

Exploitation of megapode eggs in Indonesia: the role of traditional methods in the conservation of megapodes

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Some megapode populations have already become extinct in parts of Indonesia because of the increasing human population, improved infrastructure and the abandonment of traditions governing the collection of megapode eggs for human consumption. In other areas megapode eggs are being collected unsustainably, while in more remote areas traditions, and megapode populations, are still intact. The authors examine the ways that traditional egg-collecting methods could be incorporated successfully into megapode conservation projects.

Introduction

Megapodes (Megapodiidae, Galliformes) exhibit a remarkable breeding behaviour. All 22 species use external heat sources to incubate their eggs, which they bury in volcanic soils, in soils heated by the sun or in mounds of rotting leaves (Jones *et al.*, 1995). Indonesia holds 15 megapode species, the highest number in any country, and in theory are all protected by law. This paper pays special attention to two species: the maleo *Macrocephalon maleo* from Sulawesi, which uses volcanic and radiation heat to incubate its eggs, and the moluccan megapode *Eulipoa wallacei*, which uses radiation heat. Hundreds of birds may congregate at specific communal sites for egg laying and these nesting grounds may contain hundreds or even thousands of eggs during the peak of the egg laying season.

Megapode eggs weigh as much as 15–20 per cent of the female body weight. Eggs of the moluccan megapode weigh just over 100 g, while those of the much larger maleo average approximately 230 g. Moreover, the eggs contain a large amount of yolk: 55–69 per cent of the weight of the egg contents, which is among the highest in avian eggs (Dekker and Brom, 1990, 1992; Jones *et al.*, 1995). These large, yolky, and therefore nutritious, eggs are highly valued for human consumption (e.g.

Uno, 1949; Kisokau, 1976; Dwyer, 1981; Watling, 1983). Overexploitation of eggs has brought some species or populations to critical levels (Collar *et al.*, 1994; Dekker and McGowan, 1995). This paper describes past and present exploitation of eggs of the maleo and the moluccan megapode, and is based on field studies carried out between 1985 and 1994 and a review of the literature. The authors discuss how traditional practices could be integrated into megapode conservation plans.

The maleo and moluccan megapode: the background

Not all 22 species of megapode suffer equally from egg collecting. Those that lay their eggs communally at volcanically heated sites and sun-exposed beaches, the so-called burrow-nesters, are more at risk than those that bury their eggs in self-made mounds of rotting leaves. The maleo and moluccan megapode are the only two burrow-nesters in Indonesia.

The maleo

The largest known coastal nesting ground for the maleo, which covered less than 1 ha in July 1994 (M. Argeloo, pers. obs.), is situated on a beach of black sand at the mouth of the

Bakiriang river, 90 km south-west of Luwuk, capital of the Banggai district in Central Sulawesi. Between October and May, the site is visited daily by up to 50 pairs of maleo. Two smaller nesting sites are situated 3 km inland on the banks of the Bakiriang river.

According to local people, maleo eggs play a traditional role in the history of the Kingdom of Banggai. It is said that, some 300 years ago maleos, captured on Java (where no megapodes occur, authors' note) were released in Central Sulawesi and laid their eggs only at Bakiriang. Every year in October or November the first harvest of eggs was, and still is, presented to the Royal Family of the Banggai archipelago. Once the palm-leaves in which the eggs were presented to the King have been returned to Bakiriang local people are free to collect and consume the eggs.

The number of eggs presented to the Royal Family is said to vary from five to 44, and even up to 200, or is said to equal the number of families living in Batui, a village near Bakiriang. This tradition, *tumpe*, resulted in a deep respect for the maleo. Most inhabitants of the district, including the Banggai islands, are still aware of the egg-collecting tradition and 'traditional eldersmen' ensure that it remains part of the cultural heritage. Thus eggs are still collected, despite protection by Indonesian law. The majority of eggs collected by the local people are for private consumption. Only a few are sold in the markets of Luwuk and Batui. Prices vary between Rp1000 and 3500 (\$US0.5-1.8) per egg.

In North Sulawesi, a province influenced and altered by the arrival of Javanese and Balinese transmigrants, traditions have been abandoned and the harvest of maleo eggs is no longer sustainable. Opportunistic exploitation of maleo eggs has resulted in a severe decline of maleo populations. Now most coastal nesting grounds are severely threatened while some have been abandoned entirely (Dekker, 1990; Argello, 1994).

The moluccan megapode

The moluccan megapode is one of the least known megapodes. A major nesting ground,

one of the largest for the species, was rediscovered in 1991 near Kailolo on the island of Haruku (Dekker, 1991). According to local tradition, early settlers who brought Islam to the island buried egg-shaped pieces of gold near the mosque and ever since then megapodes have visited Kailolo. The villagers consider the nesting ground to be a miracle.

During the main breeding season, which appears to last from October until May, eggs are collected daily. As many as 200 eggs, all laid during the previous night, can be collected on a single day, providing a main source of food and cash crop for the small community of 2800 inhabitants.

Traditionally, the Kailolo nesting ground is leased on a yearly basis to the highest bidder, who is always a member of the Kailolo community. The lease-system is generally described as 'sasi lelang' (Volker, 1925) and was originally developed to control agricultural crops in the Moluccas. Kriekhoff (1989) described three objectives for a 'sasi' on coconuts on Seram: (i) protection of the crop against theft, (ii) protection of the harvest and (iii) raising funds. Benda-Beckmann *et al.* (1992) concluded that the objectives have changed from the traditional ones developed to maintain a balance between nature, human beings and the spiritual world, to those focused on economic gain and protection from theft.

In the case of the moluccan megapode the contract between the village community and the tenant lasts from 1 April until 31 March of the following year. The eggs are collected by a team of four villagers who work for the tenant. No one else is allowed to collect the eggs. The fee is donated to the community and used for the restoration and maintenance of the mosque as well as for other local requirements. Between 1992 and 1994 the bid increased from Rp2,750,000 (\$US1400), to Rp3,750,000 (\$US2000), to Rp6,000,000 (\$US3150), respectively. This increase of more than 100 per cent over a period of only 2 years is remarkable, especially because the price per egg did not change accordingly. At the local market it still varies between Rp250 and 300 (\$US0.13-0.15). In the nearby village of Haruku, with a christian instead of islamic



Collecting eggs at the nesting ground of the Moluccan megapode *Eulipoa wallacei* at Kailolo, Haruku, Moluccas, 27 October 1991 (Marc Argeloo).

population, the same system is applied as in Kailolo, although for a much smaller nesting ground. Here only a few eggs can be collected daily. The 'sasi' regulations in this village are implemented in a much stricter way. In addition to a complete ban on collecting eggs during certain months of the year, it is also forbidden to harvest other products such as fish and mangrove trees during specific periods. Even in the egg-collecting season, some parts of the nesting ground are excluded from harvesting. The 'sasi' is used in this way to safeguard the megapode population and guarantee future harvests.

Sulawesi versus Haruku

The main difference between egg collecting in North Sulawesi and Haruku is the way in which the nesting grounds are exploited. The strict regulations at Haruku are in clear contrast with the 'take-as-much-as-you-can'

attitude in North Sulawesi (M. Argeloo and R. Dekker, pers. obs.). The situation at Bakiriang is more or less intermediate between Haruku and North Sulawesi (M. Argeloo, pers. obs.).

The traditional method of egg collecting in North Sulawesi (e.g. von Rosenberg, 1865) was disrupted by the increase of the human population, which was caused by immigration and a high birth-rate. At Bakiriang, the process of transmigration has only just started. The small island of Haruku has not been included in any transmigration planning, so the human population has remained relatively stable and traditions are more or less intact.

Importance of megapode eggs to the local economy

Early this century, the income of the King of Banggai partly depended on the trade of maleo eggs from Bakiriang (Goedhart, 1908). Until the mid-1980s maleo eggs from nesting

grounds throughout Sulawesi were shipped as far as Jakarta. Following the decline of the species, the trade is now limited to a few local markets. Only exceptionally are eggs transported over distances of 350 km or more. The economic importance of the exploitation of maleo eggs in North and Central Sulawesi has, therefore, decreased significantly. To earn a minimum daily income, an egg collector has to sell at least six eggs. Because it is possible to find only a small number of eggs now, they are used mainly for personal consumption, and seldom to generate income. Strangely enough, maleo eggs do not have any added value: the price of an egg, which weighs as much as five chicken eggs, is similar to the price of five chicken eggs.

The eggs of the moluccan megapode are mainly for local use, although some are transported to nearby islands, such as Seram, Saparua and Ambon. In November 1991, 60 eggs from Kailolo were found for sale at the market of Masohi on the south coast of Seram, opposite Haruku. The importance of the eggs for the village economy is tremendous, considering the large number collected per annum and the large sum of money paid to gain the rights over the harvest of this site. To recover the money paid for the contract 11,000, 12,500 and 20,000 eggs needed to be collected during 1992, 1993 and 1994, respectively (Table 1). As well as the money for the contract, the tenant and his four assistants must make a living from the sale of the eggs. The total number might therefore rise to at least 30,000 eggs harvested during the 1994/95 season based on a monthly income of Rp125,000 for the tenant and his four assistants during the main period of the harvesting season between October and May.

Exploitation and megapode population trends

Increasing human population, a better infrastructure, improving living standards and the loss of traditions have had a serious impact on the maleo population in North Sulawesi (Dekker, 1990; Argeloo, 1994). In 1991 the

number of maleos visiting beaches in North Sulawesi was estimated at only 340–670 pairs, a decrease of approximately 90 per cent since the 1950s (Argeloo, 1994).

The maleo population at Bakiriang is also suffering from increasing human population and the loss of traditions (Watling, 1983; M. Argeloo, pers. obs.). Based on information from the Indonesian Nature Conservation Department, as many as 100 pairs visited this site daily during the egg-laying season only about 10 years ago. Bakiriang probably still offers nesting facilities for several hundred pairs, an estimate based on the number of nesting burrows (255 in August 1994; M. Argeloo, pers. obs.), the daily number of pairs said to visit the site during the egg-laying season (40 pairs in December 1991; Indrawan, 1992), and the number of eggs said to be collected.

Assuming that moluccan megapodes lay on average 10 eggs per year, a number based on figures for the related maleo (Dekker, 1990), the population of the moluccan megapode on Haruku should be at least 3000 pairs if a yearly harvest of 30,000 eggs is required as indicated above. Calculations based on information from the Kailolo community suggest a yearly egg production of 40,000–50,000 eggs or 4000–5000 pairs of birds (Dekker, 1991). The recent increase in the contract price and thus of the number of eggs that have to be collected might imply that the exploitation is increasing, with negative impacts for the megapode population, or that the megapode population and therefore the total yearly egg production has increased.

Challenges for conservation

In order to take cultural, religious, economic and ecological aspects into account, it seems worthwhile to link the 'sasi' system as practised on Haruku or a system as executed at Bakiriang to nature conservation in general and megapode conservation in particular.

Using existing traditions and involving appropriate people will increase acceptance by the local community. Thus, on Haruku there

A staff member of Dumoga Bone National Park, North Sulawesi, Indonesia, with an egg of the maleo *Macrocephalon maleo*, Tumokang nesting ground, December 1990 (Marc Argeloo).

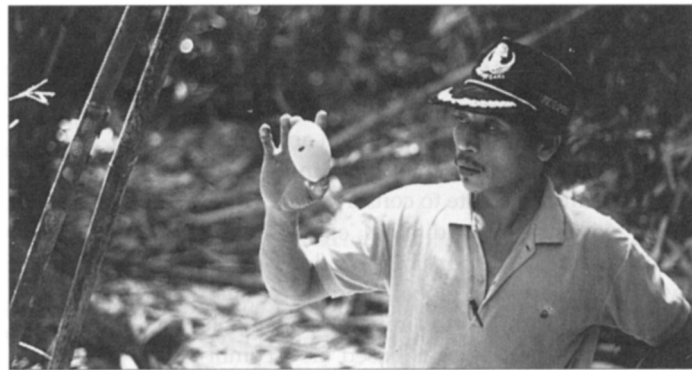


Table 1. Contract price, egg price and number of eggs that need to be sold to equal the contract price for the period 1992–94

Season (1 April–31 March)	Contract price (Rp)	Egg price (Rp)	No. eggs to = contract price
1992/93	2,750,000	250	11,000
1993/94	3,750,000	300	12,500
1994/95	6,000,000	300	20,000

are two options for action to consider if the growth of the megapode population appears to be too low. (i) Eggs could be sold at a slightly higher price than usual. An increase of, for example, 10 per cent in relation to an unchanged year contract would guarantee the same income while fewer eggs would need to be harvested. This would mean that 10 per cent of the eggs could remain untouched or, more specifically, 10 per cent of the nesting ground could be declared an 'egg-collecting-free zone'. (ii) A conservation organization or a governmental institution could buy the rights to harvest and pay the salaries of the tenant and his assistants. Such a system would cost \pm \$US5000. The number of eggs harvested under this arrangement would not necessarily be linked to the contract price and could therefore be much lower than the number harvested currently. A small number of eggs could even be handed over free to the local people or additional chicken eggs could be sold. Both systems would only need little time for implementation (2 years) because their impact affects only a single, small community, which does not need to be convinced of their importance. Implementation could be directly through the village heads instead of governmental departments.

At Bakiriang, the situation is deteriorating, even though the influence of former traditional egg-collecting methods is still evident. Law enforcement is needed to stop illegal egg collecting. Furthermore, an arrangement should be made between the Royal Family and the local authorities to restore and fully implement the traditional egg-collecting system. Implementation of these plans is estimated to require about 4 years.

In North Sulawesi, the situation is more complex and the community more difficult to convince because most people are not indigenous and economic factors play only a minor role. Traditions have been lost and maleo eggs are no longer an essential source of protein. The options suggested for Haruku would not work here. Strict law enforcement would appear to be the only way to protect these nesting grounds. Action should be taken by government officials at village, subdistrict, district and province levels. This will probably take 3–8 years.

The situations described for the maleo in North and Central Sulawesi and the moluccan megapode on Haruku demonstrate that a single solution for apparently similar problems is not appropriate and conservation strategies must be based on the local situation.

Until recently the importance of anthropological aspects of conservation projects has been seriously underestimated, although stimulating examples, as for instance in Venezuela (Kline, 1994), Cameroon and Nepal (Kempf, 1993) showed that indigenous lifestyles can contribute to conservation.

The existence of traditional egg-collecting methods and the responsibility Indonesia has towards megapodes globally create a challenging opportunity to initiate sustainable harvest of megapode eggs based on a combination of ecological and anthropological factors.

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References

- Argeloo, M. 1994. The maleo *Macrocephalon maleo*: new information on the distribution and status of Sulawesi's endemic megapode. *Bird Conservation International*, **4**, 383–393.
- von Benda-Beckmann, F., von Benda-Beckmann, K. and Brouwer, A. 1992. Changing 'indigenous environmental law' in the central Moluccas: communal regulation and privatization of *sasi*. Paper presented to the Congress of the Commission on Folk Law and Legal Pluralism. August 1992. Victoria University, Wellington.
- Collar, N.J., Crosby, M.J. and Stattersfield, A.J. 1994. *Birds to Watch 2. The World List of Threatened Birds*. BirdLife, Cambridge.
- Dekker, R.W.R.J. 1990. The distribution and status of nesting grounds of the maleo *Macrocephalon maleo* in Sulawesi, Indonesia. *Biological Conservation*, **51**, 139–150.
- Dekker, R.W.R.J. 1991. The moluccan megapode *Eulipoa wallacei* 'rediscovered'. *Megapode Newsletter*, **5**, 9–10.
- Dekker, R.W.R.J. and Brom, T.G. 1990. Maleo eggs and the amount of yolk in relation to different incubation strategies in megapodes. *Australian Journal of Zoology*, **38**, 19–24.
- Dekker, R.W.R.J. and Brom, T.G. 1992. Megapode phylogeny and the interpretation of incubation strategies. In Proceedings of the First International Megapode Symposium, Christchurch, New Zealand, December 1990 (eds R. W. R. J. Dekker and D. N. Jones). *Zoologische Verhandelingen*, **278**, 19–31.
- Dekker, R.W.R.J. and McGowan, P.J.K. 1995. *Megapodes: An Action Plan for their Conservation 1995–1999*. IUCN, Gland.
- Dwyer, P.D. 1981. Two species of megapode laying in the same mound. *Emu*, **81**, 173–74.
- Goedhart, O.H. 1908. Drie Landschappen In Celebes. *T.B.G.*, **50**, 561–564.
- Indrawan, M. 1992. News on the maleo colony at Bakiriang, eastern Sulawesi, Indonesia. *Megapode Newsletter*, **6**, 13–14.
- Jones, D.N., Dekker, R.W.R.J. and Roselaar, C.S. 1995. *The Megapodes (Megapodiidae)*. Oxford University Press.
- Kempf, E. (ed.) 1993. *The Law of the Mother: Protecting Indigenous Peoples in Protected Areas*. Sierra Club Books, San Francisco.
- Kisokau, K. 1976. A study in the biology of the megapodes of West New Britain. *Papua New Guinea Bird Society Newsletter*, **121**, 18–20.
- Kline, E. 1994. *From Turtle Predators to Protectors*. WWF features, January 1994.
- Kriekhoff, V.J.L. 1989. Sasi: satu bentuk pengawasan sosial di Maluku Tengah. Paper presented at the seminar on legal anthropology. January 1989. Universitas Indonesia, Jakarta.
- von Rosenberg, C.B.H. 1865. Reistogten in de afdeeling Gorontalo, gedaan op last der Nederlandsch Indische Regering. Frederik Muller, Amsterdam.
- Uno, A. 1949. Het natuurmonument Panoea (N. Celebes) en het maleohoen (*Macrocephalon maleo* Sal. Müller) in het bijzonder. *Tectona*, **39**, 151–165.
- Volker, T. 1925. Het recht van sasi in de Molukken. *Adatrechtbundel*, **24**, 296–313.
- Watling, D. 1983. Sandbox incubator. *Animal Kingdom*, **53**, 28–35.
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