Phylogenetic Relationships of Waders (Charadriiformes: Scolopacidae) in Sarawak Inferred from Cytochrome Oxidase I and Recombinant Activating Gene 1
(Hubungan Filogenetik Burung Laut (Charadriiformers: Scolopacidae) di Sarawak yang Tersimpul daripada Sitokrom Oksidase I dan rekombinan gen pengaktif I)

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ABSTRACT

Family Scolopacidae includes the sandpipers, shanks, snipes, godwits and curlews. Systematic classifications of shorebirds at the higher level have been successfully resolved. Nevertheless, the phylogeny of shorebirds in the familial level is still poorly understood. Thus, this phylogenetic study on Scolopacidae was conducted upon the framework provided by the first sequence-based species-level phylogeny within the shorebirds to determine the phylogenetic relationships among family members of Scolopacidae in West Borneo, Sarawak using combined gene markers, mtDNA Cytochrome Oxidase I (COI) and nucDNA Recombinant Activating Gene 1 (RAG1). A total of 1,342 base pair (bp) were inferred from both COI and RAG1 gene from 45 sequences constituted of 15 species Scolopacidae sampled from Sarawak namely Xenus cinereus, Actitis hypoleucos, Tringa totanus, Tringa glareola, Tringa stagnatilis, Heteroscelus brevipes, Calidris alba, Calidris ruficollis, Calidris ferruginea, Calidris tenuirostris, Calidris alpina, Gallinago stenura, Gallinago megala, Numenius arquata, and Numenius phaeopus. The phylogenetic tree was constructed with Charadrius mongulus derived as an outgroup. The Bayesian Inference (BI) tree constructed supported grouping of species into several lineages of Numeniinae, Calidrininae, Scolopacinae and Tringinae. The groupings of species into several lineages correlate with morphological features that contribute to their adaptation and ability of the species to fit to their ecosystems.

Keywords: Cytochrome Oxidase I; phylogenetic; Recombinant Activating Gene 1; waders

INTRODUCTION

Shorebirds are embedded in order Charadriiformes consisting more than 350 species and 19 families (Clements 2007). This falls into three sub-clades: Scolopaci (waders), Charadrii (plovers) and Lari (Baker et al. 2007; Mayr 2011; Paton & Baker 2006; Paton et al. 2003). Sub-clades Scolopaci consist of several families including Scolopacidae, Jacanidae, Rostratulidae, Thinocoridae and Pedionomidae. The largest of these families is the Scolopacidae with 90 species (Clements et al. 2010) including the sandpipers, shanks, snipes, godwits and curlews. In family Scolopacidae, 65 species of waders were recorded worldwide (Clements et al. 2010), while 35 species were recorded in Borneo alone (Smythies 1999). Variation in life-histories, behavioral ecology and morphological traits makes this order a popular subject to study.

The study of order Charadriiformes were well established based on nuclear and mitochondrial DNA sequence by Ericson et al. (2003), Pereira and Baker