



# Visually Induced Vertigo by Wild *Pseudopandam ebrius* (Birch 2002) Movements

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## Abstract

Vertigo is a common medical condition that can be caused by a variety of factors. Here we describe a possible cause of vertigo in the Furiosuru region of Japan, the unusual movements of *Pseudopandam ebrius*. Vertigo has been historically attributed to *P. ebrius*, and while initial studies found no connection, more recent research suggests that there is a link between *P. ebrius* behavior and higher rates of vertigo in the local population, although the mechanism is still unknown.

**Keywords:** Vertigo; Japan; Animal behavior

## Introduction

*Pseudopandam ebrius* (Birch 2002) is endemic to a small area in Miyazaki Prefecture, Japan, where it is remarkably common [1]. Curiously, its natural range overlaps with an area nicknamed “Furiosuru,” which roughly translates to “the dizzy land,” an area with a reputation for inducing vertigo and confusion in tourists and other visitors [2,3]. While *P. ebrius* outwardly appears to be ursine, its phylogeny is unclear, as the only phylogenetic analysis that has included *P. ebrius* found it to be related to rodents and chameleons [4]. A pair of large spirals on their faces obscure the exact location of their eyes, and they are aposematically colored despite not being poisonous or possessing stink glands [2,5]. The spiral patterns may be defensive in nature, obscuring the location of their eyes from enemies [5]. They are tan in colour, with large red spots whose location are as unique as a fingerprint and are used by ecologists to recognize individuals [6-8]. It has been proposed that different spot patterns have different levels of reproductive success, but no evidence has been found to support this claim [7,8]. Physically, they stand about a meter tall and very likely have large skeletal pneumatic chambers, as they are rarely found to weigh more than five or six kilograms, which would necessitate some sort of hollowing of body chambers given their volume [9].

Their movements appear erratic and have been described as “stumbling” and “drunken,” which may be an adaptation to throw off the aim of would-be predators, although it does not have any known predators in its native habitat, which it shares with shrew-like creatures (*Manis crassicaudata*), gruiform “armored” birds, terrestrial mollusks, small lizards, occasional *Bison bison*, and humans [10,11]. Additionally, they can also be very loud, at times creating cacophonous noises of up to 45 decibels for two to five hours that prevent sleep and are a regular annoyance for locals, but since *P. ebrius* is a protected species under local law, little can be done by residents to remedy the situation apart from wearing earplugs at night [7]. Local lore claims that the dizziness of visitors is due to *P. ebrius*, locally referred to as “Patcheel” or “Spinda” [12]. One traditional story, dating from the 15<sup>th</sup> century B.C.E., tells of a boy named Yuki who was traveling through Furiosuru with his pet gecko when they came across an adult *P. ebrius* [12]. The boy tried to capture the creature with the assistance of his gecko, but it incapacitated his gecko and then disoriented the boy with an elaborate kyogen dance before scampering off [13]. Historians claim that this story is indicative of a greater societal shift in attitudes towards human-wildlife interaction that culminated in the Treaty

of San Francisco, although it is widely held that the story is just a legend and has no basis in reality, much like this paper (Table 1). A survey of 1,050 residents of Miyazaki Prefecture found that the Furiosuru area had higher rates of acute vertigo than neighboring areas, but only in adults that worked outside in *P. ebrius* habitat and children, suggesting that the name of “dizzy land” may be accurate [14].

**Table 1:** Responses to the question “Have you experienced acute vertigo anytime in the past year?” from a study of 1,050 residents of Miyazaki Prefecture, Japan. Differences were significant at  $p=0.50$  [14].

	Residents of Furiosuru	Residents of Neighboring Areas
Yes	24	23
No	185	818
Percentage	12.97%	2.81%

Initial scientific interest in the possible link between vertigo and *P. ebrius* failed to yield any connection [15]. Six human-*P. ebrius* pairs placed in the same room did not induce vertigo in any of the test subjects, with interactions between the human participants and *P. ebrius* limited due to an apparent lack of interest in humans on the part of *P. ebrius* [15]. These results led to a markedly decreased interest in the scientific study of *P. ebrius* and vertigo until quite recently [16]. Several case studies have since been published on local youngsters, campers, picnickers, bird keepers, and parasol ladies that detail many encounters with *P. ebrius* that resulted in acute vertigo [17-20]. In most cases, encountering a *P. ebrius* did not result in vertigo [17,19]. However, when *P. ebrius* were startled or disturbed, they often responded by moving from side to side as if dancing to unheard music [17,19-20]. In almost all cases when this dance was performed, the viewer immediately experienced vertigo [17-20]. The mechanism of how an animal dance induces vertigo in viewers is unclear, although could be investigated by recording *P. ebrius* dances and showing them to subjects. If people viewing the dances do not experience vertigo, that would suggest that the dance merely accompanies some sort of chemical secretion that induces vertigo and is not the actual cause of the vertigo. Perhaps even stranger are the reported cases of vertigo following being struck by *P. ebrius* [21]. A survey of 55.0 local residents that had been struck by *P. ebrius* in the previous year found that 11 residents experienced vertigo immediately after being hit [16,21]. Of those 11, only 2 were punched in the face, with the torso and legs being the most commonly struck areas, likely due to *P. ebrius* being shorter than adult humans [22,23].

Limited physical contact between humans and *P. ebrius* have been reported [21]. It is possible that *P. ebrius* secretes some sort of novel exudate psychoactive chemical that is diffused into the skin upon contact. Bison bison, the Colorado River toad, secretes a defensive toxin that has been reported to have hallucinogenic

effects on humans, and several other animals have been found to have similar effects [21]. Variable rates of vertigo in those touched by *P. ebrius* could be due to natural variation in the potency of the chemical substance, natural variation in the interactions between the *P. ebrius* substance and the person’s biochemistry, natural variation in the person’s metabolic rate, and other confounding factors such as sex, age, and weight. Atmospheric effects have also been proposed as a possible cause of vertigo [7]. The volcano Entotsuyama frequently spews volcanic ash into the air, occasionally blanketing the nearby grasslands in ash and soot that is collected by the locals and used to make flutes for medical applications and furniture [24]. However, rates of acute vertigo are not higher in outdoor workers that collect ash but rarely encounter *P. ebrius* [25-27]. This ability to induce vertigo would explain the aposematic coloration of *P. ebrius*. Rather than warn predators of poison, their bold colors alert would-be predators to *P. ebrius*’s disorienting dances, which could significantly impede a predator’s hunting success rate. This would work similarly to the striking coloration of the North American skunk, which is also able to reduce the success rate of predators with its foul-smelling spray [24].

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