REQUEST FOR THE CONSERVATION OF *RANA SPHENOCEPHALA* COPE, 1886, AND THE SUPPRESSION OF *RANA UTRICULARIUS* HARLAN, 1826 AND *RANA VIRESCENS* COPE, 1889 (AMPHIBIA: SALIENTIA).

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For nearly a hundred years herpetologists have recognized two forms of leopard frogs (*Rana pipiens* complex) in eastern North America. During most of the period since the beginning of this century each of these forms had a relatively stable nomenclature. The northerly distributed form has been referred to as *R. pipiens* Schreber, 1782 (or *R. pipiens pipiens*), and the form with a more southern distribution has been known as *R. sphenocephala* Cope, 1886 (or *R. pipiens sphenocephala*). Recent evidence (Littlejohn and Oldham, 1968; Brown and Brown, 1972; Brown, 1973; Mecham, Littlejohn, Oldham, Brown and Brown, 1973) indicates that the two forms are reproductively isolated from each other, being particularly well differentiated in their species-specific mating calls (an important isolating mechanism in anuran amphibians). Although the two species are similar in appearance, they can be distinguished by a combination of morphological characteristics (Mecham et al., 1973), but not by features of their vocal sacs. The revelation that the two forms are distinct species did not disrupt nomenclatural stability since herpetologists have long been familiar with the names *R. pipiens* and *R. sphenocephala*. More recently, however, Pace (1974) proposed an unwarranted and disruptive resurrection of the forgotten name *R. utricularius* Harlan, 1826 (emended to *R. utricularia*), for the more southerly distributed species. Since the stability of the nomenclature of this complex is of great importance to biologists of many disciplines, we here develop an alternate proposal that the name *R. sphenocephala* be conserved for the southerly distributed species, and that the names *R. utricularius* and *R. virescens* Cope, 1889, be suppressed.

2. The first name applied to the species with a southern distribution was *R.aquatica* Catesby, 1743. This name was pre-Linnean and thus lacks legal status. Kalm (1761) provided the name "*Rana virescens plantis tetradactylis*...", the first two words of which were applied by some later workers as a second name for southern frogs. Since Kalm's (1761) name was not a binominal or trinominal, it lacks availability. Nevertheless, in 1782 Schreber described *R. pipiens* and listed "*Rana virescens,*..." as a

synonym. However, "A name first published as a synonym is not thereby made available..." (Art. 11d, International Code of Zoological Nomenclature, 1964, p. 11). [The first usage of the name in conformance with the requirements for availability appeared in Cope (1889, p. 397), to which we return hereinafter.] S. Garman (1884) also listed the name "*R. virescens* Kalm" but provided no description. A third name, *R. oxyrhynchus*, was given to leopard frogs from near the St. John's River, Florida, by Hallowell, 1857 (no types designated). That name, however, was preoccupied by an African species. This led Cope (1886) to propose a fourth name, *R. h.* [*alecina*] *sphenocephala*, as a replacement name for Hallowell's *R. oxyrhynchus* (*R. halecina* Daudin, 1802, is a junior synonym of *R. pipiens*). Art. 72d requires that the types of *R. oxyrhynchus,* however determined, constitute the types of the replacement nominal taxon. The replacement name does not date from 1889 as indicated by Pace (1974, p. 18). However, the first *description* for the name *sphenocephala* was given by Cope in 1889 under the combination *R. virescens sphenocephala* (no types designated). He also indicated that *R. v. sphenocephala* was distributed in Florida, Georgia, Louisiana, and other states. The name *virescens* was soon ignored in later works (because it was thought to be a junior synonym of *R. pipiens*), and the name *sphenocephala* (as either *R. p. sphenocephala* or *R. sphenocephala*) became firmly established as a name for the more southerly distributed species in the eastern United States. A great many subsequent herpetological publications utilized *sphenocephala,* the most influential being: all editions (1st - 6th) of "A Check List of North American Amphibians and Reptiles" (Stejneger and Barbour, 1917, 1923, 1933, 1939, 1943; Schmidt, 1953); Dickerson (1906); Noble (1931); A.A. Wright and A.H. Wright (1933, 1942); A.H. Wright and A.A. Wright (1949); Conant (1958); Mecham et al. (1973); and Nace, Culley, Emmons, Gibbs, Hutchison and McKinnell (1974). The name *sphenocephala* was also used in a variety of disciplines and types of publications (e.g., Andrewartha and Birch, 1954; Cochran and Goin, 1970; Comstock, 1939; Cott, 1957; Cuellar, 1971; Foote, 1952; Goin and Goin,1971; Herald, 1949; Kudo, 1954; Mecham, 1969; Minckley, 1963; P.W. Smith, 1961; Thorson and Svihla, 1943). Many embryologists, physiologists, biochemists and other experimental biologists are familiar with the name *sphenocephala* because leopard frogs are among the most frequently utilized animals for experimental research in the United States. To have *sphenocephala* (which has remained stable as a name for the southerly distributed species for over fifty years) replaced by any other name would be highly confusing to non-herpetologists and even to herpetologists who are not taxonomically oriented. Consequently, it is of far reaching importance that the stability of nomenclature be served by conserving the long entrenched name *R. sphenocephala*.

3. In 1826 Harlan described *R. utricularius* (no types designated) for leopard frogs from Pennsylvania and New Jersey. Although he utilized the name in two subsequent publications (Harlan, 1827-1829; 1835 [this

publication represents reprints of Harlan's earlier papers]) it never became widely accepted and (until Pace, 1974) was used as a senior synonym in only two other publications (Boulenger, 1882; H. Garman, 1892). Pace (1974, p. 21) stated that a third reference used *R. utricularia:* "... Günther (1900) used the name for Mexican leopard frogs...". She misinterpreted Günther (1900) since he clearly indicated (p. 198) that *R. utricularia* is a junior synonym of *R. halecina* (= *R. pipiens*). We have completed an extensive examination of the literature and we are quite certain that the name *utricularia* was not used as a senior synonym during the fifty years between 1924 and Pace's 1974 publication. This forgotten name was never even listed in The Zoological Record in any of the years of its publication. Nonetheless, Pace (1974) felt it necessary to revive *R. utricularia* to replace the well established name *R. sphenocephala.* She also designated neotypes for both nominal taxa. The sole justification for these actions was based on her contentions about vocal sac structure. She maintained that she could distinguish *R. utricularia* from *R. pipiens* by the large external vocal sacs of the former and lack of external vocal sacs in the latter. Moreover, she felt that Harlan (1826) differentiated *R. utricularius* from *R. halecina* (= *R. pipiens*) in the same manner. If this was true, then *R. utricularius* Harlan, 1826, would have priority over *R. sphenocephala* Cope, 1886. Pace (1974, p. 12) stated "He [Harlan] named it *Rana utricularius*... because of the large balloon-like external vocal sacs by which he distinguished it from *Rana halecina*." A careful reading of Harlan's (1826) species description does not substantiate this claim. Harlan's only references to vocal sacs in *R. utricularius* were: (1) p.60, "a vocal vesicle on each side of the neck", and (2) p. 61, "a greenish vocal bladder extending on each side of the inferior jaw and crossing the arms in the male". Furthermore, in his description of *R. halecina* (1826, p. 61-62), Harlan made no mention of vocal sacs nor did he mention the sex of the animal he described. The specimen could have been a female, juvenile, or male collected out of breeding condition, all of which lack external vocal sacs. Thus, Harlan (1826) did not compare *R. halecina* and *R. utricularius,* and he did not even mention that his *R. utricularius* had large vocal sacs. Pace read things into Harlan's (1826) descriptions that are not there.

4. We have examined a great many living and preserved specimens of *R. pipiens* and the southern species from many parts of their ranges. It is quite clear that preserved and living males of both species in breeding condition have internal vocal sacs and enlarged external vocal sacs. Other workers that were aware of the differentiation of the two forms (e.g., Conant, 1958; Wright and Wright, 1942) have also noted the enlarged external vocal sacs of *R. pipiens.* Even Pace (1974) indirectly admitted the presence of external vocal sacs in *R. pipiens*, but she referred to them as stretched skin. We have seen many *R. pipiens* with external vocal sacs crossing the arms in the exact manner that Harlan (1826) described for the vocal sacs of his *R. utricularius*. Therefore it is equally likely that Harlan

(1826) utilized male *R. pipiens* for his species description of *R. utricularius*. This explanation was offered earlier by Hallowell (1857, p. 142): "Both authors [Duméril and Bibron; Holbrook] quote among the synonyms of halecina [= *R. pipiens*], the Rana utricularia of Harlan, which is the male halecina with distended vocal vesicles".

5. Another fallacy in Pace's (1974) interpretation of Harlan's papers (1826, 1827 - 1829, 1835) concerns geographical distributions. In these publications the distribution Harlan gave for *R. utricularius* (Pennsylvania and New Jersey) encompassed the edges of the ranges of both *R. pipiens* and the southern species (see figs. 1 and 4, Pace, 1974). In 1827-1829 and 1835 Harlan stated that *R. halecina* inhabited Pennsylvania and southern states. It is thus obvious that Harlan considered *R. halecina* to be the correct name for the southern species. Pace (1974, p. 12) attempted to salvage Harlan's confusion by stating: "the frog illustrated in general herpetology works of the day (e.g., Shaw, 1802) was the northern leopard frog, while the one discussed in those same works was often the southern one". Again, this statement is not substantiated by examination of Shaw's (1802) publication. Most of the description Shaw (1802) gave for the southern species (which he called *R. pipiens*) was taken almost verbatim from Catesby's (1743) description of *R. aquatica* (pre-Linnaean). However, the leopard frog Shaw (1802) illustrated was not the northern species as maintained by Pace (1974). Rather, Shaw's (1802) illustration is almost an exact mirror image of the drawing of *R. aquatica* (= the southern species) presented by Catesby (1743). Both drawings are almost exactly the same size but in Shaw's (1802) figure the pitcher plant was eliminated. Catesby's (1743) frog has narrow light green rings around the spots (quite similar to the condition frequently found in *R. sphenocephala*). Since Shaw's (1802) frog was not coloured, the rings are white and the contrast is much greater, making the spot rings appear somewhat more like the condition in *R. pipiens*. Both frogs most certainly represent the southern species since they both have pointed snouts, lack snout spots, and are mirror images of one another. It is the method of reproduction of Shaw's (1802) figure that makes the spot rings appear more prominent and thus somewhat more like the condition in *R. pipiens*. At the most, Shaw's (1802) figure might be interpreted as being a composite. Hence it is again obvious that another premise that Pace (1974) used in support of her resurrection of *R. utricularia* is unmistakably erroneous.

6. Thus, for a number of reasons we can conclude that it is clear that the name *R. utricularius* is an unquestionable nomen dubium, unless it is construed that Pace's (1974) arbitrary fixation of a neotype also fixes the name. Aside from that arbitrary decision, which was grossly ill-advised from the standpoint of nomenclatural stability, the name is of uncertain

allocation. In addition the name was an "unused senior synonym" in the most recent sense of the Code, as stated in 1974 (I.C.Z.N., *Bull. zool. Nomencl.*, 31: 87-89)., Pace revived the name either in ignorance of the proper nomenclatural procedure, or under the assumption that substitution of *utricularia* for *sphenocephala* would not, in her judgment, "disturb stability or universality or cause confusion" (I.C.Z.N., loc. cit., p. 81). We have already provided documentation in the preceding discussion for the view here advanced that Pace's (1974) proposed change would emphatically and overwhelmingly disturb stability and universality, and cause confusion.

7. Pace (1974) recognized two subspecies of *R. utricularia*. She assigned *R. u. sphenocephala* to peninsular Florida and *R. u. utricularia* to the rest of the range of the species. Her restriction of the name *sphenocephala* as a subspecies to peninsular Florida did very little to preserve the depth and breadth of the entrenchment of that name. Peninsular Florida is a rather small area when compared to the total range of the southerly distributed species. Former researchers associated the name *sphenocephala* with a frog having a much wider distribution. Furthermore, most researchers utilize specific names without subspecific designations. Thus, *sphenocephala* would be guaranteed obscurity if utilized only at a subspecific level.

8. In distinguishing *R. u. sphenocephala* from *R. u. utricularia*, Pace (1974, p. 24) indicated that for the former subspecies: "Juveniles and adults of both sexes are often very dark dorsally and ventrally (Duellman and Schwartz, 1958) ...". This was a complete misrepresentation of Duellman and Schwartz's (1958) comments. Their study was confined to only the extreme southern tip of peninsular Florida and the Florida Keys. In describing leopard frogs from the Everglades and surrounding area they did not indicate that the frogs had very dark dorsal surfaces. Furthermore, they stated (p. 256): "The undersurfaces are white or cream ... The above description is adequate for most specimens from the mainland ...". Duellman and Schwartz (1958) only indicated that darker dorsal and ventral surfaces were characteristic of leopard frogs from islands off the coast of southern Florida. Other features Pace (1974) used to characterize *R. u. sphenocephala* ("textured" vocal sacs, Mullerian ducts present in males, inwardly folding vocal sacs, large size) by her own admission (and confirmed by our examination of specimens in the Florida State Museum) distinguish only some of the peninsular Florida leopard frogs from her *R. u. utricularia*. We thus conclude that *R. u. utricularia* and *R. u. sphenocephala* cannot be adequately differentiated and that the designation of these two subspecies was unwarranted.

9. Dr. Richard Sage (personal communication) has recently accumulated interesting data of considerable relevance to the question of the validity of Pace's (1974) subspecific designations. He used starch gel electrophoresis in a study of eleven structural gene loci of *R. sphenocephala* from New Jersey, North Carolina, and three localities in

Florida (Tallahassee [not peninsular], Port St. Lucie [peninsular], and Big Pine Key [peninsular island]). The samples from the different localities were compared in regard to genetic identity by computing I-values (I = Nei's measure). I-values between populations ranged from .89-.95 among all possible comparisons. There was no higher similarity between the two peninsular populations than there was between the peninsular populations and the other three populations. Dr. Sage concluded: "There is no evidence of genetic distinctiveness of the peninsular Florida populations from localities away from the peninsula".

10. A strong case can also be made against the use of the name *R. virescens*. The most important reason that this name should be suppressed is that Cope (1889), in the first descriptions of the subspecies of *R. virescens* (no types designated), indicated (p. 398) that *R. virescens virescens* "is the *Rana utricularia* of Harlan", and again (p. 403), "The *Rana virescens virescens* is the *R. utricularia* of Harlan". The phraseology and context make it clear that *virescens* was not adopted as a nomenclatural replacement for *utricularia*, but merely as the earliest name (under Cope's assumption that it was already available) for a taxon of his own concept that included *utricularia*. The distinction is a fine but important one, for if simply a nomenclatural substitute, the replacement name ipso facto has the same type as the name substituted for, whereas if proposed as a new name which embraces but is not limited to another, it has its own type. The present situation is complicated by the fact that Cope was not intentionally creating a new name, although in fact he did. We conclude that it should not be interpreted as a replacement name in the strict sense. *R. virescens* is also a forgotten name that went out of general usage in the early part of this century. The name has been used in the primary zoological literature only once (Wyburn and Bacsich, 1948) in the last fifty years. It is apparent that Cope's (1889) description of *R. v. virescens* encompassed several species. Firstly, he indicated that the subspecies has its spots "margined with bright yellow" (p. 402) - a characteristic common to *R. pipiens*. Secondly, the frog in Cope's fig. 100 (p. 402) is most similar to *R. sphenocephala* in the shape of its snout. Thirdly, the described call "chock, chock, chock" (p. 402) is similar to that of *R. blairi* Mecham et al., 1973, but the mating calls or other vocalizations of most species of leopard frogs in the United States could be described in that manner. Fourthly, the distribution that Cope gave for *R. v. virescens* (p. 403) encompasses parts of the ranges of the leopard frog species *R. pipiens, R. sphenocephala, R. berlandieri* Baird and *R. blairi*. It is thus obvious that *R. v. virescens* is a nomen dubium.

11. In conclusion, the interest of nomenclatural stability is best served by the suppression of the names *utricularius* and *virescens*, and the conservation of *R. sphenocephala*. Lack of suppression would only encourage the perpetuation of forgotten names with confusing nomenclatural histories and applications in a complex of frogs where stability is particularly important. It is consequently pertinent at this point to mention

that one of the paramount objectives of the International Code of Zoological Nomenclature is to promote the stability of scientific names (see Preamble, p. 2,3). In para. 2 and 3 above we have complied with the basic requirements of the Code (I.C.Z.N., 1974: 87-89) for suppression of unused senior synonyms, viz.: "a *prima facie* case that stability is threatened will be made if it can be shown that the senior name is not known to have been used during the immediately preceding fifty years and that the name it would replace has been applied to a particular taxon, as its presumably valid name, by at least 5 different authors and in at least 10 publications during the same period". The usage of the name *sphenocephala* in the period 1924-1974 far exceeds the above minimum requirement. There was no usage at all of *utricularia* over that period (except for Pace, 1974) and only one of *virescens*. In our opinion the latter two exceptions do not justify refusal to suppress either name.

12. Accordingly, the International Commission on Zoological Nomenclature is requested:

(1) to use its plenary powers to suppress the species-group name *utricularius*, as published in the combination *Rana utricularius* Harlan, 1826, for the purposes of the Law of Priority but not for those of the Law of Homonymy;

(2) to use its plenary powers to suppress the species-group name *virescens*, as published in the combinations *Rana virescens* Cope, 1889, and *Rana virescens virescens* Cope, 1889, for the purposes of the Law of Priority but not for those of the Law of Homonymy;

(3) to place the specific name *sphenocephala*, as published in the binomen *Rana sphenocephala* Cope, 1886, on the Official List of Specific Names in Zoology; and

(4) to place the names suppressed in (1) and (2) above on the Official Index of Rejected and Invalid Specific Names in Zoology.

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