Exotic Species Survey of the Kokoda Track,

Papua New Guinea

Honolulu, Hawai‘i
December 2015

Cover shot: Alola Village and Kokoda Track showing anthropogenous vegetation.
Photo: Allen Allison.

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Report prepared for:
PNG Conservation and Environmental Protection Authority (CEPA),
Port Moresby, Papua New Guinea

Bishop Museum Technical Report 67

Honolulu, Hawai'i
December 2015

Bishop Museum Press
1525 Bernice Street
Honolulu, Hawai‘i

ISSN 1085-455X

Contribution No. 2015-004 to the Pacific Biological Survey

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Executive Summary

We conducted a survey of exotic (i.e., non-indigenous) species along the entire length of the Kokoda Track, starting in Kokoda and ending at Ower's Corner, over the course of 27 days during March–April 2014. We focused primarily on weedy plants, collecting and/or photographing a total of 91 species. We have identified all but a small fraction of these.

The exotic plant species that occur along the track grow primarily in anthropogenous grasslands, which cover open areas along the track and occupy clearings around villages. All the species that we documented were already known from Papua New Guinea. Many of them are included in the treatment of New Guinea weeds by Henty and Pritchard (1975) and most of these have been known to occur in Papua New Guinea for decades.

Only three of the exotic plant species we found appeared to invade intact native ecosystems: sanchezia (*Sanchezia speciosa*), white angel's trumpet (*Brugmansia candida*), and clidemia (*Clidemia hirta*).

Sanchezia is a large bush or small tree from South America that is generally found in riparian habitats and prefers shaded areas. It was crowding out native vegetation and forming nearly pure thickets along seepages on steep slopes along several areas along the Track, especially along the Efogi River between Naduri and Lanumu.

In Australia's North Queenland it (listed as *S. parvibracteata*) is regarded as undesirable but is apparently not a major pest. It is a common ornamental plant in Papua New Guinea and we have observed it around villages throughout the country, so its occurrence along the track is hardly surprising, but the extent to which it is invading native ecosystems is a matter for concern.

Similarly, white angel's trumpet is also from South America and often co-occurs with sanchezia in riparian ecosystems within Papua New Guinea. It is less common than is sanchezia but certainly has the ability to invade intact riparian ecosystems.

Clidemia, also known inaccurately as Koster's curse (Evenhuis, 2014), is presently a minor pest along the Kokoda Track, but elsewhere in Papua New Guinea, including Varirata National Park, is a serious invasive pest. It has the potential to become a serious pest along the Kokoda Track.

We established bait stations at several points along the Track but did not detect any problematic ant species, such as the little fire ant (*Wasmannia auropunctata*), an extremely undesirable species from South America that has recently reached Australia and the Solomon Islands.

We also did not observe any introduced land vertebrates except for domesticated species. However, it is clear from rooting depressions that feral pigs are common in

some areas and are causing localized damage to the Track.

Rainbow trout (*Oncorhynchus mykiss*), originally from North America, were present in the streams in the upper drainage basins of Eora Creek and the Brown River. Although this species was undoubtedly deliberately introduced and is heavily fished by the local people, it is highly invasive and may have a deleterious impact on endemic fish species and populations of aquatic invertebrates.

In August 2015 during a herpetological field survey of Mt. Victoria, one of us (Allen Allison) surveyed the exotic species of plants around Manumu No. 2 village (-9.06173 S; 147.592101 E) at around 1050 m elevation and approximately 10 km WNW of the Kokoda Track. Very few trekkers pass through Manumu No. 2 so we can reasonably assume that the exotic plant species found there were not introduced or spread by trekkers and represent something of a baseline exotic flora characteristic of the region. There were only 24 species of non-cultivated exotic plants occurring at Manumu No. 2 compared to > 80 at comparable locations along the Kokoda Track.

Our overall conclusion is that there is no evidence of any new-to-PNG exotic pest species having been introduced by trekkers along the Kokoda Track but it is likely that the high volume of people walking along the Track are assisting the spread of exotic plant species along it.

To ensure long-term protection of the Track we are recommending that it be regularly monitored on an annual, low intensity basis for the introduction or spread of exotic pest species. In addition we are recommending that consideration be given to the eradication of several species of plants that are present in small numbers but are known elsewhere to be serious invasive pests.

We are also recommending preparation of a field guide to promote ecotourism along the track and encourage trekkers to report any new introductions that they notice. This guide would include details on native species of interest and also photos of the major exotic species. It would include a request and instructions for trekkers to report any pests that they think are new. It is likely that some of the trekkers, particularly those from North Queensland, will be familiar with tropical weeds and may be able to contribute valuable observations to the overall monitoring program.

1 Introduction

The Kokoda Track, which connects the north and south coast lowlands of Papua New Guinea through a gap between the high peaks of the Owen Stanley Range, is well known as the site of important battles between Japanese and Australian forces during the early part of WWII. Parts of the track originated in the mists of time as an anastomosing network of trails inter-connecting villages and hamlets on the lower slopes of the Owen Stanley Range. When gold was discovered in the Yodda Valley on the north coast in the late 1800s, the colonial government developed a route across the Owen Stanley Mountains to help assure the safety of the miners. Initially this route connected the networks of existing trails on either side of the main range, but was expanded and enlarged during WWII and transformed into what we know today as the Kokoda Track.

In July 1942 the Japanese Empire landed a large expeditionary force on the north coast of New Guinea and began advancing over the Kokoda Track towards Port Moresby. They were met by Australian forces in a series of horrific engagements and by November 1942 had been pushed back into north coast strongholds of Buna, Gona, and Sanananda, where they were eventually defeated by joint Australian and American forces. As the main theater of WWII moved northwards, the historical significance of what is called the Kokoda Campaign was overshadowed by the many larger battles that subsequently took place.

After WWII, air travel, which was already well advanced in New Guinea by the 1930s, expanded considerably, as did coastal shipping. These developments made the Kokoda Track less important as a travel corridor between the north and south coasts, and with the passage of time public interest in its military significance faded. However, beginning in the early 1980s, the publication of a series of influential books on the Kokoda Campaign, many of them extensively documented with first-hand accounts, revived public interest in the Kokoda Campaign and in the Kokoda Track. This coincided with the development of trekking businesses in Papua New Guinea and growing interest, particularly in Australia, in both the military history of the Kokoda Campaign and in adventure tourism. Today, upwards of 3000–4000 trekkers, mainly from Australia, follow the Track annually, accompanied by a similar number of guides and porters.

The Kokoda Track is today regarded as an important historical site by both the Australian and Papua New Guinea governments, and is one of Papua New Guinea's most important tourist destinations. In 2008 the Australian and Papua New Guinea governments signed a joint understanding to collaboratively advance the management and protection of the Kokoda Track, and to improve the livelihoods of the people living along it. This agreement, known as the Kokoda Initiative, is implemented by the Australian Department of the Environment and the

Papua New Guinea Conservation and Environmental Management Authority (CEPA). These agencies work extensively with the Kokoda Track Authority, which regulates trekking through a permit system and helps maintain the Track.

The increasing number of trekkers along the Kokoda Track has drawn attention to a number of issues related to its protection and management. One of these is the potential for trekkers to introduce alien pest species.

Alien species cause billions of dollars of annual agricultural and environmental damage world-wide and are one of the primary drivers of biological extinction, particularly on islands. Many such pests have excellent dispersal qualities and often hitchhike on clothing or camping equipment. With the large and growing number of trekkers crossing the track, there is increasing potential for the introduction of alien species. If such introductions take place in remote regions along the Kokoda Track, infestations could easily reach uncontrollable levels before coming to the attention of agricultural and environmental authorities.

2 Purpose

Our Study had two main purposes:

2.1 Compilation of a Checklist of Exotic Species

A checklist of exotic species along the track provides a scientific baseline for management action and for the detection of future introductions.

2.2 Document Particularly Problematic Species

In most cases it is feasible to eradicate invasive species only if an introduction is detected early when the population is small. We therefore paid particular attention to any species that were serious pests elsewhere but were rare or uncommon along the Kokoda Track.

Because funding was limited, we combined the exotic pest survey with field surveys along the Track of the amphibians, reptiles, and birds, which were funded from other sources. This allowed us to extend the exotic pest survey from an expected ten days to nearly a month along the Kokoda Track.

3 Personnel

3.1 Field Team

Dr. Allen Allison, Bishop Museum – team leader – focusing on exotic species and herpetology

Dr. Thane Pratt, Bishop Museum – focusing on exotic species and ornithology

Oliver Tallowin, Tel Aviv University – focusing on herpetology

Bulisa Iova, PNG National Museum – focusing on herpetology and ornithology

Alu Kaiye, PNG Department of Environment and Conservation (now the Conservation and Environmental Protection Authority [CEPA] – assistance in herpetological fieldwork and logistics

Szabolcs Kókay - artist and focusing on ornithology

3.2 Laboratory Team

Dr. Linda Pratt, Bishop Museum – ID Team Leader

Dr. Thane Pratt, Bishop Museum - identifications

Dr. Allen Allison, Bishop Museum – identifications

Clyde Imada, Bishop Museum – identifications

4 Field Itinerary and Schedule

20 March 2014 – Thursday – POM to Kokoda by air

21 March 2014 – Friday – Kokoda to Isurava

22 March 2014 – Saturday - Isurava

23 March 2014 – Sunday - Isurava

24 March 2014 – Monday - Isurava

25 March 2014 – Tuesday – Isurava

26 March 2014 – Wednesday – Isurava

27 March 2014 – Thursday - Isurava

28 March 2014 – Friday – Isurava to Eora Creek

29 March 2014 – Saturday – Eora Creek to Templeton 01

30 March 2014 – Sunday – Templeton 01

31 March 2014 – Monday – Templeton 01 to 1900 Crossing

01 April 2014 – Tuesday – 1900 Crossing

02 April 2014 – Wednesday – 1900 Crossing [side trip to Myola 02]

03 April 2014 – Thursday – 1900 Crossing [OT to Myola 2]

04 April 2014 – Friday – 1900 Crossing [AA & TKP side trip to Myola 2]

05 April 2014 – Saturday – 1900 Crossing [AA & TKP side trip to Myola 1]

06 April 2014 – Sunday – 1900 Crossing

07 April 2014 – Monday – 1900 Crossing

08 April 2014 – Tuesday – 1900 Crossing to Kagi [side trip to Myola 2 overlook]

09 April 2014 – Wednesday – Kagi to Brigade Hill

10 April 2014 – Thursday – Brigade Hill

11 April 2014 – Friday – Brigade Hill

12 April 2014 – Saturday – Brigade Hill to Augulogo

13 April 2014 – Sunday – Augulogo
14 April 2014 – Monday – Augulogo
15 April 2014 – Tuesday – Augulogo to Ioribaiwa
16 April 2014 – Wednesday – Ioribaiwa to Ower's Corner

5 Methods

Because of limitations in time and personnel, we focused primarily on plants, collecting a total of 113 specimens, most which we have subsequently identified (Appendix 3). We also took colour photos of most of the species we encountered, including common weeds that we didn't collect. We supplemented this work by establishing bait stations for ants at several places along the track, and by examining vegetation along the track for signs of significant insect damage. We also made *ad hoc* observations as opportunities arose.

We had initially planned to use handheld GPS units to mark the positions of all species of plants along the track. It quickly became apparent that most of the species that we were encountering were widespread taxa that occur in disturbed areas throughout Papua New Guinea. Mapping the occurrence of each species would have required enormous amounts of effort for little scientific return. We therefore concentrated on developing a species checklist of exotic taxa that we documented along the track and directed our attention in particular to searching for taxa that were particularly undesirable.

Our checklist is undoubtedly incomplete. Our survey was relatively brief and although we established several camps that we occupied for up to a week each, we passed fairly quickly along other parts of the Track. In addition, some taxa flower seasonally and if they weren't in flower during our survey we would have likely missed them. This is particularly true for grasses. It also rained frequently, hampering observations. Nevertheless, we believe that the checklist that we have compiled will provide an important foundation and a crucial baseline for detecting the establishment of any plant and animal species in the future.

6 Results

The names that are applied to exotic plant species are constanly changing as a result of taxonomic studies and reidentifications. In addition many species are also known by a variety of different common names. This can get very confusing. Many of the species that we found along the Kokoda Track are treated in Henty and Pritchard (1975). Although this reference is now out of date, it is still the only comprehensive guide to Papua New Guinea weeds and is enormously useful. To reduce any confusion arising from name changes, we have listed in Appendix 1 all species included in Henty

and Pritchard (1975) under their original scientific names and families, together with their current scientific names (documented with references) and their current families (based on the Angiosperm Phylogeny Group [APG] III system).

All taxa of plants that we collected or documented along the Track are listed in Appendix 2, together with comments on the biology of the species and the threat that they pose to the area. Henty and Pritchard (1975) list 146 species of weeds for Papua New Guinea, including native species. This is undoubtedly a significant underestimate. There are at least 550 species of naturalized plants known from the wet tropics of North Queensland, with 138 of them classed as undesirable. Many of these same species occur in Papua New Guinea.

6.1 Plants

The dominant vegetation along the Kokoda Track would have originally included two types of rain forest: medium-crowned lowland hill forest at elevations below 1400 m, and lower montane forest at higher elevations (Paijmans, 1975). Much of this vegetation remains, but extensive areas along the track have been cleared and are occupied by anthropogenous grasslands.

The vegetation along the Track near Kokoda Station is composed almost entirely of exotic species (Figure 1).

Figure 1. Exotic vegetation along the Kokoda Track near Kokoda Station.

In addition there are remnant rubber plantations (*Hevea brasiliensis*) (Figures 2, 3), and recent plantings of oil palm (*Elaeis guineensis*) (Figure 4).

Figure 2. Remnant rubber trees (*Hevea brasiliensis*) from a semi-abandoned plantation along the Kokoda Track near Kokoda Station.

Figure 3. Rubber tree (*Hevea brasiliensis*) near Kokoda Station.

Figure 4. Oil palm (*Elaeis guineensis*) plantation near Kokoda Station. The oil palm is native to West Africa.

Anthropogenous grasslands dominate much of the Track corridor, particularly the region between Kokoda Station and Eora Creek on the northern versant, and around the populated areas such as Kagi and Efogi villages on the southern side (Figures 5-7).

Figure 5. Alola Village and Kokoda Track showing anthropogenous vegetation [DSCN6993]

Figure 6. Anthropogenous grasslands and garden clearings along the central section of the Kokoda Track. Naduri Village is visible in the distance to the left; Kagi Village is visible to the far right.

Figure 7. Kokoda Track – typical exotic vegetation in partially shaded, disturbed areas along the Kokoda Track north of Minari Village [DSCN8845]

Exotic plant species are for the most part confined to grasslands or to disturbed, open areas. The exotic vegetation is for the most part very similar to that found at comparable elevations throughout Papua New Guinea. In some areas native colonizing species dominate, such as *Dicranopteris* (Figure 8).

Figure 8. Native species colonizing disturbed areas along the Kokoda Track. Efogi aerodrome in the distance [DSCN8551]

We documented the occurrence of at least 91 exotic plant species along the Kokoda Track (Appendix 2). Inasmuch as the impacts of exotic pest species depend to a large extent on the type of ecosystem involved, we separated the region into the six environmental components in order to better evaluate likely impacts:

6.1.1 Medium-Crowned Hill Forest

This is the original vegetation along much of the Track. It is dominated by trees around 20-25 m tall and is floristically quite diverse. Common genera include *Pometia*, *Canarium*, *Cryptocarya*, *Terminalia*, *Syzygium*, *Ficus*, and *Dysoxylum*. We commonly encountered a variety of exotic plant species along sections of the Track through this vegetation, primarily scarlet sage (*Salvia splendens*) and bloodleaf (*Iresine herbstii*). It is likely that at least some individuals, perhaps most of them, had been planted by Track maintenance workers. None was spreading into the surrounding forest and we saw no cause for concern. In fact, many of the open areas and clearings within these forests were being colonized by native succession species such as *Dicranopteris* ferns and trees such as *Macaranga* and *Homalanthus*.

6.1.2 Lower Montane Forest

This vegetation was dominant in elevations along the track higher than 1400 m, including sections of the Track on either side of the Gap, on Brigade Hill, etc. The dominant genera of trees include *Castanopsis*, *Lithocarpus, Elaeocarpus,* and

Sloanea. As with Medium-crowned Hill Forest, there were generally very few exotic plant in disturbed areas along the track, including *Salvia*, *Impatiens*, and *Iresine*, many of which were likely planted for decoration by Track maintenance workers.

In one area – primarily around Propeller Camp - Marmalade bush (*Streptosolen jamesonii*) [Solanaceae] was quite common but appeared to be planted as an ornamental.

On partially shaded and wetter portions of the Track, a scrambling ground herb, false buttonweed (*Spermacoce assurgens*) formed dense thickets but was easily controlled during Track maintenance.

None of the exotic species found along the Track in Lower Montane Forest appear to be invading that forest.

6.1.3 Riparian Vegetation

We define riparian vegetation as that occurring in the immediate proximity of streams and rivers. This vegetation typically includes a variety of shade-tolerant species, particularly members of the nettle family (Urticaceae), but in many areas along the Kokoda Track also include two serious invasive plants: sanchezia (*Sanchezia speciosa;* often identified as *Sanchezia parvibracteata*) and white angel's trumpet (*Brugmansia candida*). Both species readily reproduce by broken branches and by seeds. They have spread throughout the catchment basins of Eora Creek and the Brown River. These two species are crowding out the native vegetation and in some areas, such as along the Efogi River, occur in nearly pure thickets. We regard both species, but particularly sanchezia, as serious invasive plant pests.

6.1.4 Anthropogenous Grasslands and Disturbed Areas

These associations are dominated primarily by alien species and include virtually all the exotic pest species that we documented along the track.

The dominant taxa included at least 14 species of exotic grasses, all of which are widely established throughout Papua New Guinea. These include such undesirable species as Guinea grass (*Megathyrsus maximus*), molasses grass (*Melinis minutiflora*), *Cenchrus* sp., and Thurston grass (*Paspalum conjugatum*).

These and other species of grasses dominate most sections of the Track in open areas, but in some areas, particularly between Kokoda and Isurava villages, around Kagi, Efogi, and Menari villages, and in places such as Brigade Hill, tobacco weed (*Elephantopus mollis*) is the aspect dominant, particularly in very open, exposed areas. It often occurs together with Cinderella weed (*Synedrella nodiflora*), which are also extremely common along the Track. Tobacco weed is extraordinarily fast growing and quickly grows back when cut, overtaking other plants. It therefore tends to dominate sections of the Track where the vegetation is cut back most frequently.

The species of grasses and other aspect dominants such as tobacco weed (*Elephantopus mollis*), goatweed (*Ageratum conyzoides),* Spanish needle *(Bidens pilosa),* hempweed or mile-a-minute (*Mikania micrantha*)*,* and arrowleaf (*Sida rhombifolia*) are common through Papua New Guinea and other tropical areas of the world. They are heavily dependent on disturbed areas and generally outcompete native successional species in gardens that are left fallow; all are common roadside weeds. Although they are highly undesirable, they are not easily controlled except by physical removal or cutting. Fortunately they are generally confined to open, disturbed areas and do not invade intact native vegetation.

The lowland regions of the Track around Kokoda village are highly disturbed and include a large number of pantropical weeds, including escaped ornamental herbs, shrubs, and a few trees such as the African tulip tree (*Spathodea campanulata*). There are also remnant plots of rubber trees. The central sections of the Track were largely free of exotic tree species, except for *Eucalyptus* cf. *tereticornis* around Efogi village, that appeared to be planted as a firewood crop.

6.1.5 Gardens and Cultivated Areas

Most of the species of plants cultivated in Papua New Guinea village gardens are introduced – i.e., exotic, but are obviously not pest species. These include such common food plants as kaukau, taro (various species), yams, bananas, pawpaw, passion fruit, pineapples, corn, and squash, but also sugar cane and pitpit, both of which are native.

All of the plants encountered in anthropogenous grasslands and disturbed areas are common garden weeds and considerable effort is required to keep them from overrunning gardens. In particular, tobacco weed (*Elephantopus mollis*), goatweed (*Ageratum conyzoides),* Spanish needle *(Bidens pilosa),* climbing hempweed or mile-a-minute (*Mikania micrantha*)*,* arrowleaf (*Sida rhombifolia*), and matico (*Piper aduncum*) can, without frequent maintenance, take over a garden. This is not something specific to the Kokoda Track region but is the case throughout Papua New Guinea. All of the garden weeds that we found along the Kokoda Track are common throughout Papua New Guinea and were almost certainly not brought in by trekkers.

There is one species in something of a category by itself: choko (*Sechium edule*). This plant, originally from South America, can quickly overrun an area. It is said to have been brought in by the Japanese military during WWII. It is now a common food plant and a major source of “greens” (kumul) throughout much of Papua New Guinea. However, it can quickly grow out of control and smother adjacent native vegetation. There are many instances of this along the Track from Deniki to Isurava. The fruits and vine tips are actively harvested by local villagers so the plant has become important to the subsistence economy, but its further spread may become problematic.

6.1.6 Rivers and Streams

We did not exhaustively sample rivers and streams for exotic plant species but we didn't observe any obvious problems, except that there were large growths of algae in the upper Eora Creek catchment.

6.1.7 Beneficial Uses of Exotic Plants

Although most species of exotic plant species that have become established in Papua New Guinea are generally considered to be pests, a number of species also have beneficial uses.

We have already mentioned choko. Although it can smother native vegetation along tracks and roads, it has become an important source of greens (kumul) throughout much of Papua New Guinea. Similarly a grass, *Setaria palmifolia*, which grows through New Guinea and can become weedy but is probably native, is sometimes eaten for its thick stems. Most other species of grasses are weeds, although some are useful as cattle fodder.

The five most common and widespread non-grass weeds are probably tobacco weed (*Elephantopus mollis*), goatweed (*Ageratum conyzoides*), Spanish needle (*Bidens pilosa*), hempweed or mile-a-minute (*Mikania micrantha*), and arrowleaf (*Sida rhombifolia*). *Bidens pilosa* is edible but rarely eaten; *Mikania micrantha* is used is some parts of the world to heal cuts but its use in PNG is unknown; goatweed is toxic; arrowleaf is sometimes used for fiber and the foliage can be used to treat a variety of ailments including headaches, rheumatism, and to relieve swelling. *Elephantopus mollis* has no known beneficial uses.

False buttonwood (*Spermacoce laevis*), seemingly ubiquitous in Papua New Guinea, can form dense thickets but is generally represented by scattered individuals; it is sometimes used to treat cuts and burns by crushing the leaves and applying them to the wound.

Salvia (*Salvia* sp.), impatiens (*Impatiens* sp., including both exotic and native species), bloodleaf (*Iresine herbstii*), marmalade bush (*Streptosolen jamesonii*), sanchezia (*Sanchezia speciosa*), Croton (*Codiaeum variegatum*), and white angel's trumpet (*Brugmansia candida*) are grown mainly as ornamentals. All parts of *Brugmansia* are toxic.

Several species of exotic mints, including *Hyptis*, are grown both as ornamentals as as flavouring for food. Turkey berry (*Solanum torvum*) produces edible berries that are thought to be a rich source of iron. Coffee senna (*Senna occidentalis, syn. Cassia occidentalis*) is mainly used as an ornamental, but in Africa the seeds are sometimes roasted and added to coffee; the foliage is thought to be toxic but is also consumed in Africa. In PNG this species is mainly an ornamental. Similarly, thickweed (*Crassocephalum crepidioides*) has a variety of medical uses in Africa and is sometimes eaten as a vegetable but is thought to have long-term toxic effects.

In general the most important uses of exotic pest plants in Papua New Guinea seems to be as ornamentals.

6.2 Animals

6.2.1 Insects

The identification of ants that we collected from bait stations is difficult and ongoing, but we did not detect any of the highly problematic species, such as the little fire ant (*Wasmannia auropunctata*), a South American species that has been inadvertently introduced to various Pacific Islands such as Hawaii, Tuvalu, Vanuatu, and the Solomon Islands. It was recently detected in Cairns, Australia. It is generally spread through nursery plants and not by people, so it probably has a low risk of being introduced by trekkers to the Kokoda Track.

6.2.2 Fishes

A number of fishes have been introduced to Papua New Guinea and it is likely that at least some of them occur in the Brown River drainage basin and in the river around Kokoda village on the north coast. They require special equipment and considerable effort to survey, and were beyond our survey capability. However, when we reached 1900 Crossing and established a field camp, we quickly noticed that the streams were inhabited by rainbow trout (*Oncorhynchus mykiss*) (Figure 9), a species native to North America that has been introduced around the world. Rainbow trout are very aggressive invaders and can rapidly outcompete native species. They are generally a cold water species and have been introduced to various upland areas of Papua New Guinea, especially the Highlands provinces. We were a little surprised to find them in the upper Brown River catchment; this undoubtedly represents a deliberate introduction. They are actively fished by local residents and, judging by the numbers that locals could catch in an evening, are extremely common. It is very likely that their presence has adversely impacted populations of native fishes and also native aquatic invertebrates, but in the absence of further study this is simply speculation.

There are no currently recognized freshwater fish species endemic to the Brown River catchment. A rainbow fish named from the Goldie River is actually quite widespread along the south coast of New Guinea, but the upland rivers and creeks have not been surveyed. However, the presence of rainbow trout in the area does merit attention.

Figure 9. Rainbow trout (*Oncorhynchus mykiss*) from the headwaters of Eora Creek, Kokoda Track. [DSCN6897]

6.2.3 Amphibians and Reptiles

There are no known introduced reptiles to Papua New Guinea. There is only one known introduced amphibian, the cane toad (*Rhinella marina*), which is well known from the lowlands around Popondetta and Kokoda villages. We did not encounter it along the track.

6.2.4 Birds

There are only five known introduced birds in Papua New Guinea. These include; the rock dove (*Columba livia*), which is generally restricted to urban areas; the common myna (*Acridotheres tristis*), an Asian species that has been introduced to various areas around the world, including Australia and the Solomon Islands, that was recently found in Alotau; the common starling (*Sturnella vulgaris*), a European species that has also been commonly introduced around the world and was recently sighted in Port Moresby; and two species of passerid finches that have recently become established around Port Moresby, *Passer domesticus* and *P. montanus*.

None of these species was observed along the Kokoda Track, but the red junglefowl (*Gallus gallus*) or domesticated chicken (*G. g. domesticus*) is, of course, common around villages.

6.2.5 Mammals

The only introduced mammals that we observed along the track were domestic cats (*Felis catus*) and dogs (*Canis lupus familiaris*). Feral pigs (*Sus scrofa*) were clearly active in many areas along the Track based on telltale depressions caused by their rooting. Inasmuch as many of the people living along the track are members of the SDA Church, which eschews eating pork, we infer that hunting pressure on pigs is probably low. The feral populations therefore have potential to increase in size, and thus could damage the Track and its natural vegetation.

7 Additional Survey Work Off the Kokoda Track

In August 2015 one of us (Allen Allison) spent nearly a month conducting field surveys for amphibians and reptiles in the headwaters of the Brown River and on the upper slopes of the Mt Victoria massif west of the Kokoda Track. This area is seldom visited by trekkers and is far off the beaten track. However, it is in the same environmental zone as villages along the central section of the Kokoda Track and is less than 11 km WNW of Kagi. We can reasonably assume that the exotic plants growing in this area were not introduced or spread by trekkers. By comparing the exotic flora of this area with that of the central sections of the Kokoda Track we can potentially gain insight into the influence of trekking on the exotic flora around villages and along interconnecting tracks. With this in mind Allison conducted a comprehensive

survey of the exotic plant species in the area.

7.1 Study Site

The primary survey site was Manumu No. 2 Village (-9.068659°, 147.592039°) a small hamlet situated on a south-facing ridge at 1050 m elevation. Secondary survey sites included the track from Manumu No. 2 to the village of Milei (-9.079534°, 147.601813°) at about 650 m elevation; the track from Manumu No. 2 to Kaolagi (-9.052775°, 147.575553°) at around 680 m; and the upper Brown (Naoro) drainage to an elevation of ca. 1500 m (Figures 10-12).

Figure 10. Secondary-growth forest at southern edge of Manuma No. 2 Village [DSCN7538]

Figure 11. Secondary-growth vegetation at southern edge of Manuma No. 2 Village [DSCN7560]

Figure 12. Secondary growth within forest at northern margin of Manuma 2 Village [DSCN6571]

Although areas upstream of Kaolagi are now uninhabited, the 1:100,000 topographic map (1974) shows several villages in the area. The local people pointed these out to us. We spent several days at one of these sites, Mouru, which has not been inhabited for at least a decade.

7.2 Results

A total of 24 exotic species were documented from Manumu No. 2 and the upper Brown River catchment, all of which are known from the Kokoda Track (Appendix 5). Most of the exotic plants were found around Manumu No. 2, Milei, or Kaolagi or along the interconnecting tracks.

The vegetation around the former village of Mouru consisted primarily of native successional species such as *Homalanthus*, *Macaranga*, and *Pipturus*. There was also a lime tree growing in the area, but it was likely planted.

Only two species of exotic plant species were encountered beyond Kaolagi, both invasive shrubs: sanchezia (*Sanchezia speciosa*; often identified as *Sanchezia parvibracteata*) and white angel's trumpet (*Brugmansia candida*). We encountered dense thickets of both species, but primarily sanchezia along streams up to elevations of around 800 m.

8 Discussion

We documented the occurrence of 83 species of exotic plant pests (weeds) growing along the Kokoda Track. We also noted signs of feral pigs in many areas and the presence of introduced rainbow trout in the upper reaches of Eora Creek and the Efogi River. We did not detect the presence of any of the highly problematic ant species, such as little fire ant (*Wasmannia auropunctata*).

All of the plant taxa that we documented from the Kokoda Track represent species that have become widely established in Papua New Guinea (Henty and Pritchard, 1975; personal observations) and are commonly found around villages in the lowlands, hill forests, and lower montane rain forest zones throughout the country. In other words, we did not find any unusual exotic plant species along the Kokoda Track.

The exotic and weedy plants that we encountered along the Kokoda Track are listed in Appendix 2, together with comments on their distribution and environmental impacts. The top ten species, on the basis of invasive tendencies and abundance along the Kokoda Track, are listed in Table 1.

Table 1. The ten worst exotic plant species growing along the Kokoda Track, based on abundance and invasive tendencies

Sanchezia	*Sanchezia speciosa* [Acanthaceae]
White angel's trumpet	*Brugmansia candida* [Solanaceae]
Mikania, climbing hempweed, or mile-a-minute	*Mikania micrantha* [Asteraceae]
Thurston grass or buffalo grass	*Paspalum conjugatum* [Poaceae]
Russell River grass	*Paspalum paniculatum* [Poaceae]
Tobacco weed	*Elephantopus mollis* [Asteraceae]
Matico	*Piper aduncum* [Piperaceae]
Clidemia	*Clidemia hirta* [Melastomataceae]
Goatweed	*Ageratum conyzoides* [Asteraceae]
Cinderella weed	*Synedrella nodiflora* [Asteraceae]

It is difficult to consistently rank exotic species in terms of their current or potential impact on the environment. Two of the species that we included, *Sanchezia speciosa* and *Brugmansia candida,* are clearly invasive and are displacing native riparian vegetation along the Kokoda Track. Mikania is a relatively recent introduction to Papua New Guinea and has spread quickly across the country. It was common along the Kokoda Track. Although it is largely confined to disturbed areas, it grows quickly and can smother native vegetation at the margins of clearings.

Although *Clidemia hirta* was relatively uncommon along the Track, this species is a serious invasive pest elsewhere in Papua New Guinea and is, for example, displacing native vegetation in Varirata National Park. It could become a very serious pest along the Kokoda Track. *Piper aduncum* was fairly common along the Track but was largely found in disturbed areas or in areas recovering from disturbance. However, it has invasive tendencies and could over time become a very serious exotic pest along the Track.

The other species are included largely because they are common along the track. However, they are all restricted to disturbed areas such as anthropogenous grasslands, along the margins of the Track, or in clearings. Of these, tobacco weed (*Elephantopus mollis*) is probably the most serious pest.

Tobacco weed is an aggressive, fast growing species that in places was overrunning the Track. The only feasible method of control is to cut it back with grass knives and bush knives, which is very labour intensive. When vegetation along the Track is cut back, however, tobacco weed returns quickly and over time can crowd out other exotic plants to form nearly pure stands. It was, for example, the dominant non-grass exotic on the Naduri Aerodrome.

The two species of grasses on the list (*Paspalum conjugatum, P. paniculatum*) are both abundant. However, there are probably at least 25 species of exotic grasses along the track. Some of these are escaped forage species and are beneficial elsewhere in Papua New Guinea. The two species of *Paspalum*, however, have little value as forage species, cover large areas, and are highly undesirable.

The remaining species, goatweed and the creeping composite *Synedrella nodiflora,* are abundant but not particularly problematic. Other species, besides grasses that are common but not particularly problematic, include arrowleaf sida (*Sida rhombifolia*), Spanish needle (*Bidens pilosa*), and false buttonweed (*Spermacoce assurgens*).

Henty and Pritchard (1975) treated 146 species in their *Weeds of New Guinea and their Control* (1988). The species treated include well over half the exotic pest plants and weeds that we found along the Kokoda Track. Henty and Pritchard (1975) defined weeds as those species that interfere with agricultural, pastoral or horticultural activities. They did not include environmental weeds, such as sanchezia, an aggressive invader that has no apparent impact on agriculture. If these species were included it is likely that the list of weeds

known from Papua New Guinea would increase to at least 200 species and perhaps considerably more.

There are at least 504 plant exotic plant species known to have become established in the Wet Tropics of North Queensland (Werren, 2001), representing nearly 11% of the overall flora. Using robust assessment criteria, Werren (2001) considered fewer than 60 of these species to be serious weeds. Many of these same weeds occur in Papua New Guinea (Henty and Pritchard, 1975) but only eight of the top 30 weeds occurring in the Wet Tropics of Queensland were found along the Kokoda Track and one, the African tulip tree (*Spathodea campanulata*), occurred only in the abandoned plantations around Kokoda Station (Table 2).

Table 2. Exotic pest species occurring along the Kokoda Track that are among the top 30 weeds in the Wet Tropics of North Queensland (Werren, 2001)

Mikania, hempweed, or mile-a-minute	*Mikania micrantha*
Snakeweed	*Stachytarpheta* spp.
Tobacco weed	*Elephantopus mollis*
African tulip tree	*Spathodea campanulata*
Bushmint	*Hyptis* spp.
Creeping ox-eye	*Sphagneticola trilobata*
Mexican sunflower	*Tithonia diversifolia*

A comparison of the two lists reveals one of the challenges of assessing the impacts of alien and invasive species. Only two of the species on the list of the 30 worst species in North Queensland are serious pests along the Kokoda Track: tobacco weed (*Elephantopus mollis*) and mikania or mile-a-minute (*Mikania micrantha*) (Table 2). Other species that are particularly problematic in North Queensland that also occur along the Kokoda Track include snake weed (*Stachytarpheta* spp.), African tulip tree (*Spathodea campanulata*), bushmint (*Hyptis* spp.), creeping ox-eye (*Sphagneticola trilobata*), and Mexican sunflower (*Tithonia diversifolia*).

The African tulip tree is one of the world's most invasive species (Global Invasive Species Programme, 2015). However, it appears to be restricted to plantation regrowth areas around Kokoda and is essentially absent from the Track. Species of snake weed are fairly common throughout Papua New Guinea, but appear to compose a relatively small fraction of the exotic plant biomass along the Track. Creeping Ox-eye was present along the track in small patches but didn't appear to be spreading. Species of bushmint appear to be cultivated by local people as ornamentals and as herbs to season food. In this sense they are beneficial taxa. Mexican sunflower was observed only around villages and may have been cultivated as an

ornamental. Five of the of the exotic plant species found along the Kokoda Track, together with the rainbow trout, were included on the Global Invasive Species Programme (GISP) list of the world's worst invasive species (Table 3).

Table 3. Species of plants and animals occurring along the Kokoda Track that are included on the Global Invasive Species Programme's list of the world's 100 worst alien invasive species

Mikania, hempweed, or mile-a-minute	*Mikania micrantha*
African tulip tree	*Spathodea campanulata*
Creeping ox-eye	*Sphagneticola trilobata*
Lantana	*Lantana camara*
Clidemia	*Clidemia hirta*
Rainbow trout	*Oncorhynchus mykiss*

All of these species are also known from Australia, but clidemia has apparently been eradicated from there. Only one of the plants on the GISP list, mikania or mile-a-minute (*Mikania micrantha*), is a serious pest along the Kokoda Track. As already mentioned, the African tulip tree is essentially absent from the Track. Creeping ox-eye is uncommon, as is lantana. Clidemia is present but is not yet common. However, it definitely has potential to become a significant problem judging by its success at invading parts of Varirata National Park.

The rainbow trout is known to have significant adverse impacts on native fishes and invertebrates of streams where it becomes established. However, it was obviously introduced deliberately and has become a significant source of protein to people living along the higher elevation sections of the Track.

There is no evidence to suggest that trekkers along the Kokoda Track are introducing exotic species to Papua New Guinea. However, it is likely that the high volume of foot traffic along the Track aids in the dispersal of exotic species along the Track. An indication of this is apparent when the exotic flora of around Manumu No. 2 in the upper Brown River catchment (Appendix 5) is compared to the exotic flora occurring along the Kokoda Track (Appendix 2). The Manumu No. 2 area is well off the beaten track and is seldom visited by trekkers. It has only 24 exotic plant species, or less than a third of the species occurring along the Kokoda Track. Inasmuch as virtually all the species occurring along the Kokoda Track are widespread in Papua New Guinea, there is no evidence to suggest that trekkers are introducing additional species. However, it is likely that the high foot traffic along the park is aiding the spread of exotic species.

9 Recommendations

9.1 Regular surveys

Our brief study has documented the occurrence of the exotic plant species that comprise most of the biomass along the Kokoda Track. These data provide an important scientific foundation or baseline of species known from the Track. If an exotic plant pest is inadvertently introduced by trekkers this should be easy to detect. We therefore recommend that there be periodic monitoring surveys – once a year, if possible.

This need not be a costly enterprise. A botanist from the Forest Research Institute could be engaged and included in a trekking group. Their remit would be to note (and collect) any exotic species not already on our checklist and to report on their findings. This would serve as something of an early warning system for potential new invasions. Over time this would result in the compilation of a comprehensive list of the exotic flora, an essential baseline for detecting any new introductions from trekkers or other sources.

9.2 Species Eradication and Monitoring

Some of the plant species that are relatively uncommon or rare along the Kokoda Track are serious invasive weeds elsewhere in the world or in Papua New Guinea, including clidemia (*Clidemia hirta*), creeping ox-eye (*Sphagneticola trilobata*), African tulip tree (*Spathodea campanulata*), lantana (*Lantana camara*), and Mexican sunflower (*Tithonia diversifolia*). It is not clear what is limiting the spread of these species along the Kokoda Track. Inasmuch as they are now relatively uncommon it may be possible to limit their spread by eradicating existing populations and regularly monitoring the track to ensure that they are eliminated. We are recommending that Track authorities evaluate the feasibility of this management action.

9.3 Field Guide and Citizen Science

The Kokoda Track passes through some of the richest ecosystems in Papua New Guinea. There are estimated to be 450 bird species along the track. During our survey we observed 217 species, which is an impressive total for the relatively short time that we spent on the Track (Appendix 4). This included 13 species of birds of paradise, more than a quarter of the world total. In addition, we observed a Doria's tree kangaroo (*Dendrolagus dorianus*), which is very difficult to see in most other places of Papua New Guinea (Appendix 4). There are likely more

than 2000 species of vascular plants along the track, including many showy orchids and other species. In short, the Track is a wonderland of biodiversity.

During our trek we took many high quality photographs and also had an artist with us who created paintings of many species of plants and animals, especially birds. Although the main attraction of the Track to tourists is its military history, we feel that there is enormous potential to develop nature-based ecotourism along the Track. In order to support such an enterprise there is a clear need for a natural history guide to the Track.

This guide should include high quality photographs and drawings of the plants and animals along the track likely to be observed by ecotourists. It should also include photos and checklists of species. In particular, it should include photos and checklists of exotic plant species and a request for readers to photograph anything that they think is out of place. It is likely that at least some of the ecotourists will be familiar with some of the exotic plants, particularly ecotourists from North Queensland, and their observations could be incorporated into the monitoring program for exotic species along the track (see recommendation 9.2, above).

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11 Acknowledgements

This project was funded by a grant from the Papua New Guinea Conservation and Environmental Protection Authority (CEPA). We would like to thank the extraordinarily helpful staff of the Kokoda Track Authority for their assistance, as well as the rangers along the track. The landowners and camp managers along the track were all extremely helpful. We also thank the staff of CEPA, particularly James Sabi, who oversaw the project, and Alu Kauye, who participated in the survey and is the ongoing project manager.

We would also like to thank the staff of the National Research Institute for accommodation in Port Moresby and other assistance.

The many people or communities who logistically or otherwise helped with the study are:

1) Mr. Max Kaso – Kokoda Frogs Ltd. Guide
2) Mr. Bulisa Iova – PNGNMAG senior technical officer
3) Mr. Oliver Tallowin, Tel Aviv University and Bishop Museum
4) Mr. Alex Slavenko, Tel Aviv University
5) Mr. Peter Joseph – PNGNMAG technical officer
6) Mr. Ivan Luvila - Isurava village ranger
7) Mr. Donald Siga – Kagi village ranger
8) Mr. Andy Noel – Efogi village ranger
9) Mr. Henry Amuri - Kokoda Station Guesthouse Owner
10) Mr. Ubuli Luvila – Isurava Guesthouse Owner
11) Mr. David Suga – Eora Creek Guesthouse Owner
12) Mr. Minoi Gabuve – Templeton 1 Guesthouse Owner
13) Mr. Kentu Matama – 1900 Guesthouse Owner
14) Mr. Isisi Kelea and family – Myola Guesthouse Owner
15) Mr. Isaac Matama – Kagi Guesthouse Owner
16) Mr. Gasi Moroi – Brigade Hill Guesthouse Owner
17) Mr. Sobil – Agulogu village chief and Guesthouse Owner
18) Mr. Jack Mado – Ioribaiwa village chief and Guesthouse Owner
19) Mr. & Mrs. Jackson Luvila – Porter and for providing lunch at Alola village
20) Mr. Nick Bero and family – Porter and for providing lunch at Efogi 1 village
21) Mr. Peter Goria – Porter
22) Mr. Dabio Moi – Porter
23) Mr. Jonathan Iova – Porter
24) Mr. Barnabas Devi – Porter
25) Mr. Raka Uiama – Porter
26) Mr. Ako Neka – Porter
27) Mr. Jackson Luvila – Porter
28) Mr. Augustine Ginio – Porter
29) Mr. Bile Senisi – Porter
30) Mr. Adave Bioro – Porter
31) Mr. Michael Ame – Porter
32) Mr. Bernard Kabaru – Porter
33) Mr. Vicky Luvila - Porter
34) Mr. Rynold Saga – Porter

35) Mr. Lucas – Porter
36) Mr. Tobias Melai – Porter
37) Mr. Ben – Porter
38) Mr. Toni and Lily – Porter
39) Mrs. Janet Michael – Porter
40) Community of Kokoda village
41) Community of Isurava village
42) Community of Alola village
43) Community of Kagi village
44) Community of Naduri village
45) Community of Launumu village
46) Community of Efogi 2 village
47) Community of Efogi 1 village
48) Community of Enivilogo village
49) Community of Agulogo village
50) Community of Manari village
51) Community of Ofi Creek village
52) Community of Ioribaiwa village
53) Mr. Havala Laula – Kagi village

APPENDIX 1 – Checklist of Plant Species Listed in Henty and Pritchard (1975) *Weeds of Papua New Guinea* Updated to Current Usage Following APGIII for Family and Cited References for the Scientific Name

Henty & Pritchard Family	Henty & Pritchard Scientific Name	APGIII family	Current Scientific Name	Comments & References
Dennstaedtiaceae	Pteridium aquilinum	Dennstaedtiaceae	Pteridium aquilinum	Imada 2012
Salviniaceae	Salvinia molesta	Salviniaceae	Salvinia molesta	Imada 2012
Thelypteridaceae	Sphaerostephanos unitus	Thelypteridaceae	Sphaerostephanos unitus	The Plant List website: http://www.theplantlist.org/
Cycadaceae	Cycas circinalis	Cycadaceae	Cycas circinalis	The Plant List website: http://www.theplantlist.org/
Commelinaceae	Commelina benghalensis	Commelinaceae	Commelina benghalensis	Imada 2012
Commelinaceae	Commelina diffusa	Commelinaceae	Commelina diffusa	Imada 2012
Commelinaceae	Commelina paleata	Commelinaceae	Commelina paleata	The Plant List website: http://www.theplantlist.org/
Commelinaceae	Murdannia nudiflora	Commelinaceae	Murdannia nudiflora	Imada 2012
Cyperaceae	Cyperus bifax	Cyperaceae	Cyperus rotundus	The Plant List website: http://www.theplantlist.org/
Cyperaceae	Cyperus brevifolius	Cyperaceae	Cyperus brevifolius	Imada 2012
Cyperaceae	Cyperus cyperoides	Cyperaceae	Cyperus cyperoides	Imada 2012
Cyperaceae	Cyperus distans	Cyperaceae	Cyperus distans	Acevedo-Rodriguez & Strong 2012
Cyperaceae	Cyperus rotundus	Cyperaceae	Cyperus rotundus	Imada 2012
Cyperaceae	Fimbristylis dichotoma	Cyperaceae	Fimbristylis dichotoma	Imada 2012
Gramineae	Brachiaria reptans	Poaceae	Urochloa reptans	Zuloaga et al. 2003: 633
Gramineae	Cenchrus echinatus	Poaceae	Cenchrus echinatus	Imada 2012
Gramineae	Cynodon arcuatus	Poaceae	Cynodon radiatus	The Plant List website: http://www.theplantlist.org/
Gramineae	Cynodon dactylon	Poaceae	Cynodon dactylon	Imada 2012
Gramineae	Digitaria insularis	Poaceae	Digitaria insularis	Imada 2012
Gramineae	Digitaria setigera	Poaceae	Digitaria setigera	Imada 2012
Gramineae	Eleusine indica	Poaceae	Eleusine indica	Imada 2012
Gramineae	Eragrostis tenuifolia	Poaceae	Eragrostis tenuifolia	Imada 2012
Gramineae	Imperata cylindrica	Poaceae	Imperata cylindrica	The Plant List website: http://www.theplantlist.org/
Gramineae	Paspalum conjugatum	Poaceae	Paspalum conjugatum	Imada 2012
Gramineae	Rottboellia exaltata	Poaceae	Rottboellia cochinchinensis	Acevedo-Rodriguez & Strong 2012
Gramineae	Sorghum propinquum	Poaceae	Sorghum propinquum	The Plant List website: http://www.theplantlist.org/
Gramineae	Sorghum verticilliflorum	Poaceae	Sorghum arundinaceum	Acevedo-Rodriguez & Strong 2012
Pontederiaceae	Eichhornia crassipes	Pontederiaceae	Eichhornia crassipes	Imada 2012

Henty & Pritchard Family	Henty & Pritchard Scientific Name	APGIII family	Current Scientific Name	Comments & References
Acanthaceae	Psacadocalymma comatum	Acanthaceae	Justicia comata	The Plant List website: http://www.theplantlist.org/
Acanthaceae	Thunbergia alata	Acanthaceae	Thunbergia alata	Imada 2012
Aizoaceae	Mollugo pentaphylla	Molluginaceae	Mollugo pentaphylla	The Plant List website: http://www.theplantlist.org/
Aizoaceae	Trianthema portulacastrum	Aizoaceae	Trianthema portulacastrum	Imada 2012
Amaranthaceae	Achyranthes aspera	Amaranthaceae	Achyranthes aspera	Imada 2012
Amaranthaceae	Alternanthera bettzickiana	Amaranthaceae	Alternanthera tenella var. bettzickiana	Acevedo-Rodriguez & Strong 2012
Amaranthaceae	Alternanthera pungens	Amaranthaceae	Alternanthera pungens	
Amaranthaceae	Alternanthera sessilis	Amaranthaceae	Alternanthera sessilis	Imada 2012
Amaranthaceae	Amaranthus lividus	Amaranthaceae	Amaranthus lividus	Imada 2012: Hawn material is ssp. polygonoides
Amaranthaceae	Amaranthus spinosus	Amaranthaceae	Amaranthus spinosus	Imada 2012
Amaranthaceae	Celosia argentea	Amaranthaceae	Celosia argentea	Imada 2012
Amaranthaceae	Cyathula prostrata	Amaranthaceae	Cyathula prostrata	Acevedo-Rodriguez & Strong 2012
Amaranthaceae	Gomphrena celosioides	Amaranthaceae	Gomphrena celosioides	Imada 2012
Asclepiadaceae	Asclepias curassavica	Apocynaceae	Asclepias curassavica	Imada 2012
Capparidaceae	Cleome viscosa	Cleomaceae	Arivela viscosa	Acevedo-Rodriguez & Strong 2012
Caryophyllaceae	Drymaria cordata	Caryophyllaceae	Drymaria cordata	Imada 2012: Hawn material is var. pacifica
Compositae	Adenostemma lavenia	Asteraceae	Adenostemma lavenia	The Plant List website: http://www.theplantlist.org/; Hawn material was formerly called Adenostemma lavenia, but now considered a misapplied name (= Adenostemma viscosum); PNG material might be the real A. lavenia?
Compositae	Ageratum conyzoides	Asteraceae	Ageratum conyzoides	Imada 2012
Compositae	Bidens pilosa	Asteraceae	Bidens pilosa	Imada 2012
Compositae	Blumea lacera	Asteraceae	Blumea lacera	The Plant List website: http://www.theplantlist.org/
Compositae	Conyza aegyptica	Asteraceae	Erigeron aegyptiacus	The Plant List website: http://www.theplantlist.org/
Compositae	Crassocephalum crepidioides	Asteraceae	Crassocephalum crepidioides	Imada 2012
Compositae	Dichrocephala bicolor	Asteraceae	Dichrocephala bicolor?	The Plant List website: http://www.theplantlist.org/ calls this an unresolved name
Compositae	Eclipta prostrata	Asteraceae	Eclipta prostrata	Imada 2012
Compositae	Elephantopus mollis	Asteraceae	Elephantopus mollis	Imada 2012

Henty & Pritchard Family	Henty & Pritchard Scientific Name	APGIII family	Current Scientific Name	Comments & References
Compositae	Eleutheranthera ruderalis	Asteraceae	Eleutheranthera ruderalis	Acevedo-Rodriguez & Strong 2012
Compositae	Emilia sonchifolia	Asteraceae	Emilia sonchifolia	Imada 2012: HI has 2 vars., javanica & sonchifolia
Compositae	Erechtites valerianifolia	Asteraceae	Erechtites valerianifolia	Imada 2012
Compositae	Erigeron sumatrensis	Asteraceae	Erigeron sumatrensis	The Plant List website: http://www.theplantlist.org/
Compositae	Eupatorium odoratum	Asteraceae	Chromolaena odorata	Acevedo-Rodriguez & Strong 2012
Compositae	Galinsoga parviflora	Asteraceae	Galinsoga parviflora	Imada 2012
Compositae	Mikania micrantha	Asteraceae	Mikania micrantha	Acevedo-Rodriguez & Strong 2012
Compositae	Sigesbeckia orientalis	Asteraceae	Sigesbeckia orientalis	Imada 2012
Compositae	Sonchus oleraceus	Asteraceae	Sonchus oleraceus	Imada 2012
Compositae	Spilanthes grandiflora	Asteraceae	Acmella grandiflora var. brachyglossa	The Plant List website: http://www.theplantlist.org/
Compositae	Spilanthes paniculata	Asteraceae	Acmella paniculata	The Plant List website: http://www.theplantlist.org/
Compositae	Synedrella nodiflora	Asteraceae	Synedrella nodiflora	Imada 2012
Compositae	Tridax procumbens	Asteraceae	Tridax procumbens	Imada 2012
Compositae	Vernonia cinerea	Asteraceae	Cyanthillium cinereum	Imada 2012
Compositae	Wedelia biflora	Asteraceae	Wollastonia biflora	The Plant List website: http://www.theplantlist.org/
Compositae	Wedelia spilanthoides	Asteraceae	Wedelia spilanthoides	The Plant List website: http://www.theplantlist.org/
Compositae	Xanthium pungens	Asteraceae	Xanthium pungens	The Plant List website: http://www.theplantlist.org/
Compositae	Youngia japonica	Asteraceae	Youngia japonica	Imada 2012
Convolvulaceae	Cuscuta australis	Convolvulaceae	Cuscuta australis	The Plant List website: http://www.theplantlist.org/
Convolvulaceae	Ipomoea hederifolia	Convolvulaceae	Ipomoea hederifolia	Imada 2012
Convolvulaceae	Ipomoea plebeia	Convolvulaceae	Ipomoea biflora	The Plant List website: http://www.theplantlist.org/
Convolvulaceae	Ipomoea triloba	Convolvulaceae	Ipomoea triloba	Imada 2012
Cruciferae	Cardamine hirsuta	Brassicaceae	Cardamine hirsuta	Imada 2012
Cucurbitaceae	Momordica charantia	Cucurbitaceae	Momordica charantia	Imada 2012
Ericaceae	Rhododendron macgregoriae	Ericaceae	Rhododendron macgregoriae?	The Plant List website: http://www.theplantlist.org/ calls this an unresolved name
Euphorbiaceae	Acalypha boehmerioides	Euphorbiaceae	Acalypha lanceolata	The Plant List website: http://www.theplantlist.org/
Euphorbiaceae	Croton hirtus	Euphorbiaceae	Croton hirtus	Acevedo-Rodriguez & Strong 2012
Euphorbiaceae	Euphorbia geniculata	Euphorbiaceae	Euphorbia heterophylla	The Plant List website: http://www.theplantlist.org/
Euphorbiaceae	Euphorbia heterophylla	Euphorbiaceae	Euphorbia heterophylla	Imada 2012

Henty & Pritchard Family	Henty & Pritchard Scientific Name	APGIII family	Current Scientific Name	Comments & References
Euphorbiaceae	Euphorbia hirta	Euphorbiaceae	Euphorbia hirta	Imada 2012
Euphorbiaceae	Euphorbia thymifolia	Euphorbiaceae	Euphorbia thymifolia	Imada 2012
Euphorbiaceae	Phyllanthus niruri	Phyllanthaceae	Phyllanthus niruri	Acevedo-Rodriguez & Strong 2012
Labiatae	Anisomeles malabarica	Lamiaceae	Anisomeles malabarica	The Plant List website: http://www.theplantlist.org/
Labiatae	Hyptis capitata	Lamiaceae	Hyptis capitata	Imada 2012
Labiatae	Hyptis pectinata	Lamiaceae	Mesosphaerum pectinatum	Harley & Pastore 2012
Labiatae	Hyptis suaveolens	Lamiaceae	Mesosphaerum suaveolens	Harley & Pastore 2012
Labiatae	Leucas aspera	Lamiaceae	Leucas aspera	The Plant List website: http://www.theplantlist.org/
Labiatae	Salvia misella	Lamiaceae	Salvia misella	Acevedo-Rodriguez & Strong 2012
Lauraceae	Cassytha filiformis	Lauraceae	Cassytha filiformis	Imada 2012
Leguminosae	Aeschynomene americana	Fabaceae	Aeschynomene americana	Acevedo-Rodriguez & Strong 2012
Leguminosae	Aeschynomene indica	Fabaceae	Aeschynomene indica	Acevedo-Rodriguez & Strong 2012
Leguminosae	Cassia absus	Fabaceae	Chamaecrista absus	Acevedo-Rodriguez & Strong 2012
Leguminosae	Cassia alata	Fabaceae	Senna alata	Imada 2012
Leguminosae	Cassia occidentalis	Fabaceae	Senna occidentalis	Imada 2012
Leguminosae	Cassia tora	Fabaceae	Senna obtusifolia	The Plant List website: http://www.theplantlist.org/ : Cassia tora is a misapplied name
Leguminosae	Clitoria ternatea	Fabaceae	Clitoria ternatea	Imada 2012
Leguminosae	Crotalaria retusa	Fabaceae	Crotalaria retusa	Imada 2012
Leguminosae	Mimosa invisa	Fabaceae	Mimosa diplotricha var. diplotricha	Acevedo-Rodriguez & Strong 2012
Leguminosae	Mimosa pudica	Fabaceae	Mimosa pudica	Imada 2012: Hawn material is var. unijuga
Malvaceae	Malvastrum coromandelianum	Malvaceae	Malvastrum coromandelianum	Imada 2012: Hawn material is ssp. coromandelianum
Malvaceae	Sida acuta	Malvaceae	Sida acuta	Imada 2012: Hawn material is ssp. carpinifolia
Malvaceae	Sida cordifolia	Malvaceae	Sida cordifolia	Imada 2012
Malvaceae	Sida rhombifolia	Malvaceae	Sida rhombifolia	Imada 2012
Malvaceae	Urena lobata	Malvaceae	Urena lobata	Imada 2012
Melastomataceae	Clidemia hirta	Melastomataceae	Clidemia hirta	Imada 2012: Hawn material is var. hirta
Nyctaginaceae	Boerhavia diffusa	Nyctaginaceae	Boerhavia diffusa?	Wagner et al. 1999: In HI, the name B. diffusa has been misapplied to B. acutifolia & B. repens; PNG material could be real B. diffusa
Nyctaginaceae	Boerhavia erecta	Nyctaginaceae	Boerhavia erecta	Imada 2012

Henty & Pritchard Family	Henty & Pritchard Scientific Name	APGIII family	Current Scientific Name	Comments & References
Onagraceae	Ludwigia adscendens	Onagraceae	Ludwigia adscendens	Acevedo-Rodriguez & Strong 2012
Onagraceae	Ludwigia hyssopifolia	Onagraceae	Ludwigia hyssopifolia	The Plant List website: http://www.theplantlist.org/
Onagraceae	Ludwigia octovalvis	Onagraceae	Ludwigia octovalvis	Imada 2012
Oxalidaceae	Oxalis corniculata	Oxalidaceae	Oxalis corniculata	Imada 2012
Passifloraceae	Passiflora foetida	Passifloraceae	Passiflora foetida	Imada 2012
Piperaceae	Peperomia pellucida	Piperaceae	Peperomia pellucida	Imada 2012
Piperaceae	Piper aduncum	Piperaceae	Piper aduncum	Imada 2012
Plantaginaceae	Plantago major	Plantaginaceae	Plantago major	Imada 2012
Polygalaceae	Polygala paniculata	Polygalaceae	Polygala paniculata	Imada 2012
Polygonaceae	Polygonum barbatum	Polygonaceae	Persicaria barbata	The Plant List website: http://www.theplantlist.org/
Polygonaceae	Polygonum nepalense	Polygonaceae	Persicaria nepalensis	The Plant List website: http://www.theplantlist.org/
Polygonaceae	Polygonum orientale	Polygonaceae	Persicaria orientalis	The Plant List website: http://www.theplantlist.org/
Polygonaceae	Polygonum strigosum	Polygonaceae	Persicaria strigosa	The Plant List website: http://www.theplantlist.org/
Polygonaceae	Rumex crispus	Polygonaceae	Rumex crispus	Imada 2012: Hawn material is ssp. crispus or fauriei
Portulacaceae	Portulaca oleracea	Portulacaceae	Portulaca oleracea	Imada 2012
Rubiaceae	Hedyotis corymbosa	Rubiaceae	Oldenlandia corymbosa	Imada 2012
Rubiaceae	Mitracarpus villosus	Rubiaceae	Mitracarpus hirtus	Acevedo-Rodriguez & Strong 2012
Rubiaceae	Spermacoce laevis	Rubiaceae	Spermacoce laevis	Acevedo-Rodriguez & Strong 2013
Rubiaceae	Spermacoce repens	Rubiaceae	Spermacoce exilis	The Plant List website: http://www.theplantlist.org/
Scrophulariaceae	Bacopa procumbens	Plantaginaceae	Mecardonia procumbens	The Plant List website: http://www.theplantlist.org/
Scrophulariaceae	Lindernia crustacea	Linderniaceae	Torenia crustacea	Fischer et al. 2013
Scrophulariaceae	Stemodia verticillata	Plantaginaceae	Stemodia verticillata	Acevedo-Rodriguez & Strong 2013
Solanaceae	Physalis angulata	Solanaceae	Physalis angulata	Imada 2012
Solanaceae	Solanum erianthum	Solanaceae	Solanum erianthum	Acevedo-Rodriguez & Strong 2013
Solanaceae	Solanum nodiflorum	Solanaceae	Solanum americanum	Acevedo-Rodriguez & Strong 2013
Solanaceae	Solanum torvum	Solanaceae	Solanum torvum	Imada 2012
Sterculiaceae	Melochia corchorifolia	Malvaceae	Melochia corchorifolia	The Plant List website: http://www.theplantlist.org/
Tiliaceae	Corchorus aestuans	Malvaceae	Corchorus aestuans	Acevedo-Rodriguez & Strong 2013
Tiliaceae	Triumfetta rhomboidea	Malvaceae	Triumfetta rhomboidea	Imada 2012
Urticaceae	Laportea interrupta	Urticaceae	Laportea interrupta	The Plant List website: http://www.theplantlist.org/

Henty & Pritchard Family	Henty & Pritchard Scientific Name	APGIII family	Current Scientific Name	Comments & References
Urticaceae	Pilea microphylla	Urticaceae	Pilea microphylla	Imada 2012
Verbenaceae	Lantana camara	Verbenaceae	Lantana camara	Imada 2012
Verbenaceae	Stachytarpheta jamaicensis	Verbenaceae	Stachytarpheta jamaicensis	Imada 2012
Verbenaceae	Stachytarpheta urticaefolia	Verbenaceae	Stachytarpheta cayennensis	Imada 2012
Verbenaceae	Verbena bonariensis	Verbenaceae	Verbena bonariensis	Imada 2012
Zygophyllaceae	Tribulus cistoides	Zygophyllaceae	Tribulus cistoides	Imada 2012

APPENDIX 2 – List of Plant Exotic Pest Taxa or Environmental Weeds Identified Along the Kokoda Track in April-May 2015

Prickly chaff flower (*Achyranthes aspera)* [Amaranthaceae] (Figure 13) – Introduced to and widespread in Papua New Guinea – often found in pastures.

A pantropical weed; it reportedly has some medicinal value – common in various areas along the Track, with a tendency to be in shaded areas. Known from Papua New Guinea since at least 1881 (Henty and Pritchard, 1975: 178).

Figure 13. Prickly chaff flower (*Achyranthes aspera*) [DSC_1986]

Goatweed (*Ageratum conyzoides*) [Asteraceae] (Figure 14) – Introduced to and widespread in Papua New Guinea.

Ageratum conyzoides is native to Central and South America, and the West Indies. It commonly grows in the proximity of habitation, thrives in any garden and agricultural soils and is very common in disturbed sites and degraded areas. It invades forest, woodland, grassland, cultivated land, riparian zones (banks of watercourses), wetlands, and coastal dunes. *Ageratum conyzoides* is an important weed of plantation crops and overgrazed pastures. It has been known from Papua New Guinea since at least 1960 (Henty and Pritchard, 1975: 178.

Figure 14. Goatweed (*Ageratum conyzoides*) [DSCN8207]

Golden Trumpet Vine (*Allamanda cathartica*) [Apocynaceae] (Figure 15) – Introduced to and widespread in Papua New Guinea.

Allamanda is a genus of 12-15 species native to the Americas, occurring from Mexico to Argentina. Several species are have large, colorful flowers and are commonly planted as ornamentals throughout the tropics. *Allamanda cathartica* occurs throughout Papua New Guinea and is commonly planted as an ornamental around villages. It was relatively uncommon along the Kokoda Track. Werren (2001) includes it on his list of the top 30 environmentals weed in North Queensland.

Figure 15. Golden Trumpet Vine (*Allamanda cathartica*)

Joyweed (*Alternanthera bettzickiana)* [Amaranthaceae] – Introduced to and widespread in Papua New Guinea.

Native to South America, this common ornamental plant was common along many parts of the Track, generally in shady places. Many of the individuals that we encountered may have been planted. It superficially resembles *Iresine herbstii.* It has been known from Papua New Guinea since at least 1960 (Henty and Pritchard, 1975: 178.

Malabar catmint *(Anisomeles malabarica*) [Lamiaceae] – Apparently native to Papua New Guinea.

This species is native to a large area of the tropics extending from India to New Guinea; it tends to frequent disturbed area along the Kokoda Track. Known from Papua New Guinea since at least 1881 and treated as a weedy species by Henty and Pritchard, (1988: 178), although it is likely native to Papua New Guinea.

Spanish needle (*Bidens pilosa*) [Asteraceae] (Figure 16) – Introduced to and widespread and common throughout Papua New Guinea.

Native to tropical areas of the New World, this species has seeds that readily attach to clothing, particularly socks, bird feathers, and fur, and has become a pantropical weed. Known from Papua New Guinea since at least 1881 (Henty and Pritchard, 1975: 178).

Figure 16. Spanish needle (*Bidens pilosa*) [DSC_1427]

White angel's trumpet (*Brugmansia candida*) [Solanaceae] (Figure 17) – Introduced to Papua New Guinea and fairly widespread.

This is generally regarded as a hybrid between two species of *Brugmansia* that were originally from South America. It is a common ornamental and has become established through much of the tropical world and is found throughout Papua New Guinea, generally in open, riparian associations. It is often found with *Sanchezia speciosa*

but does not appear to be nearly as invasive as that species. The foliage and flowers are both highly toxic.

This species was is not listed in Henty and Pritchard (1975), suggesting that it is a relatively recent introduction or was not thought to be a weed. It is most likely the latter explanation. It does not really qualify as a weed according to Henty and Pritchard (1975), who defined them as plants that "interfere with man's horticultural and pastoral activities."

Figure 17. White angel's trumpet (*Brugmansia candida*) [DSCN6892]

It is known from the Wet Tropics of North Queensland (Werren, 2001) but is not thought to be a serious pest there. For example, it is not listed in the Pocket Guide, Agricultural and Environmental Weeds, Far North Queensland (Department of Natural Resources and Mines, Queensland Government, 2001).

We consider *Brugmansia candida* to be one of the more serious environmental weeds or exotic pest species along the Kokoda Track. It is often found in disturbed areas along streams but is also invading intact native riparian habitat, often in association with sanchezia (*Sanchezia speciosa*), such as along the Efogi River near Launumu.

Kikuyu grass (*Cenchrus clandestinus*) [Poaceae] – Introduced to Papua New Guinea.

This species native range is tropical eastern Africa. It is known to be introduced to many Pacific Islands, Australasia, China, Indonesia, Philippines, and South Africa. Introduction pathways to new locations include agriculture –used as a pasture grass; for ornamental purposes - used as a lawn grass; translocation of machinery/equipment - Small pieces of rhizomes or stolon can be transported to new locations in weed clearing machinery.

Several species of *Cenchrus* were mentioned by Henty and Pritchard (1975), but C. *clandestinus* was not, although it is quite widespread in Australia and Papua New Guinea.

Elephant grass (*Cenchrus* sp.) [Poaceae] (Figure 18) – Introduced to and fairly widespread in Papua New Guinea.

This unidentified species of *Cenchrus* is fairly common along the Kokoda Track. It is related to *C. purpureus* (elephant grass), which is not treated as a weed by Henty and Pritchard (1975), but is mentioned in their introduction (p. 1) as an example species that is generally beneficial (as a fodder grass) but behaves as a weed in some situations, such as in young tree plantations.

Figure 18. Elephant grass (*Cenchrus* sp.) [DSCN8183]

Knapweeds (*Centaurea* sp.) [Asteraceae] (Figure 19) – We have not yet been able to identify this to species so its distribution in Papua New Guinea is unknown.

There were scattered populations along the Kokoda Track, mostly around villages, with some suggestion that *Centaurea* is mostly grown as an ornamental along the Kokoda track. It is certainly not a serious weed along the Track. Members of the genus are found only north of the equator, mostly in the Eastern Hemisphere.

Figure 19. Knapweed (*Centaurea* sp.) [DSCN8219]

Butterfly pea (*Centrosema pubescens*) [Fabaceae] – Introduced to and widespread in Papua New Guinea.Fairly common along the Kokoda Track, particularly around villages. Although it is used elsewhere as a forage crop, it generally does not seem to be a food crop in Papua New Guinea and should be considered as a weed, although it is generally not a serious pest and does not appear to be invasive.

Common mouse-ear chickweed (*Cerastium fontanum*) [Caryophyllaceae] - Introduced to Papua New Guinea and fairly widespread.This species is native to Europe but introduced elsewhere. It is not treated in Henty and Pritchard (1975), suggesting that it is a relatively recent introduction but it is fairly widespread in Papua New Guinea. *Cerastium vulgare* has been reported from North Queensland (Werren, 2001). This is a fairly innocuous species and is of little concern.

Day-blooming jasmine (*Cestrum* cf. *diurnum*) [Solanceae] - Introduced to Papua New Guinea.This species is native to the tropical Americas and was growing along the Kokoda Track mostly as an ornamental; It is not treated as a weed in North Queensland (Werren, 2001), nor is it treated as a weed in Papua New Guinea by Henty and Pritchard (1975).

Clidemia (*Clidemia hirta*) [Melastomataceae] (Figure 20) - Introduced to Papua New GuineaThis species is native to tropical America and is considered a serious pest in at least 16 countries, including Hawaii, Fiji, and Indonesia. It was not particularly common along the Kokoda Track, suggesting that it may be a recent introduction.

Figure 20. Clidemia (*Clidemia hirta*) [DSCN 6992]

It is known from Papua New Guinea since at least 1881 (Henty and Pritchard, 1975: 178) and is very common in Varirata National Park where it is a serious invasive pest. This species is difficult to control but can spread quickly. Based on its behavior elsewhere – such as in Hawaii and in Varirata National Park, where it readily invades native ecosystems, it should be considered as serious exotic pest along the Kokoda track and in Papua New Guinea. Although Varirata National Park is outside of our Kokoda track study area, *Clidemia hirta* is clearly a very serious pest there and it would be prudent to address this when upgrading facilities in the park.

Flaxleaf fleabane (*Conyza bonariensis*) [Asteraceae] - Introduced to Papua New Guinea.

This species is native to North America. It is not treated in Henty and Pritchard (1975), who mention a fairly close relative, *Conyza aegyptica*, which was first reported from Papua New Guinea in 1931-1940. *Conyza bonariensis* is patchily distributed along the Kokoda Track and is not a serious weed.

Thickhead (*Crassocephalum crepidioides*) [Asteraceae] (Figure 21) - Introduced to Papua New Guinea and widespread throughout the country.

This species is native to Africa and Madagascar. Henty and Pritchard (1988: 2) report that the species was first noted in Papua New Guinea between 1935 and 1940. It is occasionally eaten in its native Africa (see section 4.1.7) and is occasionally eaten in Papua New Guinea (Henty and Pritchard, 1975). By 1955 it had spread throughout Papua New Guinea and acquired local names (Henty and Pritchard, 1975). It is a common species along the Kokoda Track, but is present in fairly low

abundance and is not considered to be a serious exotic pest.

Figure 21. Thickhead (*Crassocephalum crepidioides*) [DSCN8260]

Montbretia (*Crocosmia* x *crocosmiiflora*) [Iridaceae] (Figure 22) – Introduced to and widespread in Papua New Guinea.

A hybrid species between two tropical South African species, originally produced in France, this taxon is commonly encountered in upland areas throughout Papua New Guinea. We noted small patches around 1900 Crossing and in the grasslands of Myola. It is not a serious pest and is not treated in Henty and Pritchard (1975).

Figure 22. Montbretia (*Crocosmia* × *crocosmiiflora*) [DSCN8267]

Crotalaria (*Crotalaria retusa*) [Fabaceae] (Figure 23) – Introduced to and widespread in Papua New Guinea.

Native to Bangladesh, Bhutan, and India. Cultivated throughout the dry and wet tropics and to a lesser extent in the subtropics and even cool temperate steppe, this species was first documented from Papua New Guinea in 1951-1960 and occurs largely in areas with a distinct dry season (Henty and Pritchard, 1975: 121). It was relatively uncommon along the Kokoda Track and was not a serious weed, although in some parts of Papua New Guinea it is a fairly serious agricultural pest.

Figure 23. Crotalaria (*Crotalaria retusa*) [DSCN8768]

Cigar plant (*Cuphea ignea*) [Lythraceae] (Figure 24) - Introduced to and patchily distributed in upland areas around Papua New Guinea.

This species is native to Mexico and the West Indies. It is not treated as a weed by Henty and Pritchard (1975) and is generally grown as an ornamental. It does, however, appear to be spreading on its own but is relatively uncommon around the Kokoda Track, where it is largely confined to 1900 Crossing. It is not a serious pest.

Figure 24. Cigar plant (*Cuphea ignea*). Photograph of a garden plant in Ashbury, Sydney, New South Wales Australia [DSCN9830]

White water sedge (*Cyperus mindorensis*, syn. *Kyllinga nemoralis*) [Cyperaceae] - Native to Papua New Guinea.

This species is widely distributed in the Old World tropics and subtropics. We generally encountered it in disturbed areas along the Kokoda Track, suggesting that it was a weed, but it is apparently native to Papua New Guinea.

Nutsedge (*Cyperus* sp.) [Cyperaceae] – Widespread in Papua New Guinea.

Cyperus is a large genus of about 700 species of sedges, distributed throughout all continents in both tropical and temperate regions. The various species are difficult to identify but several of them are common grassland pests.

Desmodium (*Desmodium intortum*) [Fabaceae] - Introduced to Papua New Guinea and relatively widespread.

This species is native to Mesoamerica, South America, and in a restricted area of Brazil between 18 and 25°S. It is now naturalised in small areas of higher altitude tropics and the humid subtropics. It was generally found in shady, upland areas along the Kokoda Track. *Desmodium* spp. are not treated in Henty and Pritchard (1975), suggesting that they are recent introductions, but we have noted the occurrence of several species in different parts of Papua New Guinea, suggesting that they are widespread.

Desmodium (*Desmodium* sp.) [Fabaceae] (Figure 25) – We have not yet identified all of our *Desmodium* collections to species, but it appears that several taxa are involved besides *D. intortum*. We have observed these taxa elsewhere in Papua New Guinea, suggesting that they are widespread.

Seven species of of *Desmodium* are known from the Wet Tropics of North Queensland (Werren, 2001), and some of these are serious garden pests around the world. None of the taxa along the Kokoda Track appeared to be serious exotic pests, but they spread easily and could in future become serious pests. See note under *D. intortum*, above. All species are native to Mesoamerica.

Figure 25. Desmodium (*Desmodium* sp.)

Dianthus (*Dianthus* sp.) [Caryophyllaceae] Introduced to Papua New Guinea.

Dianthus is a genus of about 300 species of flowering plants in the family Caryophyllaceae, native mainly to Europe and Asia, with a few species extending south to North Africa. We are uncertain as to the specific identity of this taxon. In any case it was relatively uncommon along the Kokoda Track and seemed to be growing largely as an ornamental.

Sheda grass (*Dichanthium* cf. *annulatum*) [Poaceae] - Native to Papua New Guinea.

This species is native to Africa, Asia, and Indochina and is likely native to Papua New Guinea, although it was found mainly in disturbed areas along the Kokoda Track and appeared to be a weed.

Tropical chickweed (*Drymaria cordata*)

[Caryophyllaceae] - Introduced to Papua New Guinea.

This species is native to Texas and throughout southwest America. It was often encountered in relatively shady and wet places along the Kokoda Track. It is sometimes eaten as an herb but it is poisonous to livestock and can become a serious pest in overgrazed pastures. It was first noted in Papua New Guinea by 1881 (Henty and Pritchard, 1975). It was not a serious weed along the Kokoda Track.

Golden dewdrop (*Duranta erecta*)

[Verbenaceae] (Figure 26) – Introduced to Papua New Guinea from the Mexico to South America.

This is an extremely common ornamental in Papua New Guinea but is regarded as an invasive weed in Australia and some other tropical regions. It seemed to be mainly growing as an ornamental along the Kokoda Track and there was no evidence that it was invading native ecosystems.

Figure 26. Golden dewdrop (*Duranta erecta*) [DSCN 8466]

Tobacco weed *(Elephantopus mollis)*

[Asteraceae] [Figure 27] - Introduced to and extremely widespread in Papua New Guinea.

This species is native to tropical regions in the Americas, and has spread to most tropical regions around the world. It was a serious weed along the Kokoda Track, and in many open areas would overgrow the Track if not controlled. This is one of the most abundant and common weeds along the Track and is a serious pest. It was first documented to occur in Papua New Guinea in 1931-1940 (Henty and Pritchard, 1975) and is now virtually ubiquitous.

Figure 27. Tobacco weed (*Elephantopus mollis*) [DSCN8677]

Forest red gum (*Eucalyptus* cf. *tereticornis*) [Myrtaceae] – Introduced from Australia; status in Papua New Guinea unknown.

This species is native to eastern Australia. It appeared to be growing as a wood crop around villages along the central section of the Track (e.g., Kagi).

Poinsettia (*Euphorbia pulcherrima*) [Euphorbiaceae] (Figure 28) – Introduced to and widespread in Papua New Guinea.

Native to Mexico and Central America, this species, on account of its bright red bracts subtending the flowers, is a common ornamental that has been planted throughout Papua New Guinea, particularly in hill forest and upland areas, where it has escaped from cultivation. It is relatively uncommon along the Kokoda Track, occurring around villages. It is not listed as an environmental weed in North Queensland (Werren, 2001).

Figure 28. Poinsettia (*Euphorbia pulcherrima*)

Chickenweed (*Euphorbia thymifolia*) [Euphorbiaceae] – Introduced and widespread in Papua New Guinea.

This species occurs throughout India in plains and low hills, ascending to 1660 m in Kashmir. It was first noted between 1881 and 1900 to occur in New Guinea (Henty and Pritchard, 1975: 180). It is fairly innocuous and not a serious pest.

Fringe-rush (*Fimbristylis* sp.) [Cyperaceae] We are still working to confirm the identification of our collections.

Fimbristylis dichotoma is known to occur throughout Papua New Guinea from sea level to as high as 2500 m. It was first noted between 1951 and 1960 (Henty and Pritchard, 1975:180). *Fimbristylis dichotoma* is largely confined to anthropogenous grassy areas.

Cudweed (*Gnaphalium* sp.) [Asteraceae] - Status in Papua New Guinea unknown, but almost certainly introduced.

We remain uncertain as to the identity of the material that we collected. Species in this genus are widespread and common in temperate regions,

although some are found on tropical mountains or in the subtropical regions of the world. This taxon was relatively uncommon along the Kokoda Track.

Fourspike heliotrope (*Heliotropium procumbens*) [Boraginaceae] (Figure 29) - Introduced to Papua New Guinea, where it is probably widespread.

This species is native to the US and Carribbean and has been introduced to Hawaii and Oceania. It is a fairly innocuous weed, generally found in disturbed areas in moist, shady places. It is not a serious pest. It is not mentioned in Henty and Pritchard (1975), and may represent a recent introduction, although we have encountered it in various parts of Papua New Guinea, suggesting that it is now widespread.

Figure 29. Fourspike heliotrope (*Heliotropium procumbens*) [DSC_2475]

Herbe aux lacs (*Hylodesmum repandum*) [Fabaceae] - Native to Papua New Guinea.

This species is distributed throughout the tropics and subtropics of the Old World. We mostly encountered this taxon in disturbed areas, suggesting that it was a weed, but it is apparently native to Papua New Guinea.

Bushmint (*Hyptis* sp.) [Lamiaceae] (Figure 30) - Status in Papua New Guinea unknown.

These plants, known commonly as bushmints, are widespread in tropical North and South America, as well as parts of West Africa. Although treated as serious weeds in the Wet Tropics of North Queensland (Werren, 2001), bushmint is often grown in Papua New Guinea as an ornamental or as an herb for seasoning food. It was mostly confined to disturbed areas along the Kokoda Track, but has invasive tendencies and could in the future become a serious weed.

Figure 30. Bushmint (*Hyptis* sp.) [DSC_2499]

Busy Lizzy (*Impatiens walleriana*) [Balsaminaceae] - Introduced to Papua New Guinea; status unknown.

This species is native to eastern Africa from Kenya to Mozambique. It is commonly planted along the Kokoda Track together with native species and cultivars derived from native species. It does not seem to be spreading on its own, although this can be difficult to determine. It is not a serious pest, particularly as it is planted as an ornamental. It is not mentioned in

Henty and Pritchard (1975), but we have seen it in different parts of Papua New Guinea, suggesting that it is widespread.

Impatiens (*Impatiens* sp.) [Balsaminaceae] (Figure 31, 32) –Complex cultivars of native Papua New Guinea species have been introduced into cultivation, and some may have escaped back into disturbed areas or have been planted along the Kokoda Track.

Although common along the Track, particularly in upland areas, this taxon appears mostly to be propagated as an ornamental. There are many species native to Papua New Guinea, some of which, as mentioned above, are widely cultivated.

Figure 31. Impatiens (*Impatiens* sp.) [DSCN7734]

Figure 32. Impatiens (*Impatiens* sp.) [DSCN7337]

Bloodleaf (*Iresine herbstii*) [Amaranthaceae] (Figure 33) - Introduced to Papua New Guinea and widespread.

This species is native to Brazil and is widespread in Papua New Guinea, where it appears to be propagated and planted as an ornamental. It seems to be spreading on its own along the Track, but was clearly planted as an ornamental in many places.

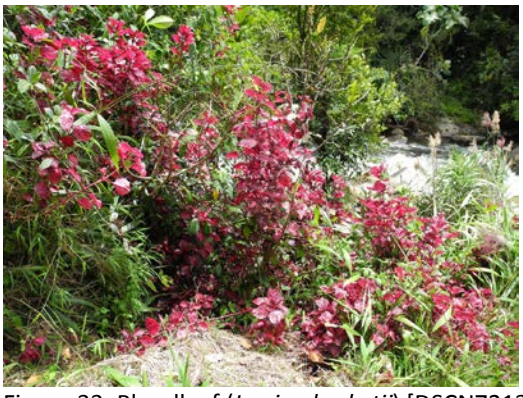

Figure 33. Bloodleaf (*Iresine herbstii*) [DSCN7213]

Hyacinth bean (*Lablab purpureus*) [Fabaceae] - Introduced to Papua New Guinea.

This species is native to Africa and is now widely cultivated pantropically, including Papua New Guinea, as a food plant.

Lantana (*Lantana camara*) [Verbenaceae] (Figure 34) – Introduced to and widespread in Papua New Guinea.

Native to Mexico, Central America, the Caribbean, and tropical South America, lantana occurs along roadsides, in degraded lands, in riparian zones (banks of watercourses), along fence lines, in pastures and parklands, in plantations, and forest edges and gaps, and is now seen invading native vegetation in woodlands and savannas (notably in protected areas). Although considered a serious pest in Australia (Werren, 2001), it was not a serious pest along the Kokoda Track, where it was represented by just a few widely dispersed infestations. Lantana has been known from Papua New Guinea since at least 1881 (Henty and Pritchard, 1975: 180).

Figure 34. Lantana (*Lantana camara*) [DSCN6699]

Loosestrife (*Lysimachia* sp.) [Primulaceae] - Status in Papua New Guinea unknown.

Molecular phylogenies do not offer clear inferences on the overall historical biogeography of *Lysimachia*, but Southeast Asia origins of several clades, including the Hawaiian endemic clade and the Iberian *Lysimachia ephemerum*, are strongly supported. We have not yet been able to identify our material to species. This is not a serious pest in Papua New Guinea or along the Kokoda Track.

Guinea grass (*Megathyrsus maximus*) [Poaceae] – Introduced to and widespread in Papua New Guinea.

Native to Africa. A very common and widespread weed of crops, orchards, vineyards, disturbed sites, roadsides, railways, footpaths, parks and gardens, bushland, and riparian vegetation throughout much of the tropics. It has been cultivated as a pasture grass in warm regions of Australia and was apparently introduced from there to Papua New Guinea. It is abundant along the Kokoda Track but is confined to open, disturbed areas.

Molasses grass (*Melinis minutiflora*) [Poaceae] (Figure 35) - Introduced to and widespread in Papua New Guinea.

This species is native to Africa and Indian Ocean islands. It inhabits grassland, shady places, and rocky slopes in sub-humid and humid climates, sometimes forming pure stands. It is naturalized throughout the tropics and subtropics. It regrows

quickly following fire and now covers huge areas of Papua New Guinea. It was relatively uncommon along the Kokoda Track, often confined to isolated patches. This species can be a serious garden pest and its occurrence along the Kokoda track should be monitored. It is not mentioned in Henty and Pritchard (1975), suggesting that it is a relatively recent introduction, although it is widespread in Papua New Guinea.

Figure 35. Molasses grass (*Melinis minutiflora*) which occupies the right side of the photo [DSCN7152]

Mikania, climbing hempweed, or mile-a-minute (*Mikania micrantha*) [Asteraceae] (Figure 36) – Introduced to Papua New Guinea and now widespread.

Mikania is a relatively recent introduction to Papua New Guinea, having been introduced after 1960 (Henty and Pritchard, 1975: 180). A vigorous, fast-growing vine, *Mikania micrantha* can quickly smother other plants. Although it is largely confined to disturbed areas, it readily climbs into native trees at the margins of clearings and is therefore invasive. The seeds are wind dispersed and the species is able to spread quickly. It is also a serious pest of garden areas. This is one of the more serious exotic plant species occurring along the Kokoda Track.

Figure 36. Mikania, climbing hempweed, or mile-a-minute (*Mikania micrantha*) [DSC_4145]

Mimosa (*Mimosa pudica*) [Fabaceae] (Figure 37) – Introduced to and widespread in Papua New Guinea.

Native to the tropical Americas, this species is incredibly common throughout Papua New Guinea, where it occurs in gardens, pastures, and other disturbed areas. It has been known from Papua New Guinea since at least 1881 (Henty and Pritchard, 1988: 174). It was common along the Kokoda Track.

Figure 37. Mimosa (*Mimosa pudica*)

Perennial soybean (*Neonotonia wightii*) [Fabaceae] – Status in Papua New Guinea unknown but probably widespread.

This species is native to Africa and generally considered an African genus. It is also known to be native to the following: Arabia, India, Sri Lanka, Indonesia [Java], and Malaysia [peninsula]. It is found in grassland and shaded situations in bushland, thicket, and woodland. It has been naturalised in subtropical Australia [particularly in former rainforest areas and around rainforest margins] and in many other parts of the tropics. It is generally used in others parts of the world for hay and silage. It is essentially a weed in places along the Kokoda Track, but is not a serious pest.

Basketgrass (*Oplismenus hirtellus*) [Poaceae] - Introduced to Papua New Guinea, but status unknown.

This species is widespread in the eastern regions of southern Africa. It was largely confined to open disturbed areas along the Kokoda Track and did not appear to be an especially serious pest.

Panicgrass (*Panicum* sp.) [?] [Poaceae] - Status in Papua New Guinea unknown; it is likely that a number of species of *Panicum* have been introduced to Papua New Guinea.

Panicum [panicgrass] is a large genus of about 450 species of grasses native throughout the tropical regions of the world.

Thurston grass or buffalo grass (*Paspalum conjugatum*) [Poaceae] – Introduced to and widespread throughout Papua New Guinea.

This species is thought to have originated in tropical America, but is now found throughout the tropical regions of the world. It is one of the most common weeds in Papua New Guinea, particularly in village gardens, and is one of the most common grass species in disturbed areas along the Kokoda Track. It is a serious weed, but is so widespread that it cannot be feasibly controlled and generally must be removed by hand or with a bush knife.

Russell River grass (*Paspalum paniculatum*) [Poaceae] (Figure 38) – Widespread in Papua New Guinea.

A widespread species in tropical regions in Africa, the western Indian Ocean, temperate and tropical Eastern Asia, Malesia, Papuasia, Australia, the Pacific, Mesoamerica, the Caribbean, and South America. This species has many of the same characteristics as *Paspalum conjugatum*, and like that taxon is a serious weed in Papua New Guinea and along the Kokoda Track.

Figure 38. Russell River grass (*Paspalum paniculatum*) [DSC_1453]

Banana passion flower (*Passiflora* cf. *mollissima*) [Passifloraceae] - Introduced to Papua New Guinea and widespread.

This species is widely cultivated throughout Papua New Guinea for the fruit.

Sweet granadilla (*Passiflora ligularis*) [Passifloraceae] (Figure 39) - Introduced to Papua New Guinea.

A tropical species ranging from central Mexico through Central America and western South America, through western Bolivia to south-central Peru, this species is widely cultivated in Papua New Guinea for the delicious, sugar-rich fruit.

Figure 39. Sweet granadilla (*Passiflora ligularis*) [DSCN7361]

Passion Flower (*Passiflora* sp.) [Passifloraceae] - Status in Papua New Guinea unknown.

We have not yet been able to identify the material that we collected. Most species of *Passiflora* are found in South America, eastern Asia, southern Asia, and New Guinea.

Chinese knotweed (*Persicaria chinensis*) [Polygonaceae] (Figure 40) - Status in Papua New Guinea unknown.

Chinese knotweed was relatively uncommon. It was largely restricted to relatively shaded but disturbed areas in forest along the track and was relatively uncommon.

Figure 40. Chinese knotweed *Persicaria chinensis*) [DSCN7163]

Inkweed (*Phytolacca octandra*) [Phytolaccaceae] - Introduced to Papua New Guinea and fairly widespread in Papua New Guinea.

This species is found in Mexico, Central America, the Caribbean, and tropical South America. It is not mentioned in Henty and Pritchard (1975) and is a relatively innocuous weed.

Matico (*Piper aduncum*) [Piperaceae] (Figure 41) – Introduced to and widespread in Papua New Guinea.

This species was fairly common along the Kokoda Track. Henty and Pritchard (1988: 180) report that its first occurrence in Papua New Guinea was noted after 1960, so it represents a comparatively recent introduction. It is a serious invasive species in Papua New Guinea, where it has spread quickly and often becomes established with a minimal amount of disturbance. It can in places form large thickets. It does not yet appear to be a terribly serious pest along the Kokoda Track, but it is a species that should be closely monitored.

Figure 41. Matico (*Piper aduncum*)

Orosne (*Polygala paniculata*) [Polygonaceae] (Figure 42) – Introduced to and widespread in Papua New Guinea.

This is a common and widespread weed that is generally innocuous. It is thought to have been introduced to Papua New Guinea between 1891 and 1900 and is now virtually ubiquitous from sea level to upwards of 2000 m (Henty and Pritchard, 1975: 180).

Figure 42. Orosne (*Polygala paniculata*)

Stone fruit (*Prunus* sp.) [Rosaceae] - Introduced to Papua New Guinea?

The genus comprises around 430 species spread throughout the northern temperate regions of the globe. Our unidentified collection may represent a cultivated species or a native one.

Cane fruit (*Rubus* sp.) [Rosaceae] - Status in Papua New Guinea unknown.

We have yet to fully identify the material that we collected. Some species of *Rubus* are native to Papua New Guinea and others have been introduced. Some species are invasive.

Purple showers (*Ruellia* cf. *brittoniana*) [Acanthaceae] (Figure 43) - Introduced to Papua New Guinea.

This species is native to Mexico and South America. It was relatively uncommon along the Kokoda Track, but may have been planted as an ornamental.

Figure 43. Purple showers (*Ruellia* cf. *brittoniana*) [DSCN6886]

Wild petunia (*Ruellia* sp.) [Acanthaceae] - Status in Papua New Guinea unknown.

We have yet to fully identify our collection of *Ruellia*. Some species are native to Papua New Guinea.

Mushroom plant (*Rungia klossii*) [Acanthaceae] (Figure 44) – Native to New Guinea and commonly cultivated there; widespread and common throughout Papua New Guinea.

This species is commonly planted in village gardens and is relatively common along the Kokoda Track. It is a popular source of greens (the leaves are rich in chlorophyll and protein) and can be eaten raw or cooked. It often escapes from cultivation but is largely restricted to disturbed areas.

Figure 44. Mushroom plant (*Rungia klossii*) [DSC_4139]

River sage (*Salvia* cf. *misella*) [Lamiaceae] - Introduced to Papua New Guinea; status unknown.

An erect herb originally from South America. It was relatively uncommon and was not a serious weed along the Kokoda Track.

Scarlet sage (*Salvia splendens*) [Lamiaceae] (Figure 45, 46) - Introduced to Papua New Guinea and fairly widespread.

Salvia splendens is native to Brazil and possibly Colombia, although it has also been reported as introduced to Colombia. The species is introduced to the West Indies, central Africa, and most tropical and temperate climates. It was quite common along the Kokoda Track, particularly above 1000 m elevation. It appears to be spreading on its own, but it also seems to be widely propagated and planted as an ornamental.

Figure 45. Scarlet sage (*Salvia splendens*) [DSC_2468]

Figure 46. Scarlet sage (*Salvia splendens*)

Sanchezia (*Sanchezia speciosa*) [Acanthaceae] (Figure 47) - Introduced to and widespread in Papua New Guinea.

Sanchezia speciosa is native to Peru and Ecuador, where it grows in the humid environment of the tropical rainforests. This species is a serious invasive pest species along streams, where it readily displaces native riparian vegetation. It was particularly common along the Efogi River below Lanumu. In a follow-up survey, one of us (Allison) found it to be common in the upper Brown River drainage (to elevations of 800 m). Broken branches readily take root and also spreads by seed. It has potential to infest the entire Brown River drainage basin. Sanchezia is widely grown as an ornamental in Papua New Guinea and other tropical areas and it has likely escaped from cultivation.

The exact identity of the taxon in Papua New Guinea is somewhat uncertain. We identified it as *Sanchezia speciose,* but the taxon that is present in the Wet Tropics of North Queensland has been identified as *Sanchezia parvibracteata* (Werren, 2001). It is likely that the Papua New Guinea and North Queensland taxa are the same species; we currently have this under study. This is probably the most serious exotic pest species in the Kokoda Track region.

Figure 47. Sanchezia (*Sanchezia speciosa*) [DSCN8383]

Club-rush (*Schoenoplectus* sp.) [Cyperaceae] - Status in Papua New Guinea unknown.

We have yet to fully identify our material. This genus has a cosmopolitan distribution. This was not a serious pest along the Kokoda Track.

Choko (*Sechium edule*) [Cucurbitaceae] (Figure 48) – Introduced to Papua New Guinea and widespread throughout the country.

This plant, which is said to have been introduced to Papua New Guinea by the Japanese Expeditionary Force during World War II, is now widely used for human consumption throughout the country. It is also widely cultivated in other tropical areas, including Mesoamerica, where it is native. The growing tips are used for greens (kumul) and the fruits are also eaten.

Although now important as a food plant in many parts of Papua New Guinea, particularly in remote regions, this species also has a tendency to overgrow other vegetation. This was particularly apparent along sections of the Kokoda Track from Deniki to Isurava. This is something that should be monitored over time to ensure that the species does invade native forest.

Figure 48. Choko (*Sechium edule*) [DSCN7195]

Ringworm shrub (*Senna alata*, syn. *Cassia alata*) [Fabaceae] (Figure 49) – Introduced to and widespread in Papua New Guinea.

A species that is native to tropical South America. It is a weed of waterways, floodplains, wetlands, drainage channels, native bushland, disturbed sites, waste areas, roadsides, and overgrazed pastures in wetter tropical and subtropical environments. Known from Papua New Guinea since at least 1921-1930 (Henty and Pritchard, 1975: 178).

Figure 49. Ringworm shrub (*Senna alata*) [DSCN9043]

Coffee senna (*Senna occidentalis*, syn. *Cassia occidentalis*) [Fabaceae] (Figure 50) – Introduced to and widespread in Papua New Guinea.

A plant native to the tropics and subtropics of the Americas. Occupies roadsides, waste areas, disturbed sites, pastures, grasslands, open woodlands, coastal environs, and crops in tropical, subtropical, and semi-arid regions. Known from Papua New Guinea since at least 1881-1900 (Henty and Pritchard, 1975: 178).

Figure 50. Coffee senna (*Senna occidentalis*) [DSCN7002]

Palmgrass (*Setaria palmifolia*) [Poaceae] – Native to Papua New Guinea.

A species native to China, southern Japan, Taiwan, the Indian subcontinent, and southeastern Asia [including the Malay Archipelago], this taxon is thought to be native to Papua New Guinea. However, it is generally restricted to disturbed areas. The thick stems are sometimes consumed as food.

Foxtail (*Setaria* sp.) [Poaceae] - Status in Papua New Guinea unknown.

We have yet to fully identify the material that we collected. The genus comprises some 114 species that are widely distributed in tropical and subtropical regions of the world.

Arrowleaf sida (*Sida rhombifolia*) [Malvaceae] (Figure 51) – Widespread in Papua New Guinea. A cosmopolitan species, particularly in warmer regions [i.e. pantropical], that is thought to have originated in the Americas. Widely naturalised in northern and eastern Australia, Lord Howe Island, Norfolk Island and Christmas Island, and throughout the tropical Pacific, this is a serious weed of pastures, where it can become dominant if there is heavy grazing. Although considered a major pest in the Wet Tropics of North Queensland (Werren, 2001), this is a relatively innocuous species along much of the Kokoda Track, although it occurs in large, dense thickets in some areas. This species was first noted between 1941 and 1950 to occur in Papua New

Guinea (Henty and Pritchard, 1975: 181).

This should be considered a moderately serious weed along the Kokoda Track.

Figure 51. Arrowleaf sida (*Sida rhombifolia*) [DSCN8794]

Catchfly (*Silene* sp.) [Caryophyllaceae] - Status in Papua New Guinea unknown.

Our collection, which we have yet to fully identify, may represent a cultivated ornamental. This is certainly not a serious pest species.

Turkey berry (*Solanum torvum*) [Solanaceae] - Introduced to Papua New Guinea, where it is now widespread.

This species is found in southern Mexico, Central America, the Caribbean, and tropical South America. It is commonly cultivated in Papua New Guinea and was noted growing there before 1881 (Henty and Pritchard, 1975: 181). This species is generally considered to be undesirable because it is unpalatable to cattle and can build up in overgrazed pastures. The berries are thought to be rich in iron and are sometimes consumed as food. This species is relatively uncommon along parts of the Kokoda Track and is not a serious pest.

Solanum (*Solanum* sp.) [Solanaceae] - Status in Papua New Guinea unknown.

We have yet to fully identify this species; it may represent a native species, although it was collected in a disturbed area.

African tulip tree (*Spathodea campanulata*) [Bignoniaceae] – Introduced to Papua New Guinea and relatively widespread.

This is one of the worst invasive species in the world (GISP, 2015) and can occur from sea level to mid-elevations. Fortunately, it is virtually absent from the Kokoda Track. We noted it only in former plantation areas near Kokoda Station. There was no evidence that it was spreading, but because of its invasive tendencies its presence along the track should be monitored.

False Buttonweed (*Spermacoce assurgens*) [Rubiaceae] (Figure 52) - Introduced to Papua New Guinea and now widespread.

Spermacoce assurgens is native to tropical America. The genus consists of ca. 275 species that are found throughout the tropics and subtropics. It apparently did not reach Papua New Guinea until after 1960 (Henty and Pritchard, 1975: 181), but is now virtually ubiquitous. Although it was one of the most abundant weeds along the Kokoda Track, it is largely restricted to disturbed areas and is fairly innocuous,

although in some places it formed large thickets. Given its relative abundance, it is one of the more serious weeds along the Kokoda Track.

Figure 52. False buttonweed (*Spermacoce assurgens*) [DSC_1483]

Creeping ox-eye (*Sphagneticola trilobata*) [Asteraceae] (Figure 53) - Introduced to Papua New Guinea and now widespread.

A species native to Mexico, Central America, the Caribbean, and tropical South America, *Sphagneticola trilobata* is one of the world's worst invasive species and is in the top 100 list produced by the Global Invasive Species Programme of the International Union for Conservation of Nature. However, it was relatively uncommon along the Kokoda Track and was present in only a few isolated patches. Its presence along the Track should, however, be monitored closely to ensure that it doesn't spread.

Figure 53. Creeping ox-eye (*Sphagneticola trilobata*) [DSCN8238]

Staggerweed (*Stachys arvensis*) [Lamiaceae] - Introduced to Papua New Guinea.

This species is native to northern Africa, the Azores, the Madeira Islands, the Canary Islands, western and southern Europe, and western Asia. It was relatively uncommon along the Kokoda Track and appeared to be fairly innocuous.

Pink snakeweed (*Stachytarpheta mutabilis*) [Verbenaceae] - Introduced to Papua New Guinea and now widespread.

Stachytarpheta mutabilis is native to Mexico, the Caribbean, and tropical South America. It is one of several species introduced to Papua New Guinea that are now considered serious weeds. It was fairly common along the Kokoda Track and is a weed of modest concern.

St. Augustine grass (*Stenotaphrum secundatum*) [Poaceae] - Introduced to Papua New Guinea.This species is thought to be native to tropical Africa, southern USA, eastern Mexico, Central America, the Caribbean, and South America. However, because this species is widely naturalised, its exact native range is obscure. It is not a serious pest along the Kokoda Track.

Marmalade bush (*Streptosolen jamesonii*) [Solanaceae] (Figure 54) – Introduced to Papua New Guinea and moderately widespread in upland areas, where it is generally planted as an ornamental.

This species is native to South America. The population along the Kokoda Track seems to be restricted to the 1900 m Crossing and Propeller Camp areas, where it appears to be planted as an ornamental. This species does not appear to have invasive tendencies and does not appear to be a pest along the Kokoda Track.

Figure 54. Marmalade bush (*Streptosolen jamesonii*) [DSCN7741]

Cinderella weed (*Synedrella nodiflora*) [Asteraceae] (Figure 55) - Introduced to Papua New Guinea.

Synedrella nodiflora originated in tropical America, from where it has spread throughout the warmer regions of the world. It is probably found in every tropical and subtropical country in situations that favour its growth. It is very common along the Kokoda Track and in view of its abundance should be considered to be one of the more serious weeds. It was introduced to Papua New Guinea sometime after 1960 (Henty and Pritchard, 1975: 181).

Figure 55. Cinderella weed (*Synedrella nodiflora*) [DSCN8379]

Thunbergia (*Thunbergia* sp.) [Acanthaceae] (Figure 56) – Introduced to and widespread and relatively common throughout Papua New Guinea.

Thunbergia is a small genus of vines and shrubs native to Africa, Madagascar, and southern Asia. Several species have large, showy flowers and are commonly cultivated as ornamentals. Some, such as *T. alata*, have escaped from cultivation and have become serious roadside weeds throughout the tropics, including North Queensland (Werren,

2001) and Papua New Guinea (Henty and Pritchard, 1988). It was relatively widespread but locally uncommon along the Kokoda Track.

Figure 56. Thunbergia (*Thunbergia* sp.)

Mexican sunflower (*Tithonia diversifolia*) [Asteraceae] (Figure 57) - Introduced to Papua New Guinea.

Tithonia diversifolia is reported to be native to southern North America, Mesoamerica, and northern South America, and also reported to be a native of Zanzibar in Africa. It has been introduced to tropical parts of Africa, Asia, China, Australia, and several Pacific islands, including Hawaii, French Polynesia, and New Caledonia. It is generally considered to be a serious invasive species. However, it was relatively uncommon along the Kokoda Track and was found mainly around villages, suggesting that it may be cultivated as an ornamental. It does not appear to be a serious pest along the Kokoda Track.

Figure 57. Mexican sunflower (*Tithonia diversifolia*) [DSCN8765]

Spiderwort (*Tradescantia* sp.) [Commelinaceae] (Figure 58) - Introduced to Papua New Guinea.

Species of *Tradescantia* are native to the New World from southern Canada south to northern Argentina, including the West Indies. Although we have yet to fully identify our material to species, the taxon along the Kokoda Track was moderately common but confined to disturbed areas. Given its abundance, it should be considered to be a moderately serious pest.

Figure 58. Spiderwort (*Tradescantia* sp.) [DSC_1869]

Guatemala grass (*Tripsacum andersonii*) [Poaceae] (Figure 59) – Introduced to Papua New Guinea.

A species native to Central and northern South America, but now widely distributed in the tropics as a fodder plant, Guatemala grass was common around the monument at Isurava and also formed dense stands between Naduri and Lanumu. It does not appear to invade native ecosystems, but can form pure stands in disturbed areas, crowding out other species of grasses. It is not listed in Henty and Pritchard (1980), nor is it listed as a weed in the Wet Tropics of North Queensland (Werren, 2001).

Figure 59. Guatemala grass (*Tripsacum andersonii*) [DSCN8334]

Caesar weed (*Urena lobata*) [Malvaceae] (Figure 60) - Introduced to Papua New Guinea, where it is widespread.

This species has been known from Papua New Guinea from 1881 to 1890 (Henty and Pritchard, 1975: 181). It occurred in many areas along the Kokoda Track but was restricted to disturbed, open areas and was generally not locally abundant. The fruit have barbed spines, which aid in its dispersal. It can become a serious pest of pastures (Henty and Pritchard, 1975), but does not appear to be a serious pest along the Kokoda Track.

Figure 60. Caesar weed (*Urena lobata*) [DSCN8235]

Green summer grass (*Urochloa* cf. *decumbens*) [Poaceae] - Introduced to Papua New Guinea; status unknown.

Urochloa decumbens is native to tropical eastern Africa. We are still studying the material that we collected and have tentatively identified it as this taxon. It does not appear to be a serious pest species.

Alexander grass (*Urochloa* cf. *plantaginea*) [Poaceae] - Introduced to Papua New Guinea; status unknown.

Urochloa plantaginea is native to Africa and the Americas. We are still studying the material that we collected and have tentatively identified it as this taxon. It does not appear to be a serious pest species along the Kokoda Track.

APPENDIX 3 – Plant Specimens Collected Along the Kokoda Track (Kokoda Exotic Plant Survey vouchers)

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 01	Boraginaceae	*Heliotropium procumbens* Mill.	Kokoda Track, Eora Creek to Templeton's Crossing #1.	1425-1800 m	Along trail.	A. Allison & T. Pratt	29 Mar 2014	L. W. Pratt
PNG 02	Solanaceae	*Solanum torvum* Sw.	Kokoda Track, Templeton's Crossing #1 to 1900 m crossing.	1800-2100 m	Along trail.	A. Allison & T. Pratt	31 Mar 2014	L. W. Pratt
PNG 03	Lythraceae	*Cuphea ignea* A. DC.	Kokoda Track, track south of 1900 m crossing.	1900 m	Along trail.	A. Allison & T. Pratt	5 Apr 2014	L. W. Pratt
PNG 03b	Lythraceae	*Cuphea ignea* A. DC.	Kokoda Track, track south of 1900 m crossing?	1900 m	Along trail.	A. Allison & T. Pratt [sheet 2 of 2]	5 Apr 2014	L. W. Pratt
PNG 04	Asteraceae	*Synedrella nodiflora* (L.) Gaertn.	Kokoda Track, Kokoda to Isurava.		Along trail.	A. Allison & T. Pratt	22 Mar 2014	L.W. Pratt
PNG 05	Poaceae	*Paspalum conjugatum* P. J. Bergius	Kokoda Track, Kokoda to Isurava.		Along trail.	A. Allison & T. Pratt	22 Mar 2014	A. Allison
PNG 06	Amaranthaceae	*Alternanthera bettzickiana* (Regel) Nichols	Isurava			A. Allison		L.W. Pratt
PNG 07	Malvaceae	*Sida rhombifolia* L.	Kokoda Track, Kokoda to Isurava.		Along trail.	A. Allison & T. Pratt	22 Mar 2014	L. W. Pratt
PNG 08	Acanthaceae	*Sanchezia speciosa* Leonard	Kokoda Track, Kokoda to Isurava. [Lat 08.92398, Long 14773628]	534 m	1st sighted along trail.	A. Allison & T. Pratt [sheet 1 of 3]	Mar 2014	L. W. Pratt

Speci-men #	Family	Species	Locality	Elev-ation	Habitat	Collec-tors	Date	Deter-miner
PNG 08b	Acanthaceae	*Sanchezia speciosa* Leonard	Kokoda Track, Kokoda to Isurava. [Lat 08.92398, Long 14773628]	534 m	1st sighted along trail.	A. Allison & T. Pratt sheet 2 of 3	Mar 2014	L. W. Pratt
PNG 08c	Acanthaceae	*Sanchezia speciosa* Leonard	Kokoda Track, Kokoda to Isurava. [Lat 08.92398, Long 14773628]	534 m	1st sighted along trail.	A. Allison & T. Pratt sheet 3 of 3	Mar 2014	L. W. Pratt
PNG 09	Rubiaceae	*Spermacoce assurgens* Ruiz. & Pav.	Kokoda Track, Isurava.	1375 m	Along trail.	A. Allison & T. Pratt [sheet 1 of 2]	24 Mar 2014	L. W. Pratt
PNG 09b	Rubiaceae	*Spermacoce assurgens* Ruiz. & Pav.	Kokoda Track, Isurava.	1375 m	Along trail.	A. Allison & T. Pratt sheet 2 of 2	24 Mar 2014	L. W. Pratt
PNG 10	Amaranthaceae	*Alternanthera bettzickiana* (Regel) Nichols	Kokoda Track, Isurava		Herb with spike along trail.	A. Allison		L.W. Pratt
PNG 11	Asteraceae	*Bidens pilosa* L.	Kokoda Track, Isurava.	1375 m	Along trail.	A. Allison & T. Pratt [sheet 1 of 3]	24 Mar 2014	A. Allison
PNG 110	Poaceae	Unknown grass	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	
PNG 11b	Asteraceae	*Bidens pilosa* L.	Kokoda Track, Isurava.	1375 m	Along trail.	A. Allison &T. Pratt [sheet 2 of 3]	24 Mar 2014	A. Allison

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 11c	Asteraceae	*Bidens pilosa* L.	Kokoda Track, Isurava.	1375 m	Along trail.	A. Allison & T. Pratt [sheet 3 of 3]	24 Mar 2014	A. Allison
PNG 12	Asteraceae	*Crassocephalum crepidioides* (Benth.) S. Moore	Kokoda Track, Isurava.	1375 m	Along trail.	A. Allison & T. Pratt	24 Mar 2014	A. Allison
PNG 13	Asteraceae	*Elephantopus mollis* Kunth	Kokoda Track, Isurava.	1375 m	Along trail.	A. Allison & T. Pratt	24 Mar 2014	L. W. Pratt
PNG 14	Caryophyllaceae	*Drymaria cordata* (L.) Willd. ex Roem.	Kokoda Track, Isurava.	1375 m	Along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt
PNG 15	Poaceae	*Isachne myosotis* Nees	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt
PNG 16	Poaceae	*Isachne* sp.?	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L.W. Pratt
PNG 17	Lamiaceae	*Anisomeles malabarica* [?] (L.) R. Br.	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L.W. Pratt
PNG 18	Solanaceae	*Brugmansia candida* Pers.	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt
PNG 19	Fabaceae	*Hylodesmum repandum* (Vahl) H. Ohashi & R. R. Mill	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	T. K. Pratt
PNG 20	Poaceae	*Oplismenus hirtellus* (L.) P. Beauv.	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt
PNG 21	Commelinaceae	*Tradescantia* sp.	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt
PNG 22	Amaranthaceae	*Achyranthes aspera* L.	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 23	Poaceae	*Setaria palmifolia* (J. König) Stapf	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt
PNG 24	Solanaceae	*Cestrum nocturnum* L.	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt
PNG 25	Lamiaceae	*Plectranthus parviflorus* [?] Willd.	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	L. W. Pratt
PNG 26	Lamiaceae	*Salvia splendens* J. Roemer & J. A. Schultes	Kokoda Track, Isurava forest.	1375 m	In forest along trail.	T. Pratt & A. Allison	25 Mar 2014	T. Pratt
PNG 27	Rosaceae	*Prunus* sp.	Kokoda Track, Isurava Village.	1375 m	Planted in village.	T. Pratt & A. Allison	26 Mar 2014	L.W. Pratt
PNG 28	Poaceae	*Cenchrus purpureus* (Schumach.) Morrone	Kokoda Track, Isurava Village edge.	1375 m	On edge of village.	T. Pratt & A. Allison	26 Mar 2014	L. W. Pratt
PNG 29	Fabaceae	*Lablab purpureus* (L.) Sweet	Kokoda Track, Templeton crossing #1	ca. 1800 m	Planted? At village.	T. Pratt & A. Allison	30 Mar 2014	L. W. Pratt
PNG 30	Passifloraceae	*Passiflora ligularis* Juss.	Kokoda Track, Templeton crossing #1	ca. 1800 m	At edge of village.	T. Pratt & A. Allison	30 Mar 2014	L. W. Pratt
PNG 31	Rosaceae	*Rubus* cf. *papuanus* Schlecter	Kokoda Track, Templeton crossing #1 to 1900 m crossing.	ca. 1800-2100 m	Along trail.	T. Pratt & A. Allison	31 Mar 2014	T.K. Pratt & A. Allison
PNG 32	Asteraceae	*Bidens pilosa* L.	Kokoda Track, Templeton crossing #1 to 1900 m crossing.	ca. 1800-2100 m	Along trail.	T. Pratt & A. Allison	31 Mar 2014	A. Allison

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 33	Asteraceae	*Adenostemma lavenia* (L.) Kuntze	Kokoda Track, Templeton crossing #1 to 1900 m crossing.	ca. 1800-2100 m	Along trail.	T. Pratt & A. Allison	31 Mar 2014	L.W. Pratt
PNG 34	Poaceae	*Paspalum paniculatum* L.	Kokoda Track, Isurava.	1375 m	On edge of village.	T. Pratt & A. Allison	31 Mar 2014	L. W. Pratt
PNG 35	Amaranthaceae	*Iresine herbstii* W. J. Hooker	Kokoda Track, between Isurava and Eora Creek.		Along trail, planted [?]	T. Pratt & A. Allison [sheet 1 of 2]	28 Mar 2014	L. W. Pratt
PNG 35b	Amaranthaceae	*Iresine herbstii* W. J. Hooker	Kokoda Track, between Isurava and Eora Creek.		Along trail, planted [?].	T. Pratt & A. Allison [sheet 2 of 2]	28 Mar 2014	L. W. Pratt
PNG 36	Acanthaceae	*Ruellia* sp	Kokoda Track, between Isurava and Eora Creek.		Along trail.	T. Pratt & A. Allison	28 Mar 2014	L. W. Pratt
PNG 37	Asteraceae	*Tithonia diversifolia* (Hemsl.) A. Gray	Kokoda Track, between Isurava and Eora Creek.		Along trail.	T. Pratt & A. Allison	28 Mar 2014	L. W. Pratt
PNG 38	Poaceae	*Oplismenus hirtellus* (L.) P. Beauv.	Kokoda Track, between Isurava and Eora Creek.		Along trail.	T. Pratt & A. Allison	28 Mar 2014	L. W. Pratt
PNG 39	Amaranthaceae	*Achyranthes aspera* L.	Kokoda Track, between Isurava and Eora Creek.		Along trail.	T. Pratt & A. Allison	28 Mar 2014	L. W. Pratt
PNG 40	Fabaceae	*Desmodium* cf. *intortum* (Mill.) Urb.	Kokoda Track, between Isurava and Eora Creek.		Along trail.	T. Pratt & A. Allison	28 Mar 2014	L. W. Pratt
PNG 41	Polygonaceae	*Persicaria chinensis* (L.) H. Gross	Kokoda Track, Eora Creek to Templeton Crossing #1.	ca. 1425-1800 m	Along trail.	T. Pratt & A. Allison	29 Mar 2014	L. W. Pratt

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 42	Poaceae	*Stenotaphrum secundatum* (Walter) Kuntze	Kokoda Track, Eora Creek to Templeton Crossing #1.	ca. 1425-1800 m	Along trail.	T. Pratt & A. Allison	29 Mar 2014	L. W. Pratt
PNG 43	Malvaceae	*Urena lobata* L.	Kokoda Track, Eora Creek to Templeton Crossing #1.	ca. 1425-1800 m	Along trail.	T. Pratt & A. Allison	29 Mar 2014	L. W. Pratt
PNG 44	Poaceae	*Melinis minutiflora* P. Beauv.	Kokoda Track, Eora Creek to Templeton Crossing #1.	ca. 1425-1800 m	Along trail.	T. Pratt & A. Allison	29 Mar 2014	T. K. Pratt
PNG 45	Solanaceae	*Solanum* cf. *trichostylum* Merr. & L. M. Perry	Kokoda Track, Eora Creek to Templeton Crossing #1.	ca. 1425-1800 m	Along trail.	T. Pratt & A. Allison	29 Mar 2014	L. W. Pratt
PNG 46	Passifloraceae	*Passiflora* cf. *mollissima* (Kunth) L. H. Bailey	Kokoda Track, Myola 1 bog, western margin.	ca. 1900 m	Along trail.	A. Allison & T. Pratt	5 Apr 2014	L. W. Pratt
PNG 46b	Passifloraceae	*Passiflora* cf. *mollissima* (Kunth) L. H. Bailey	Kokoda Track, Myola 1 bog, western margin.	ca. 1900 m	Along trail.	A. Allison & T. Pratt sheet 2 of 2	5 Apr 2014	L. W. Pratt
PNG 47	Passifloraceae	*Passiflora* sp.	Kokoda Track, Propeller Junction.	ca. 2000 m	Along trail.	A. Allison & T. Pratt	5 Apr 2014	L. W. Pratt
PNG 48	Poaceae	*Arthraxon hispidus* (Thunb.) Makino	Kokoda Track.		Along trail.	A. Allison & T. Pratt	5 Apr 2014	L. W. Pratt
PNG 49	Cyperaceae	*Fimbristylis* sp.	Kokoda Track, Myola 1 bog.	ca. 1900 m	Along trail.	A. Allison & T. Pratt	5 Apr 2014	L. W. Pratt
PNG 50	Poaceae	*Setaria parviflora* (Poir.) M. Kerguelen	Kokoda Track, Myola 1 bog.	ca. 1900 m	Along trail.	A. Allison & T. Pratt	5 Apr 2014	L. W. Pratt

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 51	Unknown	unknown1	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 52	Primulaceae	*Lysimachia* [?] sp.	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 53	Cyperaceae	*Schoenoplectus* sp.	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 54	Caryophyllaceae	*Dianthus* [?] sp.	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 55	Unknown	Unknown3 sp.	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 56	Caryophyllaceae	*Cerastium fontanum* Baum.	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 57	Unknown	Unknown 4	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 58	Cyperaceae	*Cyperus* sp.	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 59	Cyperaceae	*Kyllinga nemoralis* (J. G. Forster & G. Forster) Dandy	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 60	Asteraceae	Unknown 5	Kokoda Track, Myola 1 bog.	ca. 1900 m	In bog along trail.	T. Pratt & A. Allison	5 Apr 2014	L. W. Pratt
PNG 61	Myrtaceae	*Eucalyptus* cf. *tereticornis* Sm.	Kokoda Track, Efogi 1 Village.	ca. 1220 m	Planted in village along trail.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt
PNG 62	Acanthaceae	*Ruellia* cf. *brittoniana* E. Leonard	Kokoda Track, Efogi 2 Village.	ca. 1300 m	In forest along trail near village.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 63	Asteraceae	*Conyza bonariensis* (L.) Cronq.	Kokoda Track, Efogi 1 Village.	ca. 1220 m	Along trail.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt
PNG 63b	Asteraceae	*Conyza bonariensis* (L.) Cronq.	Kokoda Track, Efogi 1 Village.	ca. 1220 m	Along trail.	T. Pratt & A. Allison [sheet 2 of 2]	9 Apr 2014	L. W. Pratt
PNG 64	Fabaceae	*Desmodium* sp.	Kokoda Track, Efogi 1 Village.	ca. 1220 m	Along trail.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt
PNG 65	Phytolaccaceae	*Phytolacca* cf. *octandra* L.	Kokoda Track, 1900 Crossing.	1900 m	Along trail.	T. Pratt & A. Allison	7 Apr 2014	L. W. Pratt
PNG 65b	Phytolaccaceae	*Phytolacca* cf. *octandra* L.	Kokoda Track, 1900 Crossing.	1900 m	Along trail.	T. Pratt & A. Allison [sheet 2 of 2]	7 Apr 2014	L. W. Pratt
PNG 66	Fabaceae	*Desmodium intortum* (Mill.) Urb.	Kokoda Track, 1900 Crossing.	1900 m	Along trail.	T. Pratt & A. Allison	7 Apr 2014	L. W. Pratt
PNG 66b	Fabaceae	*Desmodium intortum* (Mill.) Urb.	Kokoda Track, 1900 Crossing.	1900 m	Along trail.	T. Pratt & A. Allison sheet 2 of 2	7 Apr 2014	L. W. Pratt
PNG 67	Balsaminaceae	*Impatiens walleriana* J. D. Hook.	Kokoda Track, 1900 Crossing.	1900 m	Along trail.	T. Pratt & A. Allison	7 Apr 2014	L. W. Pratt
PNG 68	Asteraceae	*Gnaphalium* [?] sp.	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	7 Apr 2014	L. W. Pratt
PNG 69	Asteraceae	*Conyza bonariensis* (L.) Cronq.	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 70	Scrophulariaceae?	Unknown 6	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 71	Orchidaceae	*Spiranthes sinensis* (Pers.) Ames	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 72	Asteraceae	Unknown 7	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 73	Asteraceae	*Elephantopus mollis* Kunth	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 74	Campanulaceae	*Wahlenbergia marginata* (Thunb.) DC.	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 75	Lamiaceae	*Stachys arvensis* L.	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 76	Caryophyllaceae	*Cerastium fontanum* Baumg.	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 77	Violaceae	*Viola arcuata* Blume	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 78	Ericaceae	*Styphelia suaveolens* (Hook. f.) Warb. ex P. Sarasin	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	6 Apr 2014	L. W. Pratt
PNG 79	Asteraceae	*Sphagneticola trilobata* (L.) Pruski	Kokoda Track, Kagi.	1400 m	In village along trail.	T. Pratt & A. Allison	8 Apr 2014	L. W. Pratt
PNG 80	Poaceae	*Cenchrus clandestinus* (Hochst. ex Chiov.) Morrone	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	8 Apr 2014	L. W. Pratt
PNG 81	Fabaceae	*Crotalaria* cf. *montana* Roth	Kokoda Track, Myola 2 bog.	1900 m	In bog along trail.	T. Pratt & A. Allison	8 Apr 2014	L. W. Pratt
PNG 82	Lamiaceae	*Plectranthus* cf. *parviflorus* Willd.	Kokoda Track, Naduri.	ca. 1400 m	Along trail.	T. Pratt & A. Allison	8 Apr 2014	L. W. Pratt
PNG 83	Asteraceae	*Ageratina* cf. *adenophorum* (Spreng.) R. King & H. Robins	Kokoda Track, Naduri.	ca. 1400 m	Along trail.	T. Pratt & A. Allison	8 Apr 2014	L. W. Pratt
PNG 84	Fabaceae	*Desmodium* cf. *heterocarpon* (L.) DC.	Kokoda Track, Naduri.	ca. 1400 m	Along trail.	T. Pratt & A. Allison	8 Apr 2014	L. W. Pratt
PNG 85	Rubiaceae	*Spermacoce* sp.	Kokoda Track, Naduri.	ca. 1400 m	Along trail.	T. Pratt & A. Allison	8 Apr 2014	L. W. Pratt

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 86	Verbenaceae	*Stachytarpheta mutabilis* (Jacq.) Vahl	Kokoda Track, Naduri.	ca. 1400 m	Along trail.	T. Pratt & A. Allison	8 Apr 2014	L. W. Pratt
PNG 87	Fabaceae	*Neonotonia wightii* (Wight & Arn.) Lackey	Kokoda Track, Efogi 1.	ca. 1220 m	Along trail.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt
PNG 88	Poaceae	*Urochloa ruziziensis* (R. Germ. & C. M. Evrard) Crins	Kokoda Track, Kagi to Naduri.	ca. 1300-1500 m	Along trail.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt
PNG 88b	Poaceae	*Urochloa ruziziensis* (R. Germ. & C. M. Evrard) Crins	Kokoda Track, Kagi to Naduri.	ca. 1300-1500 m	Along trail.	T. Pratt & A. Allison sheet 2 of 3	9 Apr 2014	L. W. Pratt
PNG 88c	Poaceae	*Urochloa ruziziensis* (R. Germ. & C. M. Evrard) Crins	Kokoda Track, Kagi to Naduri.	ca. 1300-1500 m	Along trail.	T. Pratt & A. Allison sheet 3 of 3	9 Apr 2014	L. W. Pratt
PNG 89	Poaceae	*Cenchrus purpureus* (Schumach.) Morrone	Kokoda Track, Kagi to Naduri.	ca. 1300-1500 m	Along trail.	T. Pratt & A. Allison sheet 1 of 2	9 Apr 2014	L. W. Pratt
PNG 89b	Poaceae	*Cenchrus purpureus* (Schumach.) Morrone	Kokoda Track, Kagi to Naduri.	ca. 1300-1500 m	Along trail.	T. Pratt & A. Allison sheet 2 of 2	9 Apr 2014	L. W. Pratt
PNG 90	Unknown	Unknown 10	Kokoda Track, Efogi River to Lanumu.	ca. 1200 m	Along trail.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt
PNG 91	Asteraceae	*Centaurea* sp.	Kokoda Track, Efogi Village.	ca. 1220 m	In village along trail.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt
PNG 92	Malvaceae	*Urena lobata* L.	Kokoda Track, Naduri.	ca. 1400 m	In village along trail.	T. Pratt & A. Allison	9 Apr 2014	L. W. Pratt
PNG 92b	Malvaceae	*Urena lobata* L.	Kokoda Track, Naduri.	ca. 1400 m	In village along trail.	T. Pratt & A. Allison sheet 2 of 2	9 Apr 2014	L. W. Pratt
PNG 93	Poaceae	*Urochloa* cf. *plantaginea* (Link) R. D. Webster	Kokoda Track, Brigade Hill.	ca. 1415 m	Along trail.	T. Pratt & A. Allison [sheet 1of 2]	10 Apr 2014	L. W. Pratt

Specimen #	Family	Species	Locality	Elevation	Habitat	Collectors	Date	Determiner
PNG 93b	Poaceae	*Urochloa* cf. *plantaginea* (Link) R. D. Webster	Kokoda Track, Brigade Hill.	ca. 1415 m	Along trail.	T. Pratt & A. Allison [sheet 2 of 2]	10 Apr 2014	L. W. Pratt
PNG 94	Melastomataceae	Unknown sp.	Kokoda Track, near Menari.	ca. 850 m	Inside forest interior along trail.	T. Pratt & A. Allison	12 Apr 2014	L. W. Pratt
PNG 94b	Melastomataceae	Unknown sp.	Kokoda Track, near Menari.	ca. 850 m	Inside forest interior along trail.	T. Pratt & A. Allison [sheet 2 of 2]	12 Apr 2014	L. W. Pratt
PNG 95	Melastomataceae	*Clidemia hirta* (L.) D. Don	Kokoda Track, near Menari.	ca. 850 m	Inside forest interior along trail.	T. Pratt & A. Allison	12 Apr 2014	L. W. Pratt
PNG 96	Euphorbiaceae	*Euphorbia thymifolia* L.	Kokoda Track, near Menari.	ca. 850 m	In village.	T. Pratt & A. Allison	12 Apr 2014	L. W. Pratt
PNG 97	Piperaceae	*Piper aduncum* L.	Kokoda Track, near Menari.	ca. 850 m	Outside village.	T. Pratt & A. Allison	12 Apr 2014	L. W. Pratt
PNG 98	Fabaceae	*Crotalaria micans* Link	Kokoda Track, near Uberi.	ca. 850 m	Along trail.	T. Pratt & A. Allison	16 Apr 2014	L. W. Pratt
PNG 99	Fabaceae	*Crotalaria micans* Link	Kokoda Track, near Uberi.	ca. 850 m	Along trail.	T. Pratt & A. Allison	16 Apr 2014	L. W. Pratt
PNG 102	Fabaceae	*Crotalaria micans* Link	Kokoda Track, near Uberi.	ca. 850 m	Along trail.	T. Pratt & A. Allison	16 Apr 2014	L. W. Pratt
PNG 103	Lythraceae	*Lythrum maritimum* Kunth	Kokoda Track, Ofi Creek.	ca. 600 m	At guest pavilion, spreading from plantings.	T. Pratt & A. Allison	16 Apr 2014	L. W. Pratt
PNG 104	Poaceae	*Tripsacum andersonii* J. R. Gray	Kokoda Track, Agulogo.	ca. 700 m		T. Pratt & A. Allison	13 Apr 2014	L. W. Pratt
PNG 104b	Poaceae	*Tripsacum andersonii* J. R. Gray	Kokoda Track, Agulogo.	ca. 700 m		T. Pratt & A. Allison sheet 2 of 2	13 Apr 2014	L. W. Pratt

Speci-men #	Family	Species	Locality	Elev-ation	Habitat	Collec-tors	Date	Deter-miner
PNG 105	Acanthceae	*Pseuderanthmum* sp.?	Kokoda Track, near Menari.	ca. 850 m	Along trail in densly shady, moist area.	T. Pratt & A. Allison	12 Apr 2014	
PNG 106	Amaranthaceae	*Cyathula prostrata* (L.) Bl.	Kokoda Track, Kokoda to Isurava. [Lat 08.92398, Long 14773628]	534 m		A. Allison & T. Pratt	Mar 2014	L. W. Pratt
PNG 107	Lamiaceae	*Salvia* sp	Kokoda Track, between Isurava and Eora Creek.	1375 m	Along trail.	T. Pratt & A. Allison	28 Mar 2014	L. W. Pratt

APPENDIX 4 – Other Natural History Observations

Although the primary purpose of the field survey was to document exotic pest species along the Kokoda Track, because funding was limited we supplemented this with funds from the U.S. National Science Foundation, the Binational Science Foundation, and other sources, and expanded the survey to include native birds, amphibians, and reptiles.

The bird observations were made primarily by Dr. Thane Pratt, who observed 217 species along the track, including several rare taxa, such as chestnut-shouldered goshawk (*Erythrotriorchis burgersi*). In addition we observed healthy populations of New Guinea vulturine parrot (*Psittrichas fulgidus*) at Isurava. This bird, an upland species, has been extirpated in many areas of Papua New Guinea. The fact that there was a resident flock at Isurava is a good indication that hunting pressure is low.

During our herpetological survey we collected specimens documenting 27 species of frogs, 25 species of lizards, and 3 species of snakes. Although studies are ongoing, it is likely that five or six of these taxa are new to science. Prior to our survey there were relatively few collections along the Kokoda Track. Our survey considerably expanded knowledge of the distribution and diversity of the herpetofauna along the track.

At 1900 Crossing we observed a Doria's tree kangaroo (*Dendrolagus dorianus*) high up in a *Pandanus* (karuka) tree. Tree kangaroos are generally heavily hunted and are very elusive in New Guinea forests. The fact that we observed one close to camp is, again, another indication that hunting pressure is low.

APPENDIX 5 – Exotic Plant Species Occurring Around Manumu No. 2 in the Upper Brown River Catchment

There were 24 species of exotic plant species growing around the hamlet of Manumu 2 (not including crop species) and along the tracks from Milei to Manumu 2 and from Manumu 2 to Morou. There were no exotic plant pest species beyond Morou (i.e., in the upper Brown River drainage). Species that are planted as ornamentals or as food plants are indicated with an *.

1. Sanchezia (*Sanchezia speciosa*) [Acanthaceae]
2. Goatweed (*Ageratum conyzoides*) [Asteraceae]
3. Spanish needle (*Bidens pilosa*) [Asteraceae]
4. Thickhead (*Crassocephalum crepidioides*) [Asteraceae]
5. Tobacco weed (*Elephantopus mollis*) [Asteraceae]
6. Mile-a-minute (*Mikania micrantha*) [Asteraceae]
7. Cinderella weed (*Synedrella nodiflora*) [Asteraceae]
8. Imaptiens (*Impatiens* sp.) [Balsaminaceae]*
9. Choko (*Sechium edule*) [Cucurbitaceae]*
10. Croton (*Codiaeum variegatum*) [Euphorbiaceae]*
11. Coffee senna (*Senna occidentalis*) [Fabaceae]*
12. Unidentified bean [Fabaceae]
13. Scarlet sage (*Salvia splendens*) [Lamiaceae]
14. Bushmint (*Hyptis* sp.) [Lamiaceae]
15. Unidentified mint 1 [Lamiaceae]
16. Unidentified mint 2 [Lamiaceae]
17. Buffalo grass (*Paspalum conjugatum*) [Poaceae]
18. Russell River grass (*Paspalum paniculatum*) [Poaceae]
19. Palmgrass (*Setaria palmifolia*) [Poaceae]
20. False buttonweed (*Spermacoce laevis*) [Rubiaceae]
21. Turkey berry (*Solanum torvum*) [Solanaceae]
22. White angel's trumpet (*Brugmansia candida*) [Solanaceae]
23. Golden dewdrop (*Duranta erecta*) [Verbenaceae]*

This same assemblage of plants is found around villages throughout Papua New Guinea at low to mid-elevations. What is particularly interesting is that many widespread exotic pest plant species – i.e., weeds – that occur in Papua New Guinea and are common along the Kokoda Track were absent from the upper Brown River catchment area – e.g., bloodleaf (*Iresine herbstii*) [Acanthaceae], desmodium (*Desmodium* spp.) [Fabaceae], molasses grass (*Melinis minutiflora*) [Poaceae], many other species of introduced tropical grasses, snakeweeds (*Stachytarpheta* spp.) [Verbenaceae], and lantana (*Lantana camara*) [Verbenaceae]. Overall, the area around Milei, Manumu 2, and Kaolagi had only around a third of the exotic pest plant species that commonly occur around villages along the Kokoda Track.

Four of the exotic plant species in the upper Brown River catchment, two composites—*Mikania micrantha* and *Elephantopus mollis,* and two grasses*, Paspalum conjugatum and P. paniculatum*—are serious garden weeds. All four species are common components of disturbed habitats throughout Papua New Guinea and much of the tropical world. They can be effectively controlled by physical removal.

The presence of two additional species, both riparian shrubs—*Sanchezia speciosa* and *Brugmansia candida*—is a matter of some concern. Both species are highly invasive and were common components of the riparian vegetation along the upper Brown River and its tributaries to an elevation of around 800 m. This means that the entire Brown River drainage basin is potentially infested with these species. They both readily propagate from broken twigs and branches or by seed and can form pure stands that crowd out native vegetation. Both species are regarded as undesirable in tropical North Queensland.