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Functional aspects of emotions in fish

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ABSTRACT

There is an ongoing scientific discussion on whether fish have emotions, and if so how they experience them? The discussion has incorporated important areas such as brain anatomy and function, physiological and behavioural responses, and the cognitive abilities that fish possess. Little attention has however, been directed towards what functional aspects emotions ought to have in fish. If fish have emotions – why? The elucidation of this question and an assessment of the scientific evidences of emotions in fish in an evolutionary and functional framework would represent a valuable contribution in the discussion on whether fish are emotional creatures. Here parts of the vast amount of literature from both biology and psychology relating to the scientific field of emotions, animal emotion, and the functional aspects that emotions fulfil in the lives of humans and animals are reviewed. Subsequently, by viewing fish behaviour, physiology and cognitive abilities in the light of this functional framework it is possible to infer what functions emotions may serve in fish. This approach may contribute to the vital running discussion on the subject of emotions in fish. In fact, if it can be substantiated that emotions are likely to serve a function in fish similar to that of other higher vertebrate species, the notion that fish do have emotions will be strengthened.

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1. Historical development – human thinking of animal emotion

'Pleasures and pains' or emotions have played a key role in human thinking about animal behaviour throughout the history. Aristotle (384 BC–322 BC) wrote in his book 'History of Animals' that '*all animals pursue pleasure in keeping with their nature*'. The French 17th century philosopher René Descartes has often been blamed for the view that animals are without feelings, but did in fact write about fear, hope and joy as motivating the behaviour of animals (Fraser and Duncan, 1998). Jeremy Bentham, the well known English philosopher and lawyer was one of our first proponents of animal rights. He emphasized that the ability to experience 'pleasures and pains' should be the only criterion essential to hold or deserve an inherent moral status. Bentham is much quoted in animal rights and animal welfare for stating. 'The question is not can they reason? Nor can they talk? But can they suffer?' Bentham's pleasures included those derived from satisfying hunger and thirst, from sexual experiences, from health and from gratifying curiosity. His pains covered feelings arising from disappointment, hunger, thirst, disease or experiencing excessive heat and cold (Bentham, 1823).

Thirty years later Herbert Spencer (1855) put these ideas into a more biological context by proposing that feelings are adaptations. He believed that feelings combined with memory and reason allowed an animal to substitute flexible, adaptive reactions for merely reflexive ones. Nevertheless, the perhaps most influential publication on animal emotion came in 1872 with Charles Darwin's. 'The expression of emotions in man and animals', which will be addressed shortly.

1.1. The science of emotion

The science of emotions has been termed both contradictory and confusing. Many models and theories exist, partly because researchers have focused on different components of the emotional reaction such as expressions, behaviour or physiology. A major problem in the field of emotion has been the wide variety of definitions that have been proposed. In an attempt to resolve the resulting confusion, 92 definitions were in 1981 compiled from a variety of sources in the literature of emotion. These definitions were classified into 11 different categories, on the basis of the emotional phenomena or theoretical issues emphasized in the various definitions (Kleinginna and Kleinginna, 1981). This certainly illustrates the complexity of the concept of emotions.

In the present article two examples of how an emotion can be defined are included. These are two quite recent definitions that do operate on different levels but still indicate something essential about emotions. The American psychologist and professor of medicine Robert Pluchik, stated that an emotion is not simply a feeling state. An emotion is a complex chain of events that begins with a stimulus and includes feelings, psychological changes, impulses to action and specific, goal-directed behaviour (Plutchik, 2001). A somewhat simpler but elegant definition was proposed by neuroscientist Jaak Panksepp who defines emotions as 'processes which are likely to have evolved from basic mechanisms that gave animals the ability to avoid harm or punishments and to seek valuable resources or reward' (Panksepp, 1998). It is worth noting that both definitions emphasize goal-directed behaviour and thus the ultimate and adaptive nature of emotions, while the first also includes proximate aspects.

1.2. Traditions within the science of emotion

Different scientific traditions such as the evolutionary, the psycho-physiological and the cognitive perspective have contributed with important developments in the understanding of emotions. From an evolutionary perspective Charles Darwin's publication 'The expression of emotions in man and animals' can be seen as a cornerstone of modern emotion research. The general impact of this publication was that behaviours were seen as functional properties of species that played a significant role in adaptation. Furthermore, emotions were no longer seen as dysfunctional, in the sense as something to reject or control, but instead as something being functional and ultimately essential for survival (Scherer et al., 2001). Darwin also put much emphasis on the social and communicative function of emotions as illustrated by the several drawings depicting animals and human faces experiencing different emotions (Fig. 1). Subsequently, in the wake of Darwin's theory of evolution, it became common to view emotions and other mental states of animals including humans as adaptive products of natural selection.

In the late 19th century a psycho-physiological perspective on emotions was at the centre of attention. Emotions were looked upon as part of a chain with multiple events that prepared the organism for potential action and provided the individual with information regarding the meaning of the current state of the environment (Scherer et al., 2001). A question that received quite a deal of attention is what happens first, the emotion or the physiological arousal?

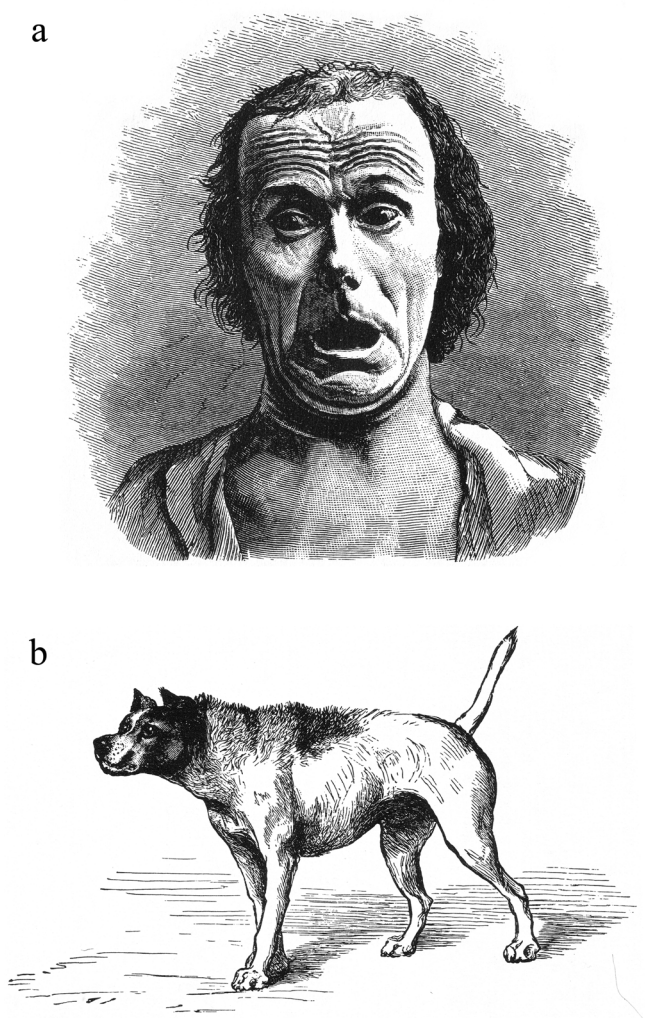

Fig. 1. Drawings depicting emotional expressions in man and dog published in Charles Darwin's book 'The expression of emotions in man and animals' (1872).