Briefing on Crustacean Sentience and Welfare

Decapod Crustacean Sentience

Findings from scientific studies suggest that it is highly likely that decapod crustaceans are "*capable of experiencing pain or suffering*" – the criteria required under Section 1, 3 of the Animal Welfare Act 2006 (England and Wales) to include an invertebrate taxon under the definition of 'animal'. Whilst it is impossible to conclusively prove the existence of any subjective experience in another human or non-human animal (Dawkins, 2001; Proctor, 2012; Sherwin, 2001), Elwood (2012) argues that as much scientific evidence is now present for pain in decapod crustaceans as for fish. Yet fish are protected under the Act, suggesting that the exclusion of decapods is based on a taxonomic bias rather than scientific evidence. A Freedom of Information request, submitted in January 2017, revealed that no assessment had been either conducted or commissioned by DEFRA into the ability of decapod crustaceans to feel pain since 2005 (Crustacean Compassion, 2017a). In addition, the Hansard reports that DEFRA were criticised by the Select Committee for not submitting the existing evidence of decapod sentience to the Scientific Advisory Committee in 2005 before excluding them from its protections (Select Committee, 2005). In what follows we summarise some key findings in support of their inclusion, both in the Animal Welfare Act 2006 and in the proposed Animal Welfare (Sentencing and Recognition of Sentience) Bill.

The Animal Welfare Act 2006 (England and Wales) became law just before the European Food Safety Authority (EFSA) report on the welfare of animals used for experimental purposes decisively classed decapod crustaceans as Category One animals, where "*the scientific evidence clearly indicates…..that animals in those groups are able to experience pain and distress*" (EFSA, 2005). Since that time increasingly compelling research has emerged. Research attracting significant media attention has been conducted by a team based at Queen's University Belfast, led by Professor Robert Elwood. The team investigated whether it was possible to distinguish between a nociceptive reflex response in decapods (a simple reflex response to harmful stimuli) and a subjective, felt experience known as pain (Barr et al., 2008; Sneddon, 2004), whose adaptive function is to provide a strong motivation to avoid that stimulus in the future (Bateson, 1991). A series of experiments were devised which sought to identify a number of criteria (Elwood, 2012), including avoidance learning, physiological responses (see also Patterson et al., 2007), rapid behaviour change, prolonged rubbing of the affected areas (see also Barr et al., 2008), the laying down of memories, and motivational trade-offs (Magee and Elwood, 2013; Magee and Elwood, 2016).

For example, one experiment varied the potential cost of avoidance of a mild electric shock to the abdomen of hermit crabs (Elwood and Appel, 2009a). One group of hermit crabs were given high quality shells to inhabit, and another group were offered poor quality shells. The shells had wires attached that would deliver small shocks to the abdomen of some of the crabs (shocks that were calibrated at just below the level that would normally induce them to vacate). Both the shocked and non-shocked groups were then offered new shells. They found that the shocked crabs were more likely to move out of their shell and into a new one. They also did this more quickly than the non-shocked crabs; they retained a memory of the shock for up to 24 hours (Appel and Elwood, 2009a); and they would explore the shell afterwards to try to locate the source of the pain. Crucially, they were much more likely to move if the shell they were occupying was a less preferred species of shell. The crabs were

'trading off' the experience of pain for a preferred shell, suggesting that the pain was acting as a guide to flexible decision making, rather than a simple reflex response (Appel and Elwood, 2009a). When a response pattern like this is observed in vertebrates, it is interpreted as awareness of a painful stimulus (Gherardi, 2009). Appel and Elwood (2009b) concluded:

"All of these responses are consistent with criteria suggested to indicate pain ….and add further weight to the suggestion that pain is felt by crustaceans"

Whilst there remains some disagreement over whether decapods should meet additional criteria before full confidence is expressed (decapods meet 14 out of 16 of Sneddon's criteria for pain (Sneddon, 2015), with the remaining two criteria yet to be studied), it is agreed by many that that the evidence is sufficient to pay regard to their welfare (Mason, 2011; Sherwin, 2001; Horvath et al., 2013; Broom, 2007) if cost effective methods can "mitigate the risk of a full scale animal welfare disaster" (Birch, 2017). Broom (2007) states *"The case for protecting these animals would appear to be substantial".*

Welfare Concerns

Despite this evidence, decapods are frequently seen crammed together in brightly lit tanks in food retail establishments, with no consideration for their welfare. Lobsters prefer to reside in sheltered crevices, prefer dark conditions (Mehrtens et al., 2005), and are solitary animals (Beard & McGregor, 2004), and so it is highly likely that bright, crowded conditions cause stress (Carder, 2017). A recent pilot study shows that they are frequently given little space to move, are unable to carry out natural behaviours, and are not provided with dark shelters which are known to be preferred by certain species (Carder, 2017). Crabs have even been found for sale live yet entirely immobilized in shrink-wrap (Blair, 2015). Numerous retailers also sell decapods direct to the home consumer, with some advising storing the live animal in a fridge for up to a week. Since many species of lobster are unable to adequately consume oxygen in air (Fotedar & Evans, 2011) this could be a significant welfare issue.

Of particular concern is the welfare of decapods at killing. In the food industry, there are no official guidelines available. Killing is sometimes preceded by breaking off the legs, head or tail, and is often accomplished by boiling alive. Roth and Øines (2010) estimate that an edible crab boiled alive may remain conscious for at least three minutes, an interval which would be unconscionable in a vertebrate species. Many of the most common methods of killing have been described as inhumane by the EU's Animal Health and Welfare Scientific (AHAW) Panel (EFSA, 2005). Chilling before boiling is often believed to be more humane; however this was found by Roth and Øines (2010) to be ineffective in edible crabs, taking them 30-40 minutes to lose behavioural signs of consciousness in the freezer, during which time they showed signs of stress by losing their legs (autonomy) (ibid).

Whilst mechanical methods can be humane if carried out correctly (RSPCA Australia, 2016), current research suggests that electrical stunning is likely to be the most humane method of killing (Roth and Øines, 2010; Neil, 2010; Neil and Thompson, 2012). Several machines are currently in use such as the Crustastun and the Stansas, for example by Waitrose, Tesco and Whole Foods, demonstrating that commercially viable solutions are possible (Crustacean Compassion, 2017b). Switzerland's recent ban on boiling lobsters alive (Swiss Conferedation, 2018), demonstrates that pragmatic legal reform is possible, and is of public interest (Wedderburn in The Telegraph, 2018; The Guardian, 2018; BBC, 2018).

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