

Frustrations in economic botany: the efforts to manage the coconut scale insect in German Micronesia (1899–1914)*

by Dirk H. R. Spennemann

Abstract

Wide-spread and largely unregulated introduction of plants and animals for private or public gain under the guise of economic botany can pose substantial risk to a local economy. Inadvertent introductions of plant pests can devastate subsistence or production crops. Such is the case with the introduction of the coconut scale insect to Micronesia during the final years of the Spanish administration (pre-1899). The agents responsible for its introduction and spread were a combination of traditional trading practices and communications networks. To combat the infestations, the incoming German colonial administration (1899–1914) moved to both contain its spread through regulations and land management practices and through the introduction of coccinellid beetles from a range of sources. This paper discusses the various approaches taken by an increasingly frustrated German administration which was worried that the scale insect might cause the collapse of the copra industry and thus threaten the economic viability of the Micronesian colonies. The German actions are the first recorded incidence of biological control of plant pests in the Pacific Islands outside of Hawai'i.

The colonial enterprise of the nineteenth century was driven by two major factors: access to resources, both mineral and agricultural, to fuel the economies of the home state; and a strategic consideration to provide ports-of-call for supplies and a safe haven, usually at locations that would connect the economically viable colonies and could potentially be used as naval bases to deny rival powers access to their colonial possessions. A rare factor is imperial vanity, i.e. controlling a space to convey the projection of power, implied or real, to a domestic or foreign audience.¹

* I am indebted to the Konrad Englberger (formerly SPC, Pohnpei) and the late Lois Englberger (Pohnpei) for encouraging me in the pursuit of the historical introduction of the coconut scale insect to Micronesia.

¹ The data analysed in this paper have been primarily extracted from original sources, such as annual reports published by the Imperial German Colonial Office ('Reichskolonialamt'), articles written by the administrators of the respective districts and published in the German colonial journals and magazines; and a consultation of correspondence in the files maintained by the German Colonial Office (and now held by the German

Archives in Berlin) as well as the files of the Governor for German New Guinea and Micronesia in Rabaul (now held by the Australian Archives in Canberra). The local-level files of the district administrations on Jaluit, Pohnpei, Saipan and Yap, and the files held at the stations on Chuuk and Palau, have been lost since the Japanese annexation of Micronesia in the early days of World War I in October 1914. The files were handed

Imperial Germany had acquired the atolls of the Marshall Islands from Spain in 1885 to safeguard its copra interests there. Spain, which also controlled the Philippines, retained the rest of Micronesia, comprised the Caroline, Palau and Mariana Islands, but apart from Guam did not engage in any major development projects. During the late 1880s, German traders systematically expanded their reach in Micronesia, always focusing on purchasing copra produced by the various island communities. German trading interests based in the Marshalls, namely Adolph Capelle, not only developed copra plantations on Likiep in the Marshalls as well as Agrigan and Pagan in the Marianas, but also purchased local copra when and where it could be had.²

When the future of Spanish Micronesia came into doubt following Spain's defeat in the Spanish-American war in 1898 and its associated loss of the Philippines and Guam, Imperial Germany stepped in and purchased the islands (except for Guam) from Spain in 1899. German traders argued that only the atolls were of economic value, and that the high islands, such as Pohnpei (the 'Ponape'), Chuuk (then 'Truk') and Yap, were not only unproductive but also settled by troublesome 'natives'.³ The imperial government disregarded the advice and went ahead with the purchase. This was a purchase motivated by imperial vanity, as henceforth any map showing the colonial world would show that Germany owned a large chunk of the globe, not only in Africa (today's Tanzania, Namibia, Togo and Cameroon), but also in the Pacific (New Guinea, Samoa, and especially Micronesia). No one really needed to know that over 99.5 per cent of that possession was water, and the productivity of colonial goods on the large islands was low. The line on the map sufficed.

That of course did not apply to the rational decision-making among the echelons of the Imperial Colonial Office in Berlin. They, in fact, were very parsimonious. As the new colony was expected to be loss-making, at least in the mid-term future, Berlin only budgeted for a skeleton staff, comprising, in the first instance, a district administrator and a small number of Indonesian mercenary soldiers (from Macassar, Celebes) to provide protection and policing. For ease and continuity of administration, Germany maintained the district structure the Spanish had imposed,⁴ and consequently established its district administrations in the same locations: Pohnpei, Yap and Saipan.⁵ The German administrators were faced with the challenge to establish colonial rule, to maintain peace and order—and develop the local economies to eventually make the districts pay for themselves. All administrators were engaged in agricultural

Note 1 *continued*

intact to the incoming Japanese occupation force as the administrators fully expected to return after war's end. It appears that the files were taken back to Tokyo, where they were reputedly destroyed by air raids during World War II. The state of the Japanese files of the same period is unclear: they too are reputedly lost. It is these files that would have contained detailed relevant correspondence, of high granularity, whereas only high-level administrative correspondence has survived. Private business archives have not survived. For printed resources see inter alia: Dirk H. R. Spennemann, *An annotated bibliography*

of German language sources on the Mariana Islands. Saipan, (2004); id., *An annotated compendium of German language sources on the German protectorate of the Marshall Islands*, I, *Bibliography* (1999).

² Dirk H. R. Spennemann, *Edge of empire. The German period in the Mariana Islands 1899–1914* (2007).

³ Ibid., p. 9.

⁴ The only boundary correction occurred in the case of the Marshallese atolls of Enewetak and Ujelang, which during the 1885 acquisition of the Marshall Islands had ended up on the 'wrong' side of boundary.

⁵ Spennemann, *Edge of empire*.



FIGURE 1. Arno Senfft in 1900

Source: Anonymous, 'Nachruf! Herr Regierungsrat Arno Senfft', *Amtsblatt für das Schutzgebiet Deutsch Neuguinea* 1 (6, Suppl. 2) (1909), p. 46.

development to further the quality of the local food supply, to develop export industries and to produce crops that had strategic importance to the German empire. Economic botany was writ large. Cash crop production, economically primarily benefiting the colonial power, was introduced or increased. To aid agricultural development, a large number of plant and animal species were introduced and trialled, with individual administrators driving this based on their own personal interests and experience.⁶

At the same time, the administrators had to contend with the local conditions, some of which were unexpected, such as the frequency with which devastating typhoons would lay waste to plantations, in particular in the Marianas, but also in the western Carolines (centred on Yap).⁷ When Arno Senfft (Figure 1) commenced his tenure in Yap in November 1899, he faced a different problem: a tiny translucent insect that, while feeding on the sap of the leaves of coconut palms, dramatically reduced a palm's capacity to produce sizeable coconuts. While a trained and skilled and skilful administrator, Senfft was wholly unprepared to deal with an issue that threatened to undermine his every effort at economic development.

⁶ Dirk H. R. Spennemann, 'Trial and Error: the introduction of plants and animals to German Micronesia 1885–1914', *J. Pac. Hist.*, 54 (2019), pp. 507–28.

⁷ Spennemann, *Edge of empire*, p. 300; id., *Typhoons in Micronesia. A history of tropical cyclones and their effects until 1914* (2004).

This article is an examination of how the German administration tried to combat this tiny enemy. It will show that it was the agency of individuals at the colonial periphery that mattered, individuals who tried to address the situation without effective guidance from their superiors. Berlin was far away, not only in terms of geography and communications delays, but also on a level of conceptual understanding. The Imperial Colonial Office had other, economically and politically more significant matters to address than combatting a tiny insect at the periphery of its vision. This paper shows an administrator trying every trick in his book to get on top of the issue: attempts at mechanical, biological, and chemical control, backed up by ever-more intrusive government regulations and associated law enforcement. It shows his attempts at marshalling support from national and international authorities in colonial agriculture and plant pests. Nothing worked. By losing the battle against the tiny coconut scale insect, the administration was at risk of losing the respect of the local population and thus, ultimately, its moral authority.

I

Before delving into the detail of the problem and range of actions taken, it is apposite to briefly examine the administrative structures within which the actions occurred and to look at the individuals that gave effect to them. The German administrators in Micronesia were afforded much discretionary authority, at least during the first five years of administration. In the beginning, mail to or from Berlin was unreliable and could take between 60 and 150 days. Matters improved once a dedicated shipping line had been established in late 1904, but the mail still took 45–60 days.⁸ The reality faced by the German administrators was that they could not expect to receive a response to a request for guidance until three to four months had passed—even if it was acted upon swiftly by the German colonial office and sent by return mail. The German Governor in New Guinea, nominally the line manager of all Micronesian districts (bar Jaluit), was postally even further away. Until the dedicated shipping line was established, direct communication was haphazard and unreliable. Consequently, until 1905 the Micronesian district administrators communicated directly with Berlin, who then sent copies of their responses to the administration in New Guinea.

These communications constraints, exacerbated by the fact that the parsimonious Imperial Colonial Office ran the Micronesian colonies with a skeleton staff, meant that specialist skills were often lacking. In consequence, the individuals played a greater role than normal, and their personalities, abilities and cultural attitudes attained much greater significance. This warrants a brief look at the chief protagonists.

All three administrators that took up their positions in Micronesia were obviously versed in public administration. Georg Hahl (Pohnpei and later Rabaul),⁹ and Arno Senfft (Yap)

⁸ Spennemann, *Edge of empire*, p. 67f.

⁹ Hahl's tenure on Pohnpei was short lived as he took over the Governorship of German Guinea June 1901 (acting, confirmed 1902. On Pohnpei he was replaced by Victor Berg, an administrator with experience in colonial Africa. After having been severely censured by

the colonial head office in Berlin for his initial strong distaste for the Pohnpeians, Berg embarked on an exemplary career in colonial administration, following the official line to the letter both in spirit and in actions, yet developing some sympathy for those he ruled. When the position in Pohnpei became vacant after Berg's death,

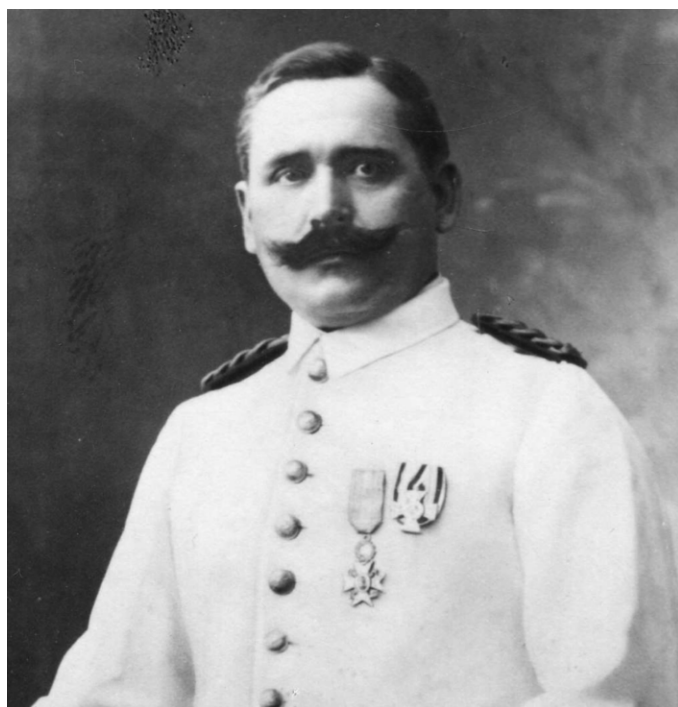


FIGURE 2. Georg Fritz in 1901

Source: Anonymous, 'Botanisches Museum. Personalangelegenheiten. Nachruf Georg Volkens', *Notizblatt des Königlichen Botanischen Gartens und Museums zu Berlin* 7 (64) (1917), pp. 117–18.

had backgrounds as judiciary clerks or lawyers, who, while competent administrators, were relatively clueless when it came to the improvement of tropical agriculture. Only Georg Fritz (Saipan) stands out, as he had a background in financial administration and forestry (Figure 2.) Although nominally equal in their positions, the German Colonial Office had different priorities. Of the three districts, Yap was the most well known, at least economically, and thus was afforded the highest level of significance which is borne out by the fact is the only district which was afforded an assessment of its agronomic potential. Both Pohnpei and Saipan were seen as stepping-stones of lesser importance. While both Hahl and Senfft had held positions in the German possession in the Pacific, Georg Fritz was chosen for Saipan as he spoke fluent Spanish, which was an essential requirement in a territory that had been a Spanish possession for over 300 years.

Arno Senfft had commenced his public service career working in the judiciary of Thuringia and then earned his stripes as an administrator in German New Guinea from 1891.¹⁰ While working in the Marshall Islands as deputy and later as acting administrator he had become immersed in Micronesian social structures and the complexities of multiple levels of land

Note 9 *continued*

Senfft was supposed to take up that position, possibly because it was a poisoned chalice given the fractiousness of the population. In the event Fritz was moved to Pohnpei. Spannemann, *Edge of empire*; Francis X. Hezel, *The first taint of civilization: a history of the Caroline and*

Marshall Islands in pre-colonial days, 1521–1885 (1994).

¹⁰ Arno Senfft (*28 March 1864 Weimar, Thuringia, † 14 February 1909 Hong Kong). For obituary see: Anonymous, 'Nachruf! Herr Regierungsrat Arno Senfft', *Amtsblatt für das Schutzgebiet Deutsch Neuguinea* 1(6 Suppl 2) (1909), p. 46.

and resource rights. Unlike his arrogant and supremacist successor Eugen Brandeis, Senfft managed the affairs in Jaluit with a high level of cultural sensitivity and thus was eminently qualified to navigate the shoals of Yapese politics.¹¹ Senfft was asked to take over the vacant administration of Pohnpei in 1907 but preferred to continue his work in Yap. Both he and Fritz steered the recovery of the Eastern Carolines following the devastation by the typhoon of Good Friday 1907.¹² After his death from an undisclosed illness *en route* back to Germany in 1909, Georg Fritz was appointed administrator of the combined Caroline and Mariana Islands district.

Georg Fritz had not come through the echelons of the German colonial service but had a background in the German civil service as a financial administrator in Hesse as well as in agricultural research in South America. Fritz had a patronizing but very benevolent attitude towards the Micronesians and he attempted, where possible, to effect cultural change in a fashion where decisions were mutually agreed upon by the local leaders and the German government, even if this process was a tedious and drawn out one. In this he was very much in line with the consensus-based approach to decision making that was prevalent in the power relations of traditional Micronesia.¹³

When this little band of brother administrators left German New Guinea in September 1899 in company of Governor Rudolf von Bennigsen who was to officiate over the various transfer ceremonies, they were accompanied by Georg Volkens, adjunct professor of botany at the University of Berlin and staff of the Central Botanical Office for the Colonies of the Botanic Museum of Berlin.¹⁴ His task was to accompany Arno Senfft to Yap where Volkens was to systematically assess the agricultural potential of the island on behalf of the 'South Seas Studies Syndicate' (a loose association of commercial German trading interests) and the German government. Von Bennigsen first visited Jaluit and Kosrae, followed by Pohnpei, where he took possession and dropped off Albert Hahl, then Chuuk, Palau and Yap. There he dropped off Senfft and Volkens, before he left for Saipan, concluding the final transfer ceremony dropping off Georg Fritz.¹⁵ While Volkens visited a number of islands other than Yap, albeit only for very short period of time, usually 1–2 days, there seems to have been no survey or sampling.

¹¹ Dirk H. R. Spennemann, *An officer, yes; but a gentleman? A biographical sketch of Eugen Brandeis, Military adviser, imperial judge and administrator in the German Colonial Service in the South Pacific* (Pacific Island Studies Monographs 21, 1998); Hezel, *First taint of civilization*.

¹² Dirk H. R. Spennemann, *Melinel. The Good Friday Typhoon of 1907 and its aftermath in the Mortlocks, Caroline Islands* (2007); id., *Typhoons in Micronesia*; id., *Edge of empire*.

¹³ For background on Georg Fritz (*24 November 1865, † November 1944 both Alzey, Germany), his activities in the Marianas and his work in Yap and Pohnpei see Spennemann, *Edge of Empire* and Spennemann, *Melinel*.

¹⁴ Georg Ludwig August Volkens (*13 July 1855, † 10 January 1917, both Berlin) researched and taught

pre-dominantly plant physiography and 'colonial botany'; initial research in North and East Africa; Professor of Botany, University of Berlin from 1895. Fieldwork in German New Guinea, the Marianas, Carolines and Java. For obituary see: Anonymous, 'Botanisches Museum. Personalangelegenheiten. Nachruf Georg Volkens', *Notizblatt des Königlichen Botanischen Gartens und Museums zu Berlin* 7(64) (1917), pp. 117–18.

¹⁵ Dirk H. R. Spennemann, 'Introduction', in Dirk H. R. Spennemann (ed.), *Rudolf von Bennigsen (1859–1912) The German take-over of the Caroline, Palau and Mariana Islands* (Division of Historic Preservation Occasional Historical Papers, Saipan, 2003), pp. iii–xxxiii; id., 'A micronesians multiple first day cover. The postcard that chronicles the German take-over of Micronesia', *Collectors Club Philatelist* 85 (2006), pp. 163–73.

All of Volkens' work is focused on Yap.¹⁶ Volkens stayed on Yap until June 1900. During his surveys he focused on the presence of plant pests and diseases. One of these was the coconut scale insect.¹⁷

II

Coconut oil was an extremely versatile product, its uses ranging from human consumption in the form of the oil itself and of coconut fat as the basis for margarine, to a lubricant for machinery during the early nineteenth century. When the early European traders in the South Pacific began to acquire locally pressed coconut oil, the quality of the product was mixed. Moreover, that oil was subject to further spoilage during the long voyage to Europe, often leading to rancid oil being landed. In Samoa in the 1850s, Theodor Weber, resident trader of the Hamburg-based Johann Cesar Godeffroy and Co., developed a technique to air-dry the coconut meat, thereby concentrating the oils in the flesh, reducing the overall weight, and, most importantly, preventing spoilage. That new half-product, copra, was to revolutionize the Pacific trade.¹⁸

Not surprisingly, the German traders were keen to expand the industry both through trade with the local communities and through the establishment of company-owned coconut plantations. While the majority of plantations owned by Godeffroy & Co., and by its successor company, the Deutsche Handels- und Plantagengesellschaft, were based on Samoa, German traders opened up large areas of the Pacific for the copra trade through a dense network of traders who were working as agents for the company, rather than as independent traders.¹⁹

As coconut palms (*Cocos nucifera* L) are, biologically, colonizing wave-dispersed shoreline plants, they thrived on the low-lying sandy islets of the atolls in the Central and Eastern Pacific, which hitherto had been of low economic interest to traders and especially colonial powers (apart from short-lived resource extraction, i.e. *bêche-de-mer* and pearls/pearl shell).

During the nineteenth century, copra production in Micronesia was closely entangled with rights to land. The concept of personal or of government land ownership did not exist, with the exception of the Marianas with their long history of legal and social change exacted by the Spanish. Rather, rights to land were vested in various levels of local rulers. Rights to produce were held by their subjects with rulers owning a share. At the risk of oversimplifying the

¹⁶ Given that the new possessions in German Micronesia comprised a number of large islands other than Yap, all likewise with volcanic-derived soils (Kosrae, Pohnpei, Chuuk, Palau, Saipan, Tinian) one has to wonder why the sole agronomic assessment focused on Yap. The reason may well rest in the fact that Yap was best known as the base of the Irish-American trader David O'Keefe, who had developed a trading empire since the mid 1870s. Hezel, *First taint of civilization*.

¹⁷ Georg Volkens, 'Über die Schildlauskrankheit der Kokospalmen in Togo und auf der Karolinen Insel Yap', *Notizbl. Kön. Bot. Gart. Mus. Berl.* 3 (1901), pp. 86–90.

¹⁸ Paul Preuß, 'Wirtschaftliche Werte in den

Deutschen Südseekolonien', *Tropenpfl.* 19 (1916), pp. 539–61.

¹⁹ Handley B. Sterndale, *Papers relating to the South Sea Islands: their natural products, trade resources, etc. Part III. Memoranda by Mr. Sterndale on some of the South Sea Islands. Appendix to the Journals of the House of Representatives of New Zealand* (1874), vol. A-3B. See also contemporary sentiment reviewed in Dirk H. R. Spennemann, "Vell, I don't call dot very shentlemanly gonduck." The Portrayal of Germans as ungentlemanly South Seas traders in Louis Becke's short stories', *Pacific Asia Inquiry* 5 (2014), pp. 107–29.

matter, different individuals, of different social status, could hold rights over a given section of land, with different individuals holding rights to its produce and raw materials. Some of them might be held by individuals living on different islands, only to be exercised in times of food shortages, for example following typhoons.²⁰

Traditionally, coconut palms were a subsistence crop that supplemented food supply and provided raw materials for houses and objects. During the second half of the nineteenth century, Micronesia was in a period of transition from a purely a subsistence economy to an economy where the production of some crops could be intensified to produce tradeable commodities.²¹ Resident as well as ship-based traders could only acquire as much copra as the local community was prepared to produce to satisfy its need for income to purchase goods. Company-owned plantations, which would produce predictable amounts of copra, were not feasible unless land could be leased or acquired by way of marriage.²² To boost production, the German colonial administration levied a head tax, which could be paid in the form of copra or labour. This was only marginally successful, except in the Marshall Islands where the highest-ranking chiefs had been given a cut of the taxes in return for their role as tax collectors.²³

In the eyes of the German colonial office copra was king and all South Sea islands were presumed to be suitable for copra production along the lines of Samoa or the productive atolls of the Marshall Islands. Environmental conditions soon showed otherwise. On Pohnpei, where 8,400 acres had been cleared and planted with palms, it soon became clear that the climate there was too humid to properly dry copra without using artificial heating.²⁴ In the neighbouring district of the Marianas its administrator Georg Fritz enthusiastically pushed the development of the copra industry. Unlike elsewhere in Micronesia, much of the land on Saipan was in government ownership (courtesy of the Spanish government's actions in the early 1700s) and thus could be deeded to the local community (as wedding gifts) or leased to German or local entrepreneurs.²⁵ Despite high expectations and early indications that the Marianas might become an economic powerhouse courtesy of the large-scale planting of coconut palms, the devastation caused by several typhoons in short succession put paid to that. While the plantations recovered, the Marianas never gained economic prominence.²⁶

All land on Yap, the focus of our discussion, was owned by family lineages, which could make sections of this land or its produce and resources and production units (e.g. taro pits) available to other families (e.g. through marriage).²⁷ The complex network of rights and

²⁰ William A. McGrath and W. Scott Wilson, 'Marshall, Caroline and Mariana Islands. Too many foreign precedents', in, Ron Crocombe (ed.), *Land tenure in the Pacific Suva* (1987), pp. 190–210.

²¹ Kurt Hassert, 'Kolonialer Nutzwert der neuen deutschen Erwerbungen in der Südsee', in, Willy Scheel (ed.), *Deutsche Kolonien. Koloniales Lesebuch zur Einführung in die Kenntnis von Deutschlands Kolonien und ihrer Bedeutung für das Mutterland* (1907), pp. 176–95.

²² As in the case of the de Brum and Capelle acquisition of Likiep Atoll.

²³ Hezel, *First taint of civilization*; Spennemann, *An officer*, p. 21.

²⁴ Spennemann, *Edge of empire*, p. 78.

²⁵ *Ibid.*, pp. 116 ff.

²⁶ That changed dramatically under the Japanese occupation, when sugar cane was successfully trialled.

²⁷ Francis Mahoney, 'Land tenure patterns on Yap', in, John Edward DeYoung (ed.), *Land Tenure Patterns: Trust Territory of the Pacific Islands Agaña* (1958); McGrath and Wilson, 'Marshall, Caroline and Mariana Islands'.

obligations meant that large, European-owned, or -leased plantations could not be established on Yap itself. Copra was produced, but the Yapese community maintained its reliance on agricultural production, which allowed for a strong subsistence economy.²⁸ A further complication was that Yapese society was caste-based and that higher-ranking members could and would extract surplus from lower-ranking members, making it pointless for the latter to produce more copra than absolutely necessary.²⁹ While the German administration tried to break this custom as it clearly affected the profitability of the colony, it was a slow process.

III

The history of plant introductions to Micronesia, however, also shows that government officials as well as private individuals had introduced many plants without much concern for the accidental introduction of plant pests and other 'hitch hikers'.³⁰ Waterhouse and Norris have reviewed the history and presence of plant pests in the Pacific and analysed the efficacy of various plant control measures. A perusal of this study shows that the majority of the biological controls date from the 1930s onwards, with a few dating to the 1920s.³¹

The history of plant introductions to Micronesia shows that there were no controls placed on imports during the pre-German period, and only a few controls during the time of the German administration.³² The absence of disease controls implies that that traders as well as government officials could have inadvertently introduced all sorts of plant pests for which there were no local enemies or parasites.

Uncontrolled imports of plant matter by private individuals seem to have occurred, but are impossible to quantify because the nineteenth- and early twentieth-century business records of planters in the Pacific were not kept or have not survived, a few exceptions notwithstanding.³³ It is very tempting to assume that the spread of the major plant pests, such as the coconut scale insect and, later, the rhinoceros beetle (*Oryctes rhinoceros*) are due to uncontrolled movement of infested plant matter by traders but that oversimplifies the matter as local inter-island exchange has to also be considered as well.

The planters not only introduced plants, they also took matters into their own hands and trialled methods of biological pest control. In many cases these introductions did not cause much damage—at least not during the early periods of infestation. In such cases we can assume that most of them would have gone unreported, if not wholly unrecognized. Documentation exists only for cases that reached prominence, mainly because of their economic impact or because they are mentioned in autobiographies or reminiscences.

²⁸ Georg Fritz, 'Eine Reise nach Palau, Sonsol, und Tobl', *Dtsch. Kolonialbl.* 18 (1907), pp. 659–68.

²⁹ Hassert, 'Kolonialer Nutzwert'.

³⁰ Spennemann, 'Trial and Error'.

³¹ D. F. Waterhouse and K. R. Norris, 'Chapter 8: *Aspidiotus destructor* Signoret', in D. F. Waterhouse and K. R. Norris (eds), *Biological control Pacific prospects* (1987), pp. 62–71.

³² Spennemann, 'Trial and Error'.

³³ Dirk H. R. Spennemann, 'The deBrum Library on Likiep Atoll as an example of Private Library Development in Micronesia at the turn of the Nineteenth Century', *J. Pac. Stud.*, 28 (2005), pp. 310–27; Jon O'Neill and Dirk H. R. Spennemann, *Conservation Assessment of the Joachim De Brum House. Likiep Atoll, Republic of the Marshall Islands* (Johnstone Centre of Parks, Recreation and Heritage Report, 151, 2000).

From Samoa we have examples where planters introduced viruses and bacterial cultures to destroy what they considered to be vermin. A good example is the introduction of avian cholera, which devastated the flying fox populations between 1893 and 1896.³⁴ The indiscriminate use, of course, had side effects, killing domestic fowl populations as well as native fruit doves. Little is known about the period of virulence and its long-term effect, but the disease seems to have run its course.

Of all the German colonies in the Pacific, Yap was the first to suffer from introduced plant diseases, and to suffer from them for the longest time. Using the case of coconut scale insects, the remainder of this paper draws on published and unpublished government reports, and newspaper articles as well as items in contemporary professional publications, to provide the first detailed examination of pest control in German Micronesia, and the first account of the beginnings of biological pest control in the Pacific outside Australia and New Zealand. It is a story of individual agency and international connections, how an ever-more desperate colonial administration struggled to control the outbreak with its actions ever-more intrusive on the life of the Yapese.

IV

The coconut scale insect (*Aspidiotus destructor* Signoret [1869]), also known as 'transparent scale', is very small, measuring 1.5 to 2mm in diameter (Figure 3).³⁵ It infests a range of host species and damages them by sucking out plant sap, leading to a yellowing of the leaves (colloquially often called 'fronds'), resulting in reduced photosynthesis and thus reduced productivity of the plant. In severe cases the infestation can be so extensive as to lead to the death of the plant. The sheltered underside of leaves is preferred, but the adult females have been observed on the upper side of leaves, the rachis and even on young drupes.³⁶ Juvenile insects ('crawlers') are dispersed by flying insects, birds, flying foxes, and, to a lesser extent, extreme winds (e.g. storms and cyclones/typhoons). Dispersal can also occur on the clothing of plantation workers.³⁷ Given the size of the insect, especially that of single juveniles, an infestation by coconut scale insect may not be recognized in its early stages, in particular when the infested palms are old and thus tall. It can then only be noted once the infestation has become so severe that the palms exhibit extensive yellowing.³⁸

³⁴ Dirk H. R. Spennemann and Gary J. Wiles, 'A historical attempt to control flying foxes in Samoa with an introduced disease', *Aust. Mammal.* 23 (2002), pp. 177–9.

³⁵ Victor Signoret, 'Essai sur les cochenilles (Homoptères-Coccides), 4ème partie', *Ann. Soc. Entomol. Fr.* 9 (1869), pp. 109–38.

³⁶ Waterhouse and Norris, '*Aspidiotus destructor*', p. 63; M. Ramsden, J. McDonald, and F. Ross Wylie, *Forest pests in the South Pacific region: A review of the major causal agents of tree disorders. ACIAR Project FST/2001/045: Development of Forest Health Surveillance Systems for South Pacific Countries and Australia 2002*;

Sad N. Lal, 'Coconut Stick Insect *Aspidotus destructor* Signoret (Hemiptera: Dispididae)', Pest Advisory Leaflet (Secretariat of the Pacific Community, Plant Protection Service) 38 (2004); T. H. C. Taylor, 'The campaign against *Aspidiotus destructor* Sign., in Fiji', *Bull. Entomol. Res.* 26 (1935), pp. 1–102; Paul Preuß, 'Über Schädlinge der Kokos-Palme', *Tropenpfl.* 15 (1911), pp. 60–91.

³⁷ Waterhouse and Norris, '*Aspidiotus destructor*', p. 63; R. W. Paine, 'Economic importance of *A. destructor* in Fiji prior to 1928', *Bull. Entomol. Res.*, 26 (1935), pp. 8–11.

³⁸ While the coconut scale insect has reached infamy as a major pest on coconut palms (*Cocos nucifera*), the

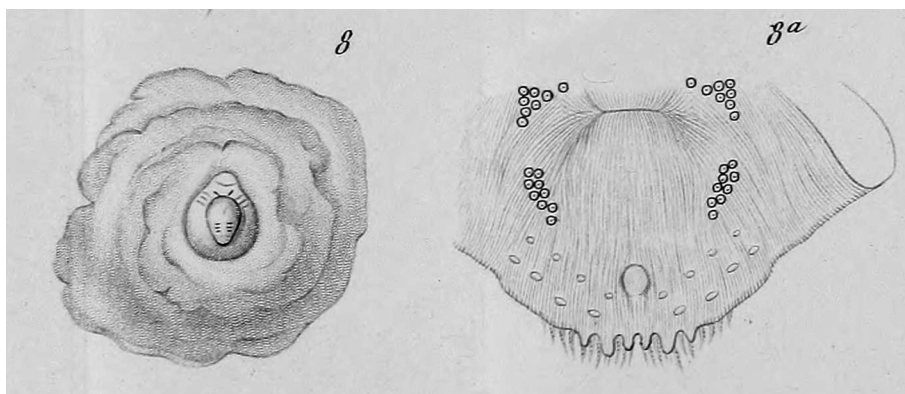


FIGURE 3. The coconut scale insect (*Aspidiotus destructor*).

Source: V. Signoret, 'Essai sur les cochenilles (Homoptères-Coccides)', 4ème partie, *Annales de la Societe Entomologique de France* 9 (1869), pp. 109–38, plate III illustrations 8 and 8a.

The presence of the coconut scale insect was recognized during the first inspection of the newly acquired colony of Yap in late 1899 by the German botanist Georg Volken (Figure 4).³⁹ While the cause of the problem was easily observable, the German administration struggled to identify the underlying conditions. Georg Volken, reportedly stated that 'this disease, like all other diseases that do not affect the roots, will eventually die down'.⁴⁰ That was an overly optimistic assessment and was not borne out by Volken's own assessment in 1901.⁴¹ As will become clear later, the spread of the infestation might well have been stopped or at least slowed if concerted efforts had been made as soon as Volken noted it. It is likely that his initial assessment set in train a sense of complacency, especially as other matters would have occupied Senfft's mind.

As it was noted that ants were actively spreading aphids, it was assumed that ants had to be regarded as one of the main vectors.⁴² This was a complete misunderstanding of

Note 38 continued

insect thrives on a wide range of host species. In the Micronesian setting it encompasses a range of traditional and semi-traditional food plants, as well as numerous introduced species. It also attacks forest trees such as *Barringtonia* and *Calophyllum*, as well as ornamental plants such as roses: Waterhouse and Norris, '*Aspidiotus destructor*', p. 63; Paine, '*Aspidiotus destructor* in Fiji'; Mohammad Tabibullah and Bernardo F. Gabriel, 'Biological study of *Aspidiotus destructor* Signoret in different coconut varieties and other host plants', *Philippine Entomologist*, 2 (1973), pp. 409–26; Ramsden, McDonald, and Wylie, *Forest pests*; Waterhouse and Norris, '*Aspidiotus destructor*', p. 63.

³⁹ The vast majority of sources drawn for this analysis use the German contemporary colloquial terminology. In the German colonial reports the coconut scale insect

is referred to as the '*Schildlaus*' ('scale insect') and infestation with scale insects as '*Schildlauskrankheit*' ('scale insect disease'). As some of the scale insects are quite indistinguishable to the untrained eye (even though the actual coconut scale insect tends to be quite translucent) there may be some inaccuracies in the actual species attributions. This is borne out in the case of Nauru.

⁴⁰ Reichskolonialamt, 'Denkschrift über die Entwicklung des Schutzgebietes von Deutsch Neu Guinea, einschliesslich des Inselgebietes der Karolinen, Palau, und Marianen im Jahre 1899/1900', *Stenographische Berichte über Verhandlungen des Reichstages*, X. Legislaturperiode, 1. Session, 1898/1900. 1. Anlageband (1900), pp. 1002–10.

⁴¹ Volken, '*Schildlauskrankheit*'.

⁴² Reichskolonialamt, 'Jahresbericht 1898/1900', p. 1002.



FIGURE 4. George Volkens in 1900.

Source: Anonymous, 'Georg Volkens', *Deutsche Kolonialzeitung* 17(44) (1900), p. 504.

the causalities. Ants were not spreading the scale insects but were removing predators of the coconut scale insect, thereby aiding in their establishment.⁴³ Ten years after taking possession of Yap, the German administration had to acknowledge that they were no closer to understanding the causalities. The annual report notes an apparent correlation between the level of infestation and the age of the plants, as well as the quality of the soils. Older palms and palms on poorer soils seemed to be most affected. The report concluded that the soil needed to be manured and tended.⁴⁴ The fact that the Eastern Caroline Islands did have a high infestation with scale insects, but seemed to experience only limited reduction in copra production, was attributed to the fact that, compared to Yap, Pohnpei did not suffer from drought and thus that the impact of the scale insect on sap flow was limited. In addition, it was falsely assumed that the heavy rainfall would wash many insects off the leaves.⁴⁵ Similarly, in Yap it was observed that the high rainfall period seemingly reduced the level of infestation.⁴⁶ While scale insects are unlikely to be dislodged by rainfall, especially as they tend to infest the underside of leaves, heavy rainfall may affect juvenile crawlers. Modern analyses of the infestations with coconut scale insects have indeed shown that infestations increase during dry periods and during periods of drought, while wet periods tend to reduce the level of activity and infestation.⁴⁷

According to a report by Arno Senfft, the 'coconut palm disease', the infestation with coconut scale insects, had been on record on Yap since about 1892, when it was introduced

⁴³ Lal, 'Coconut Stick Insect'.

⁴⁴ Reichskolonialamt, *Denkschrift über die Entwicklung der Schutzgebiete in Afrika und der Südsee 1909/10* (Berlin, 1910).

⁴⁵ Reichskolonialamt, *Jahresbericht 1909/10*.

⁴⁶ Kolonialamt, *Denkschrift über die Entwicklung der deutschen Schutzgebiete in Afrika und in der*

Südsee 1902/1903, *Stenographische Berichte über Verhandlungen des Reichstages XI. Legislaturperiode, 1. Session, 1. Sessionsabschnitt, 1903/1904. I. Anlageband* (1903), pp. 131–4.

⁴⁷ Waterhouse and Norris, 'Aspidiotus destructor', p. 65.

from the Philippines, possibly on infested kava roots, or, more likely, on infested coconut leaves woven into carry baskets.⁴⁸

The infestation gained a firm hold and was spreading. In late November 1899 and early 1900 Volkens carried out an in-depth examination of the agricultural potential of Yap and noted an extensive mortality of host palms.⁴⁹ In his desktop review of the annual report for 1900/01 the geographer Hans Singer stressed the observation that in the southern and south-western districts of the island up to 45 per cent of the palms had died due to infestation.⁵⁰ The annual report notes that not just palms, but also other plants, especially fruit trees, were affected. In some areas all fruit trees were destroyed.⁵¹ The annual report for FY1904/05 noted that the infestation had progressed unabated, mainly attacking older palms.⁵² Two years later the coconut scale insect was found across the entire island of Yap.

Yap was the traditional power centre in the Western Carolines, with extensive networks of tribute and mutual obligations (*sawei*) reaching deep into the Central Caroline atolls, as well as Palau, and even the Philippines.⁵³ Not surprisingly, Yap became the prime dispersal node as many goods were transported in baskets woven from coconut leaves. The insect readily spread from Yap to several outlying atolls: in 1901 it was reported from Elato, Oleai, Satawal and Lamotrek (Map 1).⁵⁴

The coconut scale insect was reputedly accidentally introduced to Palau in the mid- to late 1890s.⁵⁵ Esaki, according to oral information obtained in the 1920s, claimed that a chief from Peleliu brought betel nut from Yap in 1899.⁵⁶ Internal Palauan communications and exchange of goods and foods ensured that by 1904 the pest had spread northwards and severely affected

⁴⁸ Kolonialamt, 'Teil FII. Deutsch Neu-Guinea, Inselgebiet. Denkschrift über die Entwicklung der deutschen Schutzgebiete in Afrika und in der Südsee 1900/1901', *Stenographische Berichte über Verhandlungen des Reichstages X. Legislaturperiode, 2. Session, 1900/1902. V. Anlageband* (1901), pp. 2948–53; Kolonialamt, 'Denkschrift über die Entwicklung der deutschen Schutzgebiete in Afrika und in der Südsee 1901/1902', *Stenographische Berichte über Verhandlungen des Reichstages X. Legislaturperiode, 2. Session, 1900/1903. VIII. Anlageband* (1902), pp. 5301–11.

⁴⁹ Volkens, 'Schildlauskrankheit'.

⁵⁰ Reichskolonialamt, 'Jahresbericht 1898/1900', p. 1002; Hans Singer, 'Die deutschen Schutzgebiete in der Südsee im Jahre 1900', *Globus*, 76 (1901), pp. 343–45; Hassert, 'Kolonialer Nutzwert'.

⁵¹ Reichskolonialamt, 'Jahresbericht 1898/1900', p. 1002.

⁵² Kolonialamt, 'Denkschrift über die Entwicklung der deutschen Schutzgebiete in Afrika und in der Südsee 1904/1905', *Stenographische Berichte über Verhandlungen des Reichstages XI. Legislaturperiode, 2. Session, 1. Sessionsabschnitt, 1905/1906, IV. Anlageband* (1905), p. 2641–747.

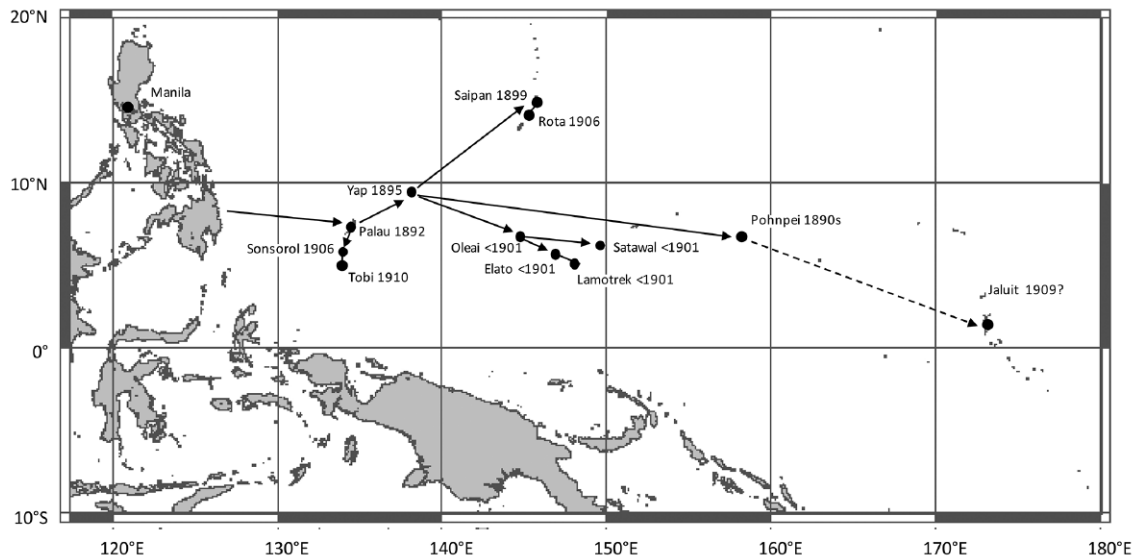
⁵³ Central Carolines: Mark L. Berg, 'Yapese politics,

Yapese money and the Sawei tribute network before world war I', *J. Pac. Hist.*, 27 (1992), pp. 150–64; R. L. Hunter-Anderson and Y. Zan, 'Demystifying the Sawei, A Traditional Interisland Exchange System', *ISLA: J. Micronesian Stud.* 4 (1996), pp. 1–45; Palau: Scott M. Fitzpatrick, 'Maritime interregional interaction in Micronesia: Deciphering multi-group contacts and exchange systems through time', *J. Anthropological Arch.* 27 (2008), pp. 131–47; Philippines: C. Descantes, H. Neff, and M. D. Glascock, 'Yapese prestige goods: the INAA evidence for an Asian dragon jar', in M. D. Glascock (ed.), *Geochemical evidence for long-distance exchange* (2002), pp. 229–56.

⁵⁴ Kolonialamt, 'Jahresbericht 1901/02'.

⁵⁵ Kolonialamt, 'Jahresbericht 1900/01'; Kolonialamt, 'Jahresbericht 1901/02'; Richard Deeken, *Die Karolinen. Nach eigenen Reisebeobachtungen, älteren Monographien und den neuesten amtlichen Berichten*, 24, (1912), p. 84.

⁵⁶ Teiso Esaki, 'Notes and records of some important pests of Micronesia mostly introduced during the period under Japanese mandate', in Teiso Esaki (ed.), *Proc. Ninth Int. Congress of Entomology, Amsterdam, Netherlands, August 17–24, 1951 Hague, Netherlands* (1952), pp. 813–18.



MAP 1. Spread of the coconut scale insect in Micronesia, 1892–1914

Koror.⁵⁷ The following year the infestation seems to have approached substantial proportions,⁵⁸ but does not seem to have reached the catastrophic impact it had on Yap.⁵⁹ The insect was so damaging, however, that it was given its own Palauan name: *togpog* or *topkapk*.⁶⁰ A possibly separate introduction to Babeldaob occurred prior to 1908, when a steamer operated by the West-Karolinen Gesellschaft imported betel nut from Yap to Palau.⁶¹

Given the traditional obligations of tribute and exchange and the resultant inter-island travel, it was only a question of time until the infestation also spread to the outlying atolls of Palau. While the southern atolls of Sensorol and Tobi were free from infestation in 1902, the coconut scale insect was found on Sensorol by 1906, and on Tobi by 1910.⁶²

An independent introduction of the insect occurred in the Mariana Islands. It is likely it was introduced on Saipan in May 1899 when Filipino garrison troops were moved there from Manila

⁵⁷ Arno Senfft, 'Bericht über eine Reise nach den Palau Inseln vom 18. Juli bis 22. August 1904', *Dtsch. Kolonialbl.*, 16 (1905), pp. 49–52; Kolonialamt, 'Jahresbericht 1904/05'.

⁵⁸ Reichskolonialamt, 'Denkschrift über die Entwicklung der deutschen Schutzgebiete in Afrika und in der Südsee 1905/1906', *Stenographische Berichte über Verhandlungen des Reichstages XII. Legislaturperiode, 1. Session*, 239 (1906), pp. 23–89.

⁵⁹ Fritz, 'Reise'.

⁶⁰ *Togpog*: Fritz, 'Reise'; *topkapk*: Augustin Krämer, *Palau. Ergebnisse der Südsee-Expedition 1908–10. Abteilung VII: Geschichten und Gesänge. Abteilung VIII: Botanischer, Zoologischer und Palauwörter-Index* (5 vols,

1929), IV, p. 337.

⁶¹ Esaki, 'Pests of Micronesia'.

⁶² Arno Senfft, 'Ein Besuch auf der Insel Tobi', *Völkerschau: illustrierte Monatsschrift*, 2 (1902), pp. 321–23; Sensorol: Reichskolonialamt, 'Deutsch Neu-Guinea, Inselgebiet. Denkschrift über die Entwicklung der Schutzgebiete in Afrika und der Südsee im Jahre 1906/07', *Stenographische Berichte über Verhandlungen des Reichstages XII. Legislatur-Periode I. Session. Anlagen zu den Stenographischen Berichten*, 245 (1907), pp. 4117–58; Tobi: Fritz, 'Reise'; Alwin Buse, 'Bericht des Kaiserlichen Regierungsrates Dr Buse in Jap über eine Reise nach den südlich von Palau gelegenen Inseln', *Amtsbl. Schutzgeb. Dtsch-Neuguinea* 3 (1911), pp. 79–80.

after Spain's defeat during the Spanish American War.⁶³ An infestation was first formally noted in late August 1903.⁶⁴ As only young palms had been infested, and the infestation was still very limited, there was hope that it might be contained, but by 1906 the infestation was also noted on Rota.⁶⁵ A second introduction to Saipan seems to have occurred in 1907 or 1908 when following the devastation wrought by the Good Friday typhoon of 1907 large numbers of people from Yap were temporarily moved to Saipan.⁶⁶ Indeed, the local Chamorro term is 'gaga Yap' (Yap insects) making the toponymic connection.⁶⁷ It would appear that the infestation went unnoticed and unchecked until the outbreak of World War I and the loss of the German colonies to Japan in October 1914. Infestation became pronounced on Saipan in 1915–16 and on Rota in 1920.⁶⁸ The insect was introduced to the southernmost of the Mariana Islands, the American territory of Guam, in 1911 but did not cause major issues.⁶⁹ Its origin is not clear. It may have come from Rota via inter-islands communication, or directly from Yap. The coconut scale insect was again introduced in c.1920, with a first major outbreak in 1924–25.⁷⁰

Further to the east, coconut scale insects were observed frequently on Pohnpei (formerly 'Ponape') in the Eastern Carolines, on coconuts, other fruit trees and on ornamental plants.⁷¹ While they affected coconut plantations in large numbers, they did not cause major damage to copra production.⁷² The extent of infestation reported in 1902 suggests an introduction, well pre-dating the German period. As Pohnpei is outside the range of Yapese trading contacts and exchange networks, we have to assume that this infestation occurred during the Spanish period, subsequent to the establishment of the Spanish military garrison in 1886 with its ongoing contacts with the Philippines as well as with Yap.⁷³

The commencement of a reliable mail steamer service from 1905 onwards, using the copra steamer *Germania*, facilitated inter-island communication beyond the reach of the Yapese system.⁷⁴ By 1908, the insect had spread to Nauru, severely impacting the coconut production there.⁷⁵ As there are no traditional connections between Yap/Palau and Nauru, we have to

⁶³ Spennemann, *Edge of empire*, 13ff; Esaki, 'Pests of Micronesia', claims this occurred in 1911, but mixes this in with 1907 and 1908.

⁶⁴ Arno Senfft, 'Reise des Bezirksamtmannes Senfft in Yap nach den Westkarolinen', *Dtsch. Kolonialbl.*, 15 (1904), pp. 12–14; Stanislaus von Prowazek, *Die Deutschen Marianen. Ihre Natur und Geschichte* (1913), 93.

⁶⁵ Reichskolonialamt, 'Jahresbericht 1906/07'.

⁶⁶ Spennemann, *Melimele*; Spennemann, *Edge of empire*, pp. 197 ff.

⁶⁷ Esaki, 'Pests of Micronesia'.

⁶⁸ Ibid.

⁶⁹ S. R. Vandenberg, 'Report of the Entomologist', *Guam Agricultural Experiment Station Report*, 1925 (1926), pp. 17–20 [not seen]; not mentioned in W. H. Weston, 'Report on the plant disease situation in Guam', *Guam Agricultural Experiment Station Report* 1917 (1917), pp. 45–62.

⁷⁰ Esaki, 'Pests of Micronesia'; A. B. Clifford, 'The coconut scale', *Guam Recorder* 11 (1934), p. 80;

C. W. Edwards, 'Method of controlling the coconut scale (*aspidiotus destructor*)', *Guam Recorder* 1 (1924), p. 4.

⁷¹ Kolonialamt, 'Jahresbericht 1901/02'.

⁷² Viktor Berg, 'Jahresbericht über die Entwicklung des Inselgebietes der Ost-Karolinen in der Zeit vom 1. April 1901 bis zum 31. März 1902, 1902, Record Series G1, file 126, German Colonial Archives Rabaul. Jahresberichte Ponape 1900–1907, National Archives of Australia.

⁷³ Hezel, *First taint of civilization*.

⁷⁴ Dirk H. R. Spennemann, 'Time table and brief history of service of the Jaluit Gesellschaft Mail Steamer Germania 1904–1914: A contribution to the communications history of Micronesia', *Micron. J. Human. Soc. Sci.* 4 (2005), pp. 158–75.

⁷⁵ A. Müller, 'VI. Karolinen und Marshall-Inseln. C. Marshall-Inseln. 2 Nauru', *Medizinal-Berichte über die Deutschen Schutzgebiete für das Jahr 1908/09* (1910), pp. 452–54.

assume that the insect was inadvertently spread by workers from Palau and the Carolines who had been recruited to work in the developing phosphate mines on Nauru.⁷⁶

The government itself also may have inadvertently aided in the dispersal, since as early as 1900 Senfft sent samples of diseased leaves to both Fritz in Saipan and Hahl in Pohnpei to warn them about the plant pest.⁷⁷ In 1901 additional samples of diseased palm leaves were sent from Yap to the German administration at Herbertshöhe (Kokopo, near Rabaul, New Guinea) and from there on to the German consul in Batavia (Jakarta), with the request to have the disease identified by the Botanic Gardens in Buitenzorg, then in the Dutch East Indies (now Bogor, Indonesia).⁷⁸ Given that the coconut scale insect is also spread on the clothing of workers, one wonders about the quarantine issues that this may have entailed. We are uninformed as to how the samples were packaged. Given the lack of traditional contacts with Yap or the Philippines, the first record of infestation with coconut scale insect in German New Guinea may be an indication of this. In 1908 it was reported from the Duke of York Group, from Nanuk and from Matupit, all near Rabaul on New Britain, for 1908.⁷⁹ Subsequently, Preuß mentioned that he observed palms in the Bismarck Archipelago being affected, but that the insect seemed to cause far less damage than it did on Yap.⁸⁰

V

In his assessment of the agronomic potential of the island in 1899 and 1900, Volkens rightfully considered the coconut scale insect a threat to the copra industry.⁸¹ Even though the German administrator of the district, Arno Senfft, undertook steps to minimize the impact (discussed below), the infestation continued to engulf the island. By 1904/05 the coconut scale insect was found across the entire island of Yap and it led to a collapse of the once-thriving copra production on Yap, with a concomitant reduction in trading profits.⁸² If it were to spread to the outer atolls or gain hold on Palau, the insect threatened to severely affect the productivity of palms throughout the entire Western Carolines district⁸³

Thus, when the deputy administrator of Yap, Georg von Heynitz, counselled in November 1904 that Yap did not provide much opportunity for German entrepreneurs to invest in

⁷⁶ A. Müller, 'Eine epidemisch auftretende Erkrankung des Nervensystems auf Nauru', *Arch. Schiffs. Tropenhyg.* 14 (1910), pp. 535–43.

⁷⁷ Kolonialamt, 'Jahresbericht 1900/01'.

⁷⁸ Rudolf von Bennigsen, Imperial Governor von Bennigsen to German Consul in Batavia, dated Herbertshöhe 18 August 1901, Aug 18 1901, Record Series G1, file 7, German Colonial Archives Rabaul, 'Allgemeine Verwaltung Yap'. National Archives of Australia.

⁷⁹ Karl Rudolph, 'Obergärtner Rudolph berichtet über eine Dienstreise nach den Inseln Nanuk und Palakuvur (23.–27. Februar 1909)', *Amtsbl. Schutzgeb. Dtsch-Neuguinea*, 1 (1909), pp. 87–88; Carl Brick, 'XIV. Bericht über die Tätigkeit der Abteilung Pflanzenschutz für die Zeit vom 1. Juli 1911 bis 30. Juni 1912.

Planzenschädigungen aus außerdeutschen Länder und aus deutschen Kolonien', *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten*, 39 (1912), pp. 248–52.

⁸⁰ Preuß, 'Über Schädlinge der Kokos-Palme', p. 86.

⁸¹ Volkens, 'Schildlauskrankheit'.

⁸² Georg Eberhard von Heynitz, 'Nachrichten aus dem Kameradenkreise. Briefe von Kameraden. Karolinen 5 November 1904', *Dtsch. Kulturpionier* 5 (1904), pp. 46–47.

⁸³ Reichskolonialamt, 'Jahresbericht 1906/07'; Anon., 'Aussenhandel der West-Karolinen, Palau und Marianen im Kalenderjahre 1907 im Vergleich mit dem Handel im Kalenderjahre 1906', *Dtsch. Kolonialbl.* 19 (1908), pp. 806–09.

tropical agriculture as the coconut scale insect severely limited production prospects,⁸⁴ he mainly referred to the outer islands.

The annual report for 1906/1907 expressed the concern that the entire coconut production could come to an end within one or two years.⁸⁵ In the beginning, even when the coconut scale insect severely limited production, the resulting loss of cash income did not severely affect the Yapese community as their reliance on agricultural production still allowed for a strong subsistence economy.⁸⁶ The combined effects of coconut scale insect and the typhoon of March 1907, however, impacted coconut production to such a degree that the district administration on Yap had to prohibit all export of copra to prevent starvation.⁸⁷ Suddenly, the sole source of cash for the Yapese community had dried up. The annual report for 1907 expressed the concern that the entire coconut production could come to an end within one or two years.⁸⁸ Nothing had changed by the end of 1908, with the government conceding that all attempts at containment had failed.⁸⁹

Any loss of productivity undermined the overall economic viability of the colony, especially from the viewpoint of the colonial power. There was the risk that the wider public might then question the wisdom of acquiring such colonies. It may also have damaged the reputation of the German administration in the eyes of the Yapese, showing the administration to be fallible.

VI

If the coconut scale insect had been introduced to Yap in 1892, we have to ask why the Spanish administration, which was in charge until late 1899, had not taken action? On the one hand we need to consider the time lag between infestation and the point when it literally becomes a visible problem. On the other hand, the Spanish administrative presence on Yap was limited and primarily concerned with 'flying the flag' and keeping competitors, such as the Germans, out.⁹⁰

The German administration had come to stay, and to make the colony pay. Thus, given the economic impact wrought by the coconut scale insect, it is no wonder that concerted efforts were made to control its spread and reduce its impact. To control the spread of the plant pest, a range of methods were used, from the destruction of the infested matter to fumigation, to the application of insecticides and the introduction of biological predators. In addition to the practical methods, an attempt was made to control and contain the spread of the coconut scale insect through government regulation, enforcement and penalties.

⁸⁴ Von Heynitz, 'Nachrichten aus dem Kameradenkreise'.

⁸⁵ Reichskolonialamt, 'Jahresbericht 1906/07'.

⁸⁶ Fritz, 'Reise'.

⁸⁷ Reichsmarineamt, *Forschungsreise S.M.S. Planet 1906/07*, I, Reisebeschreibung (1909); id., *Typhoons in Micronesia*; id., *Melimel*.

⁸⁸ Reichskolonialamt, 'Jahresbericht 1906/07'.

⁸⁹ Reichskolonialamt, 'Deutsch Neu-Guinea, Insel-

gebiet. Denkschrift über die Entwicklung der Schutzgebiete in Afrika und der Südsee im Jahre 1908/09', *Stenographische Berichte über Verhandlungen des Reichstages XII. Legislatur-Periode, 2 Session. Anlagen zu den Stenographischen Berichten* 271 (1909), pp. 4117–58.

⁹⁰ Francis X. Hezel, *Strangers in their own land. A century of colonial rule in the Caroline and Marshall Islands* (1995).

The first technical advice was furnished by the German botanist Georg Volkens who examined the infestation on Yap in late 1899 and early 1900.⁹¹ He recommended that the infested plants be sprayed with a Bordeaux mixture.⁹² Volkens' recommendation was a proverbial stab in the dark, akin to selling 'snake oil'.⁹³ Bordeaux mixture had been found to be effective at preventing mildew on vines and fruit trees and was peddled as a generic go-to approach, particularly as it had no obvious unwanted side-effects. It was never trialled in Yap, however, because the required ingredients could not be procured due to infrequent shipping connections. Volkens also questioned whether his own suggestions might actually be practical given the height of the palms, some of which were 20m tall.⁹⁴ One wonders whether Volkens felt compelled to be seen in control and to recommend something – where anything would do.

Even though administratively the districts of Pohnpei, Saipan and Yap were subordinate to the Governor of German New Guinea, the realities of inter-island shipping meant that they had considerable latitude in decision-making. Consequently, there was no concerted, orchestrated effort to contain the spread of coconut scale insect. Essentially, Senfft, whose district was the main one affected, had to fight his own battles.

Faced with the impact of the coconut scale insect on the copra production of Yap and thus the economic viability of the colony, Senfft had to take – and be seen to take – decisive action. Senfft had been provided by Volkens with suggestions that were not practical, but also with a potentially dangerous belief that the infestation would eventually run its course.⁹⁵ In the absence of any real technical guidance, Senfft chose a multi-pronged approach: limiting the spread of the infestation in practical as well as administrative ways, and trying to eradicate an infestation primarily by chemical means and soliciting external expert advice.

In the absence of any scientific understanding of the life cycle and ecology of the coconut scale insect, any measure short of a total removal and destruction of all affected palms was a mere stab in the dark. Consequently Senfft tried everything in the traditional playbook.

A major concern, of course, was that the coconut scale insect might spread from Yap and Palau to islands that had hitherto not been affected. Thus as a first measure, Senfft passed a government ordinance at the end of June 1900 that tried to prevent the spread of coconut scale insect ('Verordnung zur Verhütung des Weiterverbreitens der Schildlauskrankheit') (Table 1). This stipulated that palm materials could not be exported from Palau and Yap.⁹⁶ At that time, the other districts of Micronesia were not concerned, nor was German New Guinea itself.⁹⁷

⁹¹ Volkens, 'Schildlauskrankheit'.

⁹² Bordeaux mixture is a mixture of copper(II) sulphate (CuSO₄) and slaked lime (Ca(OH)₂) used as a fungicide which is sprayed on the plants primarily as a preventative against mildew on vines and fruit trees. It is also widely used to control potato blight, peach leaf curl and apple scab. It has no efficacy as an insecticide.

⁹³ I am indebted to an anonymous reviewer for this analogy.

⁹⁴ Volkens, 'Schildlauskrankheit'.

⁹⁵ Ibid.

⁹⁶ The ordinance was repealed in July 1908 and substituted by a new regulation which extended the reach to all plant matter.

⁹⁷ There the first formal regulation prohibiting the trade in coconuts was purely directed at controlling and regulating the copra trade for economic reasons: Rudolf von Bennigsen, 'Verordnung des Gouverneurs von Deutsch-Neu-Guinea, betreffend den Handel mit Kokosüssen im Schutzgebiete Deutsch-Neu-Guinea mit Ausschluss des Inselgebietes der Karolinen, Palau und Marianen', in Rudolf von Bennigsen (ed.), *Die deutsche*

TABLE 1. Chronology of directives and ordinances regarding the control of coconut pests in the districts of German Micronesia and New Guinea

Date		Title	Yap	Palau	Marianas	Chuuk	Pohnpei	Marshall's	New Guinea
1900, 29 Jun	government ordinance	Verordnung zur Verhütung des Weiterverbreitens der Schildlauskrankheit*	✓						
1904, 4 Aug	verbal directive	Anweisung des Kaiserlichen Bezirksamtmanns in Jap betreffend Bekämpfung der Schildlauskrankheit		✓					
1905, 8 Nov	verbal directive	Anweisung des Stationsleiters von Palau betreffend Bekämpfung der Schildlauskrankheit		✓					
1907, 7 Oct	police order	Polizeiverfügung des Stationsleiters von Palau, betreffend Bekämpfung der Schildlauskrankheit		✓					
1908, 1 Jul	government ordinance	Verordnung des Kaiserlichen Bezirksamtmanns in Jap, betreffend Verhütung der Weiterverbreitung der Schildlauskrankheit	✓	✓					
1908, Oct 30	government directive	Erlass des Gouverneurs von Deutsch Neuguinea betreffend Bekämpfung der Schildlauskrankheit							✓
1908, 29 Dec	government ordinance	(Polizei-)Verordnung des Bezirksamts zu Jap, betreffend Bekämpfung der Schildlauskrankheit		✓					
1909, 27 May	government ordinance	Polizei-Verordnung des Bezirksamtmanns von Jaluit betreffend Bekämpfung der Schildlauskrankheit						✓	
1911, 14 Jun	government regulations	Vorschriften für die Ernte von Kokosnüssen für den Bezirk der Westkarolinen, Marianen und Palau Inseln	✓	✓	✓				

* not formally published

Sources: Senfft, 'Verordnung des Bezirksamts von Yap, betreffend Bekämpfung der Schildlauskrankheit vom 29. December 1908'; Anon., 'Vorschriften für die Ernte von Kokosnüssen für den Bezirk der Westkarolinen, Marianen und Palau Inseln', *Deutsches Handels-Archiv. Zeitschrift für Handel und Gewerbe* (1911), p. 1675; Albert Hahl, 'Verordnung des Gouverneurs von Deutsch-Neuguinea betreffend Kokosnüsse, vom 14. Juni 1911', *Dtsch. Kolonialbl.* 22 (1911), p. 739; Johannes Gerstmeyer and Otto Köbner, *Die deutsche Kolonialgesetzgebung. Sammlung der auf die deutschen Schutzgebiete bezüglichen Gesetze, Verordnungen, Erlasse, und internationale Vereinbarungen mit Anmerkungen und Sachregister*, vol. 14. Berlin, (1910), p. 269; Gerstmeyer and Köbner, *Die deutsche Kolonialgesetzgebung. Sammlung der auf die deutschen Schutzgebiete bezüglichen Gesetze, Verordnungen, Erlasse, und internationale Vereinbarungen mit Anmerkungen und Sachregister*, pp. 12, 235, 560; Arno Senfft, 'Polizei-Verordnung [betreffend Bekämpfung der Schildlauskrankheit vom 29. December 1908]', *Amtsbl. Schutzgeb. Dtsch-Neuguinea*, 1 (1909), p. 7; Wilhelm Stuckhart, 'Polizeiverordnung [betreffend Bekämpfung der Schildlauskrankheit] vom 27. Mai 1909', *Amtsbl. Schutzgeb. Dtsch-Neuguinea* 1 (1909), pp. 117–18; Anonymous, 'Koloniales Gesetze und Verordnungen in Jahre 1908', *Zeitschrift für Kolonialpolitik, Kolonialrecht und Kolonialwirtschaft* 11 (1908), pp. 349–69; Arno Senfft, 'Verordnung des Kaiserlichen Bezirksamtmanns in Jap, betreffend Verhütung der Weiterverbreitung der Schildlauskrankheit vom 1. Juli 1908', *Dtsch. Kolonialbl.* 19 (1908), p. 996.

Also in 1900 Senfft had the entire island of Yap fumigated 'from one end to the other'.⁹⁸ That process, which was repeated in January 1901,⁹⁹ essentially assumed that smoke would either kill the insects or drive them away (but where they might go was not discussed). There are no details on the techniques used. The fumigation ('abräuchern') may well have been limited to normal smoke generation using wet plant matter rather than using 'proper' insecticides. It would appear that the method was not successful.¹⁰⁰ Even though the success of the measure was not clear, Senfft ordered that the whole island again be treated in this way the following year.¹⁰¹ Senfft noted that this is 'the only toilsome job that is only possible with the aid of the natives themselves'. To combat the coconut scale insect, Senfft operated with military precision: 'Every village has to mark out lines from the coast to the non-infected interior and an east to west direction, with inflammables, which are simultaneously lit at a smoke and horn signal given from the mountains. Various chiefs certify that improvements can be observed; meanwhile it is advisable to reserve judgement, for the disease wanders a good deal, it leaves plants, but also often returns'.¹⁰²

Senfft also solicited technical advice from fellow administrators and professionals. As early as 1900 he had sent samples of diseased leaves to his fellow administrators, Georg Fritz in Saipan and Albert Hahl in Pohnpei (later Herbertshöhe, New Britain) to warn them about the plant pest.¹⁰³ In 1901 Senfft, following official channels, requested that the Imperial Foreign Office make formal enquiries at the Botanic Gardens in Buitenzorg, to investigate whether the Dutch had developed techniques to combat the disease. As mentioned above, samples of diseased palm leaves were sent to Herbertshöhe and from there on to the German consul in Batavia (Jakarta), with the request to have the disease identified.¹⁰⁴

In 1902, Senfft needing further technical advice directly contacted Leo Zehntner, an entomologist in Salatiga (Java, Indonesia) who had authored a series of descriptive articles on scale insects affecting sugar cane.¹⁰⁵ Like the advice Senfft had earlier received from Albrecht Zimmermann, the director of the Kaiserlich Biologisch-Landwirtschaftlichen Institutes in Amani in German

Note 97 *continued*

Kolonialgesetzgebung. Sammlung der auf die deutschen Schutzgebiete bezüglichen Gesetze, Verordnungen, Erlasse, und internationale Vereinbarungen mit Anmerkungen und Sachregister. Sechster Teil 1901 bis 1902 (1903), p. 221.

⁹⁸ Volkens, 'Schildlauskrankheit'.

⁹⁹ Arno Senfft, Letter to Imperial Governor von Bennigsen in Herbertshöhe, dated Yap 3 January 1901, Jan 3 1901, Record Series G1, file 7, German Colonial Archives Rabaul, Allgemeine Verwaltung Yap, National Archives of Australia; Kolonialamt, 'Jahresbericht 1901/02'.

¹⁰⁰ As predicted by Volkens, 'Schildlauskrankheit'.

¹⁰¹ Kolonialamt, 'Jahresbericht 1900/01'.

¹⁰² Ibid.

¹⁰³ Ibid.

¹⁰⁴ Bennigsen, Imperial Governor von Bennigsen to German Consul in Batavia, dated Herbertshöhe 18 August 1901.

¹⁰⁵ Leo Zehntner, 'De plantenluizen van het Suikerriet op Java. xi-xii', *Archief voor Java-Suikerindustrie* 9 (1901), pp. 577-94; Leo Zehntner, 'De plantenluizen van het Suikerriet op Java. xiii-xv', *Archief voor Java-Suikerindustrie* 9 (1901), pp. 673-94; Leo Zehntner, 'Overzicht van de Ziekten van het Suikerriet op Java', *Archief voor Java-Suikerindustrie* 5 (1897), pp. 525-75; Leo Zehntner, 'De plantenluizen van het Suikerriet op Java. IV. *Aspidiotus sacchari* caulis n. sp.', *Meded. Proefstat. Oost-Java* 39 (1897), pp. 1-10; Leo Zehntner, 'De plantenluizen van het Suikerriet op Java. II. *Chionaspis sacchari*-folii n. sp. III. *Chionaspis depressa* n. sp.', *Meded. Proefstat. Oost-Java*, 36 (1897), pp. 1-26; Leo Zehntner, 'De plantenluizen van het Suikerriet op Java. [V. VI. and VII.]', *Archief voor Java-Suikerindustrie* 6 (1898), pp. 1085-98; Leo Zehntner, 'De plantenluizen van het suikerriet op Java', *Mededeelingen van het Proefstations voor Suikerriet in West-Java te Tagok-Tegal* 37 (1898), pp. 1-14.

East Africa, it was recommended to cut off all diseased leaves except for the heart of the palm, and burn them at the base of the palm.¹⁰⁶ This equates to the removal and destruction of all infested leaf matter while using the resulting smoke for (ineffectual) fumigation. This recommendation was trialled in 1902/03 but the success was deemed to be very low.¹⁰⁷ The success rate was possibly affected by the pool of coconut scale insects on other hosts, such as fruit trees, and by the fact that mainly older, and thus much taller trees had been affected. The procedure was continued in subsequent financial years but seems to have been just as ineffective.¹⁰⁸

Senfft used his visits to the outer islands to exhort the chiefs of the various atolls to exercise vigilance regarding coconut scale infestations and employ the same treatment.¹⁰⁹ If acted upon quickly and decisively, an infestation could be mitigated and the coconut scale insect eradicated. An example of this is the atoll of Satawal in the Central Carolines, from where an infestation was reported in 1901, but found to eradicated in 1905 with no new infestation a year later.¹¹⁰ Similarly, it was reported from Lamotrek in 1901 and observed there by Senfft in September 1903 despite the trader O'Keefe's attestations to the contrary.¹¹¹ Directives on containment seem to have worked, as in 1905 only four palms were found to be affected, which Senfft directed to be cleansed with the infested leaves to be burned.¹¹²

The other treatments suggested by Zimmermann, such as the application of soap to every leaf, or the spraying of the trees with gasoline (petroleum) were impractical given the extent of the infestation and the height of the palms. It appears that some plantation owners were also privately planning to trial an unspecified remedy discovered in South America, presumably Frutolin.¹¹³

Following the successful introduction of a coccinellid species to combat cushy cotton scale (*Icerya purchasi*) in California, there was a great deal of enthusiasm during the late nineteenth century in using ladybird beetles for all manner of biological plant pest control, in particular scale insects.¹¹⁴ This was a time that Lounsbury called the 'ladybird fantasy period'.¹¹⁵ The professional press as well as newspapers were full of references on how to tackle the San Jose scale (*Quadraspidiotus perniciosus*) with ladybird beetles one of the advocated solutions.¹¹⁶ Not

¹⁰⁶ See Max Hollrung, 'Krankheiten der tropischen Nutzpflanzen', Jahresbericht über die Neuerungen und Leistungen auf dem Gebiete der Pflanzenkrankheiten 1901, 4 (1903), pp. 215–40.

¹⁰⁷ Kolonialamt, 'Jahresbericht 1902/03'.

¹⁰⁸ Kolonialamt, 'Denkschrift über die Entwicklung der deutschen Schutzgebiete in Afrika und in der Südsee 1903/1904', *Stenographische Berichte über Verhandlungen des Reichstages XI. Legislaturperiode, 1. Session, 1903/1905. 5. Anlageband* (1904), pp. 2992–9; Kolonialamt, 'Jahresbericht 1904/05'.

¹⁰⁹ For example on Ulithi and Lamotrek: Arno Senfft, 'Deutsch Neu-Guinea. Bericht des Kaiserlichen Bezirksamtmanns Senfft über seine Rundreise durch die Westkarolinen und Palau-Inseln', *Dtsch. Kolonialbl.*, 17 (1906), pp. 281–86.

¹¹⁰ Kolonialamt, 'Jahresbericht 1901/02'; Fritz, 'Reise'; Senfft, 'Rundreise', p. 284.

¹¹¹ Senfft, 'Reise nach den Westkarolinen'.

¹¹² Kolonialamt, 'Jahresbericht 1901/02'; Senfft, 'Rundreise', p. 283.

¹¹³ Kolonialamt, 'Jahresbericht 1902/03'.

¹¹⁴ Cushy cotton scale: L. E. Caltagirone and R. L. Doutt, 'The history of the vedalia beetle importation to California and its impact on the development of biological control', *Annu. Rev. Entomol.* 34 (1989), pp. 1–16.

¹¹⁵ Waterhouse and Norris, 'Aspidiotus destructor', p. 19; Charles Pugsley Lounsbury, 'The pioneer period of economic entomology in South Africa', *J. Entomol. Soc. South. Afr.* 3 (1940), pp. 9–29.

¹¹⁶ L. O. Howard and C. L. Marlatt, *The San Jose Scale: Its occurrences in the United States with a full account of its life history and the remedies to be used against it* (1896); A. L. Quaintance, *The San Jose scale and its control* (1915).

surprisingly then, based on his first-hand experience of the problem on Yap, Georg Volkens recommended the introduction of coccinellid beetles to be sourced from the Philippines as the place of the origin of the pest, or ideally from German New Guinea, presumably as matters were then kept in-house.¹¹⁷

It is ironic that one of the chief protagonists of the successful introduction of coccinellid control in California, Albert Koebele, worked in Hawai'i. While geographically almost next door, it was just as far away as Berlin as far as the mail service was concerned and we do not know to what extent he was consulted directly by Senfft or via Volkens, if at all. Volkens was not an entomologist, but must have obtained his information from colleagues in the field. At any rate, he recommended the introduction of coccinellid beetles, but did not specify which species. Volkens' recommendations were acted upon, and the first import of coccinellid beetles from German New Guinea occurred in 1901. As the beetles were shipped by administrative staff, rather than trained entomologists, the import largely failed due to high beetle mortality on the voyage. As the direct shipping service was terminated in early 1902, the importation could not be repeated the following year.¹¹⁸

Senfft seems to have been determined to obtain help from wherever he could. On occasion of his visit to Saipan in August 1903, he noted coccinellid beetles on infested fronds encountered at the Saipan government experimental farm.¹¹⁹ Senfft collected a number of these and requested that additional specimens be collected and sent from Saipan to Yap at every possible opportunity. This occurred during the following financial year. Upon receipt of the beetles, Senfft spread the insects on different parts of Yap.¹²⁰ The fate of these ladybird beetles is not recorded, suggesting that the translocation was not a success.

Eventually, beetle importations could resume with the commencement of a regular mail steamer service in 1904, which connected German Micronesia with Sydney and Hong Kong.¹²¹ In subsequent years additional specimens were obtained from German New Guinea, Australia, the Philippines and the German possessions in China.¹²² Their success was very limited, as, unbeknown to the German authorities, many species of ladybird beetles had distinct food preferences.

Concurrent with biological plant control, manual measures were continued and expanded to Palau. There the German administration aimed at indirect control and enlisted the help of the traditional Palauan leaders, the *rupaks* (chiefs). Following a meeting with all *rupaks* in August 1904 the extent of the coconut scale infestation on Palau had become clear, but it still seemed possible to control it. At the meeting, Senfft appears to have specified the removal of all affected fronds and burning them at the base of the tree.¹²³ That directive does not seem have been followed, for on November 1905 Senfft dispatched his chief of police, Wilhelm Winkler to bring the *rupaks* into line. On 8 November 1905 Winkler formally directed that all infested palm fronds were to be cut down and burnt. For that work he estimated that one hour per

¹¹⁷ Volkens, 'Schildlauskrankheit'.

¹¹⁸ Kolonialamt, 'Jahresbericht 1901/02'.

¹¹⁹ Senfft, 'Reise nach den Westkarolinen'.

¹²⁰ Kolonialamt, 'Jahresbericht 1903/04'.

¹²¹ Spennemann, 'Time table and brief history'.

¹²² reviewed in Dirk H. R. Spennemann, 'Introduction

of coccinellid beetles to control the coconut scale insect *Aspidiotus destructor* Signoret 1869 in Micronesia 1901–1914', *Orient. Insects* (2019)

¹²³ Reichskolonialamt, 'Jahresbericht 1905/06'; Senfft, 'Reise nach den Westkarolinen'

week would suffice.¹²⁴ Thus assumption was deemed quite unrealistic.¹²⁵ Indeed, it appears that Winkler's directive was studiously ignored. This is not surprising, however. After all, while copra was a cash crop that provided income, it did not have the same level of importance in the Palauan economy as it had for the German traders and administrators.

In September 1906 the visiting German district administrator Georg Fritz directed the *rupaks* of Palau to ensure that the coconut scale insect was eradicated on Palau to the greatest extent possible.¹²⁶ After yet another meeting with *rupaks*, Fritz authorized the station administrator Winkler to police the matter. To that end Winkler issued on 7 October 1907 a police directive to reduce the impact of the coconut scale insect. On 29 December 1908 this directive was replaced by a formally promulgated government regulation which stipulated that all land users, regardless of the nature and extent of actual ownership, were required to destroy infected palms and vegetation, by cutting off the affected parts and burning them immediately.¹²⁷ Any contravention of the regulation was subject to a fine of up to RMk 150 (or jail in cases when the fine could not be paid) unless other and stricter laws were found to be applicable. To put the enormity of the fine into context, it needs to be appreciated that the official daily wage for manual labour as offered by the German administration was RMk 1.¹²⁸ The practical implementation of that regulation stipulated that all residents had to remain at home for three days every full moon to look after their coconut palms and to destroy all infested fronds. This was enforced by local police who inspected the plantations and who reported any infringement. The owners of infested palms were fined. While Volkens and Augustin Krämer (in Palau in 1909) attested that the system was effective, it was also open to abuse by the police.¹²⁹

On Yap, however, nothing had changed by the end of 1908, with the government conceding that all attempts at containment had failed.¹³⁰ In view of the relative success on Palau, the same strategy was deemed to hold the greatest long-term promise for Yap since all other approaches had failed.¹³¹ Consequently, a renewed program of manual control was implemented and maintained for several years, effectively a rearguard holding action.¹³² In the absence of strong community buy-in and self-interest by individuals in the program, however, it could only be implemented through formal regulation.

Politically, the utter ineffectiveness of the German administration at combatting the tiny coconut scale insect could have turned out disastrously for the German presence: the

¹²⁴ Senfft, 'Rundreise'; Augustin Krämer, *Palau. Ergebnisse der Südsee-Expedition 1908–10. Abteilung III: Siedelungen, Bezirke, Dörfer, Verfassung. Abteilung IV: Demographie, Anthropologie, Sprache* (Hamburg, 1919), p. 43; id., *Palau. Ergebnisse der Südsee-Expedition 1908–10. Abteilung V: Stoffliches. Abteilung VI: Geistige Kultur* (Hamburg, 1926), iii, p. 43.

¹²⁵ Krämer, *Palau vol. 2*, 2, 43; Krämer, *Palau vol. 3*, 3, 43.

¹²⁶ Fritz, 'Reise'

¹²⁷ Arno Senfft, 'Verordnung des Bezirksamts von Yap, betreffend Bekämpfung der Schildlauskrankheit vom 29. December 1908', *Dtsch. Kolonialbl.*, 20 (1909),

p. 303.

¹²⁸ Spannemann, *Edge of empire*, 106.

¹²⁹ Effective: Georg Volkens, 'Maßnahmen zur Bekämpfung der Schildlaus', *Amtsbl. Schutzgeb. Dtsch-Neuguinea*, 1 (1909), p. 122.—abuse: Krämer, *Palau vol. 2*, 2, 43.

¹³⁰ Reichskolonialamt, *Jahresbericht 1908/09*.

¹³¹ Reichskolonialamt, *Jahresbericht 1909/10*.

¹³² Reichskolonialamt, *Denkschrift über die Entwicklung der Schutzgebiete in Afrika und der Südsee 1910/11* (1911); Reichskolonialamt, *Denkschrift über die Entwicklung der Schutzgebiete in Afrika und der Südsee 1911/12* (1912), p. 161.

administration was at risk of losing the respect of the local population and thus, ultimately its perceived moral authority. The Good Friday typhoon of 1907, with its widespread destruction and long-lasting economic toll, provided a welcome circuit-breaker.¹³³ Other issues were at the forefront, and any loss of productivity could be attributed to that event.

Concurrent with these administrative developments, scientific solutions were still being sought. Most of the treatments, however, proved ineffective. For example, an outbreak of the coconut scale insect in the German colony of Togo in 1900 had been combated, without much effect, with a petroleum-based soap as well as with natural, plant-based insecticides.¹³⁴

In 1905 the German colonial administration finally established a regional botanical garden and experimental farm at Rabaul (then Simpsonhafen, German New Guinea) which eventually acted as a clearing house of introduced plants and technical advice.¹³⁵ Even though Volkens had drawn attention to the matter as early as 1901,¹³⁶ it took until 1908 for the German colonial head office to take the matter seriously. In late 1908, the Imperial Research Office for Agriculture issued a review report on the effectiveness of biological control methods to combat the coconut scale insect, which was published in a leading journal for tropical agriculture. Drawing on less well-understood concepts of population dynamics, the review argued that the introduction of coccinellid beetles was at best useless, and at worst would be detrimental, as adult beetles might carry juvenile scale insects to new hosts. While admitting that the author did not possess any first-hand experience with the specific insect, the review urged that if – despite their advice to the contrary – further attempts were to be made to introduce coccinellid beetles from New Guinea or Saipan to the Carolines or Palau, this should be trialled on a small island to evaluate their effectiveness. Instead of biological control, the report strongly advocated the trial and use of insecticides, either a commercial product (Markasol),¹³⁷ a nicotine-based mixture, or an insecticidal soap (potassium hydroxide, tree resin and whale oil).¹³⁸ The recently developed

¹³³ Spennemann, *Typhoons in Micronesia*; id., *Melimele*.

¹³⁴ Volkens, 'Schildlauskrankheit'.

¹³⁵ Jahresbericht Simpsonhafen, 'Jahresbericht des Botanischen Versuchsgartens zu Simpsonhafen. Denkschrift über die Entwicklung der deutschen Schutzgebiete in Afrika und in der Südsee 1905/1906', *Stenographische Berichte über Verhandlungen des Reichstages XII. Legislaturperiode, 1. Session*, 239 (1907), pp. 334–35; Rudolph, 'Obergärtner Rudolph berichtet über eine Dienstreise nach den Inseln Nanuk und Palakuvur (23.–27. Februar 1909)'.

¹³⁶ Volkens, 'Schildlauskrankheit'.

¹³⁷ Markasol was an insecticide manufactured by Bayer & Co, Elberfeld. It had proved effective against coconut scale insects in German East Africa, where it could be applied to young, and thus accessible palms. We are uninformed whether it was ever trialled in Micronesia or German New Guinea. J. Voßeler, 'Dritter Jahresbericht des Kaiserlich Biologisch-Landwirtschaftlichen Institutes in Amani für das Jahr 104/05. Bericht des Zoologen', *Berichte über Land- und Forstwirtschaft vom Kaiserlichen Gouvernement*

von Deutsch-Ostafrika in Dar-es-Salam, 2 (1905), pp. 409–43. The insecticide is not to be confused with the Bismuth borophenate application 'Markasol' which was sold as an 'antiseptic recommended as a substitute for iodoform, as a non-irritating dry dressing for wounds, ulcers, excoriations, burns, etc'. *Druggists Circular, The modern materia medica. The source, chemical and physical properties, therapeutic action, dosage, antidotes and incompatibles of all additions to the newer materia medica that are likely to be called for on prescriptions* (3rd edn, New York, 1912), p. 172; Virgil Coblentz, *The Newer Remedies including their synonyms, sources, methods of preparation, tests, solubilities, incompatibles, medicinal properties, and doses as far as known, together with sections on organo-therapeutic agents and indifferent compounds of iron. A reference manual for physicians, pharmacists, and students* (3rd edn, Philadelphia, 1899), p. 30.

¹³⁸ Kaiserlich Biologische Anstalt für Land und Forstwirtschaft, 'Über die Frage der Schildlausbekämpfung', *Amtsblatt für des Schutzgebiet Deutsch-Neuguinea* 1 (1909), pp. 9–11.

chemical insecticide *Frutolin* was advocated as being effective against scale insects in the German-language press of the USA and Australia.¹³⁹ The insecticide was eventually trialled in Yap in 1909/10, apparently with some success.¹⁴⁰

As a graduate in colonial agriculture at the Imperial horticultural training school, Karl Rudolph, the government agriculturalist at Rabaul, followed the directions of the Imperial Research Office for Agriculture and approached the problem scientifically by systematically trialling a number of treatments on the small island of Nanuk in the Duke of York Group in 1909.¹⁴¹ He treated two rows of coconut palms each with a nicotine-based soap; with Avenarius-Carbolineum¹⁴² solution of 2 per cent concentration; with a Bordeaux mixture; and with a mixture of tobacco lye ('Tabaklauge') and Calcium hydroxide in solution. As control, some rows of palms were sprayed with seawater. In addition, Rudolph trialled a 10 per cent solution of Fichtenin¹⁴³ on heavily infested palms.¹⁴⁴ The treatment had no detectable success and it was not repeated.¹⁴⁵

In furnishing their advice, the Imperial Research Office for Agriculture seems to have primarily drawn on agricultural publications from the USA.¹⁴⁶ An abridged version of the advice was published in the official government publication, the *Amtsblatt für das Schutzgebiet Deutsch-Neuguinea*.¹⁴⁷ Since the *Amtsblatt* was not only distributed to all district administrations but was also subscribed to by the major plantation owners, it potentially had a major

¹³⁹ Frutolin was developed by the was developed (and patented) by Franz Fielitz and Georg Eisler, both working at the German consulate in Montevideo (Uruguay). Anon., 'Frutolin', *Australische Zeitung (Adelaide)* 55 (1903), p. 5 col. b; Anon., 'Frutolin', *Der Deutsche Correspondent (Baltimore)* 63 (1903), p. 2 col. b. Tests in Montevideo had shown Frutolin to be reputedly not only effective against scale insect, but also against beetles affecting palms and olives. The original article had appeared in the Export-Fachblatt 'Das Echo' (Berlin). Frutolin also found mention in published official U.S. consular reports Albert W. Swalm, 'Destruction of Fruit Scale in Uruguay', *Monthly Consular Reports* 72 (1903), pp. 476–7.

¹⁴⁰ Reichskolonialamt, *Jahresbericht 1908/09*.

¹⁴¹ Rudolph was class of 1899: Theodor Echtermeyer, 'Verzeichnis der Hörer und Hospitanten nach Jahrgängen geordnet 1824–1913', in Theodor Echtermeyer (ed.), *Die Königliche Gärtnerlehranstalt Dahlem. Denkschrift zur Erinnerung an das zehnjährige Bestehen der Anstalt in Dahlem* (1913), pp. 177–283.

¹⁴² Carbolineum Avenarius, was a tar-oil based antiseptic preparation for impregnating and coating wood. It was manufactured by Gebrüder Avenarius, Gau-Algesheim, Germany, and had been on the market since the mid 1870s Muecke & Co, 'Carbolineum Avenarius' (Pacific Rural Press 44, 1892), p. 77 (patented as 'Avenarius Carbolineum', Deutsches Reichspatent 46021/1888).

¹⁴³ Fichtenin was an insecticide trademarked in January 1907 by E. Fichtenau, of 421 Franz-Josef Strasse, Friedek, Silesia (Austria) Anonymous, 'Trademarks applied for', The chemist and druggist, 70 (1907), p. 254; Anon., 'Trademarks published February 12, 1907', *Official Gazette of the United States Patent Office* 126 (1907), p. 2576. From the limited data available, it seems to have been a fir extract which was applied as spray, supposedly acting as pheromone-based repellent. Reference to efficacy testing are limited, e.g. against woolly Apple aphids (ineffective) Martin Schwartz, 'Über einige neue und alte Mittel zur Bekämpfung schädlicher Insekten', *Kaiserlich Biologischen Anstalt für Land-und Forstwirtschaft*, 6 (1908), pp. 491–8.

¹⁴⁴ Rudolph, 'Ober Gärtner Rudolph berichtet über eine Dienstreise nach den Inseln Nanuk und Palakuvur (23.–27. Februar 1909)'.

¹⁴⁵ Karl Rudolph, 'Bericht über de zweite Dienstreise nach Nanuk und Palakuwur (7.–11. September 1909)', *Amtsbl. Schutzgeb. Dtsch-Neuguinea*, 1 (1909), p. 151.

¹⁴⁶ e.g. Frank H. Hall, 'Spraying and Fumigating for San José Scale', *New York Agricultural Experiment Station Bulletin (Popular Edition)* 202 (1901), pp. 1–6; Victor H. Lowe and Percival J. Parrott, 'San José Scale Investigations III', *N.Y. Agric. Exp. Stat. Bull.*, 202 (1901), pp. 1–45.

¹⁴⁷ Kaiserlich Biologische Anstalt für Land und Forstwirtschaft, 'Schildlausbekämpfung'.

exposure.¹⁴⁸ Reading the report of the Imperial Research Office for Agriculture, one wonders whether its author actually considered the practicality of administering a herbicide in the crowns of palms that were some 15 to 20 m above the ground. While it remains unclear, however, to what extent the advice proffered by the Imperial Research Office for Agriculture was actually followed, it was certainly contested. Volkens took issue with Schwartz and in a short note in the *Amtsblatt*, he commented on the fact that manual control and coccinellid beetles had proven to be effective, but that spraying had not.¹⁴⁹ Likewise, German planter Paul Preuß took issue with Schwartz's approach and noted that coccinellid beetles were effective.¹⁵⁰ While coccinellid beetles might not eradicate coconut scale insects altogether, they sufficiently depressed their numbers to make copra production viable.¹⁵¹

In recognition that coconut scale insect also infested plants other than coconuts, and thus could be spread by these means, Senfft moved to further control the spread of coconut scale insect in July 1908. To prevent coconut scale insect being carried to other islands, he prohibited the export of *all* plants and plant materials from Yap and Palau ('Verordnung des Kaiserlichen Bezirksamtmanns in Jap, betreffend Verhütung der Weiterverbreitung der Schildlauskrankheit'). While (clean) copra was specifically excepted, the regulation prohibited that baskets and bags made from plant materials were taken on board of any vessel.¹⁵² The masters of the vessels were held personally responsible for the enforcement of the regulation, with government officials given the powers to inspect vessels at any time and to confiscate contravening plant matter, regardless of ownership. This power was backed up with a threat of severe fines (RMk 2,000 or two month jail). While one wonders to what extent this could be enforced for traditional inter-island canoes, such draconian measures, born out of desperation, would not have sat well with the islanders. Unfortunately, we do not have any indigenous voices in this whole affair. Any local objections or dissent would have been recorded in local correspondence and file notes, which would have been kept in the local station and district files that have been lost since World War II.

After Senfft left Yap for Germany (and died en route at Hong Kong), the administration of Yap (and the Marianas) passed to Georg Fritz who was moved there from Pohnpei, and who had been acting in Senfft's position when the latter was on furlough in early 1907. Fritz seems to have had a different attitude and been less interventionist. Nonetheless, he pursued the same course as Senfft on Palau, where a further modification to the regulations was ordered in December 1908. We can assume that the Palau regulation was based on examples set by Senfft in Yap, even though they do not seem to have been formally gazetted for that island (possibly because the infestation had progressed too far). On occasion of an inspection visit to Yap the Governor of German New Guinea, Albert Hahl, moved to restrict the movement of coconuts altogether. A widely publicized regulation of 14 June 1911, applicable to all of

¹⁴⁸ Dirk H.R. Spennemann, 'Government Publishing in the German Pacific 1885–1914', *J. Pac. Hist.* 52 (2017), pp. 68–95.

¹⁴⁹ Volkens, 'Schildlaus'.

¹⁵⁰ Paul Preuß, *Die Kokospalme und ihre Kultur* (1911).

¹⁵¹ See also Friedrich Zacher, 'Die Schädlinge der Kokospalmen auf den Südseeinseln', *Arbeiten aus der*

Kaiserlich Biologischen Anstalt für Land und Forstwirtschaft 9 (1913), pp. 75–120.

¹⁵² Johannes Gerstmeier and Otto Köbner, *Die deutsche Kolonialgesetzgebung. Sammlung der auf die deutschen Schutzgebiete bezüglichen Gesetze, Verordnungen, Erlasse, und internationale Vereinbarungen mit Anmerkungen und Sachregister*, vol. 12 (1908), p. 235.

Western Micronesia, stipulated that coconuts had to be de-husked on the land and could only be moved from one island to another if the husk was left behind. Exempt from this rule were nuts removed for planting purposes and nuts destined for human and animal consumption. The primary aim of this regulation was to cut down on potential harbours for the Rhinoceros beetle (*Oryctes rhinoceros*) and other pests. Any unauthorized movement of coconuts was subject to a fine of up to RMk 150 (or jail) applicable to *both* the seller and buyer. The permissibility of moving nuts for human and animal consumption, however, constituted a loophole for further spread of the beetles as well as to further spread the coconut scale insect.

In May 1909 the district administrator of Jaluit, Wilhelm Stuckhardt, also moved to regulate the destruction of any plant matter found to be infested with the insects. The regulation stipulated that people living on properties must cut off and burn all parts of coconut palms infested with the coconut scale insect regardless of whether they own, rent or otherwise squatted on the property.¹⁵³ This was prompted by the discovery of a coconut scale insect infestation on Nauru with the fear that inter-island travel might spread the insect to the Marshalls proper.¹⁵⁴ As the phosphate industry on Nauru was just commencing at the time, the copra industry, which was the sole source of revenue for the Marshall Islands district, had to be protected at almost all costs.

It is worth noting, however, that the administration of the Eastern Caroline district (comprising Pohnpei, Kosrae, Chuuk, and outer atolls), does not appear to have passed any regulations to manage coconut scale insect. While the copra production on the high islands of Pohnpei and Kosrae was limited, as the high humidity hampered air-drying, the outer atolls of the Central Caroline Islands were reliant on copra for cash income.

Clearly, Senfft had a sense of agency and took matters into his own hands. His overarching concern was to find something – anything – that worked. And in the absence of an obvious silver bullet, it was with trialling anything that might have worked in other settings. One never knew – it just might work. At the same time, his activity demonstrated to his superiors, to the expatriate planters and traders, and to the Yapese population that the administration was not complacent in the matter. As time passed without a solution, despite the veritable parade of attempts, the unwanted side effect was that the German administration became seen as ineffective.

VII

When Arno Senfft took up the position of first administrator of the Western Colonies district, he faced a number of challenges, some of which he anticipated – and thus was prepared – and some which were unexpected. He came prepared to impose the political will of colonial Germany on a fractious and potentially adversarial indigenous community. Bringing along the economic botanist Georg Volkens, Senfft was also prepared to unlock the economic potential of

¹⁵³ P. Zorn and F. J. Sassen, *Deutsche Kolonialgesetzgebung, Text-Ausgabe mit Anmerkungen und Sachregister* (Guttentagsche Sammlung Deutscher Reichsgesetze 49, sec. edn, 1913), 404; Wilhelm Stuckhardt, 'Verordnung

des Bezirksamtmanns von Jaluit betreffend Bekämpfung der Schildlauskrankheit vom 27. Mai 1909', *Dtsch. Kolonialbl.*, 20 (1909), p. 1123.

¹⁵⁴ Müller, 'VI. Karolinen und Marshall-Inseln'.

the islands and to eventually open up at least some of the land to German agronomic interests. Unexpected, however, was that the very economic basis of the colony, copra, was threatened by the coconut scale, a small insect infesting the crowns of palms many meters above the ground.

During the early days, official guidance and specialist technical advice was far away, both in space (Berlin) and time, given the unreliability of shipping and the associated long mail delivery times. Consequently, Senfft had to keep his own counsel and develop technical directions based on his own reading and advice obtained from any available source he could communicate with. In the absence of pertinent and well-founded technical advice, let alone a silver bullet, Senfft embraced a shotgun approach, combining government-executed activities with measures to be carried out by the landowners. All these measures were backed up by government directives and ordinances, compelling participation. Senfft directed owners to engage in manual control by destroying infested leaves, while at the same time he had the entire island fumigated, and trialled control with insecticides and the introduction of biological agents. As far as can be ascertained, the introduction of the coccinellid beetles to Yap was the first organized trial of biological plant control in the Pacific.

To Senfft's frustration, none of the measures really worked and the coconut scale insect continued to devastate Yap and spread through Palau. He could chalk up one success, however. His regulatory measures to prevent the spread of coconut scale insect from Yap to the outer atolls seems to have been successful. Where an incipient infestation was noted, such as on Lamotrek, it could be successfully contained and eradicated, thereby safeguarding the copra industry on the outlying atolls.

After 1909 there seems to be a major decrease in interest in the subject matter and the extent of infestation is no longer mentioned. It appears that some of the containment measures seem to have worked in reducing the impact, coupled with what appears to be a cyclical decrease in infestation. The importation and release program of ladybird beetles seems to have come to a slow-down and eventual halt at the end of the first decade of the twentieth century. By that time, the original administrators of the districts had moved on (Fritz, Hahl) or died (Senfft, Berg) leading to a loss of institutional memory.

Finally, and possibly more significantly, the economic basis of colonial revenue in the island territory had shifted from copra and agricultural produce to the lucrative phosphate mines on Nauru (exploited from 1907) and Angaur on Palau (exploited from 1908). The major trading firm in the region, the Jaluit Gesellschaft, had also invested in the phosphate mines and therefore was likewise less reliant on copra.¹⁵⁵ Consequently, the viability of the colony was assured as far as the colonial government was concerned, although the coconut scale insect reduced the cash crop returns for the Indigenous population. The different priorities are well reflected in the later budgets.¹⁵⁶

¹⁵⁵ Wolfgang Treue, 'Die Jaluit-Gesellschaft', *Zeitschrift für Unternehmensgeschichte* 7 (1962), pp. 108–23; id., 'Der Erwerb und die Verwaltung der Marshall-Inseln. Ein Beitrag zur Geschichte der Jaluit-Gesellschaft' (Unpubl. PhD Thesis, Friedrich-Wilhelms Universität, 1940).

¹⁵⁶ Reichskolonialamt, 'Deutscher Reichstag. Entwurf

eines Gesetzes betreffend die Feststellung des Haushaltsetats für die Schutzgebiete auf das Rechnungsjahr 1913. Etat für das Schutzgebiet Neu Guinea einschliesslich der Inselbezirke der Südsee auf das Rechnungsjahr 1913' (1912); Reichskolonialamt, 'Deutscher Reichstag. Entwurf eines Gesetzes betreffend die Feststellung des Haushaltsetats für die Schutzgebiete auf das

The outbreak of World War I in August 1914 saw the end of the German colonies in the Pacific. By the end of October 1914 all German possessions in Micronesia had been occupied by Japan, which was to continue to administer the Marshall, Caroline and Mariana Islands as well as Palau until World War II. When the German administrators were relieved of their posts, all non-secret administrative files were passed to the Japanese occupiers. While the Japanese administrators could have consulted them for their own efforts at plant protection, the accumulated institutional memory seems to have been lost at take-over and the Japanese had to develop their own strategies.¹⁵⁷

Note 156 *continued*

Rechnungsjahr 1914. Etat für das Schutzgebiet Neu Guinea einschliesslich der Inselbezirke der Südsee auf das Rechnungsjahr 1914' (1913).

¹⁵⁷ See Teiso Esaki, 'A preliminary report on the entomological survey of the Micronesian islands under the Japanese Mandate, with special reference to the

insects of economic importance', in Teiso Esaki (ed.), *Proceedings of the sixth Pacific Science Congress of the Pacific Science Association University of California, Berkeley, Stanford University, and San Francisco, July 24th to August 12th, 1939* (1940), pp. 407–15; id., 'Pests of Micronesia'.