

Catalogue of American Amphibians and Reptiles.

MARTOF, BERNARD S. 1975. *Hyla squirella*.*Hyla squirella* Bosc
Squirrel treefrog*Hyla squirella* Bosc in Daudin, 1800:9. Type-locality, "la Caroline"; restricted to Charleston [Charleston County], South Carolina by Harper (1940). No holotype known.*Hyla flavigula* Glass, 1946:101. Type-locality, "Aransas National Wild Life Refuge, Aransas County, Texas." Holotype, Texas Cooperative Wildlife Coll. (Texas A and M Univ.) 1192, collected 20 June 1946 by Bryan P. Glass (not examined by author).

- CONTENT. No subspecies have been described.

- DEFINITION. A small treefrog (adults 23–37 mm snout-vent length, maximum 43 mm, with no overt sexual dimorphism in size) with these characteristics: snout rounded; canthus rostralis angular but not sharp-edged; diameter of tympanum about half that of eye; heel of adpressed hind limb reaching nearly to tip of snout; digital discs distinct, slightly smaller than tympanum; tarsal fold extending from ankle to metatarsal tubercle at base of first digit; toes about $\frac{1}{3}$ webbed; penultimate phalanx of toe 4, but only terminal phalanx of other toes free of web; skin smooth or minutely granular on dorsum and areolate on venter.

The dorsum is green, gray, or brown usually with at least a partial bar between the eyes, a white or yellowish white line on the upper lip, and a light line extending from below the eye to over the shoulder. Colors and markings are extremely variable; e.g., the dorsum may be bright green and unspotted or brown with many or few rounded spots. The concealed surfaces of the legs lack spots and vermiculations.

The mating call is a nasal, duck-like "aaaa" or "waaaaak" with a fundamental frequency of 133 Hz. Notes average about 0.24 sec. in length and are repeated after about 0.5 sec. (Blair, 1958). The "rain-call" is a raspy, squirrel-like scold (Conant, 1975) or a raucous "quack" (Duellman and Schwartz, 1958). It is usually given during the day by lone males in trees and bushes, often far from water.

- DIAGNOSIS. This nondescript *Hyla* is best identified by eliminating other sympatric species. It lacks the light spot under the eye of *H. avivoca*, *H. versicolor* and *H. chrysoscelis*; the showy lavender stripe on the side of the body of *H. andersoni*; the dark, X-shaped dorsal marking of *H. crucifer*; the prominent light stripe on the side of the body of *H. cinerea*; the diagnostic

row of yellow to orange spots on the back of the thigh of *H. femoralis*; the large size and many large round dorsal spots of *H. gratiosa*; and the very large size and absence of stripes on the head of *Osteopilus septentrionalis*.

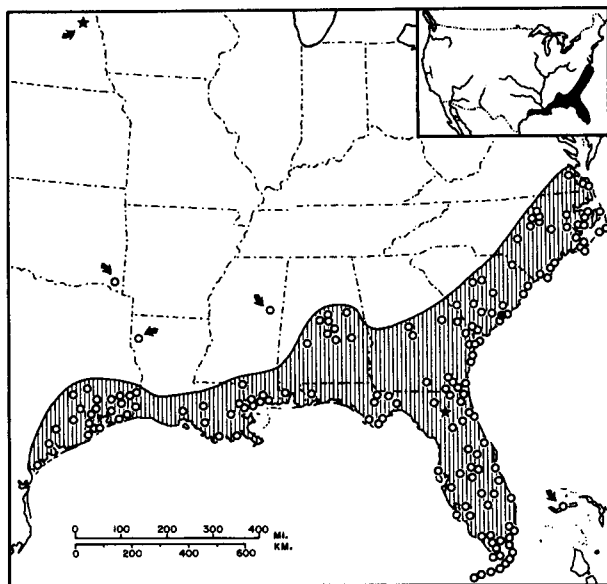
- DESCRIPTIONS. The most readily available source is Wright and Wright (1949). Other general sources are Wright (1931), Glass (1946) and Dickerson (1906). For technical descriptions of the mating call, see Blair (1958, 1959). Orton (1947) described early larval stages and Fortman and Altig (1973) described hybrid tadpoles. C. Goin (1958) described the maxillary dentition.

- ILLUSTRATIONS. Color illustrations showing variation in dorsal pigmentation appear in Conant (1975) and Dickerson (1906). Black and white photographs of adults are in Carr and Goin (1955), Dickerson (1906), Wright (1931) and Wright and Wright (1949). Photographs of eggs and tadpoles occur in Wright (1931) and Wright and Wright (1949). A fossil ilium is shown by Chantell (1964). For a sonagram of the mating call, see Blair (1958, 1959). Altig and Pace (1974) present scanning electron photomicrographs of tadpole labial teeth. The following line drawings are available: section of skin—Elias and Shapiro (1957); choroid plexus—Hilton (1954); lateral views of early tadpoles—Orton (1947); hybrid tadpole, *H. femoralis* × *H. squirella*—Fortman and Altig (1973); egg membranes—Wright and Wright (1949); mouth parts of tadpole—Wright and Wright (1949).

- DISTRIBUTION. This species occurs in the Coastal Plain from southeastern Virginia to the Florida Keys, and westward along the Gulf Coast to near Corpus Christi, Texas. In North Carolina it invades the lower Piedmont and there is an outlying record for southeast Oklahoma (Bragg, 1966). Records from Illinois, Indiana and Kentucky were based on misidentified specimens (Smith, 1961; Barbour, 1966). Crombie (1972) reported introduction into the Bahamas. Important publications dealing with distribution include Blaney (1971), Duellman and Schwartz (1958), Gosner and Black (1956), Hoffman (1955), Mount (1964), Smith (1961) and Smith and List (1955).

- FOSSIL RECORD. Records for the Pleistocene near Haile, Florida (Lynch, 1964) and Mio-Pliocene near Brown City, Nebraska (Chantell, 1964) are based on ilia. The ilium of *H. squirella* is said to be distinctive in its unique dorsal acetabular protuberance. Holman (1968) considered an Oligocene species, *H. swanstoni*, to be similar to *H. squirella*.

- PERTINENT LITERATURE. The major comprehensive works are Wright (1931) and Wright and Wright (1949). Areas covered in other papers include: comparative osteology (Gaudin, 1974); histology of skin (Elias and Shapiro, 1957); body temperature (Brattstrom, 1963); predators, habitat selection, activity and homing (Goin and Goin, 1957); variation in body size and proportions, habitat, breeding season and weather, food (Duellman and Schwartz, 1958); ecological comparisons with *H. cinerea* (Goin and Goin, 1953; O. Goin, 1958); marine associations (Neill, 1958; Webb, 1965; Blaney, 1971); hybridization and phylogeny (Ralin, 1970); mis-mating with *Gastrophryne* (Volpe, 1956); comparative call structure (Blair, 1958, 1959, 1960); color changes (Dickerson, 1906; Wright, 1931); sleep behavior (Hobson *et al.*, 1968); hibernation (Neill, 1948; Carr, 1940); phototactic responses (Jaeger and Hailman, 1973);



MAP. The solid circle marks the type-locality; open circles indicate other records. The stars mark fossil localities.

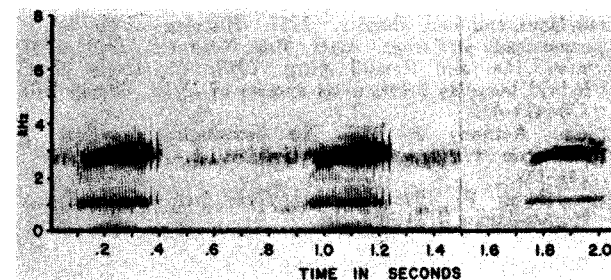


FIGURE. Audiospectrogram of mating call of *Hyla squirella*: St. Catherine's Island, Georgia, 11 May 1972, water 21.6°C; first two notes wide band (300 Hz), third narrow (45 Hz); Amer. Mus. Nat. Hist. Dept. Herpetology tape, specimen AMNH 89993.

topics related to DNA (Bachman *et al.*, 1966; O. Goin, *et al.*, 1958); other topics in ecology and life history (Neill, 1951; Anderson *et al.*, 1952); karyotype ($2n = 24$, Bogart, 1973).

• REMARKS. The name of this species was commonly attributed to Sonnini and Latreille (1801), but Harper (1940) showed that it stems from Bosc *in* Daudin (1800).

The suggestion of Wright and Wright (1949) that *Hyla flavigula* Glass is a junior synonym of *H. squirella* has not been disputed.

• ETYMOLOGY. The author of this species spent time in the Carolinas (Harper, 1940) and must have been familiar with its call. Possibly he combined the English "squirrel" with the Latin diminutive suffix *ella* in allusion to the call.

LITERATURE CITED

- Altig, Ronald, and William L. Pace. 1974. Scanning electron photomicrographs of tadpole labial teeth. *J. Herpetol.* 8(3):247-251.
- Anderson, Paul K., Ernest A. Liner, and Richard E. Etheridge. 1952. Notes on amphibian and reptile populations in a Louisiana pineland area. *Ecology* 33(2):274-278.
- Bachman, Konrad, Olive Goin and Coleman Goin. 1966. Hyliid frogs: polyploid classes of DNA in liver nuclei. *Science* 154(3749):650-651.
- Barbour, Roger W. 1958. A deletion of distribution records of *Hyla squirella*. *Copeia* 1958(1):49-50.
- Blair, W. Frank. 1958. Call differences as an isolating mechanism in Florida species of hylid frogs. *Quart. J. Florida Acad. Sci.* 21(1):32-48.
- 1959. Call structure and species groups in U. S. treefrogs (*Hyla*). *Southwestern Nat.* 3(1-4):77-89.
- 1960. Mating call as evidence of relations in the *Hyla eximia* group. *Ibid.* 5(3):129-135.
- Blaney, Richard M. 1971. An annotated check list and biogeographic analysis of the insular herpetofauna of the Apalachicola region, Florida. *Herpetologica* 27(4):406-430.
- Bogart, James P. 1973. Evolution of anuran karyotypes. pp. 337-349. *In* James L. Vial (Ed.), *Evolutionary biology of the anurans*. Univ. Missouri Press, Columbia.
- Bragg, Arthur N. 1966. Range extension: *Hyla squirella*. *Copeia* 1966(4):894.
- Brattstrom, Bayard H. 1963. A preliminary review of the thermal requirements of amphibians. *Ecology* 44(2):238-255.
- Carr, Archie F., Jr. 1940. A contribution to the herpetology of Florida. *Tech. Publ. Univ. Florida* 3(1):1-118.
- , and Coleman J. Goin. 1955. Guide to the reptiles, amphibians and fresh-water fishes of Florida. Univ. Florida Press, Gainesville, Florida. ix + 341 p.
- Chantell, Charles J. 1964. Some Mio-Pliocene hylids from the Valentine formation of Nebraska. *Amer. Midland Nat.* 72(1):211-225.
- Conant, Roger. 1975. A field guide to reptiles and amphibians of eastern and central North America. Second edition. Houghton Mifflin Co., Boston. xviii + 429 p.
- Crombie, Ronald L. 1972. The presence of *Hyla squirella* in the Bahamas. *Quart. J. Florida Acad. Sci.* 35(1):49-52.
- Daudin, Francois M. 1800. *Histoire naturelle des quadrupedes ovipares*. Livraisons 1 and 2. Paris. 24 p.
- Dickerson, Mary C. 1906. *The frog book*. Doubleday, Page and Co., Garden City, N. Y. xvii + 253 p.
- Duellman, William E., and Albert Schwartz. 1958. Amphibians and reptiles of southern Florida. *Bull. Florida State Mus.* 3(5):181-324.
- Elias, Hans, and Jack Shapiro. 1957. Histology of the skin of some toads and frogs. *Amer. Mus. Novitates* (1819):1-27.
- Fortman, Jon, and Ronald Altig. 1973. Characters of F₁ hybrid tadpoles between six species of *Hyla*. *Copeia* 1973(3):411-416.
- Gaudin, Anthony J. 1974. An osteological analysis of Holarctic tree frogs, family Hylidae. *J. Herpetol.* 8(2):141-152.
- Glass, Bryan P. 1946. A new *Hyla* from south Texas. *Herpetologica* 3(3):101-103.
- Goin, Coleman J. 1958. Notes on the maxillary dentition of some hylid frogs. *Herpetologica* 14(2):117-121.
- , and Olive Goin. 1953. Temporal variations in a small community of amphibians and reptiles. *Ecology* 34(2):406-408.
- 1957. Remarks on the behaviour of the squirrel treefrog, *Hyla squirella*. *Ann. Carnegie Mus.* 35(3):27-36.
- Goin, Olive B. 1958. A comparison of the nonbreeding habits of two treefrogs, *Hyla squirella* and *Hyla cinerea*. *Quart. J. Florida Acad. Sci.* 21(1):49-60.
- , C. J. Goin and Konrad Bachman. 1968. DNA and amphibian life history. *Copeia* 1968(3):532-540.
- Gosner, Kenneth L., and Irving H. Black. 1956. Notes on amphibians from the Upper Coastal Plain of North Carolina. *J. Elisha Mitchell Sci. Soc.* 72(1):40-47.
- Harper, Francis. 1940. Some works of Bartram, Daudin, Latreille, and Sonnini, and their bearing upon North American herpetological nomenclature. *Amer. Midland Nat.* 23(3):692-723.
- Hilton, W. A. 1954. The chorioid plexuses of frogs and toads. *Herpetologica* 10(2):111-114.
- Hobson, J. Allan, Coleman J. Goin, and Olive Goin. 1968. Sleep behavior of frogs. *Quart. J. Florida Acad. Sci.* 30(3):184-186.
- Hoffman, Richard L. 1955. On the occurrence of two species of hylid frogs in Virginia. *Herpetologica* 11(1):30-32.
- Holman, J. Alan. 1968. Lower Oligocene amphibians from Saskatchewan. *Quart. J. Florida Acad. Sci.* 31(4):273-289.
- Jaeger, Robert C., and Jack P. Hailman. 1973. Effects of intensity on the phototactic responses of adult anuran amphibians: a comparative study. *Zeit. Tierpsychologie* 33:352-407.
- Lynch, John D. 1964. Additional hylid and leptodactylid remains from the Pleistocene of Texas and Florida. *Herpetologica* 20(2):141-142.
- Mount, Robert H. 1964. New locality records for Alabama anurans. *Herpetologica* 20(2):127-128.
- Neill, Wilfred T. 1948. Hibernation of amphibians and reptiles in Richmond County, Georgia. *Herpetologica* 4(3):107-114.
- 1951. A bromeliad herpetofauna in Florida. *Ecology* 32(1):140-143.
- 1958. The occurrence of amphibians and reptiles in salt-water areas, and a bibliography. *Bull. Marine Sci. Gulf Caribbean* 8(1):1-97.
- Orton, Grace L. 1947. Notes on some hylid tadpoles in Louisiana. *Ann. Carnegie Mus.* 30(21):363-383.
- Raun, Gerald G., and Frederick R. Gehlbach. 1972. Amphibians and Reptiles in Texas. *Dallas Mus. Nat. Hist. Bull.* 2. ii + 61 p.
- Smith, Philip W. 1961. The amphibians and reptiles of Illinois. *Bull. Illinois Nat. Hist. Surv.* 28(1):1-298.
- , and James C. List. 1955. Notes on Mississippi amphibians and reptiles. *Amer. Midland Nat.* 53(1):115-125.
- Sonnini, C. S., and P. A. Latreille. 1801. *Histoire naturelle des Reptiles*. Paris. 2:1-332.
- Volpe, E. Peter. 1956. Reciprocal mis-matings between *Hyla squirella* and *Microhyla carolinensis*. *Copeia* 1956(4):261-262.
- Webb, Robert G. 1965. Observations on breeding habits of the squirrel treefrog, *Hyla squirella* Bosc *in* Daudin. *Amer. Midland Nat.* 74(2):500-501.
- Wright, Albert H. 1931. *Life-histories of the frogs of Okefinokee Swamp, Georgia*. Macmillan Co., New York. xv + 497 p.
- , and Anna A. Wright. 1949. *Handbook of frogs and toads of the United States and Canada*. Comstock Publ. Co., Ithaca, N. Y. xii + 640 p.

B. S. MARTOF, NORTH CAROLINA STATE UNIVERSITY, RALEIGH, NORTH CAROLINA 27607.

Primary editor for this account, Richard G. Zweifel.

Published October 22, 1975 by the SOCIETY FOR THE STUDY OF AMPHIBIANS AND REPTILES.