

MARINE RECORDS

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First report of a dead giant squid (*Architeuthis dux*) from an operating seismic vessel

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Abstract

We report the first sighting of a dead giant squid observed from a seismic vessel operating offshore Brazil. The observation was made by Marine Mammal Observers working on the vessel. The specimen was photographed and identified as *Architeuthis dux* on the basis of its size and morphology. Our report adds to the limited data regarding the distribution of this species in the Southern Atlantic Ocean. Because the animal was not examined, its death cannot be conclusively linked to the seismic activity. Nevertheless, given the scarcity of observations of this species offshore Brazil, we believe this record helps to understand the species distribution as well as to highlight the disturbing lack of information on the impacts of marine sound pollution on invertebrates. This record also serves as another call for further research and for the use of precautionary principle to protect species in the deep sea.

Keywords: Acoustic pollution, Cephalopods, Architeuthidae, Oil and gas explorations

Introduction

Seismic surveys are used globally to locate and map oil and gas reservoirs under the seabed. The negative impacts of seismic surveys on cetaceans are widely acknowledged. Guidelines and specific legislations are in place to protect marine mammals and marine turtles in many countries, including Brazil, although there is ongoing debate as to their effectiveness (Parsons et al. 2009). In addition, despite existing evidence of the detrimental impact of low frequency sound and seismic surveys on other taxa, such as fish, decapods and cephalopods (Lagardere, 1982; Regnault and Lagardere, 1983; Fewtrell and McCauley 2012; McCauley and Fewtrell 2008), they remain exposed and unprotected. This lack of legal protection may be a result of fewer such incidents being reported for other vertebrates and invertebrates. It may also reflect a lower concern for invertebrates amongst the general public (Guerra et al. 2011).

There is evidence of low frequency sound causing damage to cephalopod statocysts, which appear to be sensitive to kinetic sound components as they detect vibrations (Packard et al. 1990). The impacts vary

according to the taxa and level of exposure, but effects can range from simple lesions to lethal consequences (Solé et al. 2013a, b). In fact, dead beached squids have been documented in the vicinity of seismic surveys (André et al. 2011; Guerra et al. 2004). Nevertheless, it is difficult to link these observations unequivocally with seismic survey activities. In light of this, we report the first sighting of a dead giant squid documented from a seismic vessel during the time of the survey, and discuss whether the death of this animal could be evidence of the risks posed by the activity.

Observation

On May 30th, 2013, the Marine Mammal Observers (LL, DC, LV) on duty onboard an operating seismic vessel at 25°36'S 042°21'W recorded a dead giant squid floating at the water's surface. It was photographed by LL (Fig. 1). The observers estimated its length at approximately 2 m, and the specimen was identified as *Architeuthis dux* on the basis of its size and morphology (A. Guerra, personal communication). The animal looked relatively well preserved, but had begun to deteriorate due to wave action. A similar, smaller squid had been seen by LV in the same area earlier that month, but photos could not be obtained in that instance.

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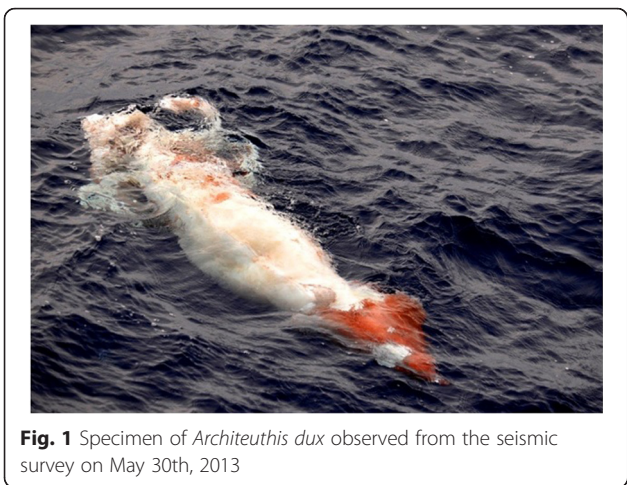


Fig. 1 Specimen of *Architeuthis dux* observed from the seismic survey on May 30th, 2013

The vessel had been operating in the area shown in Fig. 2 throughout the previous five months (since December of 2012), and was towing 48 airguns arranged in 6 sub-arrays with a shooting interval of 10 s. The total firing volume was 5085 cubic inches and the operating pressure was 2000 psi.

Discussion

Sightings of giant squids, whether at sea or stranded on shore, are rare, and the distribution of the species remains poorly understood (Roper and Shea 2013). Most records of *Architeuthis* are from the Northern Atlantic, with a few reports off southern Brazil (Arfelli et al. 1991;

Martins and Perez, 2009). Our record adds to the limited information regarding the distribution of the species in the Southern Atlantic Ocean.

Because we had no means to examine the animal, we understand that its death cannot be conclusively associated with the seismic activity. Nevertheless, we believe its record helps to highlight the disturbing lack of information on the impacts of marine sound pollution on invertebrates.

Until fairly recently, concerns about anthropogenic noise in marine ecosystem have been solely in regard to its impact on sound as means of communication, neglecting the effects of sound as a wave of pressure that can cause physical harm to certain species (André et al. 2011). Legislation has therefore been designed to protect animals which, like humans, rely on sound to communicate, and has failed to protect animals that experience sound differently. While there is no definite proof to link the death of this specimen to the seismic activity, its occurrence in an area of active surveys is suggestive of a possible link. Observations of giant squid at sea are rare, and there is a plausible mechanism for expecting the use of airguns to cause physical trauma. We believe that the precautionary principle should be applied in situations like this where species might be endangered by human activities, until a better scientific understanding is developed.

From a legal perspective, states have a general obligation under international law to protect and preserve the marine environment and to address specific sources of

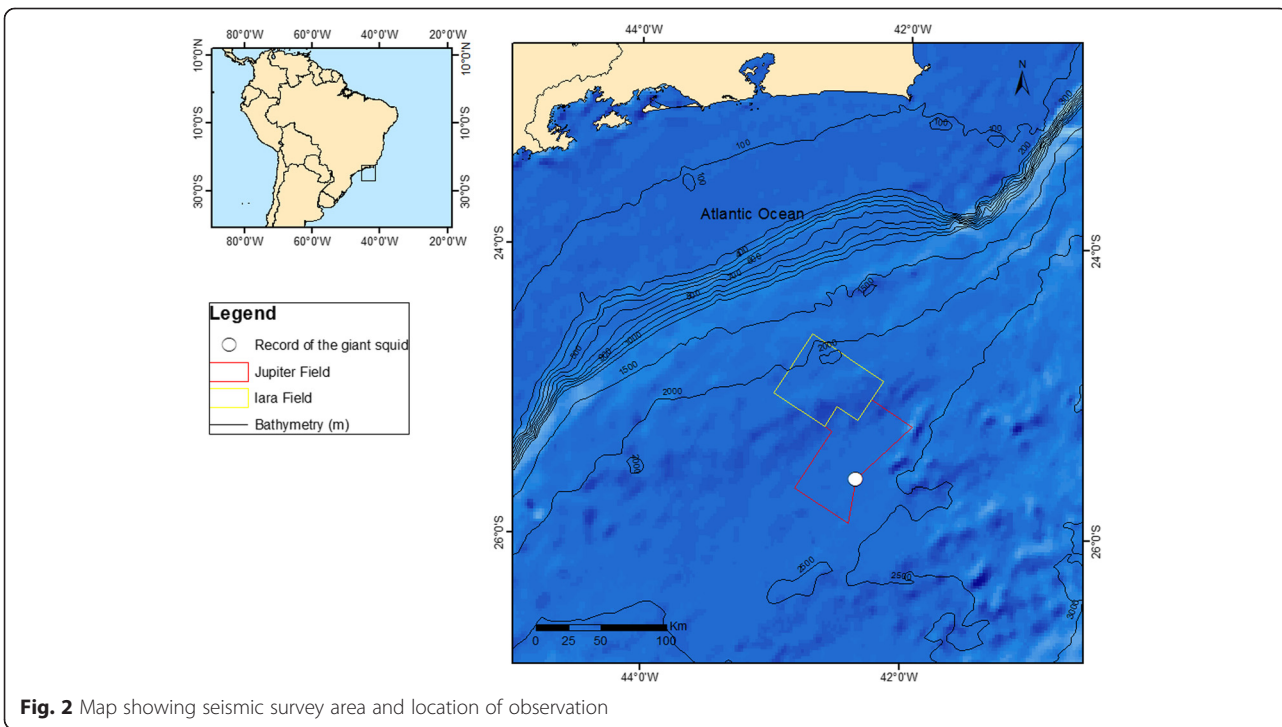


Fig. 2 Map showing seismic survey area and location of observation

marine pollution (Dotinga and Elferink 2000), including acoustic pollution. The general duty encompassed in Article 192 of the United Nations Convention on the Law of the Sea, which Brazil has ratified, includes a duty to protect the marine environment from the effects of underwater noise, which is covered under the definition since it includes the introduction of energy into the marine environment which is likely to result in deleterious effects (Firestone and Jarvis 2007).

Brazil has already endeavored to protect critical marine mammal habitat from acoustic disturbances. Brazil is required to take preventive action based on precautionary and anticipatory approaches. This obligation applies both to any activities undertaken in the Exclusive Economic Zone of Brazil and to any vessels operating in the High Seas under the Brazilian flag. Creating regulations that contribute to the collection of further marine scientific data in this area and that take into account the potential impact of sonar activities on invertebrates such as deep sea squids would be a way to fulfil this obligation.

In light of these legal obligations and the uncertainties surrounding impacts on invertebrates, we believe there is an urgent need for regulators to conduct a comprehensive review of the impacts of seismic surveys on different taxa, in addition to marine mammals. If oil and gas companies are truly committed to environmental protection, they should also play a role in contributing resources and facilitating such efforts.

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Authors' contributions

LL, DC and LV were the Marine Mammals Observers (MMOs) on duty at the time of sighting. LL defined the scope and coordinated the draft of the manuscript. JAN was responsible for the literature review. TT reviewed the manuscript and provided input on Brazil's legal obligations to protect high seas. All authors read and approved the final manuscript.

Competing interests

The authors declare that they have no competing interests.

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