

# Non-intrusive Approaches for Judging the Welfare of Aquatic Species in Farms

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## Abstract

Concern for the welfare of aquatic invertebrates produced on a commercial or industrial scale is gradually extending beyond the realm of science and becoming a requirement of other societal actors. In order to assess the welfare of *Penaeus vannamei* during the stages of reproduction, larval rearing, transportation, and growing-out in earthen ponds, this paper proposes protocols. It also discusses, based on a review of the literature, the procedures and viewpoints involved in the creation and use of on-farm shrimp welfare protocols. Four of the five areas of animal welfare nutrition, environment, health, and behaviour were the foundations upon which protocols were created. The indicators for the psychology domain were not thought of as belonging to a separate category, and the other suggested indicators only evaluated this domain inferentially. Apart from the three possible scores related to animal experience on a spectrum from positive to very negative, were defined based on literature and field experience. It is very likely that non-invasive methods for monitoring the welfare of farmed shrimp, like those suggested here, will become standard equipment for farms and labs, and that it will get harder to grow shrimp without taking their welfare into account at every stage of the production process.

**Keywords:** Aquatic • Invertebrates • Shrimp • Farm

## Introduction

Production chains in agriculture, aquaculture, and industry can only develop (and expand) as a result of change. One of the most contentious agri-food production chains for animal protein is thought to be the shrimp industry. On a number of fronts, shrimp farming techniques are currently evolving. For instance, there is a tendency towards intensifying production systems for better resource utilisation; pursuing certifications and regulations to adapt shrimp production to the new demands of the market and society at large; genetic improvement of animals; improving shrimp feeding and nutrition; and increased efforts towards hygienic-sanitary controls and biosecurity in shrimp farms, to name a few. This scenario of change, which is based on the industry's advancement in science and technology, in turn, aids. Learn why the white-leg shrimp *Penaeus vannamei*, whose global production has increased by nearly 53% in just five years, from 3803.6 thousand tonnes to 5812.2 thousand tonnes between 2015 and 2020, accounts for 51.7% of all shrimp production [1].

This species of shrimp is thought to produce more than 167 billion shrimp each year, bringing the total number of shrimp and prawns raised each year to about 440 billion. Human nature, however, means that despite all of this development, there is frequently a temptation to hold on to conventional production methods and concepts that appeared to work successfully in the past, despite the fact that they almost certainly no longer function in the same way or are no longer acceptable under current and future conditions [2]. Perhaps overcoming this obstacle will improve welfare in shrimp farming. A potentially measurable aspect of an animal's life at a specific time is what the term "welfare" refers to, making it a scientific concept. However, this idea is fundamentally dynamic and connected to a person's capacity for adaptation.

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In other words, an animal's welfare is always a passing condition influenced by its experiences and ability to move on. a spectrum ranging from bad to good. Therefore, it is important to make sure the animal has the best experience possible in order to improve animal welfare. There is still a glaring lack of recognition of the welfare of higher invertebrates, such as shrimp, despite society's recognition of the significance of animal welfare in the commercial production of homeothermic vertebrates and even ectoderms [3].

## Literature Review

The debate over whether or not it is necessary to apply the principles of animal welfare to shrimp farming focuses on two main areas: the ethical and legal implications of the matter and the current scientific evidence for sentience in these animals. According to the first viewpoint, an organism's wellbeing is inextricably linked to both its level of suffering and its current state of well-being. Thus, the ability of an animal to consciously perceive what is happening to it and what is around it, consciously perceive through the senses, and consciously feel or subjectively experience are all examples of what is meant by the term "sentience." According to Crump et al., sentience needs to be understood and addressed in a broad sense, taking into account sensations such as warmth or cold, fatigue, hunger, thirst, boredom, excitement, fear, pain, pleasure, and joy. Additionally, these authors noted that this capacity for feeling needs to be distinguished from similar capacities because a sentient being, for instance, is not always able to consider or comprehend the emotions of other animals [4]. Last but not least, they contend that in order to answer questions about invertebrate animals' capacity for feeling, we must rely (at least in part) on behavioural and cognitive markers connected to our understanding of their nervous systems. On the other hand, according to Langworthy some decapod crustaceans have cerebral ganglia that are comparable in size and degree of articulation to fish brains with penaeid crustaceans, this does not appear to be the case [5].

## Discussion

In order to evaluate the sentience of crustaceans, Crump et al. developed eight criteria, four neural and four cognitive-behavioural, with a focus on pain. The authors classified the finding as strong evidence for sentience after discovering that true crustaceans (Infraorder Brachyura) met five criteria. The authors classify the anomurid crustaceans (suborder Anomura) and

lobsters (suborder Astacidea) as substantial evidence for sentience because they satisfy three criteria. The evidence for sentience is less clear for other suborders, such as farmed shrimps (suborder Penaeidea), though the authors do point out that to the obvious knowledge gaps that still surround these organisms [6]. Therefore, it is important to avoid mistaking the absence of research on the sentience of decapod crustaceans for the absence of sentience in these creatures. "Where there are threats of serious, negative animal welfare outcomes, lack of full scientific certainty as to the sentience of the animals in question shall not be used as a justification for delaying cost-effective measures to prevent those outcomes," Birch suggested. Since these two factors are related but distinct from one another, the challenge is to define indicators that are more measurable and less subjective, take into account various aquaculture production systems, and emphasise the welfare of farmed animals rather than just the quality of the final product [7].

## Conclusion

However, since it is impossible to directly inquire how a shrimp is doing, it is assumed that meeting the animal's needs directly correlates with how well it is doing. That is how an animal interacts with its surroundings in terms of biology, behaviour, and emotion. Proposed using the five domains of animal welfare, which correspond to the five freedoms: nutrition, physical environment, health, behaviour, and psychological needs. The Farm Animal Welfare Council established. This means that any measurements or observations made in a shrimp lab or on a shrimp farm that reveal how well the needs of the shrimp are being met can be thought of as potential indicators of their welfare. The purpose of this paper is to propose protocols for measuring the welfare of *P. vannamei* during the stages of reproduction, larval rearing, transport, and growth in earthen ponds. It also discusses, based on a review of the literature, the processes and viewpoints associated with the development and application of shrimp welfare protocols.

## Acknowledgement

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## Conflict of Interest

There is no conflict of interest by author.

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