > Draining all bilge water from boats before leaving the site.
- > Disinfecting angling kit before and after use.
- > Making sure no lake water is taken away with your kit.
- > Not transferring bait between water bodies.

If you find this species, please send a photo and details of the sighting to:

alert_nonnative@ceh.ac.uk

www.nonnativespecies.org

Summary

- ➔ A new aggressive invasive non-native species
- ➔ Changes the invertebrate community on a waterbody
- ➔ Predates on other invertebrates and fish
- ➔ Need to contain it
- ➔ Need raise the awareness amongst aquatic ecologists and biologists
- ➔ Good biosecurity is essential

