Foreword: *Quo Vadis* Nature Conservation in Malaysia?

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This volume on the State of Nature Conservation 2025 in Malaysia is dedicated to the late Gathorne Gathorne-Hardy, 5th Earl of Cranbrook, formerly Lord Medway (1933-2026) whose curiosity and enthusiasm about nature-human interactions and linkages incidentally led him to explore the natural history of cave-dwelling edible-nest swiftlets in Sarawak and Indonesia for his doctorate, and whose humility and generosity made him lasting friends especially with indigenous peoples and master the Malay language or Bahasa in which he composed poetry ('pantuns') and plays. Gathorne had a distinguished teaching and research career on birds and mammals at the University of Malaya in Kuala Lumpur, where he established the Field Studies Centre in Gombak, conducted numerous field trips to remote areas including 'black' areas under security curfew at the time, and inspired and nurtured numerous Malaysian and British students in field natural history. He had an enduring association with the Malaysian Nature Society and Malaysia, and used his influence after returning to the House of Lords to foster expeditions such as to Gunung Mulu, Sarawak, environment and conservation policy such as in the Malaysian State and National Conservation Strategies, indigenous community-forest relationships such as with the Kelabit in Sarawak and to foster nature conservation in Malaysia, while at the same time addressing issues pertaining to English Heritage, European environmental policy and international zoological nomenclature.

This State of Nature Conservation 2025 builds on two previous reviews by the Malayan Nature Society in 1991 (Kiew 1991) and more recently in 2021 (Cranbrook 2021). It has two papers on fungal species, 22 on plants and 23 on animals, five on indigenous peoples and 24 on nature's connectivity and sustainability for the Anthropocene. It is the first time the Society has focused on the Anthropocene – on ecological connectivity necessary to sustain the provision, regulation and acculturation of ecosystem goods and services based on species and biotope conservation. Presentations in this volume deal well with respective issues, identify threats and remedial conservation measures, when 1991 and 2021 presentations are included for an overview. Collectively, these presentations reflect individual, not necessarily institutional, concerns over the decline in Sundaland's megadiversity heritage that resides mostly in Bornean Malaysia. They reflect the absence of nationally (and regionally) coordinated systematic surveys of biodiversity richness in tropical rainforest and marine coral reef species addressed, and especially their ecological relationships, except for some groups in Sabah and Sarawak. They identify considerable gaps in understanding the structure and function of terrestrial, freshwater, coastal and marine ecosystems which provide resource harvests for markets or are converted to other uses; and superficially identify the intangible distortionary, displacement or irreversibility risks these ecosystems experience from selective harvests, or conversion to synthetic primary industries or infrastructure development, with inadequate qualification and quantification of such risks which, for species, use the IUCN threat categories that resemble resource categories without necessarily their ecological context.

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This rich Sundaland megadiversity heritage is being exploited, transformed or converted at an unprecedented pace without understanding its information value in autonomously providing ecosystem goods (e.g., timber, fish) and services (e.g., clean air and water) through ecological interactions with the environment (e.g., energy, space-time, water and minerals) and inter-species interactions (e.g., trophic, mutualistic, symbiotic) that advance adaptive evolution. Multicellular species perform numerous metabolic and exchange functions that are poorly understood except for obvious goods or services, and hence not quite amenable to risk assessment or evaluation developed for single resources or services. Unlike the temperate zone with its impoverished biodiversity on recent nutrient-rich glacial soils adapted to climatic pulses, Sundaland's megadiversity evolved over millions of years at the tropics at the mouth of the ancient Sea of Tethys on weathered soils or shallow seas exposed to high solar insolation, intense precipitation and without climatic (except Monsoonal) pulses that resulted in high gross production and biomass, rapid nutrient recycling and storage in the biomass, and homeorhesis of interspecies exchanges and linkages, with somewhat more efficient 'closed' ecosystems succeeding 'open' ones over several hundred years. Collectively, this volume of presentations, together with the previous ones, identify three imperatives for the Malaysian Nature Society to pursue and promote in conserving Malaysia's (and Sundaland's) megadiversity heritage under national and State jurisdictions (Figure 1).

(A) Threats to megadiversity:

1. Biodiversity surveys: Coordinated and concerted national and State surveys and repositories of unique megadiversity remaining in pristine ecosystems in all environments, and threats to them and their habitats especially species of potential economic value (*e.g.*, fibre, food, oils, resins, medicines, aromatics), as initiated by Sabah and Sarawak, to complement individual and institutional assessments.

2. Species and guild autecology: Coordinated studies of critical core and peripheral guild species and population dynamics in fractal biotopes in relation to stochastic environmental fluctuations (e.g., insolation & thermal stratification, wind turbulence & circulation, hydrological cycles, flows & circulations, nutrient cycles & flows, soils or substrates) at ecotones affecting trophic and mutualistic associations and life-cycles, potentially of value to ecosystem goods and services, so as to understand unintended distortionary, displacement and irreversible risks, and to design agroecological and technological offsets to destructive human interventions and perturbations.

3. Remote-sensing technology: Exploring remote sensing technology applications for use in identifying, typifying and monitoring species and guilds especially of potential economic value as ecosystem goods and services, and the health of ecosystem types.

(B) Under-supply of socio-ecological functions and operational conditions:

4.Socio-ecological functions: Coordinated multi-disciplinary socio-ecological exploration of species guild functions in biotope fractals in relation to stochastic environmental dynamics (e.g., energy, space-time, minerals, & biotic-informational) not only at natural ecotones (e.g., land-water, highland-lowland, canopy-ground, coastal-marine, inter-species) but, also, at synthetic ecotones (e.g., impacts of hunting & gathering, selective harvesting, shifting agriculture rotations, clearing habitats and landscape / seascapes by destructive technologies, degraded or synthetic agroecosystems, and shelterbelts or buffer zones of pristine or restored ecosystems) including traditional rights and sui generis knowledge, using comparative river basins as far as may be possible so as to define the range of variables at distortionary, displacement, and irreversible risk and to design potential remedial or restorative offsets for resilient terrestrial, freshwater, coastal and marine ecosystem transformations or conversions to continue sustained provision of ecosystem goods and services.

5. Operational conditions: Coordinated exploration and crafting of operational conditions for ecosystem transformations or conversions at ecotones in accordance with Lisbon Principles for securing the sustained flow of ecosystem goods and services:

■ Provisioning services: Water, Food & Nutrients, Fibre, Oils & Latex, Aromatics & Spices, Ornamentals, Raw materials, Minerals.

■ Regulatory services: Microclimate (Thermal, Turbulence, Atmospheric particulates & aerosols), Hydrological recycling (Interception, Retention, Inundation / Flood control, Flows / Flushing, Ocean circulation, Organic decomposition & purification, Bioaccumulation, Sedimentation), Soils and Benthos (Erosion, Turbidity, Water retention, Organic decomposition), Habitability (Temperature, Atmospheric & Dissolved gases, Buffering capacity, Protective layers), Nutrient recycling, storage & mobilisation, Carbon sequestration (Net & Gross productivity, Biomass accumulation), Pest & Vector control, Species, Habitat & Ecosystem protection.

6. Design engineering centres or network: Coordinated exploration by multi-disciplinary STEAM (science, technology, engineering, arts & mathematics) networks or teams of critical socio-ecological variables in ecosystem transformations or conversions causing unintended consequences to megadiversity (distortions, displacements, and irreversibility) in order to design and craft operational conditions for safe ecosystem and natural resources conversions or transformations, so as to foster engineering and technological innovations and design to offset and minimise unintended consequences, or restore ecosystems, for the sustained flow of ecosystem goods and services.

7. Capacity strengthening: Concerted efforts to strengthen capacity through megadiversity surveys, socio-ecological explorations and design of operational conditions beyond acquiring capability (i.e., knowledge and skills, or known-knowns), through individual empowerment by research or exploring known-unknowns or unknown-knowns often under supervision, to individual emancipation and independence by research or exploring unknown-knowns and unknown-unknowns, and fabricating technology and engineering innovations and/or incubating enterprises related to sustained ecosystem goods and services. Linking science to design engineering networks should facilitate strategic emancipation of individuals and institutions.

8.University-Research Networks: Concerted formation of autonomous multidisciplinary research and development (R&D) and innovation networks on specific objectives or tasks, with defined scope and duration, between experts at universities and research institutions at the national level, and through SEAMEO (South-East Asian Ministers of Education Organisation) at the regional level, to address specific emerging challenges to the sustained provision of ecosystem goods and services including technological offset and restorative measures.

(C) Under-use or Inadequacy of Provisions or Mechanisms for Governance (Synthetic 'Commons') for Sustainability:

9.Risk assessment and conservation mechanisms: Concerted efforts to qualify distortionary, displacement and irreversibility risks to megadiversity heritage of ecosystem transformations and conversions and natural resources uses based on scarce socio-ecological knowledge gained, including identifying unknowns, offsets and restorative measures, to review the Land Capability Classification based on soil suitability for primary production for its suitability for conserving biodiversity and ecosystem functions, and to competitively design and harmonise operational conditions defined with strategic stewardship policies and instruments (such as, information transparency or disclosure, regulations, market-based incentives, stakeholder / community participation & partnerships, and tenurial, usufruct & *sui generis* rights) for the sustained provision of ecosystem goods and services, countering as much as is possible 'rent-seeking' behaviour and simplified valuation, and conserving megadiversity as a 'common pool resource' (CPR) in ecoregions and especially in Sundaland.)

10.Federal-State harmonisation: Concerted harmonisation of differentiated and concurrent Federal-State authority and responsibility (Constitution, Art. 73, 74 (Schedule 9), & 77) for fragmented sectoral stewardship of natural resources and the environment to safeguard the unique biodiversity heritage as a 'global commons' (public good), involving a range of operational instruments and spatial scale (e.g., State & Federal agencies, Integrated River Basin Management (IRBM), Integrated Land-Use Management (ILUM), Large Marine Ecosystem Management (LMEM)) and consultative mechanisms.
11.Innovative financing: Seeking innovative mechanisms to raise diverse financing resources (including levies or cess, and stakeholder partnerships) to survey megadiversity in ecoregions, understand their socio-ecological threats and risks including offset technologies, and define operational conditions for governance instruments and at scale that maintain and enhance homeorhetic connectivity for sustained provision of ecosystem goods and services.)

Lord Cranbrook's career illustrated many of the above points and provided models of what could be achieved with simple tools, solid observations but excellent communication. His studies of swiftlets, for example, were seminal in developing the birds' nest industry in Malaysia and Indonesia. They were examples of species and guild autecology (A2) that looked at socio-ecological functions (B4) and operational conditions (B5). The work was multidisciplinary (B6), drawing together industry, local practitioners, government agencies and scientists in capacity-building (B7). Risk assessment of traditional harvesting and ownership led to the honing of conservation strategies (C9) influencing legislation and management practices that have established a lucrative industry that is not merely self-financing but highly lucrative across the region (C11). His role in State and National Conservation Strategies promoted discussion with the legislature on harmonising conservation interests with socioeconomic development plans (C10). Cutting edge technology may be useful but not essential for successful conservation: more fundamental are breadth of thinking to link diverse interests, strong communications, and persistence.

The highlights from the State of Nature Conservation 2025 symposium published here provide a basis for similarly broad approaches to other taxa and ecosystems, evident in papers such as those on fungi, dipterocarps, palms, and many of the contributions on the Anthropocene. Attaining sustainable flow of ecosystem goods and services appears difficult in the best of times due to capital control but not impossible, provided nature conservationists and development practitioners constantly review critical elements of dynamic interactions between megadiversity conservation and socioeconomic demands for alternative livelihoods and habitability, and for strategic security and resilience. Although Malaysian (and Sundaland's) megadiversity heritage has been neglected somewhat to address immediate demands of a demographic transition by attracting 'external' capital to mimic temperate zone production systems for short-term gains, impact analysis and capacity strengthening enables functional review of both megadiversity heritage and changing technological alternatives, so as to design reforms for long-term security especially unexpected transboundary perturbations. A megadiversity centre like the Amazon caught the attention of advanced country investors due to the Rio Summit (UNCED 1992) only after its regional cooperation Treaty established an association of universities and research institutions to explore natural resources – biodiversity linkages. South-East Asia has networks of regional centres under the South-East Asian Ministers of Education (SEAMEO) that could be mobilised under the Association of South-East Asian Nations to address Sundaland's megadiversity conservation potential and limits. In seeking dynamic survival strategies, societies within Sundaland may need to re-visit the tenets of eco-philosophy formulated in Vedic times to balance human utility with respect, reverence and aesthetics for nature in terms of collective responsibility and security, as embodied in resource stewardship in the *Pancasila* and proposed by the existential philosopher Arthur Schopenhauer (Rohde 2013). Furthermore, since information and energy is central

to all forms of capital formation (four natural and two synthetic) in the evolution of autopoietic human species and homeorhetic ecosystems within centrifugal-centripetal 'tension fields', societies may need to explore the extent to which capital may be mutable from one form to another for collective sustainability, resilience and security: Linkages between Philosophy / Religion (natural), Politics / Organisation (natural), and Economics / Finance (synthetic) forms of capital have managed wealth for societies over millennia; and, since the European Enlightenment and demographic transition, have been challenged by emerging Human / Social (natural) and Technology / Infrastructure (Synthetic) forms of capital in the human quest for freedom, exploration and creativity, and experienced or encountered limits to habitability in inherited Environment / Biodiversity (natural) form of capital. What critical ecosystems goods and services will be needed for the next phase of human exploration and development?

Golden Rule: *Tat Tvam Asi* / Thou art that or In that way are you.
[Chandogya Upanishad, VI, 8:7, of the Samaveda]

Cranbrook, Gathorne Gathorne-Hardy, 5th Earl of, 2021. Introduction. An anniversary of anniversaries. *Malayan Nature Journal 81st Anniversary* 2021: 1-3

Kiew, R., ed., 1991. *The State of Nature Conservation in Malaysia.* 245 pp. Kuala Lumpur, MY: Malayan Nature Society

Rohde, K., ed, 2013. *The Balance of Nature and Human Impact*. 450 pp. Cambridge, U.K.: Cambridge University Press

Figure 1: Challenges to Sustain Malaysia's and Sundaland's Megadiversity - Illustrative

