Friday, 3 November 2023

CRUSTACEAN DEATHS COLLABORATIVE WORKING GROUP

A meeting of the Crustacean Deaths Collaborative Working Group was held on Friday, 3 November 2023 at the Redcar and Cleveland Civic Centre.

PRESENT Councillors Bastiman, C Cawley, Chance, Creevy, Eglington, Feeney, Gavigan, Les and P Thomson.

OFFICIALS H Clear Hill, S Connolly, E Grunert, R Saunders Thompson, J Stevens

APOLOGIES FOR ABSENCE

Apologies for absence were received from Councillors Branson, U Earl and M Ovens.

43 **TO CONFIRM THE MINUTES OF THE MEETING HELD ON 13 OCTOBER 2023**

RESOLVED that the minutes of the Crustacean Deaths Collaborative Working Group held on 13 October 2023 be confirmed and signed by the Chair as a true record.

44 **MATTERS ARISING**

None noted.

45 **DECLARATIONS OF INTEREST**

None recorded.

46 **DISCUSSION WITH INVITEES**

Professor D Roberts, University of Durham, Department of Geography

Professor Roberts, who was welcomed to the Group by the Chair, advised that he was working as part of the community effort as a sedimentologist with expertise in how sediment is deposited in coastal environments. Professor Robert's interest in the area had developed over decades, particularly in relation to waste produced as a result of coal mining activity and he has extensive experience of collecting cores from coastal areas.

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Professor Roberts advised that, following the mortality event, scientists have been examining dredging activity to assess how sediment may have found it's way to the sea floor, and what the sediment may contain. Cores had been retrieved as part of a collaborative process between the scientific and fishing communities and were currently in the process of being analysed for content. Within 6 – 12 months comprehensive results relating to the characteristics of the sediment should be available.

Professor Roberts guided the Group though a presentation, and the following observations and comments were noted:

- Plumes of sediment were released during the dredging process that were not contained. Further to this, plume is a dynamic entity which moves up and down the river with the action of the tide. For this reason, several testing points were utilised.
- Material that is dredged and goes into suspension in the water column will slowly settle and eventually reach the sea floor, providing a record of the sediment that has been released.
- The law of superposition states that younger sediments lie above older sediments and the most recent sediment layers sit on top of the sediment pile. Sediment tells us about the depositional processes and pollutant signals.
- The Group noted the location of Tees core samples and were advised that sediment cores were taken to the lab for analysis, with data derived from the following processes:
    - MSCL scans to ascertain the physical properties of the core.
    - CT scans, which allowed researchers to look inside the core to define what the sediment is.
    - XRF scans which provided elemental analysis.
- Findings from core sample analysis showed the following:

<u>S2a (pre-dredge sediment)</u>

- Dark brown; muddy sand; massive; macrofauna (worms, molluscs, gastropods); bioturbated.
- High density.
- High magnetic susceptibility.
- Elemental signal: Zn/Fe/Al ↑; Pb/Cu/Cr/V↕

<u>S3 (pre-dredge overlain by thin dredge)</u>

<u>Pre-dredge</u>

- Dark brown, muddy sand, macrofauna (worms, molluscs, gastropods)

<u>Dredge</u>

- A thin cap of red, muddy sand on top, lacking fauna, not bioturbated, laminated.
- Drop in Mag Sus and density.
- Drop in elemental signal (Zn, Cu, Pb, Fe)

S7 (pre-dredge overlain by thin dredge)
Pre-dredge
- Dark brown, muddy sand, no macrofauna

Dredge
- 10cm cap of red, mud, lacking fauna; laminated
- Drop in Mag Sus and density.
- Drop in elemental signa (Zn, Cu, Pb, Fe, Al)

S4 (pre dredge overlain by thin dredge)
Pre-dredge
- Dark brown, muddy sand, no macro fauna

Dredge
- 32cm cap of red, mud, lacking fauna; laminated
- Drop in Mag Sus and density
- Drop in elemental signal (Fe), spikes in Cu/Zn

S5a (pre dredge overlain by thin dredge)
Pre-dredge
- Dark brown, muddy sand, no macrofauna

Dredge
- 34cm cap of red, mud, lacking fauna; laminated, deformed
- Drop in Mag Sus and density
- Change in elemental signal.

- Overall findings from sample analysis point to the following
    - pre-dredge signal shows dark brown, muddy sands with extensive evidence of macro fauna (worms, gastropods, molluscs) and related bioturbation. Sediment is high in density and magnetic susceptibility and distinctive elemental signal.
    - The dredge signal is composed of fine-grained (silt/clay) sediment, which is laminated, red-brown in colour and devoid of life, low in density and magnetic susceptibility, and a different elemental signal to the pre-dredge material. The red cap of dredge signal has a local source and was deposited quickly.

The following questions and comments were noted:

- A Member asked if sediment stays settled once it falls to the sea bed, and Members were advised that this is dependant on the area of the sea/river it falls on to. Some areas may trap the signal, and it will be ripped up and eroded in more active parts. All cores taken as part of this investigation were retrieved in situ, on a single day in April 2023. Members also noted that the cores taken were not a standard length owing to difficulties in core retrieval.

- A Member asked for further information relating to the distorted sample. Members were advised that core disturbance in sample 5a was most likely caused by intense settling of large amounts of sediment. Natural deformation produces chaotic structures which are easily identified.
- Professor Roberts advised that, in his opinion, core samples 3 – 7 contained material dredged as a result of adaptation and alteration of the bank, possibly resulting from work undertaken by the Athena. Although it is difficult to date plumes, the law of deposition states that the top deposits are most recent. There has been no comprehensive survey of the river bed, but common sense would dictate that the red dredged sediment is likely to now be ubiquitous along the whole of the river bed.
- Cores S8-S13, probably containing material dredged as part of work undertaken by Orca, is slightly different in terms of signal.
- Members noted that samples were taken from the side of active channels.
- A Member asked why the pre-dredged material present in the core sample S2b showed evidence of extensive life and others did not. Professor Roberts advised that it was possible that all of the material contained in core samples 3 – 7 was inhospitable, given that much of the sediment present in the river, goinv back over decades, was exposed to industrial pollutants.
- A Member asked if the dredged sediment was beginning to be ‘capped off’, or whether it would recover or need to be taken out. Professor Roberts advised that it may stay hidden, but much of the material left in this landscape is now coming back to haunt us, and that burying the problem is not a solution.
- A member asked if the red plume that was part of the dredge might have been mistaken for the algal bloom identified by CEFAS as part of initial investigations. The Group were advised that, although there is no definitive answer to this question. Evidence suggests that plume activity entered the coastal areas and headed south to the North Yorkshire coast, and it would make sense that the two factors are linked.

Dr Gary Caldwell, University of Newcastle, School of Natural and Environmental Sciences

The Chair welcomed Dr Caldwell back to a meeting of the Working Group. Dr Caldwell advised he initially became involved in the work as a scientist, but that his interest had expanded to take a more holistic view of the wellbeing of the whole community.

Dr Caldwell provided a presentation outlining an elemental analysis of River Tees sediment core, with a focus on metals. Dr Caldwell advised that the data presented was interim, although the broader messages

would be unlikely to change. The following points were noted:

- Levels of 19 elements were determined, including metals which bio-accumulate and are known to cause environmental toxicity. The following metals were included in the study: aluminium. arsenic, barium, calcium, cadmium, chromium, copper, iron, lead, magnesium, manganese, nickel, phosphorus, potassium, silicon, sodium, strontium, tin & zinc.
- Cores were sliced and elemental levels determined at various sediment depths – 0-2 cm, 8-10 cm, 18-20 cm, 28-30 cm and 38-40 cm. There were fewer deeper samples due to limitations in core penetration.
- The core samples allowed the mapping of the prevalence of elements across the Tees estuary, with common trends in distribution identified. There were changes in concentration by location, with consistent hotspots identified from the areas of the channel affected by the Athena cutter suction dredger.
- Levels of all analysed elements were elevated, with some (aluminium and iron) remarkably high. Elemental levels changed with sediment depth, typically increasing with depth, and for some, e.g., aluminium, there was a reduction in levels in the deeper sediments likely unaffected by the Athena.
- An AI machine had been created to examine concentrations of toxicity of various substances to a suite of marine animals. The potential impact on the human food chain was referred to, and the need to quantify levels of metals in marine life to assess risk to human health.
- Hydrocarbon contamination had not been discussed, but a full composition would be available at a future date.

The following questions and comments were noted:

- A member asked if any of the metals identified above was more toxic than the rest, and how long it would remain in the food chain if it got there. Dr Caldwell advised that all of the metals tested are toxic to marine life, but the cocktail of contaminants is particularly dangerous given the complexity of the chemical world. Using AI to predict the outcome of exposure to cocktails of chemicals would be game changing. With reference to the food chain, Dr Caldwell advised that pollutants held in sediment are like a ‘continually charged toxin battery’ that is leaching into the environment, and that those toxins will bio-accumulate in the systems of organisms exposed to them. A definitive answer is not possible but would be the focus of work taking place in early 2024.
- A Member asked why PD Ports aren’t required to test dredged material more regularly given the chemical of cocktails that are present in the riverbed. Dr Caldwell advised that, in his opinion, the statutory requirements are inadequate in relation to the River Tees,

which should be looked at with more nuance and tested more regularly. Further to this, the re-development work has brought forward a new threat, and any event that returns older sediments to the channel remains a risk., particularly to the fragile areas of recovery. Animal life along the coast is so denuded that any future events might go unnoticed.

- Doctor Caldwell advised that the North East lacks data and a systematic way of monitoring the health of it's coastline, and the current response-driven method is not effective.
- A Member asked how difficult it would be for PD Ports to increase the regularity of testing. Members were advised that any well-governed and resourced organisation should be able to manage the demands of increased frequency of testing. Many organisations are now embedding Environmental, Social, Governance factors in view of the fact that companies have a duty to care for the environment.
- A Member asked if central Government had shown interest in the work being undertaken, and whether regulations had diverged since Brexit. Dr Caldwell advised that regulation had not diverged although the current Government had not done any work to strengthen environmental legislation. Central government had shown not shown a constructive interest in the work being undertaken around Tees Valley and the UK testing regime is no fit for purpose, becoming increasingly so every year.
- A Member asked for Dr Caldwell's thought's about the previously proposed causes of the die-offs. Members were advised that algal bloom was unlikely to be the cause as it was not at a scale to cause that extent of damage, and there was no direct evidence to link the deaths to a novel pathogen, which CEFAS has advised does not exist.

The Chair thanked the attendees for their contribution to the Working Group, and asked Members of the public to submit questions via himself.

47 **INDIVIDUAL AUTHORITY UPDATES**

Members were invited to start collating ideas in preparation for the concluding meeting being held in January.

A discussion took place regarding an extension of the work beyond February 2024. Owing to purdah and the fact that the Group had already worked beyond it's time remit, it was agreed that the work should conclude in February.

A Member suggested that the focus of the report should be on looking forward as opposed to finding causes for the mortalities.

The following actions were agreed:

- An invitation to December's meeting be sent to Mayor Houchen, the Environment Agency, the Marine Management Organisation and Centre for Fisheries and Aquaculture Science.
- Request the public presentation from Dr Caldwell.
- Organise a trip to Whitby Lobster Hatchery for members of the Working Group.

48 **DATES OF FUTURE MEETINGS**

Meetings scheduled as follows:

- 7 December 2023 (moved from 8 December) - TBA
- 12 January 2024 - TBA