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A NEW NATRICINE SNAKE OF THE GENUS *ADELOPHIS*  
FROM WESTERN MEXICO

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WHILE COLLECTING garter snakes (*Thamnophis*) in the mountains of western Durango, México, we discovered an undescribed species of *Adelophis*, an extremely rare natricine genus. In recognition of the major contributions of the late Wade Fox to the systematics of the genus *Thamnophis*, we are pleased to name this garter snake ally in his honor.

*ADELOPHIS FOXI* new species

*Holotype*.—LSUMZ 14330, an adult female from a meadow in pine forest (8,600 feet) ¼ mi. E Mil Diez (approx. 2 mi. W El Salto), Durango, collected 16 July 1966 by D. A. Rossman and R. M. Blaney.

*Paratypes*.—LSUMZ 14326-14327, adult female and male collected with the holotype; LSUMZ 14328-14329, offspring of the holotype, born 3 August 1966; LSUMZ 16410-16411, adult male and female topotypes collected 11 July 1967; LSUMZ 16412-16415, offspring of LSUMZ 16411, born 29 July 1967.

*Diagnosis*.—A species of natricine snake distinguished from its sole congener, *Adelophis copei* Dugès, by possessing 17-17-17 dorsal scale rows (15-15-15 in *copei*), a semidivided nasal (entirely divided in 6 of 8 cases in *copei*), a discrete loreal scale (fused with prefrontal in *copei*), longer anterior than posterior genials (posterior longer in *copei*), 4th and 5th supralabials of nearly equal size (5th equal to combined length of 2nd,

3rd, and 4th in *copei*), six infralabials (five in *copei*), two posterior temporals (one in *copei*), a proportionately longer muzzle (frontal only 28.3 to 28.6 per cent longer than muzzle<sup>1</sup> in male *foxi*, 37.2 to 51.7 per cent longer in male *copei*<sup>2</sup>), a proportionately longer tail (23.4 to 25.6 per cent of total length in adult male *foxi*, 19.8 to 21.0 per cent in male *copei*), 20 or 21 maxillary teeth (23 or 24 in *copei*), a pair of dark paravertebral stripes (lacking in *copei*), and no light lateral stripe (present in *copei*). The combined characteristics of an undivided anal plate and no dorsal scale row reduction readily distinguish the genus *Adelophis* from all other New World natricines.

*Description of holotype.*—Dorsal scales in 17 rows throughout, keeled except for those in row 1, which are smooth and enlarged (those in row 2 are weakly keeled and slightly enlarged); ventrals 132; subcaudals 51; anal entire. Supralabials 5, third and fourth entering orbit; infralabials 6, 4 in contact with anterior genials, which are longer than posterior genials ( $A/P=1.168$ ); nasal semidivided, suture below naris; loreal rectangular; preocular single; postoculars 2 on left, 1 on right; temporals 1+2. Scales on top of head normal; internasal suture 77.4 per cent length of prefrontal suture; frontal 20.3 per cent longer than muzzle, and 31 per cent shorter than parietals. Total length 419 mm, tail length 90.5 (21.6 per cent of total length).

Maxilla with 20 moderately slender, slightly recurved teeth, decreasing slightly in size posteriorly (anteriormost 3 or 4 also smaller). Ten teeth lie anterior to the prefrontal process.

Ventrolateral stripe and dorsal scale rows 1, 2, and 3 oakbuff (Maerz and Paul 13D7) in living animal. Row 4 and rows 7 and 8 coffee (15A11), with black pigment on anterior half of each scale, giving impression of dark lateral stripe and paravertebral stripe. Rows 5 and 6 gray stone (13A2), keels coffee. Vertebral row gray (13A1) with yellow pigment at anterior end of each scale. Center and posterior edge of ventral scales corn yellow (10J5) overlaid with buff (12J5).

*Variation.*—Coloration of adult paratypes differs from that of holotype primarily in being lighter and brighter (see Figure 1). The anterior end of

<sup>1</sup>Muzzle length is equivalent to the combined length of one prefrontal and the adjacent internasal when measured along the middorsal suture.

<sup>2</sup>No female specimens of *copei* are known.

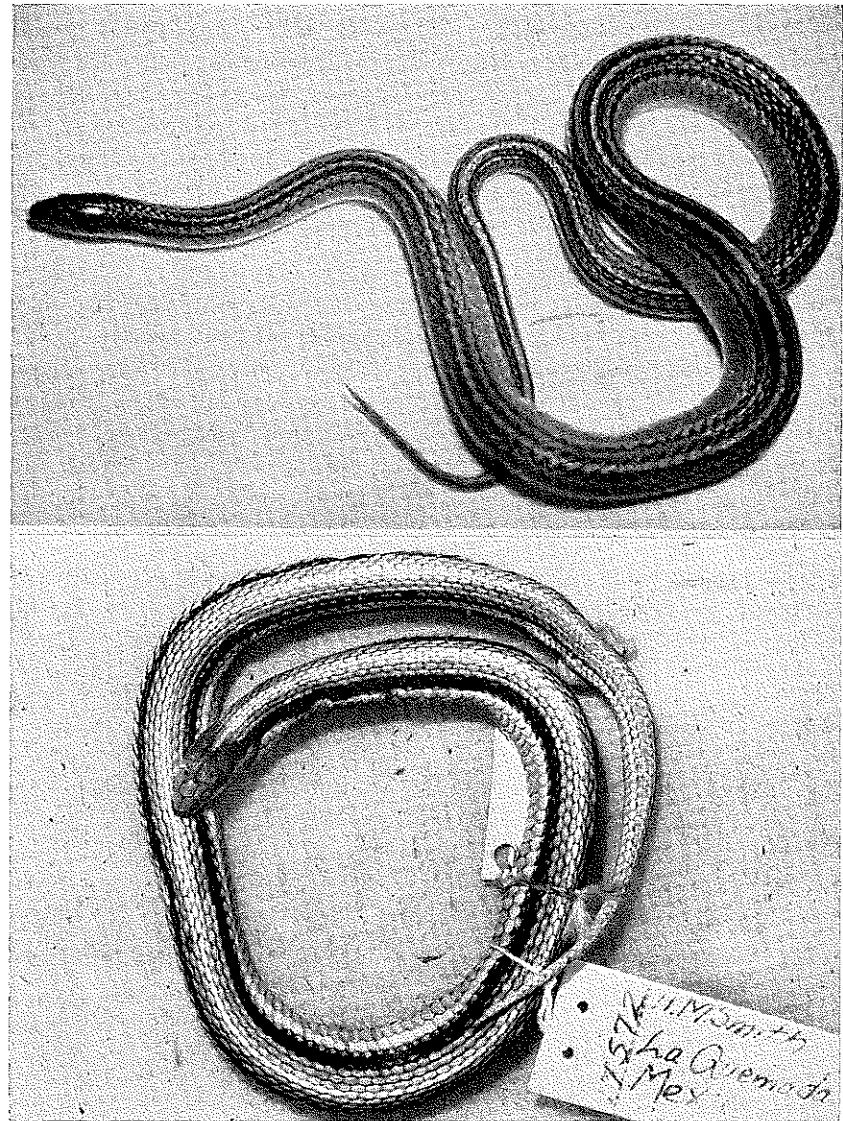


FIGURE 1. Upper: Dorsal color pattern of *Adelophis foxi* (LSUMZ 16410). Photograph from a Kodachrome by R. M. Blaney. Lower: Dorsal color pattern of *Adelophis copei* (UIMNH 17572). Photograph by J. H. Roberts.

each scale in rows 1 and 2 of an adult female paratype (LSUMZ 14326) was touched with orange in life. The newly born young have a pattern similar to that of the adults, but in life the coloration is duller (in large part because of the total lack of any yellow or orange pigment) and the dark stripes are less distinct (because of less extensive distribution of the black pigment). The venter appears dull white. In preservative the original epidermal scales slough off easily in both adults and juveniles leaving a uniformly grey dorsum, save for the light and dark stripes.

Variation in those characters that show sexual dimorphism or ontogenetic variation is summarized in Table 1. Males tend to have a longer tail, more subcaudals, a longer head, and a shorter muzzle than the females. Larger series of adults probably will reveal that males also have more ventrals and do not attain as great a length as females. Proportional tail length increases ontogenetically, juvenile males having the tail only about as long proportionately as in adult females. The marked differences between juvenile and adult females in ventral and subcaudal number probably is attributable to the small size of the sample.

One juvenile (LSUMZ 14328) is aberrant in several respects: half scutes are present at ventrals 106, 131, and 134; subcaudals 3, 4, 45, 46,

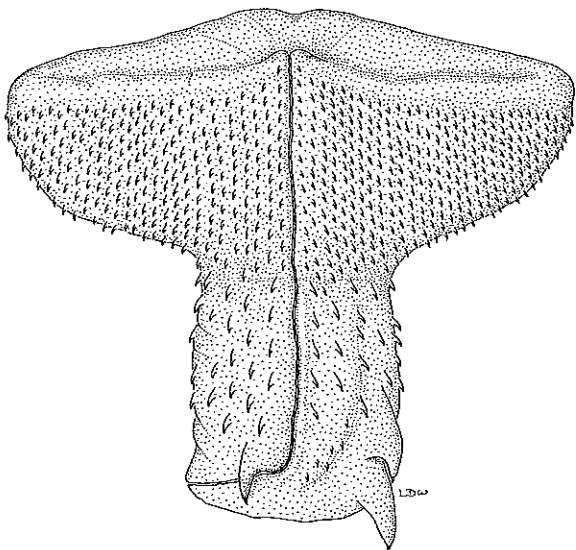


FIGURE 2. The everted hemipenis of *Adelophis foxi* (LSUMZ 14327).

TABLE 1. VARIATION IN SELECTED FEATURES OF *Adelophis foxi*.

Character	Adults		Juveniles	
	2 ♂♂	3 ♀♀	3 ♂♂	3 ♀♀
Ventrals	135.5(133-138)	133.0(132-135)	137.3(136-139)	136.3(136-137)
Subcaudals	60.0(60)	52.3(51-54)	58.0(52-64)	55.0(53-57)
Snout-Vent Length (mm)	267.0(262-272)	333.0(318-352.5)	120.0(117.5-123)	120.2(118.5-122.5)
Total Length (mm)	333.8(342-365.5)	428.7(413-454)	154.7(150-160)	152.7(151-154)
Tail as % of Total Length	24.5(23.4-25.6)	22.3(21.3-23.0)	22.4(21.7-23.1)	21.3(20.9-21.5)
Head as % of S-V Length	4.3(4.2-4.3)	3.7(3.5-3.8)	.....	.....
Eye as % of Head Length	18.0(17.4-18.6)	16.7(15.6-17.5)	.....	.....
Muzzle as % of Frontal Length	71.6(71.4-71.7)	80.3(79.7-81.2)	.....	.....
Anterior Genial/Posterior Genial	1.033(1.000-1.067)	1.291(1.168-1.438)	.....	.....

and 47 are single; an extra row of dorsal scales appears irregularly between rows 3 and 4 (giving a maximum count of 19), finally dropping out at the level of ventral 71 on the right and 84 on the left; the tail is unusually short for a male, which is reflected by both a low tail length/total length value and a low number of subcaudals (only 1 of the 6 females has fewer). One of the adults (LSUMZ 16411) also has half scutes, all on the left side of the venter (at V 14, 26, 67, and 132).

The everted hemipenis (Figure 2) of the adult male is single with the distal half of the organ greatly expanded (3 times wider than the proximal half). The sulcus spermaticus is simple and terminates apically between raised lips near the border of the sulcus. The apical surface and adjacent apical margin of the expanded portion are nude. The remainder of the organ is spinose, the spines being very small on the expanded portion, but becoming larger proximally. One enlarged basal hook is immediately adjacent to the sulcus; two others are on the opposite side of, and somewhat removed from, the sulcus.

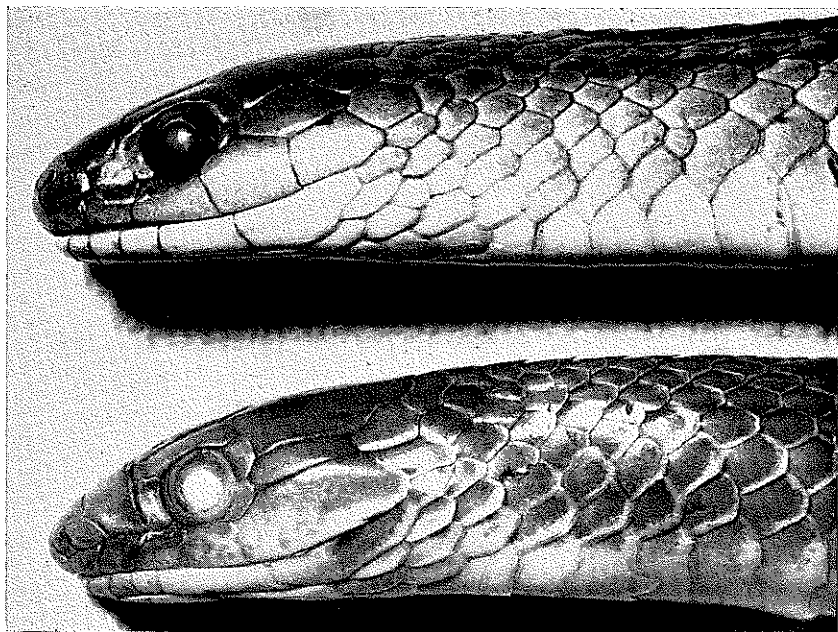


FIGURE 3. Head of *Adelophis foxi* holotype (LSUMZ 14330) above, and of *Adelophis copei* (USNM 110335) below. Photograph by J. H. Roberts.

*Relationships.*—Despite the many differences enumerated in the diagnosis (some of which are of the same magnitude as those separating certain colubrid genera), we believe that the nearest living relative of the new species is *Adelophis copei* and that the two species should be considered congeneric. The combination, unique for a New World natricine, of a single anal plate and no dorsal scale row reduction, plus the similarities in head shape (Figure 3), arrangement of maxillary teeth and shape of maxilla, basic color pattern (Figure 1), and hemipenis (*copei* appears to differ from *foxi* only in lacking the basal hook adjacent to the sulcus) suggest that we are dealing with a single evolutionary line, although with two rather diverse sections thereof. Confirmation of this hypothesis must await the examination of skeletal material of *copei*, a species presently known from only three preserved specimens.<sup>3</sup> The only known locality for *foxi*, apparently the more generalized of the two species, lies in the Sierra Madre Occidental; *copei* has been reported from a half-dozen localities along the southern portion of the Mesa Central (Figure 4).

In the original description (Dugès, in Cope, 1879), *Adelophis* was said to be allied to the genus *Tropidoclonion*, differing only in lacking a loreal. Subsequent authors variously placed the species *copei* in *Tropidoclonion* or *Storeria*, until Dunn (1931) reemphasized its distinctness and suggested that both *Adelophis* and *Tropidoclonion* are "degenerate forms allied to and probably descended from *Thamnophis*." Taylor (1942) presented a description (inaccurate with respect to the hemipenis and maxillary dentition) of a recently collected specimen of *copei* and reviewed the status of the genus, comparing it with *Storeria* and *Tropidoclonion*. He reaffirmed the validity of *Adelophis*, but gave no indication of its affinities. Inasmuch as the inclusion of *foxi* in that genus considerably alters its limits (particularly with regard to condition of the loreal and the genials) reexamination of the relationship of *Adelophis* to *Tropidoclonion* is necessary.

The differences between the two genera clearly appear to outweigh their similarities (undivided anal plate and general dorsal pattern). The hemi-

<sup>3</sup>After this paper was submitted for publication, Dr. James R. Dixon provided us with data on a specimen of *copei* that he had discovered DOR 8.7 mi. E Tapalpa, Jalisco, on 22 July 1967. This locality is situated at an elevation of 7,600 ft. in pine-oak savanna; a grassy seepage area lies adjacent to one side of the road. The specimen (Los Angeles County Museum 37322), an adult (335 mm total length) of undetermined sex, provides the first information on coloration in fresh material. The ground color of the dorsum was olive brown, the vertebral stripe straw colored, and the lateral stripe grayish white.

penis of *Adelophis* is of a generalized natricine type, similar to those of many species of *Thamnophis*; that of *Tropidozonion* is unique among New World natricines in possessing a pair of long apical papillae (see Dowling, 1959, Figure 1B). *Adelophis* usually exhibits no dorsal scale row reduction, but one apparently aberrant juvenile specimen of *A. foxi* has the 17-19-17 formula characteristic of *Tropidozonion*. In *Tropidozonion* the tail is very short and there are relatively few subcaudals (*Tropidozonion*: males 34-47, females 24-40; *Adelophis*: males 50-60, females 51-54). The posterior genials in *Tropidozonion* are markedly shorter than the anterior, much more so than in *Adelophis foxi* (the posterior are longer in *A. copei*). The crown of the head is relatively flat in *Tropidozonion*, arched in *Adelophis* (for latter see Figure 3). If one assumes a *Thamnophis*-like ancestor, *Tropidozonion* is more specialized than *Adelophis* in the condition of the hemipenis, relative tail length, and very short posterior genials, whereas

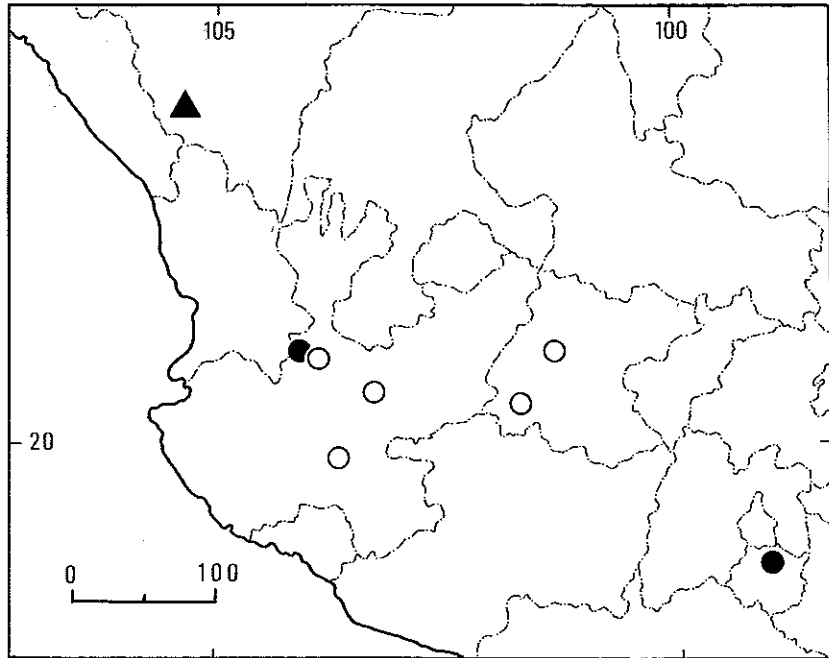


FIGURE 4. Distribution of *Adelophis foxi* (triangle) and *Adelophis copei* (circles) in western Mexico. Solid symbols represent specimens examined; hollow symbols represent literature records.

*Adelophis* is the more specialized in terms of head shape and the absence of dorsal scale row reduction.

There are also numerous osteological differences between the two genera (the information on *Adelophis* is based, with the exception of the maxilla, entirely on *foxi*). *Adelophis* has: the posterior end of the maxillary shaft extending well beyond the ectopterygoid process (the posterior end of the shaft terminates well in advance of the ectopterygoid process in *Tropidozonion*; see Figure 5); the dorsal surface of the paired nasals narrow and

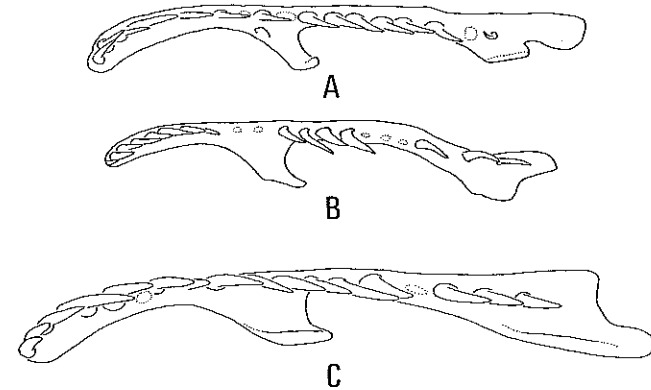


FIGURE 5. Ventral view of the left maxilla of (A) *Adelophis foxi*, (B) *Adelophis copei*, and (C) *Tropidozonion lineatum*.

lanceolate (*Tropidozonion* has the broad winglike lateral extensions typical of generalized New World natricines); the maxillary process of the ectopterygoid relatively broad (narrow in *Tropidozonion*); supratemporal scarcely longer than upper edge of its articulation with quadrate, not reaching prootic-parietal suture (supratemporal twice as long as its articulation with upper edge of quadrate and reaching the suture in *Tropidozonion*); parasphenoid process extremely narrow (broad in *Tropidozonion*); two-thirds the length of the supraoccipital lies posterior to the supraoccipital crests (less than one-half the length is posterior to the crests in *Tropidozonion*); combined frontals nearly one-third again as long as they are broad (only slightly longer than broad in *Tropidozonion*); prefrontal height equal to its length (height much exceeds length in *Tropidozonion*); dorsomedial surface of retroarticular process of compound bone broader than in *Tropidozonion*.

In most, but not all, of these skeletal features *Adelophis* appears to have the more specialized condition, its very short supratemporal and long pre-

frontal perhaps reflecting more extreme adaptation for a semi-fossorial existence. Detailed osteological comparisons with *Thamnophis* and the other New World natricine genera will be treated in studies currently being pursued by the senior author. Pending the outcome of those studies, we are inclined to believe that *Adelophis* and *Tropidoclonion* represent two independent adaptive shifts to the semi-fossorial niche by the garter snake line.

*Ecological Notes.*—The type series of *Adelophis foxi* was collected in a damp mountain meadow, at an elevation of approximately 8,600 feet. The meadow vegetation consisted largely of grasses and scattered composites. Patches of denser vegetation were generally associated with depressions in the meadow, many of which contained water (in some cases as much as a foot deep). The rocky roadbed of an abandoned railroad track extended through the middle of the meadow. Most of the rails had disappeared and many of the rocks were scattered in the adjacent meadow (Figure 6).

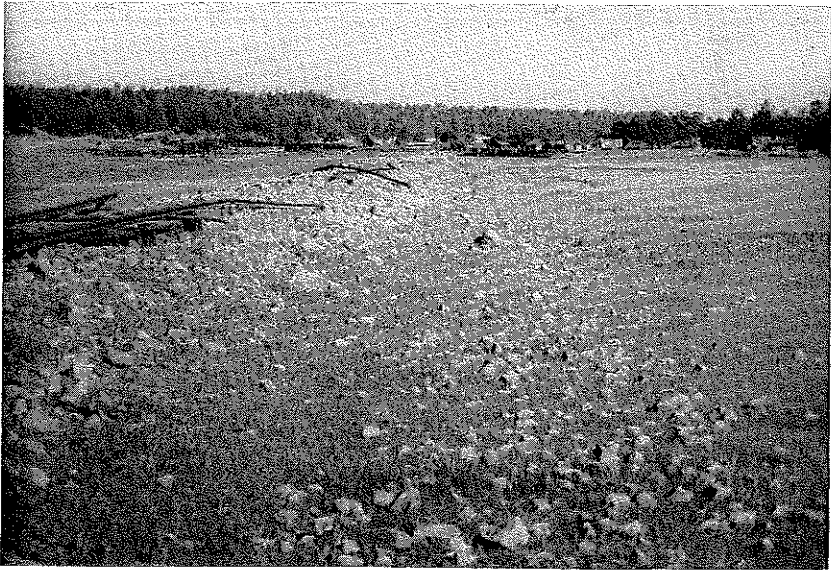


FIGURE 6. Type locality of *Adelophis foxi*, 1/4 mi. E Mil Diez, Durango, Mexico. Photograph by R. M. Blaney.

During our visits to Mil Diez in July 1966 and 1967, the nights and early mornings were cool but the air warmed up rapidly, reaching the 70's (°F.) by midday. Morning skies were clear, but afternoon cloudiness and mid-afternoon thunderstorms occurred daily.

Only one of the 5 *Adelophis* was active; it was collected in dew-damp grass as it crawled away from one of the depressions near the railroad bed. All the specimens, except one, were found within 10 yards of the railroad bed. The exception was obtained approximately 50 yards away from it near the stone fence adjacent to the village. Three of the inactive snakes were found beneath rocks, the fourth under dry bovine feces. Both of the gravid females taken had a portion of the body exposed, presumably to obtain maximum warmth for the developing young. The gravid female collected in 1966 gave birth to 2 young, and passed an infertile egg, on 3 August. The 1967 female gave birth to 4 young on 29 July.

Earthworms, which are abundant beneath the rocks in the meadow, probably serve as the principal food of *Adelophis foxi*. The fecal material of the freshly caught snakes was reminiscent of earthworm excrement, and captive *foxi* readily ate earthworms.

Other species of reptiles and amphibians observed in the meadow at Mil Diez were *Thamnophis eques*, *Thamnophis melanogaster*, *Sceloporus poinsetti*, and *Rana pipiens*. With the exception of the lizards, individuals of the other species usually were found in much closer proximity to standing water than were the specimens of *Adelophis foxi*.

That *Adelophis copei* may also prefer a damp meadow situation is indicated by the only available habitat data for that species. Hobart M. Smith (pers. comm.) related that an individual collected near La Quemada, Jalisco, was taken in an "extensive grassy swamp . . . along with considerable numbers of garter snakes."

#### ACKNOWLEDGMENTS

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