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*DACTYLOPIUS* COSTA, 1835<sup>1</sup> AND *PSEUDOCOCCUS* WESTWOOD, 1840 (INSECTA HOMOPTERA): PROPOSED DESIGNATION OF TYPE-SPECIES UNDER THE PLENARY POWERS WITH PROPOSED SUPPRESSION OF *DIAPROSTECI* COSTA, 1828. Z.N.(S.) 2056

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The purpose of this application is to request the International Commission on Zoological Nomenclature to use its Plenary Powers to ensure the continued usage of the generic names *Dactylopius* Costa, 1835a<sup>1</sup> and *Pseudococcus* Westwood, 1840 as currently understood. The economically important families Dactylopiidae Signoret, 1875 (cochineal insects) and Pseudococcidae Cockerell, 1905 (mealybugs), respectively, are based on these generic names. If the Code is strictly applied, these names will be in jeopardy.

2. Numerous accounts in the literature indicate the need of a Ruling by the International Commission on Zoological Nomenclature in regard to these generic names (e.g., Ferris, 1950, p. 170, 1955, p. 85; Morrison and Morrison, 1966, pp. 54–55, 165; McKenzie, 1967, p. 288; Williams, 1969, p. 335), but until now, no application to the Commission has been made.

3. As can be seen from the following historical accounts, the identities of *Dactylopius* and *Pseudococcus* are closely intertwined. Because I believe that it would be virtually impossible to formulate an application on one genus without affecting the other, I have prepared a single document covering both genera. To understand the problems involved in retaining *Dactylopius* and *Pseudococcus* as currently recognized, it is necessary to outline the pertinent historical developments.

#### History of *Dactylopius*

4. Costa (1828, p. 453) proposed *Diaprosteci* as a subdivision of *Coccus* Linnaeus, 1758, and included only *Coccus adonidum* Linnaeus (long-tailed mealybug) (misidentification, actually *adonidum* of authors, not Linnaeus, see paragraph 21). Therefore, *C. adonidum* is the type-species of *Diaprosteci* by monotypy. This generic name has not been used as a valid name for over 60 years (Morrison and Morrison 1966, p. 57) primarily because many authors (Cockerell 1902b, p. 453; DeLotto 1964, p. 378; Fernald 1903a, p. 22; Ferris 1957a, p. 44) believed that it was given in the Italian vernacular. However, Morrison and Morrison (1966, p. 57) stated, "We are not able to confirm that this is a 'vernacular name' as defined in the 1961 Zoological Code. Instead, *Diaprosteci* appears to us to be derived from the Greek language, although poorly formed". Two other subdivisions of *Coccus* (*Calymmata* and *Diaspis*) were described in the same publication and have been widely accepted by scale taxonomists (e.g., Fernald 1903b, pp. 167, 227; Ferris 1937, SI-31, 1957a, p. 44; Kirkaldy 1904, p. 228; Lindinger 1941, p. 67; Morrison and Morrison

<sup>1</sup>This publication was undated. The date currently accepted by coccidologists is 1835 (Fernald 1903a, p. 22; Morrison and Renk 1957, p. 56; Morrison and Morrison 1966, p. 26), but see paragraph 5.



1966, pp. 27, 29), although one of these is generally regarded as a junior synonym. It appears to me, therefore, that *Diaprosteci* must also be regarded as an available generic name.

5. In *Fauna del regno di Napoli, famiglia de' coccinigliferi o de' gallinsetti*, Napoli, Costa (pp. 2, 15) described *Dactylopius* as a replacement name for *Diaprosteci* because he was dissatisfied with the latter. The date of this publication is not known. Costa quotes several references, the latest of which are both 1828: *Memoria sugl' insette che vivono sull' olivo, Atti del R. Ist. d'Incoraggiamento*, 4<sup>o</sup> vol. and *Il Pontano, Giorn. Scient. e Lett. di Napoli No. VIII*. Sherborn (1937, *J. Soc. Bibl. nat. Hist.* 1(2) : 35-47) investigated the dates of publication of the *Fauna del Regno di Napoli* and says: "Coccinigliferi . . . pp. 1-8, 9-16, 17-23, probably before *Fulgora*, 1840". He also says: "I may mention that the recovery of these dates involved the pulling to pieces of three copies of Costa, a proceeding I think scarcely likely to be repeated. It will be well to refer to my original note". [1910, *Ann. Mag. nat. Hist.* 5 : 132]. In view of the fact that 1835 is the date which has come into use by most coccoid workers, I will, with the other requests ask that the International Commission on Zoological Nomenclature rules that the date of publication of Costa's *Fauna del Regno di Napoli, Famiglia de' coccinigliferi o de' gallinsetti. Emitteri*, Napoli be accepted as 1835. By the provisions of Article 67(i) regarding the type-species of replacement nominal genera, the type of *Dactylopius* must be *C. adonidum*. In addition to "*Dactylopius adonidum*" (long-tailed mealybug), which was only briefly mentioned, Costa also included *D. polonicus* (Linnaeus) and *D. coccus* (cochineal insect) which he described as new and which he used as a senior synonym of *Coccus cacti* Linnaeus (misidentification, *cacti* of authors, not Linnaeus, see paragraph 8). If there is any question about *C. adonidum* as the type-species of *Dactylopius*, it should be noted that the first subsequent type-designation was also *C. adonidum* by Targioni-Tozzetti, 1866, p. 129.

6. Targioni-Tozzetti (1867, p. 75) described as new *Dactylopius longispinus* for the long-tailed mealybug.

7. Signoret (1875, pp. 306, 346) did not follow Costa's 1835 concept of *Dactylopius*. Instead, he placed the cochineal insect (*C. cacti* "des auteurs") in *Coccus* and the long-tailed mealybug (*D. adonidum*) and related species in *Dactylopius*. This concept gained general usage for the next 25 years.

8. Cockerell (1899a, p. 261) pointed out that *C. cacti* Linnaeus is not the cochineal insect at all but is a member of the family Margarodidae. Most earlier references to *C. cacti* Linnaeus were misidentifications. According to Cockerell, the next available name for the cochineal insect is *D. coccus* Costa. (See De Lotto (1974, *Bull. zool. Nomencl.* 31 : 154) for discussion of *D. coccus*).

9. Cockerell (1902b, p. 454) significantly changed the concept of *Dactylopius* by restricting the genus to the cochineal insects and using *D. coccus* as the type-species. Although Cockerell's action was incorrect, it has been followed with few exceptions (e.g., Kirkaldy 1904b, p. 255; MacGillivray 1921, p. 103) and is overwhelmingly the current usage.

10. De Lotto (1971, p. 258) states that Costa (1835b, p. 6) established *Dactylopius coccus* as the type-species of *Dactylopius* by "subsequent monotypy".



However, type designation by "subsequent monotypy" does not apply in this case because three species were included in the original description of *Dactylopius* (see Article 69(a) (ii) (2)). It appears that De Lotto considered *D. coccus* to be the type of the genus by subsequent restriction, but this is not a valid mechanism for type designation.

11. According to the Rules, *Dactylopius* Costa, with its type-species *Coccus adonidum* Linnaeus (misidentification, = *Dactylopius longispinus* Targioni-Tozzetti), is a junior objective synonym of *Diaprosteci* Costa. Also, even if *Diaprosteci* is taken as a vernacular name (and I don't think it should be), *Dactylopius* is the senior generic name for the mealybug *D. longispinus* and related species in the family Pseudococcidae. Both of these interpretations are undesirable, because current usage of *Dactylopius* (type-species *D. coccus*) for the cochineal insects (family Dactylopiidae) is now well established.

12. To comply with the requirement adopted in Monaco, 1972 for the suppression of an unused senior synonym (*Diaprosteci*) to be replaced by a commonly used junior synonym (*Dactylopius*), the following citations in support of current usage are given: Balachowsky, 1948, p. 256; Fernald, 1903b, p. 80; Ferris, 1919, p. 19, 1955, p. 85, 1957b, p. 85; Green, 1922, p. 357; Hoy, 1963, p. 57; Lindinger, 1943, p. 265; Mamet, 1950, p. 17, 1951, p. 222; Mann, 1969, p. 138; Williams, 1969, p. 324. To my knowledge, the genus name *Diaprosteci* has not been used as a valid senior synonym for more than 50 years.

#### History of *Pseudococcus*

13. In the text of his *Modern Classification of Insects* (June, 1840, pp. 447, 488) Westwood described the genus *Pseudococcus* in which he included only *C. cacti*. However, in the appendix (p. 118, also published June 1840, see Blackwelder, 1949, p. 45) he included both *cacti* and *adonidum*. Therefore, Westwood's genus was not monotypic; he did not designate a type-species. (See paragraph 17 below for subsequent designation.)

14. Targioni-Tozzetti (1866, p. 121) treated *Pseudococcus* as a junior synonym of *Dactylopius* but did not designate a type-species for *Pseudococcus*.

15. Targioni-Tozzetti (1867, p. 75) described *Dactylopius longispinus* as new and treated it as a senior synonym of *C. adonidum* Linnaeus.

16. Signoret (1875, p. 328) drastically altered the concept of *Pseudococcus* to include only the mealybug species now placed in the genus *Phenacoccus* Cockerell. He made no mention of a type-species. The long-tailed mealybug *adonidum* was placed in *Dactylopius*. This concept was generally adhered to for the next 19 years.

17. Cockerell (1893, p. 318) described *Phenacoccus* for the species that Signoret included in *Pseudococcus*, but he did not designate a type-species. For *Pseudococcus* Cockerell wrote, "I find what appears to be its [*Pseudococcus*] earliest publication in the 'Modern Classification of Insects', vol. i (1839), [wrong volume and date] p. 118. Here Westwood writes: '*Pseudococcus* Westw. (*C. adonidum*, *cacti*, etc.), [actually *C. adonidum*, *Cacti*, & c.] having the female[s] not fixed, and clothed with a woolly secretion' [Cockerell continues] . . . The definition would fit several genera as now understood, but in the absence of any indication of a type species we should take *adonidum* as the type, as it is



first mentioned. However, in 'Mod. Class. Ins.' vol. ii (1840), p. 448 [actually 447], all doubt on this score is removed, since we read that *C. ilicis* is to be considered the type of *Coccus*, and of *C. cacti*, the author [Westwood] states: 'this insect . . . belongs to a genus . . . which I propose to name *Pseudococcus*'. [Cockerell continues] No mention is here made of *adonidum*, and I think we may consider that *cacti* was certainly intended as the type of the genus".

18. This quotation was the first attempt at type-species fixation for *Pseudococcus*, and it appears that Cockerell may have designated two type-species in the same publication. However, based on the following phrases from the above quotation, I conclude that *C. cacti* was intended by Cockerell to be the type-species. ". . . in the absence of any *indication* [emphasis mine] of a type species we should take *adonidum* as the type . . ." However, in the next paragraph Cockerell alluded to an *indication* as follows: "However . . . all doubt on this score is removed, since we read [in Westwood 1840] that . . . *C. cacti* belongs to a genus . . . which I [Westwood] propose to name *Pseudococcus*". Cockerell continued ". . . I think we may consider that *cacti* was certainly *intended* [emphasis mine] as the type of the genus".

19. Further evidence that Cockerell intended *C. cacti* (cochineal insect) to be the type-species is provided by the fact that he used *Pseudococcus* for the cochineal insect in later papers (e.g., Cockerell 1899b, p. 277, 1900, p. 992).

20. Cockerell (1902a, p. 342, 1902b, p. 456) significantly altered his ideas in regard to *Pseudococcus* and suggested that the genus should encompass *C. adonidum* and related mealybug species; he placed the cochineal insects in *Dactylopius*. This concept of using *Pseudococcus* and Pseudococcidae for the mealybugs has been generally followed from 1902 to the present with few exceptions (e.g., Kirkaldy, 1904a, p. 226; Laing, 1944, p. 93) and is overwhelmingly the current usage.

21. De Lotto (1965, p. 226) pointed out that *Coccus adonidum* Linnaeus, which for many years had been considered the type-species of *Pseudococcus* (e.g., Balachowsky, 1953, p. 1047; De Lotto, 1964, p. 377; Ferris, 1950, p. 117) and the valid name for the long-tailed mealybug, is not a mealybug and apparently is not even a scale insect. Therefore, most earlier references to *C. adonidum* Linnaeus are misidentifications. The first available name for the long-tailed mealybug is *Dactylopius longispinus* Targioni-Tozzetti (see paragraph 15).

22. According to the Rules *Pseudococcus* Westwood, with its type-species *Coccus cacti* Linnaeus (misidentification, = *Dactylopius coccus* Costa), is the senior available generic name for the cochineal insect *D. coccus* and related species. However, current usage of *Pseudococcus* (type-species *Dactylopius longispinus*) as a mealybug genus is well established.

23. In support of the current usage of *Pseudococcus* the following citations are given: Balachowsky, 1953, p. 1047; Borchsenius, 1949, p. 90; De Lotto, 1964, p. 377; Fernald, 1903b, p. 96; Ferris, 1950, p. 171; Green, 1922, p. 369; McKenzie, 1960, p. 725, 1962, p. 654, 1967, p. 288; Williams, 1962, p. 39.



## Justification for Retaining Current Usage

24. In the current systematic literature concerning *Dactylopius* and *Pseudococcus*, the concepts presented by Cockerell (1902b) are utilized by virtually all active scale taxonomists. Any change in these concepts would cause considerable confusion in the extensive taxonomic literature of the Pseudococcidae and Dactylopiidae.

25. *Dactylopius* and *Pseudococcus* contain species of major economic importance in biological control, economic entomology, and plant quarantine. Because of this, over the past 50 years a large quantity of economic literature has been generated utilizing the current generic concepts. Any change in these concepts would cause serious disruption in this literature.

26. To avoid the confusion caused by exchange of family name concepts (Dactylopiidae, cochineal insects, to Pseudococcidae, and Pseudococcidae, mealybugs, to Dactylopiidae) resulting from strict application of the Rules, a Ruling by the International Commission on Zoological Nomenclature is necessary. It should be obvious that any change in the currently recognized families of scale insects would cause major disruption in the economic and taxonomic literature.

27. It has been suggested that Article 70(a) (misidentified type-species) might be applied to this application. However, even though both *C. adonidum* Linnaeus (type-species of *Dactylopius*) and *C. cacti* Linnaeus (type-species of *Pseudococcus*) were misidentified, this Article is not appropriate. Application of either (i) or (iii) would be undesirable, because neither circumstance would lead to current usage. Application of (i), for *Dactylopius* would mean that the species is not even a scale insect (De Lotto, 1965). For *Pseudococcus* the nominal species involved in the misidentification of *Coccus cacti* Linnaeus is a member of the Margarodidae. If *Coccus adonidum* Linnaeus is considered as type then again the species would not be a scale insect. Application of (iii), for *Dactylopius* would result in this being the name for the mealybugs (now Pseudococcidae) and *Pseudococcus* would become the name for the cochineal insects (now Dactylopiidae). Application of (ii) is not possible because the identity of "the nominal species actually involved" is certain.

28. Therefore, in the interest of stability and uniformity of scale insect nomenclature, I request that the International Commission on Zoological Nomenclature use its Plenary Powers to conserve *Dactylopius* and *Pseudococcus* as they are presently understood. To accomplish this goal, the Commission is requested to:

(1) Use its Plenary Powers to:

- (a) suppress the generic name *Diaprosteci* Costa, 1828, for the purposes of the Law of Priority but not for those of the Law of Homonymy;
- (b) rule that the date of publication of Costa's *Fauna del Regno di Napoli, Famiglia de' coccinigliferi o de' gallinsetti. Emitteri*, Napoli be accepted as [1835];
- (c) set aside all designations of type-species made prior to the Rulings here requested for the genus *Dactylopius* Costa, 1835, and having done so, to designate *Dactylopius coccus* Costa, 1835, as the type-species of that genus;



- (d) set aside all designations of type-species made prior to the Ruling here requested for the genus *Pseudococcus* Westwood, 1840, and having done so, to designate *Dactylopius longispinus* Targioni-Tozzetti, 1867, as the type-species of that genus.
- (2) Place the generic name *Diaprosteci* Costa, 1828, (as suppressed under the Plenary Powers in 1(a) above) on the Official Index of Rejected and Invalid Generic Names in Zoology.
  - (3) Place the family group name DACTYLOPIIDAE (correction of "Dactylo-pites") Signoret, 1875 (type-genus *Dactylopius* Costa, 1835), on the Official List of Family Group Names in Zoology.
  - (4) Place the family group name PSEUDOCOCCIDAE (correction of "Pseudococcini") Cockerell, 1905 (type-genus *Pseudococcus* Westwood, 1840), on the Official List of Family Group Names in Zoology.
  - (5) Place *Dactylopius* Costa, 1835 (gender: masculine) type-species *Dactylopius coccus* Costa, 1835, by designation under the plenary powers in 1(c) above, on the Official List of Generic Names in Zoology.
  - (6) Place *Pseudococcus* Westwood, 1840 (gender: masculine) type-species *Dactylopius longispinus* Targioni-Tozzetti, 1867, by designation under the plenary powers in 1(d) above, on the Official List of Generic Names in Zoology.
  - (7) Place the specific name *longispinus* Targioni-Tozzetti, 1867, as published in the binomen *Dactylopius longispinus* (type-species of *Pseudococcus* Westwood, 1840) on the Official List of Specific Names in Zoology.
  - (8) Place the specific name *coccus* Costa, 1835, as published in the binomen *Dactylopius coccus* (type-species of *Dactylopius* Costa, 1835) on the Official List of Specific Names in Zoology.
  - (9) Place the publication by Costa "*Fauna del Regno di Napoli, Famiglia de' coccinigliiferi o de' gallinsetti*", Emitteri, Napoli on the Official List of Works Approved as Available in Zoological Nomenclature with the endorsement that its date of publication is to be cited as [1835].

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