

V. SIMPULAN DAN SARAN

A. Simpulan

Berdasarkan hasil penelitian prevalensi malaria burung pada burung Bondol Jawa (*Lonchura leucogastroides*) di pantai Trisik menggunakan metode *nested Polymerase Chain Reaction* atau *nested PCR* maka, diperoleh simpulan sebagai berikut:

1. Parasit *Plasmodium* dan/atau *Haemoproteus* penyebab malaria burung ditemukan dalam darah burung Bondol Jawa (*Lonchura leucogastroides*) yang diperoleh di daerah sekitar pantai Trisik.
2. Prevalensi parasit penyebab malaria burung yaitu *Plasmodium* dan/atau *Haemoproteus* pada burung Bondol Jawa (*Lonchura leucogastroides*) di daerah pantai Trisik adalah 20%.

B. Saran

Saran yang dapat diberikan untuk memajukan dan mengembangkan penelitian ini atau penelitian sejenis, adalah:

1. Perlu dilakukan pengukuran kualitas dan kuantitas DNA hasil ekstraksi agar tidak memengaruhi proses PCR. Pengukuran dapat dilakukan melalui spektrofotometri sinar ultra violet dengan menggunakan alat spektrofotometer. Pengukuran dilakukan pada panjang gelombang 260 - 280 nm (Sulandari & Zein, 2003).
2. Perlu dilakukan sekuensing terhadap fragmen DNA hasil amplifikasi. Informasi yang diperoleh dapat digunakan untuk mempelajari hubungan kekerabatan parasit sehingga pertukaran parasit antarindividu atau spesies burung dapat dipastikan.
3. Perlu dilakukan penelitian tentang distribusi dan kelimpahan vektor parasit khususnya vektor parasit *Haemoproteus* yaitu *ceratropogoid* dan *hyppobacid* di sekitar pantai Trisik.
4. Perlu mengembangkan metode penangkapan yang mampu untuk mendapatkan sampel dari individu burung yang sakit dan tidak aktif.

DAFTAR PUSTAKA

- Anonim. 2005. *Dna Extraction Protocols : Dna Isolation from Blood or Tissue using Phenol/Chloroform*. Lougheed Genetics Laboratory Manual. Queen's University. <http://www.queensu.ca/biology.pdf/>. 5 Desember 2009.
- Anonim, 2009. *Nested PCR*. <http://www.pcrstation.com/nested-pcr/>. 2 Juli 2010.
- Atkinson, C.T. 1986. Host specificity and morphometric variation of *Haemoproteus meleagridis* Levine, 1961 (Protozoa: Haemosporina) in gallinaceous birds. *Can. J. Zool.* 64:2634–2638.
- Atkinson, C.T. 2005. *Ecology and Diagnosis of Introduced Avian Malaria in Hawaiian Forest Birds*. USGS.
- Atkinson, C.T. dan Utzurrum, B.R. 2010. *Changes in prevalence of avian malaria on the Alaka'i plateau, Kaua'i, 1997-2007*. Pacific Aquaculture and Coastal Resources Center (PACRC). University of Hawaii.
- Atkinson, C.T. dan van Riper, III. 1991. *Pathogenecity and epizootiology of avian haematozoa: Plasmodium, Leucocytozoon, and Haemoproteus*. Pages 19–48 in *Bird-parasite interactions. Ecology, evolution, and behavior* (J. E. Loye and M. Zuk, eds.). Oxford Univ. Press, New York. Atkinson T. C. 1993. Hemospodiosis. *Field Manual of Wildlife Disease Birds* 24: 193-200.
- Atkinson, C.T., Dusek, R. J. dan Iko, M. William. 1993. Hawaii's Forests and Wildlife. USFWS *National Wildlife Health Research Center*. 8 (3):1-20.
- Atkinson, C.T., Dusek, R.J. dan Lease, J. K. 2001. Serological Responses and Immunity to Superinfection with Avian Malaria in Experimentally-Infected Hawaii Amakihi. *J. Wildl. Dis.* 37 (1): 20–27.
- Atkinson, C.T., Thomas, J.N. dan Hunter, B. D. 2008. *Parasitic Diseases of Wild Birds*. John Wiley & Sons. USA.
- Awise, J.A., Arnold, J. R. M. Ball, E. B, Neigel, J. E., Reeb, C. A. dan Saunders, N.C. 1987. Intraspecific phylogeography: The mitochondrial DNA bridge between population genetics and systematics. *Annu. Rev. Ecol. Syst.* 18: 489–522.

- Bello, N., Francino, O. dan Sanchez, A. 2001. Isolation of Genomic DNA from Feathers. *J. Vet. Diagn. Invest.* 13: 162–164.
- Bennett, G. F., Bishop, M. A. dan Peirce, M. A. 1993. Checklist of the avian species of *Plasmodium* Marchiafava and Celli, 1885 (Apicomplexa) and their distribution by avian family and Wallacean life zones. *Syst. Parasitol.* 26:171–179.
- Bennett, G. F., M. A. Peirce dan R. W. Ashford. 1993. Avian haemoatozoa: Mortality and pathogenicity. *Journal of Natural History* 27:993–1001.
- Bensch, S., Hellgren, O. dan Pe'rez-triz, J. 2009. MalAvi: a public database of malaria parasites and related haemosporidians in avian hosts based on mitochondrial cytochrome b lineages. *Mol. Eco.* 9: 1353–1358.
- Bensch, S., M. Stjernman, D. Hasselquist, O. Ostman, B. Hansson, H. Westerdahl, dan R. T. Pinheiro. 2000. Host specificity in avian blood parasites: A study of Plasmodium and Haemoproteus Mitochondrial DNA amplified from birds. *Proceeding of the Royal Society of London Series B-Biological Sciences* 267: 1583-1589.
- Bruce, M.C. dan Day K.P. 2002. Cross-species regulation of malaria parasitaemia in the human host. *Current Opinion in Microbiology* 5: 431-437.
- Caughley, G. 1977. *Analysis of vertebrate populations*. John Wiley and Sons. Brisbane.
- Caughley, G. dan Gunn, A. 1996. *Conservation biology in theory and practice*. Cambridge MASS, Blackwell Science.
- Cosgrove, L.C., Knowles, L.C.S., Day P.K. dan Sheldon, C.B. 2006. No Evidence for avian malaria infection during the nestling phase in a passerine bird. *Parasitol* 92(6): 1302-1304.
- Dale, W.J., dan Schantz, V.M. 2003. *From Genes to Genomes (concepts and application of DNA Technology)*. Jhon Wiley & Son Ltd. England.
- Deem ,S.L., Karesh, W.B., Weisman, W. 2001. Putting theory into practice: wildlife health in conservation. *Conservation Biology* 15: 1224–1233.
- Dewi. 2008. *Apa Itu Malaria Unggas*. <http://www.poultryindonesia.com/> 9 September 2009.
- Durrant, L.K., Beadell, S.J., Ishtiaq, F., Graves, R.G., Olson, L.S., Gering, E., Peirce, A.M., Milensky, M.C, Schmidt, K.B., Gebhard, C., dan Fleischer, C.R. 2008. Avian Hematozoa in south America: a

comparison of temperate and tropical zone. *Ornithological Monograph*. 60: 98-111.

- Espin, A.M.L.A. 1992. Mitochondrial DNA variability in geographical populations of the Brazilian screwworm fly. *In: Management of Insect Pests: Nuclear and Related Molecular and Genetic Techniques*. Vienna. pp.161–165.
- Esposti, M.D., S. DeVries, M. Crimi, A. Ghelli, T. Patarnello dan A. Meyer. 1993. Mitochondrial cytochrome b: evolution and structure of the protein. *Biochim. Biophys. Acta* 1143: 243-271.
- Farias, P.I., Orti, G., Sampaio, I., Schneider, H. dan Meyer, A. 2001. The Cytochrome *b* Gene as a Phylogenetic Marker: The Limits of Resolution for Analyzing Relationships Among Cichlid Fishes. *J. Mol. Evol.* 53:89–103.
- Feldman, M., Lupton, F.G.H., dan Miller, T.E. (1995). Wheats. In *Evolution of Crops*, 2nd ed., J. Smartt and N.W. Simmonds, eds (London: Longman Scientific), pp. 184–192.
- Gill, Frank dan Wright, M., 2006. *Lonchura leucogastroides* (Horsfield & Moore, (1858)). http://www.itis.gov/servlet/SingleRpt/SingleRpt?search_topic=TSN&search_value=560854. 19 Oktober 2012.
- Greiner, E.C., Bennett, G.F., White, E.M. dan Coombs, R.F. (1975) Distribution of the avian hematozoa of North America. *Can. J. Zool.*, 53, 1762–1787.
- Gutsevich, A.V. 1973. *The bloodsucking midges (Ceratopogonidae)*. [*Fauna of the USSR. Dipteran insects*, 3(5)]. Leningrad: Nauka Publishers (in Russian).
- Gutsevich, A.V., Monchadsky, A.S. dan Shtakelberg, A.A. (1970) Mosquitoes. Family Culicidae. *Fauna of the USSR. Dipteran insects*, 3(4). Leningrad: Nauka Publishers (in Russian).
- Hellgren, O., Waldenstrom, J. dan Bensch, S. 2004. A new PCR assay for simultaneous studies of Leucocytozoon Plasmodium and Haemoproteus from avian blood. *Journal of Parasitol.* 90(4):797-802.
- Herison, C., Rustikawati dan Eliyanti. 2003. Penentuan Protokol yang Tepat untuk Menyiapkan DNA Genom Cabai (*Capsicum* sp.). *Akta Agrosia* 6 (2): 38-43.

- Holdaway, R.N., Worthy, T.H. dan Tennyson, A.J.T. 2001. A working list of breeding bird species in the New Zealand region at first human contact. *New Zealand Journal of Zoology* 28: 119–187.
- Hubalek, Z. 2004. An Annotated Checklist of Pathogenic Microorganisms Associated With Migratory Birds. *J. Wildl. Dis.* 40(4): 639-659.
- Huff, C.G. dan F. Coulston. 1944. The development of *Plasmodium gallinaceum* from sporozoite to erythrocytic trophozoite. *Journal of Infectious Diseases* 75:231–249.
- Innes, J., Kelly, D., McC. Jacob, Overton dan Gillies C. 2009. Predation and other factors currently limiting New Zealand forest birds. *New Zealand Journal of Ecology*.34(1): 86-114.
- Ishtiaq, F., Gering, E., Rappole, H.J., Rahmani, R.A., Jhala, V.Y., Dove, J.C., Milensky, Olson, L.S., Pierce, A.M. dan Fleischer, C.R.. 2007. Prevalence and diversity of avian hematozoan parasites in asia: a regional survey. *Wildlife disease* 43(3): 382-398.
- Jennings, L., Webb, J. dan LeRoy, B. E. 2006. *Avian Malaria*. Veterinary Clinical Pathology Clerkship Program. University of Georgia College of Venterinary Medicine. Athens.
- Kirkpatrick, C. E. dan Smith, T. B. 1988. Blood parasites of birds in Cameroon. *J Parasitol* 74: 1009–1013.
- Krylov, M.V. 1994. *Agents of protozoan diseases of domestic animals and of man*. St. Petersburg: Zoological Institute. Part 1, 2 (in Russian).
- Kurniantoro, I. 2011. Prevalensi Parasit Penyebab Malaria Unggas Pada Ayam (*Gallus gallus bankiva* Tem.) Dan Itik (*Anas domesticus* Lin.) Di Pantai Trisik. *Skripsi S1 Fakultas Teknobiologi Universitas Atma Jaya Yogyakarta*. Tidak Diterbitkan.
- Lessinger, A.C., Junquiera, M.A.C., Lemos, T. A., Kemper, E.L., Da Silva, F.R., Vettore, A.L., Arruda, P. dan Espin, A.M.L.A. 2000. The mitochondrial genome of the primary screwworm fly *Cochliomyia hominivorax* (Diptera: Calliporidae). *Ins. Mol. Biol.* 9: 521–529.
- Li, J., R.A. Wirtz, G.A. Mcconkey, J. Sattabongkot, A.P. Waters, M.J. Rogers dan T.F. Mccutchan. 1995. *Plasmodium*: Genusconserved primers for species identification and quantitation. *Experimental Parasitology* 81: 182–190.
- MacKinnon, J. 1993. *Panduan Pengenalan burung-Burung di Jawa dan Bali*. Gadjah Mada University Press. Yogyakarta.

- Martin, S.W., Meek, A.H. dan Willeberg, P. 1987. *Veterinary Epidemiology. Principle and Methods. First edition.* Iowa State University Press/Ames.Iowa. USA.
- Martinsen, E.S., Paperna, I., Schall, J.J. 2006. Morphological versus molecular identification of avian Haemosporidia: an exploration of three species concepts. *Parasitology* 133, 279–288.
- Maruly, A. 2011. Bondol Jawa. [http:// www.kutilang.or.id/ burung/konservasi/bondol-jawa](http://www.kutilang.or.id/burung/konservasi/bondol-jawa). 20 Oktober 2012.
- Mendes, L., T. Piersma, M. Lecoq, B. Spaans dan R.E. Ricklefs. 2005. Disease-limited distributions? Contrasts in the prevalence of avian malaria in shorebird species using marine and freshwater habitats. *Oikos* 109:396–404.
- Miller, G.D., B.V. Hofkin, H. Snell, A. Hahn dan R.D. Miller. 2001. Avian malaria and Marek's disease: Potential threats to Galapagos penguins *Spheniscus mendiculus*. *Marine Ornithology* 29:43–46.
- Newton, I. 1998. *Population limitation in birds*. London, UK, Academic Press Limited.
- Nugroho, S. A. 2008. *Trisik, Kantung Keanekaragaman Burung yang Terabaikan*. <http://kabarburungkibc.wordpress.com/edisi-november-2008/trisik-kantung-keanekaragaman-burung-yang-terabaikan/>. 22 Juni 2012.
- Payne, D. 1988. Use and limitations of light microscopy for diagnosing malaria at the primary health care level. *Bulletin of the World Health Organization* 66: 621–626.
- Peirce, M.A. 2005. A checklist of the valid avian species of *Babesia* (Apicomplexa: Piroplasmorida), *Haemoproteus*, *Leucocytozoon* (Apicomplexa: Haemosporida), and *Hepatozoon* (Apicomplexa: Haemogregarinidae). *Journal of Natural History* 39:3621–3632.
- Perkins, S. L. dan J. J. Schall. 2002. A molecular phylogeny of malarial parasites recovered from cytochrome *b* gene sequences. *Parasitology* 88:972-978.
- Prasetio, A. 2010. Prevalensi Malaria Unggas Pada Burung Berkik Ekor-lidi (*Gallinago stenura Bonaparte*) Di Pantai Trisik, Yogyakarta. *Skripsi S1 Fakultas Teknobiologi Universitas Atma Jaya Yogyakarta*. Tidak Diterbitkan.

- Rakan, S.P. 2010. Penentuan Prevalensi Malaria Unggas Pada Burung Madu Sriganti (*Cinnyris jugularis*) Dengan Teknik Polymerase Chain Reaction (PCR). *Skripsi S1* Fakultas Teknobiologi Universitas Atma Jaya Yogyakarta. Tidak Diterbitkan.
- Rebecca, Cole, A. dan Milton, F. 1999. *Parasites and Parasitic Diseases (Field Manual of Wildlife Diseases)*. University of Nebraska – Lincoln.
- Ricklefs, R.E. 1992. Embryonic development period and the prevalence of avian blood parasites. *Proceedings of the National Academy of Sciences of the United States of America* 89:422–425.
- Sambrook, J., Fritsch E.F, Maniatis T. (1989). *Molecular cloning: a laboratory manual*, 2nd ed. Cold Spring Harbor Laboratory Press, Cold Spring Harbor..
- Setio, P. dan Takandjandji, M. (2007). Konservasi *Ex Situ* Burung Endemik Langka Melalui Penangkaran. *Prosiding Ekspose Hasil-Hasil Penelitian* 47-61.
- Smith, E.L., Cuthill, I.C., Griffiths, R., Greenwood, V.J., Goldsmith A.R. dan Evans, J.E. 2005. Sexing Starlings *Sturnus vulgaris* using iris colour. *BTO, Ringing & Migration*, 22: 193-197.
- Sol, D., R. Jovani, dan J. Torres. 2003. Parasite mediated mortality and host immune response explain age-related differences in blood parasitism in birds. *Oecologia* 135:542–547.
- Stoops, C. A., Barbara, A.K., Indrawan, M. Ibrahim N.I., Petrus B.W., Wijaya, S., Farzeli, A., Antonjaya, U., Sin, W.L., Hidayatullah, N., Kristanto, I., Tampubolon, M.A., Purnama, S., Supriatna, A., Burgess, H.T., Williams, M., Putnam, D.S., Tobias, S. dan Blair, J.P. 2009. H5N1 Surveillance in Migratory Birds in Java, Indonesia. *Vector-Borne and Zoonotic Diseases*. 2009 Dec;9(6):695–702.
- Sturrock, H.J.W. dan Tompkins, D.M. 2008. Avian malaria parasites (*Plasmodium* spp.) in Dunedin and on the Otago Peninsula, southern New Zealand. *New Zealand Journal of Ecol* 32 (1) : 98-102.
- Sulandari, S., Zein, A. S. M. 2003. *Panduan Praktis Laboratorium DNA*. Bidang Zoologi Pusat Penelitian Biologi LIPI. Cibinong.
- Tham, J. M., Lee ,S.H., Tan, T.M.C., Ting, R.C.Y. dan Kara, U.A.K. 1999. Detection and species determination of malaria parasites by PCR: Comparison with microscopy and with Parasite-F and ICT malaria Pf tests in a clinical environment. *Journal of Clinical Microbiology* 37: 1269–1273.

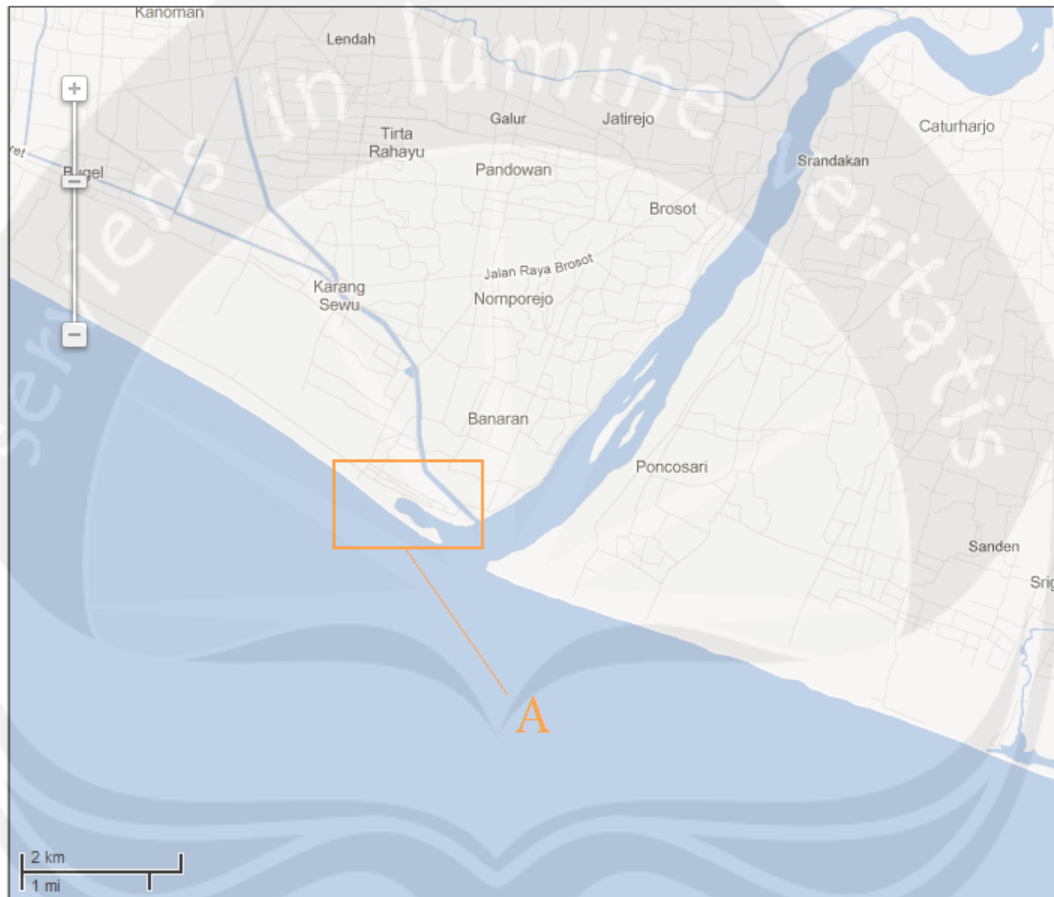
- Tompkins, D.M. dan Gleeson, D.M. 2006. Relationship between avian malaria distribution and an exotic invasive mosquito in New Zealand. *Journal of the Royal Society of New Zealand* 36: 51–62.
- Valkiunas, G. 1993. Pathogenic influence of haemosporidians and trypanosomes of wild birds in the field conditions: Fact and hypothesis. *Ekologija* 1: 47-60.
- Valkiunas, G. 2005. *Avian Malaria Parasites and Other Haemosporidia*. CRC Press, New York.
- Valkiunas, G. dan Iezhova, T.A. (2004) Detrimental effects of *Haemoproteus* infections on the survival of biting midge *Culicoides impunctatus* (Diptera, Ceratopogonidae). *J. Parasitol.*, 90: 194–196.
- van Riper, C. III, Atkinson, C.T. dan T.M. Seed. 1994. Plasmodia of birds. In *Parasitic Protozoa*, Vol. 7, J. P. Kreier (ed.). Academic Press, New York, pp. 73–140.
- van Riper, C. III, Van Riper, S.G., Goff, M.L. dan Laird, M. 1986. The epizootiology and ecological significance of malaria in Hawaiian land birds. *Ecol. Monogr.* 56:327–344.
- Waldenstrom, J., Bensch, S., D. Hasslequist dan O. Ostman. 2004. A new nested polymerase chain reaction method very efficient in detecting Plasmodium and Haemoproteus infections from avian blood. *Journal of parasitology* 90: 191-194.
- Wheeler R. 2005. Wheeler R. 2005. *Nested PCR*. http://en.wikipedia.org/wiki/File:Nested_PCR.png. 20 Oktober 2012.
- Whitworth, D., Newman, S.H., Mundkur, T. dan Harris, P. 2007. *Wild Birds and Avian Influenza: an introduction to applied field research and disease sampling techniques*. FAO Animal Production and Health Manual. Rome.
- Worthy, T.H. dan Holdaway, R N. 2002. *The lost world of the moa: prehistoric life of New Zealand*. Christchurch, New Zealand. Canterbury University Press.
- Yuda, P. 2009. High Prevalence Level of Avian Malaria in the Vulnerable of Java Sparrow. *Biota* 14 (3): 198-200.
- Yuda, P dan Aida, Y. 2009. Keragaman Jenis, Prevalensi dan Hubungan Evolusi Malaria Burung Pada Burung Liar dan Ayam. Laporan Akhir Penelitian, Hibah Penelitian Prioritas Nasional. Fakultas Teknobiologi. UAJY. Yogyakarta.

Yuwono, T. 2006. *Teori dan Aplikasi Polymerase Chain Reaction*. Penerbit ANDI. Yogyakarta.



LAMPIRAN

Lampiran 1. Lokasi Sampling Penelitian.



Gambar 14. Peta Desa Brosot, Kecamatan Galur, Kabupaten Kulonprogo, Propinsi Daerah Istimewa Yogyakarta.
(Sumber : Google Map, 2012)

Keterangan :

A = Pantai Trisik, lokasi penangkapan burung Bondol Jawa (*Lonchura leucogastroides*).