Nest-building and breeding behaviour of house-farmed white-nest swiftlets *Aerodramus* (Aves: Apodidae) in Miri, Sarawak, Malaysian Borneo

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ABSTRACT

Nesting and roosting behaviours are integral parts of breeding ecology of any bird species. Although information on Bornean cave swiftlets is readily available in abundance since more than half a century ago, the same cannot be said for the house-farmed colony. Studies on nesting and breeding behaviour of this population are so far lacking. Despite all, numerous establishment of swiftlet houses across Malaysia have been propagated by the lucrative 'birds' nest' industry. My original contribution to the knowledge on ecology of the house-farmed white-nest swiftlet includes four key findings: (i) pattern of emergence and return, (ii) behaviours at nest or roost site, (iii) nest-building behaviours and (iv) parental behaviours and investments. This study was conducted in two separate house-farmed colonies in Miri Division, Sarawak from June 2010 to March 2011 (Site-I) and February 2012 to October 2012 (Site-II). Two types of infra-red (IR) cameras were used, namely (i) fixed focal-lens IR to monitor large colony and (ii) Pan-Tilt-Zoom (PTZ) camera for close-up observation. The first key finding reports a new discovery that describes three basic activity sessions beginning with the first-emergence period (0600-0700 hr), post-emergence period (0700-1000 hr) and returning period (1800-1900 hr). During the post-emergence period, approximately half of the sampled colony was observed re-entering the swiftlet house to resume nest construction. Secondly, the general behaviours were established by classifying three primary behavioural types which are roosting behaviours, nesting behaviours and parental behaviours. Twelve ethogram categories were developed to describe these behaviours: (i) proximity fluttering, (ii) random roosting flight, (iii) pair switching, (iv) parallel shifting, (v) mounting, (vi) preening, (vii) defecating, (viii) resting, (ix) territorial display, (x) nest-building (xi) incubation and (xii) feeding of young. The third outcome was derived from detail observation on a marked pair (Pair-AB) which revealed that there is a disparity in sexual contribution in nest-building activity. Here, one partner is twice more hardworking and return more frequently during the post-emergence

period to build nest. It was hypothesised that Individual-A is the male because (i) Individual-A is the one that mounted Individual-B and not the other way around, (ii) nearly twice more hardworking in nest-building as spermatogenesis is less energy demanding compared to oogenesis and (iii) more protective over its partner when their nest reaches full-size, a point of time when copulation is expected. The final findings confirmed that each of the sexes contribute in parental duties without any assistance from 'helpers' during the incubation and nestling phase. Here, the parents incubate almost non-stop throughout the incubation phase. However, Individual-A showed more preferences for diurnal incubation compared to the partner, especially during the post-emergence period. This is probably important in order to off-set the lack of incubation time spent during the day by Individual-B that allows more time to forage and build-up reserves for subsequent breeding bout. In terms of daily feeding effort (%) during the nestling phase, two main feeding peaks were observed which includes the first-emergence period and the returning period with 44.3% and 33.6% respectively. In addition, Individual-A was observed (i) feeding the young significantly more than the partner, (ii) have longer in-nest attendance and (iii) more protective over their nestling. It seems plausible that a 'cooperative provisioning strategy' is adopted by the pair to ensure shorter gaps of delivery time while simultaneously delivering larger loads of food boluses. With regards to the reproductive fitness of a female swiftlet, good male qualities and traits as shown by Individual-A throughout all three breeding phases are significant factors (via natural selection) in determining the breeding success of a swiftlet pair. On a final note, given that my study was conducted under minimal interference using remote cameras, such behavioural display by the observed pair (in particular Individual-A) was not artificially induced by human presence (e.g. from nest collecting and data collection activity). Therefore, the above findings have provided sound evidence on the sexual disparity between Pair-AB during nest-building activity, incubation and feeding of young.

Keywords: white-nest swiftlet, house-farmed colony, nesting behaviour, roosting behaviour, parental investment

Perilaku burung walit sarang putih *Aerodramus* (Aves: Apodidae) sewaktu bersarang dan membiak dalam koloni rumah burung di Miri, Sarawak, Malaysia Borneo

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ABSTRAK

Perilaku besarang dan membiak merupakan komponen penting untuk semua spesies burung. Walaupun pengetahuan berkenaan burung walit dari populasi gua-gua Borneo mudah diperolehi, perkara yang sama tidak berlaku untuk populasi walit dalam rumah burung. Kajian terhadap perilaku pembiakan dan bersarang untuk populasi rumah burung ketika ini amatlah kurang dan terhad. Namun sedemikian, pembinaan rumah-rumah burung yang semakin banyak di seluruh Malaysia telah dimangkinkan oleh keuntungan besar daripada industri 'sarang burung'. Sumbangan asal kajian saya terhadap pengetahuan ekologi burung walit sarang putih merangkumi empat penemuan utama iaitu: (i) corak aktiviti kemunculan dan kembali (ii) perilaku berpaut, (iii) membina sarang dan (iv) penjagaan anak. Kajian ini telah dijalankan di dua lokasi rumah burung di Bahagian Miri, Sarawak. Kajian tersebut telah dijalankan dari Jun 2010 hingga Mac 2011 di Tapak kajian-I dan dari Februari 2012 hingga Oktober 2012 di Tapak-kajian-II. Dua jenis kamera infra-merah (IR) yang digunakan termasuklah (i) kamera IR lensa fokal tetap untuk memantau koloni yang lebih besar dan (ii) kamera PTZ untuk pemerhatian jarak dekat. Hasil kajian pertama melaporkan penemuan baru di mana tiga sesi aktiviti asas koloni yang merangkumi tempoh kemunculan pertama (0600-0700), tempoh selepas kemunculan pertama (0700-1000) dan tempoh kembali semula (1800-1900). Semasa tempoh selepas kemunculan pertama, lebih kurang separuh daripada koloni kembali semula ke dalam rumah burung untuk meneruskan pembinaan sarang. Kedua, perilaku am boleh diklasifikasikan kepada tiga jenis iaitu perilaku berpaut, bersarang dan penjagaan anak. Dua belas kategori ethogram telah dihasilkan seperti yang tersebut: (i) terbang secara statik, (ii) terbang-paut secara rawak (iii) pasangan bertukar posisi, (iv) peralihan selari, (v) memanjat pasangan, (vi) merapi bulu, (vii) penyahtinjaan, (viii) berehat, (ix) mempertahankan kawasan (x) membina sarang (xi) mengeram telur dan (xii) memberi makan kepada anak. Seterusnya, terdapat perbezaan dalam penglibatan di antara kedua-dua individu sewaktu membina

sarang. Salah satu individu didapati dua kali lebih rajin membuat sarang dan lebih kerap kembali ke sarang semasa tempoh selepas kemunculan pertama. Menurut hipotesis, Individu-A ialah individu jantan kerana (i) Individu-A yang memanjat ke atas Individu-B dan bukan sebaliknya (iii) hampir dua kali ganda rajin membuat sarang disebabkan spermatogenesis memerlukan tenaga yang kurang berbanding oogenesis dan (iv) memberi lebih perlindungan kepada pasangan apabila sarang hampir siap atau tempoh kopulasi dijangka berlaku.. Kajian ini menunjukkan kedua-dua pasangan terlibat dalam penjagaan anak tanpa sebarang bantuan daripada 'pembantu' semasa peringkat pengeraman telur dan tumbesaran anak. Selain itu, kedua-dua pasangan juga mengeramkan telur tanpa henti sepanjang tempoh pengeraman. Namun, Individu-A lebih memilih untuk mengeram telur pada siang hari terutamanya sewaktu tempoh 'selepas kemunculan pertama'. Ini amat penting bagi memastikan Individu-B mempunyai lebih masa untuk mencari makanan dan menyimpan tenaga untuk peringkat membiak seterusnya. Dua tempoh penting memberi makan anak burung (%) ialah sewaktu kemunculan pertama (44.3%) dan kembali semula (33.6%). Selain itu, ketika peringkat tumbesaran, Individu-A didapati (i) memberi makan lebih kerap berbanding pasangannya, (ii) lebih lama di dalam sarang dan (iii) lebih bersifat melindungi anak. Dengan ini, wujud kemungkinan "strategi penjagaan kooperatif' turut diaplikasikan oleh pasangan-AB bagi memastikan selang masa penghantaran yang sikat di samping memberikan jumlah makanan yang banyak kepada anak. Oleh itu, kualiti yang dimiliki oleh individu-A adalah sangat penting dalam memastikan keberkesanan pembiakan sepasang burung walit melalui pemilihan semulajadi. Secara kesimpulannya, tahap gangguan terhadap pasangan yang diperhatikan (Individu-A) hanyalah minima dengan menggunakan kamera kawalan jauh. Oleh itu, perilaku yang ditunjukkan oleh pasangan tersebut tidak dimanipulasikan sama sekali (aktiviti pengambilan sarang dan pengumpulan data), maka dapat membuktikan perbezaan seksual antara pasangan-AB dalam ketiga-tiga aktiviti pembiakan.

Kata Kunci: walit sarang putih, koloni, perilaku bersarang, perilaku berpaut, penjagaan anak