



Some anomalous behaviour of vertebrates and insects preceding M5+ earthquakes in the North Western Apennines (Italy)

Valentino Straser

International Earthquake and Volcano Prediction Center, Italy (valentino.straser@alice.it)

Earthquakes with a magnitude greater than M5+ are an unusual event in the seismic area of the Frignano District and the areas surrounding Parma in the North Western Apennines (Italy). Only two seismic events have occurred in the last four years: on 23 December 2008 (M5.1) and on 27 January 2012 (M5.4). The earthquake of 23 December 2008 allowed the verification of unusual behaviour in man and animals in the run-up to the main shock, in addition to anomalies of an electromagnetic type. An initial study showed that there are elements of coincidence between the seismic events and the number of admissions to hospitals around the epicentre: in the month of December 2008, the days with the greatest number of admissions coincided with seismic shocks.

A half hour before the main event of 23 December, recorded at 16:24:21 local time (see: INGV), a slowworm (*Anguis fragilis*) left its hibernation site and died shortly afterwards from the cold on a road, as did a viper (*Vipera aspis*) found near some dwellings in an area around twenty kilometres from the epicentre. The investigation proceeded in 2009, but this time based on the number of daily admissions to the hospital A&E department, between June and December 2009. During the six months of the investigation, the maximum number of emergencies was 9 per day, while the earthquakes were in line with the usual number and magnitude for the Frignano seismic district. The earthquakes from June to December 2009 numbered 10, with a magnitude from M2.5 to M3.6. In 8 cases, in the 48 hours preceding the occurrence of the seism, there was a greater number of hospital emergencies. The subsequent occasion to check on a possible relationship between anomalous behaviour in animals and a seism occurred on 27 January 2012 (see: INGV), when an earthquake with a magnitude of M5.4 shook the North Western Apennines, thankfully without resulting in victims. Like 2008, in an area around fifteen kilometres from the epicentre, a grass snake (*Zamenis longissimus*) was found lying in snow beside a road. A few months later, in the Emilian Po Valley Plain, around 70-80km from the area under investigation, a long seismic sequence featuring seven earthquakes with a magnitude between M5.0 and M6.0, afforded a further opportunity to check for other anomalies. In the area struck by one of the most powerful seisms, local beekeepers noted the sudden disappearance of bees (*Apis mellifera*) from their hives, especially near San Carlo (Ferrara – Italy), where a deep crack had formed in the ground near the village which, in certain stretches, had raised the ground by as much as half a metre and ejected considerable quantities of mud due to the liquefaction of the sand, in some areas and near the dwellings.