

1 **Defensive behavior in *Dipsas articulata* (COPE, 1868)**

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10 Snakes evolved a plethora of diverse antipredator mechanisms (LANCINI 1986; GREENE 1988).
11 Typically, most snakes escape from threats fleeing. This behavior can be affected by body
12 temperature, sex, reproductive condition, body size, ecdysis, resting posture as well as the intensity
13 of stimuli (GIBBONS & DORCAS 2002; GLAUDAS et al. 2005). Some snakes do retract, coil, hiss
14 and/or strike at threats when cornered, although many species are “cowards first, bluffers second
15 and warriors last” (POPE 1958). A number of species developed elusive defensive behaviors such as
16 cryptic and aposematic coloration to avoid detection (LA MARCA & SORIANO 2004; LANCINI 1986;
17 LOTZKAT 2007). Some colubrid snakes adopt a defensive posture by inflating the anterior part of their
18 bodies or opening their mouths in a threatening posture (GODLEY 1982; LA MARCA & SORIANO
19 2004; LOTZKAT 2007; NATERA-MUMAW et al. 2008). In arboreal snakes the body is sometimes
20 laterally compressed and made rigid (GREENE 1979; MARQUES 1999).

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22 Some snakes also exhibit more unusual defence protocols such as musking from the vent or death
23 feigning (immobilization reflex) to detract a predator’s attention (USHAKOV 2007; MENDOZA 2009).
24 A less documented defence behavior is ‘balling’, where a snake conceals its head among coils of its
25 body from threat. The behavior is best known from the Royal or Ball Python *Python regius* (SHAW,
26 1802), from West Africa (BARKER & BAKER 2006). Balling behavior has also been reported for Boidae,
27 Colubridae and Elapidae (BUSTARD 1969; MITCHELL 1978; ARNOLD & BENNETT 1984; MADSEN &
28 UJVARI 2004). Even dangerously venomous species will resort to using balling rather than biting
29 (MADSEN & UJVARI 2004).

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31 In December 2004 we encountered an adult American Snail-eater *Dipsas articulata* (COPE, 1868) in
32 an area of *Manicaria* palm swamp forest (MYERS 1990; SAVAGE 2002) at Cano Palma Biological
33 Station near the Tortuguero National Park, Costa Rica (Fig. 1). Upon capture to verify identification,
34 the snake promptly but casually retracted into a ball, concealing its head (Fig. 2). It remained in this

35 state motionless for several minutes. After placement in a vivarium the snake resumed a normal
36 posture but continued to ball and also flattened its head and created neck coils when handled. To the
37 best of our knowledge this is the first recorded case of balling defence behavior by *D. articulata*.
38 Defensive behavior has been recorded for *Dipsas albifrons* (SAUVAGE, 1884), *D. catesbyi* (SENTZEN,
39 1796), *D. indica* LAURENTI, 1768, *D. nicholsi* (DUNN, 1933), *D. oreas* (COPE, 1868), *D. pavonina*
40 SCHLEGEL, 1837, *D. temporalis* (WERNER, 1909) and *D. viguieri* (BOCOURT, 1884) (PETERS 1960;
41 CADLE & MYERS 2003; CADLE 2005). Only *D. nicholsi* has previously been reported to exhibit body
42 coiling as a defensive trait. This differs from 'balling' as the coils are more uniform in shape (see
43 MYERS & CADLE 2003). Snakes of the genus *Dipsas* are known for their docile response to threat and
44 capture. *Dipsas oreas* exhibits a defensive posturing which is common among the Dipsadini (CADLE &
45 MYERS 2003). It includes head triangulation, raising the anterior part of the body and bringing the
46 head and neck back into an S-shaped loop. The posturing and head triangulation defences of *D.*
47 *oreas*, and herein by *D. articulata*, resemble the defensive behaviors of some vipers (GREENE 1988)
48 and thus are potentially a form of behavioral mimicry.

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123 Fig. 1: *Dipsas articulata* (COPE, 1868).

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127 Fig. 2: *Dipsas articulata* (COPE, 1868) in 'balling' defence posture.

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