REMARKS ON THE GENERIC CHARACTERS OF *BULWERIA*

Among the gadfly petrels, the species *Bulweria bulwerii* of the Pacific and eastern North Atlantic Oceans and the larger *B. fallax*, described by Jouanin (1955) from the Indian Ocean, are now generally regarded as forming a genus distinct from the rest of the gadfly petrels (*Pterodroma*). Earlier, Mathews (1948) had combined the two genera under the name *Bulweria*, which has priority. Alexander *et al.* (1965: 403) deplored this action and 'the consequent vast name changes' resulting from it and these authors cited the

'marked difference' in the internal anatomy reported by Forbes (1882) and certain other osteological differences as providing good grounds for separating the two genera.

The main difference noted by Forbes (1882), one to which he attached much importance, was that the accessory femorocaudal muscle (= M. piriformis [or caudofemoralis] pars iliofemoralis; 'B' in thigh muscle formulae) was absent in *Bulweria bulwerii*, but was present in all other Procellariiformes he examined except *Pelecanoides*. Klemm (1969) confirmed the absence of this muscle in *Bulweria bulwerii* and *Pelecanoides*, but also found it to be absent in *Nesofregetta*, *Pterodroma arminjoniana heraldica*, 1 of 2 specimens of *P. phaeopygia*, and 4 of 16 specimens of *P. leucoptera*. Furthermore, I found the pars iliofemoralis to be present in a skinned carcass of *Bulweria fallax* (USNM 508090). Thus, the condition of this muscle varies intragenerically within both *Bulweria* and *Pterodroma* and cannot be used to distinguish either group. Zusi found the pars iliofemoralis present on one side and absent on the other in an individual of the sandpiper *Aechmorhynchus cancellatus* and considered the presence or absence of this muscle to be of little taxonomic significance (Zusi & Jehl 1970).

Alexander *et al.* (1965:403) stated that *Bulweria* differs from *Pterodroma* and the fulmars 'in the possession of a short, expanded nasal cavity with a separate lachrymal bone and an aperture between the nasal cavity and the orbit.' I found no consistent difference in the nasal cavities of these two genera. That of *Bulweria* is certainly no more expanded than, for instance, in any of the *Pterodroma rostrata* group. It is not clear, in their reference to 'an aperture between the nasal cavity and the orbit' whether Alexander *et al.* referred to the foramen at the junction of the lachrymal, ectethmoid, and frontal bones, or to the more medially located foramen in the ectethmoid. In any case, both of these foramina are present in the two species of *Bulweria* and in *Pterodroma* as well. The lateral foramen is much larger in a skeleton of *B. fallax* (S/1964.32.2 in the British Museum, Natural History), which may have led to their conclusion, but this foramen in *B. bulwerii* resembles that seen in many species of *Pterodroma*.

It is true, however, that the lachrymal bone is free in both species of *Bulweria* but, so far as known, is fused to the nasal and frontal bones in all species of *Pterodroma*. Furthermore, the proportions of the limb bones differ somewhat. In *Bulweria* the humeri and ulnae are relatively longer and more slender than in *Pterodroma*, while the tibiotarsi and tarsometatarsi are proportionately shorter and heavier. A new fossil species from St Helena, tentatively referred to *Bulweria* (Olson, in press), seems to combine features of both, as it has heavy leg elements but short ulnae.

The two living species of *Bulweria* are similar in colour and have more markedly cuneiform tails than do species of *Pterodroma*. However, their dark colouration is shared with several species of *Pterodroma*. The cuneate tail is a matter of degree, and the tail in some species of *Pterodroma* is also somewhat wedge-shaped. From the separate lachrymal, proportions of the limb bones, and shape of the tail, it seems evident that the two living species of *Bulweria* are more closely related to each other than to any of the species of *Pterodroma*. However, the other alleged differences between these two genera are not substantiated and there is little doubt that they are very closely related. It is perhaps more reasonable that the comparatively slight differences between the two taxa should be recognized at the subgeneric rather than generic level.

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