REPTILES & AMPHIBIANS

Antipredator Displays by the Cuban Groundlizard (*Pholidoscelis auberi*) on Little San Salvador Island (Half Moon Cay), The Bahamas, and a Review of Similar Behavior in Other Lizards

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Abstract.—Antipredator behavior in the teiid lizard *Pholidoscelis auberi* is previously unreported. I observed an arm-waving display (AWD) and lateral undulation of the tail (LUT) in two *P. auberi*, an adult and a hatchling, on Little San Salvador Island (Half Moon Cay), The Bahamas. Context indicated that these were antipredator behaviors. AWD was performed overhand (clockwise in right lateral view), with the elbow strongly flexed, and with one arm at a time. AWD is performed similarly in some other lizard species and differently in others. AWD is previously unreported in *P. auberi*, and LUT is previously unreported in all but one other teiid species.

Several English common names have been used for *Pholidoscelis auberi* (Teiidae), classified until recently as *Ameiva auberi* (Goicoechea et al. 2016), including Auber's Ameiva (Gray 1845; Beolens et al. 2011; Rodda 2020), Cuban Ameiva (Alfonso and Torres 2012; Torres et al. 2014), Cuban Whiptail (Castellón Maure and Rodríguez-Cabrera 2018; Currie et al. 2019), Blue-Tailed Whiptail (Currie et al. 2019), Corredera (Buide 1966), Corre-costa (Barbour and Ramsden 1919; Buide 1966), and Culebrina (Barbour and Ramsden 1919; Buide 1966; Garrido 1980). Local common names in The Bahamas include Blue-Tail and Lion Lizard (Attrill et al. 1983). The reassignment of the species to the genus *Pholidoscelis* generated some potential for confusion, as *P. auberi* and congeners with "Ameiva" in the common name were no longer classified as *Ameiva*. Hedges et al. (2019) solved this problem in their list of suggested standardized common names for Caribbean reptiles and amphibians, by using the noun "Groundlizard" for *Pholidoscelis* and introducing the novel combination Cuban Groundlizard as the formal English common name for *P. auberi*.

Pholidoscelis auberi is one of the most widely distributed Caribbean lizard species, with at least 40 subspecies that range across Cuba and The Bahamas (Schwartz and Henderson 1991). Much previous research on *P. auberi* has focused on the taxonomy, morphology, and distribution of its subspecies (e.g., McCoy 1970; Schwartz 1970; Garrido 1980; Lee and Schwartz 1985; Rodríguez Schettino et al. 2013; Rodríguez-Cabrera et al. 2018) and of populations to which subspecies have not yet been assigned (Torres et al. 2014). A few aspects of natural history have received attention, with multiple publications addressing habitat (mainly xeric areas with sandy or rocky substrates, especially among beach vegetation but also in disturbed areas such as towns and cultivated fields) (Gundlach 1880; Barbour 1916; Barbour and Ramsden 1919; McCoy 1970; Schwartz 1970; Torres et al. 2014), and parasites (reviewed in Henderson and Powell 2009). Alfonso and Torres (2012) detailed courtship and mating of *P. a. ustulata* in eastern Cuba. Sampedro Marín et al. (1982) examined diet (mainly insects) and hourly activity patterns of *P. a. sabulicolor* in eastern Cuba. *Pholidoscelis auberi* is known to forage for ants by digging into the craters of ant nests (Barbour 1916), also will eat small lizards (Attrill et al. 1983), and an individual of *P. a. zugi* in western Cuba was observed eating a small frog (Castellón Maure and Rodríguez-Cabrera 2018). Other natural history observations include that it is shy and quick to hide from humans (Barbour and Ramsden 1919); movements are quick and jerky (Currie et al. 2019); predators include the American Kestrel (*Falco sparverius*), the Cuban Pygmy Owl (*Glaucidium siju*), and the Bahamian Racer (*Cubophis vudii*) (Franz and Dodd 1994; Powell and Henderson 2008); and a nest in a depression under a rock in western Cuba contained a single egg that produced a hatch-

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ling in June (Estrada 1987). The natural history of most subspecies of *P. auberi* has not been studied, and antipredator displays in *P. auberi* have not been reported until now.

The observations reported herein took place on Little San Salvador Island (hereafter abbreviated LSSI), also called Half Moon Cay, a Bahamian island between the southern end of Eleuthera and the northern end of Cat Island. Specimens from LSSI are currently referred to *P. a. thoracicus* (Currie et al. 2019). This was based on an assignment by McCoy (1970), who collected a single specimen from LSSI and assigned it to *P. a. thoracicus*, a subspecies from the Bahaman islands of New Providence and Eleuthera and their connecting cays. However, the coloration of *P. auberi* on LSSI does not match that of *P. a. thoracicus*. The LSSI population has a middorsal stripe that lacks black edging on the head (edged in black on heads of *P. a. thoracicus*), the dorsolateral stripe is interrupted between the shoulder and the eyelid (not interrupted in *P. a. thoracicus*), and the lateral light stripes stop anteriorly at the shoulder (they extend only to the ears in *P. a. thoracicus*). The dorsal field is tan anteriorly and light gray posteriorly (uniformly colored in *P. a. thoracicus*), the tail is blue (gray in *P. a. thoracicus*), and in some adults the snout tip is reddish (not reddish in *P. a. thoracicus*) (Fig. 1). The coloration of the LSSI population does not match that of any other named subspecies of *P. auberi* described in McCoy (1970), but further study will be necessary to determine whether the LSSI population should be considered a distinct subspecies.

Behavioral Observations

I conducted behavioral observations during sunny weather at 1015–1100 h on 3 January 2024. I photographed and filmed an adult *P. auberi* among low vegetation between the western beach and the paved path parallel to it (24.580000, -75.952780, elev. 3 m asl) (Fig. 1D). I then photographed and filmed a hatchling (SVL ~4.0 cm, TL ~13.5 cm) a little farther north, among low vegetation between the western beach and the same paved path (24.580556, -75.953056, elev. 2 m asl) (Fig. 1E). These size estimates are comparable to those described by Estrada (1987) of a hatchling that had just emerged from the egg (SVL 3.34 cm, TL 10.39 cm). Videos of the adult and the hatchling are posted in Senter (2024b) and Senter (2024c), respectively. Both performed two distinct displays: an arm-waving display (hereafter abbreviated AWD) and lateral undulations of the tail (hereafter abbreviated LUT). Both lizards performed AWD with the elbow bent at approximately a right angle.

The first video of the adult (Senter 2024b) consists of 15 sec of footage in which the lizard was motionless except for breathing and moving its head to look at me as I stood over it. In the second video of the same lizard (Senter 2024b), it had changed its position but was motionless for 26 sec while it watched me. The lizard then resumed locomotion with jerky movements of the head and torso, pausing after 5 sec. During the pause, it performed AWD with a series of four circumductions that alternated between the left and right forelimbs, a sequence that took 4 sec. It then performed a brief LUT with a single, very shallow sinusoidal movement of the proximal half of the tail. The distal half of the tail was outside the frame of the video, so I could not determine if the LUT propagated farther down the tail. The lizard was then motionless, except for breathing, for 20 sec. It then resumed the same jerky locomotion as before. All locomotion recorded in both videos occurred at a leisurely pace, in which the lizard was not

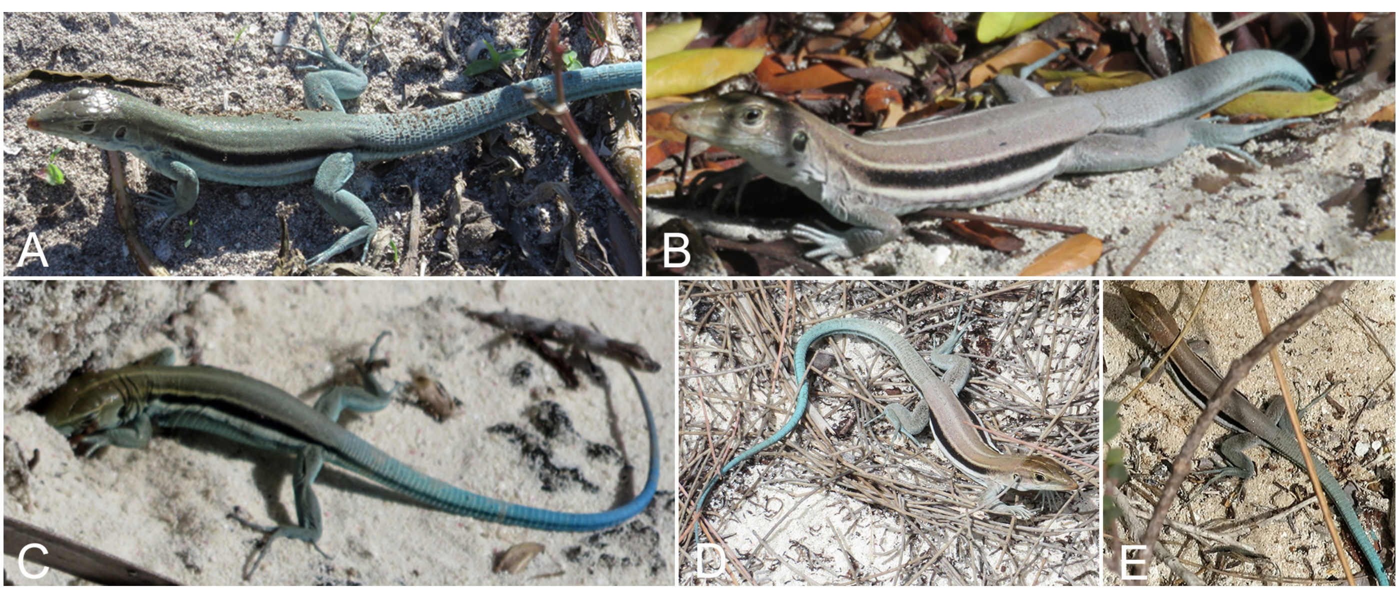

Figure 1. Cuban Groundlizards (*Pholidoscelis auberi*) on Little San Salvador Island: (A) Adult, photographed in 2016; (B) adult, photographed in 2016; (C) juvenile, photographed in 2017; (D) adult, photographed and filmed in 2024; (E) hatchling, photographed and filmed in 2024. Photographs by the author.

fleeing (in spite of my presence) but was instead foraging in pine straw that shallowly covered the sand.

I made six video recordings of the hatchling. The first two videos (altogether 48 sec) recorded a nearly continuous sequence of events, because only a few seconds passed between the end of one recording and the beginning of the next while I repositioned myself. Likewise, the third through sixth videos (altogether 3 min 21 sec) recorded a nearly continuous sequence of events. The pause between the second and third videos was longer than the other pauses, because the lizard was continuously moving, and I could not find a satisfactory position for filming until it stopped. The first video of the hatchling (Senter 2024c) consisted of 12 sec in which the lizard was stationary as I stood over it. During the first 3 sec, the proximal half of the tail underwent LUT. The tail was curled to the right, with its middle third against a twig. Whether the LUT would have propagated down the length of the tail without the interference of the twig could not be determined, but the LUT clearly began at the base of the tail. During the same 3 sec, the lizard performed AWD, with a series of circumductions first in the left forelimb, then the right, then the left, then the left again, then the right, then the left. The lizard was motionless, except for breathing, in the remaining 9 sec of footage. The second video (Senter 2024c) began with the lizard in the same spot, motionless except for 5 sec of LUT in which the entire tail was in motion, but only the proximal half was undulating, with the tip being whipped from side to side by the movements of the proximal half of the tail. During these 5 sec, the middle of the tail was against the same twig as before. The lizard then bent its torso to the right and performed AWD for 3 sec, with circumductions in the right forelimb, then the left, then the right, then the right again, then the left. It then immediately used both forelimbs to slightly reposition its anterior torso while performing LUT continuously during these 3 sec and the following 13 sec, during which the lateral surface of the middle of the tail was no longer in contact with the twig, because the middle of the tail had moved beneath the twig, with the LUT propagating approximately two-thirds the length of the tail and not continuing into the distal third. This lack of propagation to the tail tip could have been due to interference by twigs, because while the middle part of the tail was beneath the aforementioned twig, the proximal part of the tail was atop another twig, so that the tail was forced into a convex-upward arch proximally. The lizard then began the same sort of jerky locomotion as the adult, continuing for the remaining 20 sec of the video, during which it appeared to be foraging in the sand and low vegetation and did not seek to escape my presence, actually moving toward my feet during much of the 20 sec. The third video (Senter 2024c) began with the lizard motionless as I stood over it, except for breathing and 7 sec of continuous LUT, which propagated down the proximal two-thirds of the tail. In the remaining 42 sec of the video, the lizard vigorously dug into the sand with its forelimbs, creating a new depression in the sand, occasionally pausing, with nearly continuous LUT that propagated all the way to the tail tip (Fig. 2). The fourth video (Senter 2024c) began with a single circumduction of the right forelimb, which might have been the final circumduction of an AWD episode that occurred during the short interval between the third and fourth videos. It then resumed vigorous digging, with occasional short pauses, for the next 80 sec. By the end of the video, the lizard from snout to hip fit into the hole. Through the whole video, the lizard performed LUT, which propagated down the entire length of the tail. The fifth video (Senter 2024c) began with the lizard crawling over the hole that it had dug, then stopping with the middle of its tail over the hole. It performed AWD with its right forelimb for about 4 sec, circumducing the forelimb four times while performing slight LUT. It then remained still for the last 42 sec of the video. The sixth video (Senter 2024c) began with the lizard starting the sort of jerky locomotion previously mentioned, with no AWD or LUT. After 6 sec, the lizard moved out of the frame of the video.

Discussion

These lizards performed three plausibly antipredator behaviors: freezing, AWD, and LUT. When I first encountered the adult, it was moving at a leisurely pace, apparently foraging. Its subsequent episodes of motionlessness could have been responses to my presence; if so, they were antipredator behavior in the form of freezing to escape attention. The freezing was followed by AWD and LUT, which are well documented

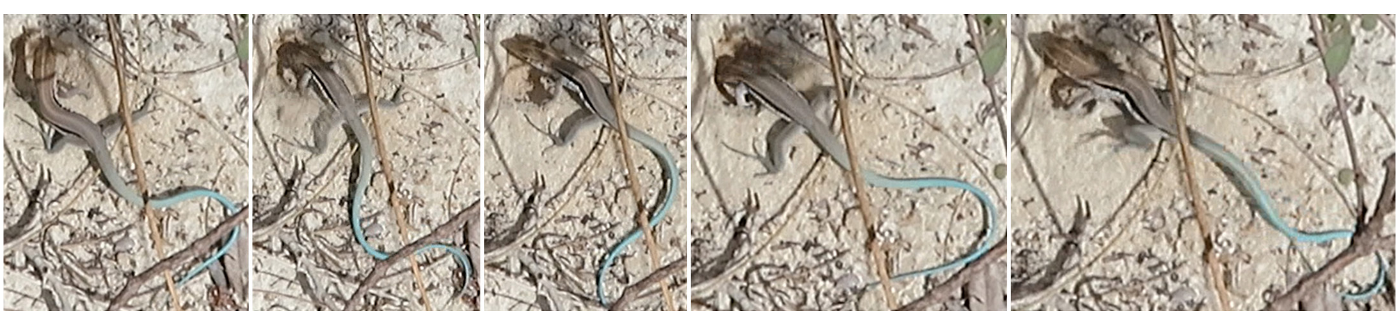

Figure 2. Hatchling Cuban Groundlizard (*Pholidoscelis auberi*) on Little San Salvador Island performing lateral undulations of the tail. This left-to-right sequence is from 4 sec of footage from video 3 of this lizard (Senter 2024c).

in other lizard species as responses to a threatening presence (see below). After the lizard's final episode of freezing, its resumption of apparent foraging at a leisurely pace instead of fleeing at high speed could be interpreted as an indication that it no longer considered me a threat.

The behavior of the hatchling provides an interesting window into hardwired behaviors before they have been modified by months or years of experience and learning. The following characteristics of the hatchling's behavior are noteworthy. All AWD and LUT occurred between and not during locomotion. Each episode of AWD occurred for 3–4 sec and included 4–6 circumductions. At least two episodes included circumductions of both forelimbs (but only one at a time), and one included circumductions of only one forelimb. AWD was always performed with simultaneous LUT (unlike AWD in the adult, which was performed without LUT), but LUT was performed with or without AWD. LUT was continuously performed during digging but stopped during locomotion. LUT propagated to the tail tip when the tail was unobstructed. AWD and LUT both occurred when the lizard was moving leisurely and digging in place, indicating it did not consider it necessary to flee my presence.

Another noteworthy aspect of this observation of a hatchling is that it occurred in January. The western Cuban hatchling in Estrada's (1987) report hatched in June. This indicates that reproductive activity in *P. auberi* is not restricted to a short season, or that it may occur at different times of year between the two regions.

AWD Comparisons.—Before now, AWD has not been reported in any species of *Pholidoscelis*, although it has been reported in other teiid genera. AWD is performed in response to the approach of a human in the teiids *Aspidoscelis laredoensis* (Walker and Cordes 2020), *Cnemidophorus arubensis* (van Buurt 2011; Senter 2024a), *C. murinus* (van Buurt 2011), *C. ruthveni* (Cooper et al. 2004; van Buurt 2011), and *Teius teyou* (Ávila and Cunha Avellar 2005), in the lacertid *Podarcis muralis* (Font et al. 2012), in the agamid *Tropicagama temporalis* (Blamires 1998), and in the iguanid *Lophosaurus dilophus* (Murphy et al. 1978). AWD is performed as a submissive signal to more dominant conspecifics in the teiid *Aspidoscelis uniparens* (Crews et al. 1983), the gecko genus *Sphaerodactylus* (Regalado 2012), several lacertid species (Kramer 1937; Kitzler 1941; Weber 1957; Verbeek 1972; Thoen et al. 1986; López and Martín 2001), and several species in the iguanian family Agamidae (Carpenter et al. 1970; Brattstrom 1971; Van Dyk and Evans 2008). AWD is performed in response to the presence of a predator or its chemicals in the agamid species *Intellagama lesueurii* (Baird et al. 2021) and several lacertid species (Van Damme et al. 1995; Van Damme and Castilla 1996; Van Damme and Quick 2001; Ortega et al. 2017). The common theme in the cases above is that AWD is a response to a perceived threat. Whether this response is meant as a signal to the threating individual or is merely a displacement behavior that expresses nervousness is difficult to ascertain.

Some lizards perform AWD in other contexts. AWD is part of the courtship ritual in females of the iguanid *Iguana iguana* (Distel and Veazey 1982), females of the phrynosomatid *Phrynosoma asio* (Recchio et al. 2014), males of the phrynosomatid genus *Uma* (Carpenter 1963, 1967), and females of the lacertids *Lacerta agilis* (Klingelhöffer 1900), *L. viridis* (Weber 1957), and *Podarcis muralis* (Kramer 1937). It is part of the rejection display of a female toward a courting male in the agamid *Ctenophorus maculosus* (Mitchell 1973), the gecko genus *Sphaerodactylus* (Regalado 2012), and the lacertids *Lacerta agilis*, *L. viridis* (Kitzler 1941), and *Podarcis muralis* (Weber 1957). It is part of a male-male display in the agamid *Ctenophorus decresii* (Osborne 2001) and the dactyloid iguanian species *Anolis opalinus* (Jensen 1979). It is part of social displays, primarily by males, in the phrynosomatids *Phrynosoma coronatum* and *P. platyrhinos* (Tollestrup 1981). It is part of an agonistic display by one female toward another in the skink *Gnypetoscincus queenslandiae* (O'Connor 2003). It is part of the male territorial display in the agamid *Chlamydosaurus kingii* (Shine 1990). A fast version of AWD is used by dominant males in various agamid species (Carpenter et al. 1970; Brattstrom 1971; Van Dyk and Evans 2008). Among other iguanians, AWD is also known in the agamids *Lophognathus gilberti* (Thompson and Thompson 2001) and *Rankinia diemensis* (Stuart-Smith et al. 2005, 2007), several species of the liolaemid genus *Liolaemus* (Halloy and Castillo 2006; Halloy 2012; Vicente 2019), the crotaphytid species *Gambelia wislizenii* (Jones 2022), and the iguanid species *Dipsosaurus dorsalis* (Jones 2020), in all of which its significance is unclear. The same is the case in the lacertid *Gallotia galloti* (Molina Borja 1981), the lacertid genus *Acanthodactylus* (Hawlena 2009), and the shinisaurid *Shinisaurus crocodilurus* (Ray and Walley 2003).

The AWD in *P. auberi* was not performed in the context of intraspecific interaction. Therefore, of the functions listed above for AWD, its most likely function in *P. auberi* during the observations reported here was as a response to a perceived threat. However, neither lizard appears to have continued to perceive me as a potential threat, because both resumed foraging after AWD, instead of fleeing. This suggests the possibility that the hatchling's second and subsequent AWD episodes were not directed at me but instead may have functioned as a means to make unseen predators reveal themselves, as suggested by Magnusson (1996). Stalking predators tend to move when their prey is in motion and remain still when their prey is still, so it is possible that by keeping a body part moving, a lizard can fool a stalking predator into moving and thereby inadvertently making its presence known (Magnusson 1996). A related hypothesis is Blamires' (1998) suggestion, echoed by Van Buurt (2005, 2011), that AWD is a signal to approaching predators that they have been spotted, discouraging further pursuit.

The AWD reported here in *Pholidoscelis auberi* was consistently "overhand" (as in an overhand tennis serve) (i.e., the forelimbs were moved clockwise when viewed from the lizard's right side). I have personally observed that AWD also is accomplished with overhand circumduction in the teiid *Cnemidophorus arubensis*, and published series of video stills indicates that the same is the case in the liolaemid *Liolaemus pacha* (Vicente 2019) and the lacertid *Podarcis muralis* (Font et al. 2012). The verbal description of AWD as "a stepping motion" in the skink *Gnypetoscincus queenslandiae* (O'Connor 2003) also indicates overhand movement. Published drawings indicate that AWD also is accomplished with overhand circumduction in the anole *Anolis opalinus* (Jensen 1979) and several species of *Liolaemus* (Halloy and Castillo 2006; Vicente 2019). However, caution should be exercised in accepting the drawings as accurate, because a published drawing also indicates AWD by overhand circumduction in *Amphibolurus* (Carpenter et al. 1970), whereas subsequent videography shows that the movement that had been thought to be circumduction in *A. muricatus* is instead a pair of up-and-down (dorsoventral) movements of the forelimb, with the forelimb held more posteriorly in the first movement (the "backward arm-wave") than in the second movement (the "forward arm-wave") (Peters et al. 2002; Peters and Evans 2003). AWD is described not as circumduction but as up-and-down movement of the arm in the phrynosomatid genus *Uma* (Carpenter 1963) and the lacertids *Archaeolacerta bedriagae*, *Podarcis* spp. (Kramer 1937; Van Damme and Quick 2001), *Lacerta viridis* (Weber 1957), and *Zootoca vivipara* (Thoen et al. 1986). AWD is usually a single lifting of the arm with occasional elaboration into up-and-down movement in the gecko genus *Sphaerodactylus* (Regalado 2012). In *Iguana iguana*, a published illustration indicates that AWD involves a half circumduction that resembles an attempt to slap toward the hip. As in *P. auberi*, the movement is clockwise when viewed from the lizard's right (Distel and Veazey 1982). Similarly, AWD is not a full circumduction in the phrynosomatids *Phrynosoma coronatum* and *P. platyrhinos* but instead resembles scratching of the substrate, but with the hand held above the substrate (Tollestrup 1981).

AWD in *P. auberi* was consistently performed with one arm at a time. The same is the case in most other lizards known to perform AWD (Kitzler 1941; Carpenter 1963, 1967; Carpenter et al. 1970; Mitchell 1973; Jensen 1979; Tollestrup 1981; Crews et al. 1983; Thoen et al. 1986; Shine 1990; Van Damme et al. 1995; Van Damme and Castilla 1996; Van Damme and Quick 2001; O'Connor 2003; Cooper et al. 2004; Ávila and Cunha Avellar 2005; Halloy and Castillo 2006; Van Buurt 2011; Font et al. 2012; Regalado 2012; Walker and Cordes 2020; Baird et al. 2021; Jones 2022). The genus *Liolaemus* is an exception. Some species of *Liolaemus* perform AWD with one forelimb at a time, some perform it with both forelimbs simultaneously, and some do both (Halloy and Castillo 2006; Vicente 2019).

AWD in *P. auberi* was performed with the elbow strongly flexed. Published illustrations show the same in the teiid *Aspidoscelis laredoensis* (Walker and Cordes 2020), the phrynosomatids *Phrynosoma coronatum* and *P. platyrhinos* (Tollestrup 1981), and the liolaemid *Liolaemus pacha* (Vicente 2019). A verbal description indicates the same in the lacertid *Lacerta agilis* (Klingelhöffer 1900). In contrast, AWD is performed with the elbow extended in *Iguana iguana* (Distel and Veazey 1982), the teiid *Cnemidophorus arubensis* (pers. obs., 30 December 2023), and the lacertid *Podarcis muralis* (Font et al. 2012; fig. 2). In other lizard species, the angle at which the elbow is held during AWD is undescribed, and published illustrations are ambiguous.

AWD Nomenclature.—Terms for AWD include circumduction (Mitchell 1973; Carpenter et al. 1970; Jones 2020; Shine 1990; Blamires 1998; LeBas and Marshall 2005; Osborne 2005; Stuart-Smith et al. 2005; Baird et al. 2021; Jones 2022), hand waves/waving (Ávila and Cunha Avellar 2005; Stuart-Smith et al. 2007; Hawlena 2009), paw-waving (Van Buurt 2011), arm-waves/waving (Crews et al. 1983; Mitchell 1991; Ord et al. 2002; Peters et al. 2002; Peters and Evans 2003; Van Dyk and Evans 2008; Cooper et al. 2004; Recchio et al. 2014; Vicente 2019; Walker and Cordes 2020), forelimb waves/waving (Brattstrom 1971; Martins et al. 2004; Hawlena 2009), forelimb wave display (Halloy and Castillo 2006; Halloy 2012), Treteln (German for "pedaling" or "stepping") (Kramer 1937; Kitzler 1941; Weber 1957; Verbeek 1972), and foot shakes/shaking (Thoen et al. 1986; Van Damme et al. 1995; Van Damme and Castilla 1996; López and Martín 2001; Van Damme and Quick 2001; Font et al. 2012; Ortega et al. 2017). The unusual versions of AWD in *Sphaerodactylus* spp., *Iguana iguana*, and *Phrynosoma* spp. have respectively been called hand up, backward-striking, and scratching (Tollestrup 1981; Distel and Veazey 1982; Regalado 2012).

Most terms for AWD are clear enough not to cause confusion (although circumduction may need to be reassessed in some species). The term "foot shaking" is an exception. It should be discarded, because in strict anatomical nomenclature, "foot" refers to the distal part of the hindlimb, not the forelimb. In strict anatomical nomenclature, the distal part of the forelimb (the metacarpal + phalangeal region) is the hand. Some authors advocate restriction of the word "hand" for an appendage that is modified for grasping and suggest that "manus" be used instead of "hand" as a general term for the metacarpal + phalangeal region in tetrapods generally (e.g., Kardong 2019: 326). However, "manus" is simply "hand" in another language (Latin), so the utility of that suggestion is questionable. Furthermore, in common practice, researchers freely use the term "hand" for homologs of the human hand in non-human tetrapods, even when those homologs terminate in hooves or function as wings, flippers, etc. (e.g., Gingerich et al. 2001; Simmons et al. 2008; Thewissen et al. 2009; Bonnan 2016; Prothero 2017). The use of "hand" for the metacarpal + phalangeal region of the lizard forelimb is well established in the primary herpetological literature (e.g., Magnusson 1996; Ávila and Cunha Avellar 2005; Halloy and Castillo 2006; Stuart-Smith et al. 2007; Hawlena; 2009; Siler and Brown 2011; Regalado 2012; Andrade et al. 2016; Stanley et al. 2016; Vicente 2019; Díaz et al. 2022). Avoiding such usage is therefore unnecessary, but calling this part of the forelimb a foot generates confusion.

LUT Comparisons.—LUT and displays involving other kinds of tail movement are widespread among lizards (Johnson et al. 2019). In most lizard species, LUT occurs mainly during pauses in locomotion, rather than during locomotion itself. Exceptions include juvenile skinks in the species *Plestiodon egregius* and *P. fasciatus*, in which the tail undergoes LUT almost continuously much of the time, whether the animal is stationary or in locomotion (Fitch 1954; Mount 1963). The LUT reported here resembles that of most other lizards in that it was performed only when the lizard was stationary. It also resembles that of most other lizards in that it was performed with the tail horizontal. *Crotaphytus collaris* performs LUT with the tail raised high (Braun and Baird 2018), but in most other lizard species it is performed with the tail unraised or only slightly elevated (Kramer 1937; Binder and Henderson 1982; Murray et al. 1991; Bohórquez Alonso et al. 2010; Doody et al. 2015; Jones 2022).

Before now, LUT has not been reported in any teiid species except *Aspidoscelis laredoensis* (Walker and Cordes 2020). LUT was performed in response to a human approach in *A. laredoensis* (Walker and Cordes 2020), the lacertids *Lacerta viridis* (Weber 1957) and *Podarcis muralis* (Kramer 1937), the varanids *Varanus glauerti* and *V. pilbarensis* (Doody et al. 2015), the crotaphytids *Crotaphytus collaris* (York and Baird 2016) and *Gambelia wislizenii* (Jones 2022), several phrynosomatid species (Dial 1986; Hasson et al. 1989; Stanley and Butterfield 2009; Cooper 2010; Hernández-Vásquez 2019), the sphaerodactylid *Gonatodes albugularis* (Bohórquez Alonso et al. 2010), and juveniles of the skink *Plestiodon laticeps* (Cooper 1998). LUT was performed in response to the approach of a predatory snake in the eublepharid *Coleonyx variegatus* (Johnson and Brodie 1974). Various varanid species performed LUT in response to capture by a human (Doody et al. 2015). LUT is a submissive or defensive signal to conspecifics in the gekkonid *Gehyra dubia* (Moss and Schwarzkopf 2019) and the lacertids *Lacerta viridis* (Verbeek 1972), *Podarcis muralis*, and *Timon lepidus* (Weber 1957). The common theme in the cases above is that LUT is performed in response to a perceived threat.

LUT occurs during the stalking of prey in numerous gekkotan species (Bustard 1965; Werner 1995), the crotaphytid *Crotaphytus collaris* (Braun and Baird 2018), the phrynosomatid *Sceloporus occidentalis* (Foster and Martin 2008), the lacertid *Podarcis muralis* (Kramer 1937), and the varanid *Varanus glauerti* (Doody et al. 2015). LUT is used in caudal luring of prey in the pygopodid species *Lialis burtonis* (Murray et al. 1991) and the skink *Leiolopisma telfairii* (Pernetta et al. 2005). It is part of an aggressive male-male display in the phrynosomatid species *Uma rufopunctata* (Tietgen and Drew 2014), and part of the male display when approaching a female in the teiid *Holcosus festivus* (Abarca and Knapp 2010) and in various gekkotan species (Bustard 1965). LUT is performed when approaching another lizard or a larger animal in various gekkonid species (Werner 1995) and is a social signal with unclear significance in numerous sphaerodactylid species (Leuck et al. 1990; Arnold 1993). It is performed by males during copulation in the skink *Carlia rubrigularis* (Lane 2006). LUT is also known in the shinisaurid *Shinisaurus crocodilurus* (Ray and Walley 2003) and the lacertid genus *Acanthodactylus* (Hawlena et al. 2006; Hawlena 2009), in which its significance is unclear. LUT in *P. auberi* was not performed in the context of an intraspecific interaction, nor in the context of a sit-and-wait predatory style (the usual context of caudal luring). Therefore, of the functions listed above for LUT, its most likely function in *P. auberi* was initially as a response to a perceived threat and subsequently as a tactic to fool unseen predators into revealing themselves, as per Magnusson's (1996) hypothesis. Another possibility is that the LUT reported here functioned as per Blamires's (1998) hypothesis of pursuit deterrence by signaling to the predator that the lizard had spotted it.

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