



THE ANIMAL HEALTH STATUS OF THE SOLOMON ISLANDS

by

Tony Martin

and

Vic Epstein



Noumea, New Caledonia
1999

SECRETARIAT OF THE PACIFIC COMMUNITY

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ABSTRACT

A serological survey for diseases of livestock was conducted in the Solomon Islands in 1998, with the objective of determining the current animal health status of the country for selected diseases. The results are presented along with those of previous surveillance activities, notably in the 1960s and 1970s. Both village livestock (pigs and poultry) and commercial livestock (cattle, pigs, poultry) were covered in the survey, along with horses and goats.

The Solomon Islands are free of the contagious livestock diseases of serious socio-economic or public health significance (OIE List A diseases), although there is serological evidence for the presence of bluetongue virus. The country is also free of rabies. Appropriate importation and quarantine procedures must be maintained to retain this disease-free status. Other important livestock diseases which are not present in the Solomon Islands include brucellosis (cattle, pigs and goats), bovine tuberculosis, Aujeszky's disease, transmissible gastroenteritis of pigs, porcine respiratory and reproductive syndrome, bovine anaplasmosis, and bovine pestivirus infection. The serological evidence also points to freedom from John's disease, and there are very few, if any, cattle ticks.

Diseases of animals present in the Solomon Islands that are transmissible to humans include trichinosis and leptospirosis. There is serological evidence for the presence of infectious bovine rhinotracheitis, theileriosis and babesiosis in cattle; and infectious bronchitis, infectious laryngotracheitis, avian encephalomyelitis and Marek's disease in poultry.

Ongoing surveillance and import controls are necessary to maintain or improve the country's animal health status.

RÉSUMÉ

Une enquête sérologique portant sur les maladies affectant le bétail a été réalisée aux Îles Salomon en 1997, en vue de déterminer la situation actuelle du pays au regard de certaines affections. Les résultats sont assortis des données concernant des activités de surveillance menées dans les années 60 et 70 notamment. L'enquête concernait tant les animaux vivant en semi-liberté dans les villages (porcs et volailles) que les bêtes d'élevage commercial (bovins, porcins, volailles), les chevaux et les chèvres.

Les Îles Salomon sont indemnes des maladies animales contagieuses de grande importance sur le plan socio-économique ou de la santé publique (maladies de la liste A de l'OIE), bien que la fièvre catarrhale du mouton ait été mise en évidence par des épreuves sérologiques. Le pays est également indemne de rage. Il importe de maintenir les prescriptions phytosanitaires et les mesures à l'importation pour conserver ce statut. Les maladies importantes ci-après sont elles aussi inexistantes aux Îles Salomon : brucellose (bovins, porcs et chèvres), tuberculose bovine, maladie d'Aujeszky, gastro-entérite transmissible du porc, syndrome dysgénésique et respiratoire du porc, anaplasmoses et pestivirus bovin. La paratuberculose n'a pas été dépistée en sérologie et les tiques sont rares, voire inexistantes, chez les bovins.

Parmi les zoonoses présentes aux Îles Salomon figurent la trichinose et la leptospirose. Les résultats sérologiques indiquent la présence des maladies suivantes : rhinotrachéite infectieuse bovine, theilériose et babésiose des ruminants; bronchite infectieuse, la laryngotrachéite infectieuse, encéphalomyélite aviaire et, chez les volailles, maladie de Marek.

Une surveillance continue est nécessaire pour maintenir ou améliorer la situation zoonositaire du pays.

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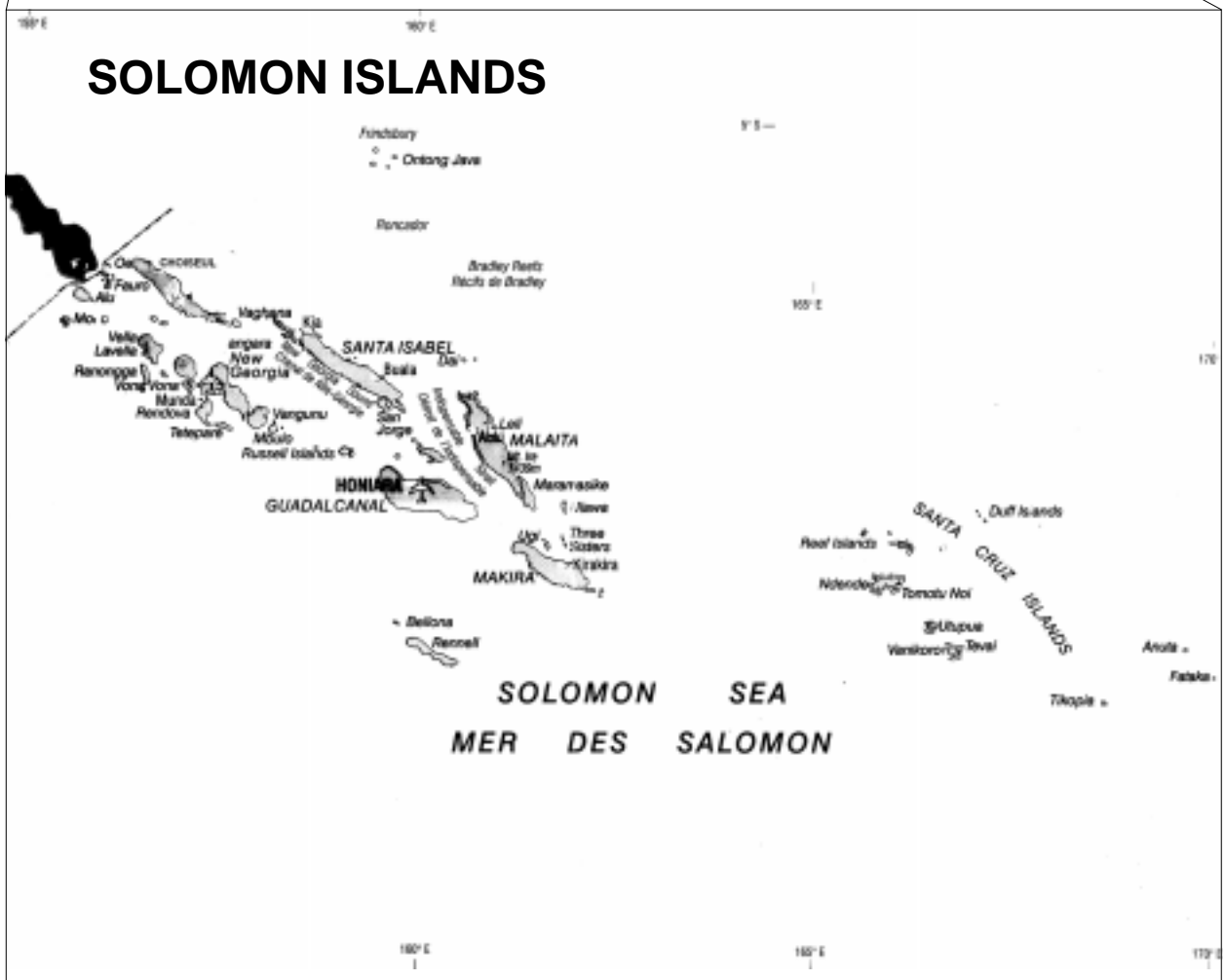
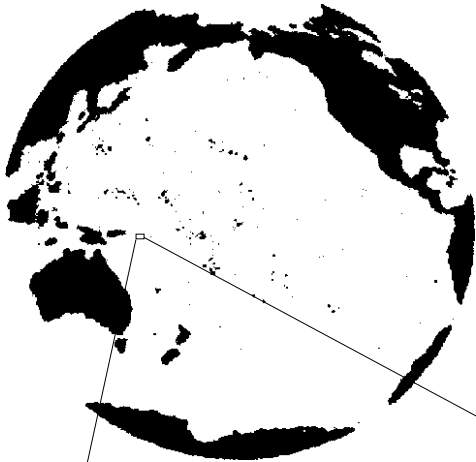
- Central Animal Health Laboratory, MAF Quality Management, Upper Hutt, New Zealand
- WHO/FAO Collaborating Centre for Reference and Research on Leptospirosis, Queensland Health Scientific Services
- WHO Arbovirus Reference and Research Laboratory, Queensland Health Scientific Services
- Koronivia Veterinary Pathology Laboratory, Ministry of Agriculture, Fisheries and Forests, Fiji
- Elizabeth Macarthur Agricultural Institute, New South Wales Agriculture
- Tick Fever Research Centre, Queensland Department of Primary Industries

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INTRODUCTION

This report presents the findings of a survey of livestock diseases in the Solomon Islands. The survey was carried out in 1998, funded by the Veterinary Epidemiology project of the Secretariat of the Pacific Community (SPC), and carried out by staff of the Veterinary and Livestock Division of the Solomon Islands Ministry of Agriculture and Fisheries, and the SPC veterinary epidemiologist. The objective of the survey was to demonstrate the presence or absence of selected livestock diseases of public health or economic importance. The results may be used as a basis for control programmes for livestock diseases, and also for public health initiatives. Findings from earlier work on animal health in the Solomon Islands are incorporated into this report. Where the absence of an infection is confirmed by the survey it is important that this be interpreted with the stated confidence limits.

LOCATION AND TOPOGRAPHY

The Solomon Islands comprise a scattered double chain of 922 islands in the Pacific Ocean, extending 1,667 km in a south easterly direction from Bougainville Island of Papua New Guinea. The Solomon Islands cover over 1.35 million square kilometres of sea, with a total land area of 28,370 km². Much of the Solomons is covered with dense rainforest, with mangrove swamps occurring along parts of the coast. Most islands are surrounded by coral reefs and lagoons.

AGRICULTURE AND LIVESTOCK

The population of Solomon Islands is about 431,600 and the growth rate (3.4% p.a.) is one of the highest in Pacific. About 84% of people live in villages. Most settlements are coastal and close to fresh water supplies. Most villages are self sufficient in vegetables, fruit, pigs and chickens. At the village level the primary species produced within the Solomon Islands are pigs and poultry.

The larger centres (e.g. Honiara) have commercially orientated pig and poultry (broiler and layer) units, with cattle being grazed primarily under coconuts as a means of clearing the ground for coconut harvesting.

Pig industry

Village pig raising is common throughout all provinces, except in villages that do not allow pigs on religious grounds. Pigs may be free range, tethered or housed, either individually or in small groups, in small dirt pens, or wooden pens raised off the ground. Husbandry practices vary from village to village; small enclosures are most common, usually containing individual pigs. Pigs are wild types or wild types crossed with domestic commercial breeds.

Commercial pig units have been established based on Australian designs and use imported Australian commercial breeding stock. The current supply of pork is far exceeded by demand.

Poultry industry

Free range poultry are found in almost every village. Some of these birds have been crossed with Australops in an attempt to improve productivity.

Intensive poultry production is based around Honiara, with an active broiler industry. The latter is based on imported day-old chicks or hatching eggs from Australia or New Zealand. The birds are fed imported commercial feeds. There are several large units (up to several hundred birds); units ranging between 100-200 birds are common.

Some egg-producing units are also found in Honiara.

Cattle industry

The cattle population is currently less than 4,000. The main cattle production centre is on the Russell Islands, under the control of RIPEL¹ which has about 2,500 head (61% of the cattle population) grazing under coconuts. The other 39% of holders include the government and small private landowners and church-owned farms, which have smaller scattered herds.

There has been a decline in cattle numbers since the peak of 25,158 in 1978 and the 1984 census figure of 22,722 (Anon, 1985). The reasons for this fall are several, and include a disease-eradication programme for tuberculosis and brucellosis, which was completed in 1986. The Solomon Islands were declared provisionally free of brucellosis in 1985, and of tuberculosis in 1986.

Horses

Horses were introduced from Australia to work cattle in the Russell Islands. Currently the major population (120) is in the Russell Islands with a small population (12) in Guadalcanal, on the government farm at Tenavatu and a few riding horses (8) for tourist use at Tamba. There are few experienced horse handlers, and many of the horses have not been broken. Culling is undertaken periodically and the carcasses are processed for pet food.

Goats

The goat population of Solomon Islands is small; most goats are on government farms. The main centre is at the government farm at Tenavatu on Guadalcanal (50 goats); all other centres receive their stock from there.

The reasons for the goat industry never expanding are unclear, but include slow rates of increase of stock numbers due to poor reproductive performance, reduction of goat numbers due to dog attacks, and limited demand by the indigenous Solomon Islanders.

SURVEY DESIGN

Livestock populations

Livestock were grouped into populations of animals with similar potential for exposure to disease. A representative sample of animals selected randomly from each such population then allows estimates to be made of the prevalence of disease or antibodies in the population, based on the results of tests carried out on the sample. The list of separate livestock populations identified when designing the survey is shown in Table 1. Cattle population information available at the start of the survey proved to be incorrect, and for cattle and other species it was necessary to revise population estimates as each province was visited.

Village pigs are generally penned or tethered, and contact between pigs on different islands is limited, but occurs regularly. Opportunities for transmission of infectious disease are plentiful, particularly within islands, but also between islands. Village poultry are free to roam, with few exceptions; so there is considerable opportunity for mixing among households.

1 RIPEL: *Russell Islands Plantation Estates Ltd.*, by far the largest cattle enterprise in the Solomon Islands

Table 1. Livestock populations in the Solomon Islands and sample numbers for a disease survey, 1998

Species	Management System	Province			
			Planned		Taken
			Per Population	Total	
Pigs	Commercial, housed	Guadalcanal	Up to 15 adults per farm	100	69
	Village / household	All provinces	20 adults per province	180	239
Cattle	Commercial	Guadalcanal	Up to 20 adults per herd	200	148
		Central Islands	40 adults	40	41
		Makira	Up to 20 adults per herd		18
		Western	Up to 20 adults per herd		20
	Village / smallholders	Other provinces	Up to 10 adults per province	60	33
Poultry	Commercial layers	Guadalcanal	Up to 20 adults per farm	80	53
	Commercial / meat	All provinces	None	0	0
	Village / free range	All provinces	20 adults per province	180	245
Goats	Paddock / tethered	All provinces	As many adults as possible	50	64
Horses	Paddock / tethered	All provinces	As many adults as possible	30	31

Commercial laying hens were taken to be a separate population from the free range village birds, and the same was true of pigs in commercial piggeries.

Most cattle are managed in separate, commercial herds. Commercial pigs, chickens and cattle are grouped in farms, each of which potentially has a different exposure to disease. Each farm was therefore considered separately for sampling purposes.

Sample sizes

Each livestock population was to be tested for the presence of antibodies to a variety of infectious agents. If present, the likely prevalences of these agents in the population vary considerably, from perhaps less than 1% for trichinosis in pigs to over 50% for classical swine fever. In addition the likely sensitivity and specificity of different serological tests vary from poor to very good. In order to determine sample size for either demonstration of freedom from disease or estimation of prevalence of exposure to disease, the critical information needed is:

- Population size
- Likely prevalence²
- Acceptable error levels in the estimation
- Test sensitivity³
- Test specificity⁴

Apart from the acceptable error levels, all of the above vary from one infection to another for all populations, so for such a survey there is no correct sample size. Practical and economic considerations came into calculation of sample sizes. We aimed to collect serum from at least 20 animals in each population, to test them all for each infection, and then interpret the results appropriately for each infection, depending on the values for each of the variables listed above.

For housed laying hens each flock was treated separately, with 20 birds sampled. In these circumstances we considered that antibody prevalence would be very high if infections such as infectious bronchitis, Newcastle disease, and others were present.

² The proportion of animals infected (prevalence of infection), or with antibodies to the infectious agent (antibody prevalence)

³ The proportion of those animals that have been infected with the disease agent that give positive results with the test

⁴ The proportion of those animals that have never been infected with the disease agent that give negative results with the test

The procedures used to interpret laboratory results assume random sampling from the population. For village poultry and pigs, we did not consider this feasible in this survey, so sampling in these populations was performed to give geographic representation. Households with livestock were selected based on convenience. Within each herd one to four adult pigs were selected, again by convenience. For free range poultry as many birds were sampled as could be caught (usually one or two).

Caged layers were taken from cages in all parts of the shed, and layers free in pens were selected based on convenience (the first birds caught).

Cattle were selected for blood sampling and TB testing in all the substantial herds encountered. Within large herds every n^{th} adult through the race was bled, where n is the number of adults in the herd divided by the desired sample size were bled. All adults were tuberculin tested. In small herds all adults were bled and tested.

Within each poultry and pig population we attempted to sample a representative selection of animals, although this was not done randomly. In presenting the results, confidence and prevalence estimates are given that assume random sampling, although this is not strictly valid.

Specific sampling considerations

Blood samples were collected from each of the nine provinces; from village stock throughout the Solomons, and commercial stock in the larger centres. More samples were collected around the larger trading centres, while attempting to maintain geographic representation.

The following details of local livestock production were important when selecting animals to participate in the survey, and should be borne in mind when interpreting the results:

- Many of the population of Rennel & Bellona Province are Seventh Day Adventists who do not keep pigs.
- Lata has a few small farms where cattle graze under coconuts; an active provincial farm (Hakama) with goats; all villages have tethered pigs and chickens.
- Central Province is the home of cattle at Yandina (RIPEL) with other villages raising pigs and chickens. It has a small provincial farm (Haraki) with goats and cattle.
- Guadalcanal, with Honiara the capital city of the Solomon Islands, has many commercial livestock producers growing cattle, pigs and poultry (both broilers and layers). The government farm and Livestock Development Authority produce cattle, goats, pigs and poultry as a primary multiplication centre for the provinces and commercial producers.
- Emphasis was placed on Shortlands and the northern area of Choiseul, due to their proximity to Bougainville and the illegal trade that is common between these areas and Bougainville.
- The Western Province was focused on because of the international trade links that exist between Gizo and Noro, and the rest of the world, especially Japan, Taiwan and Korea.
- Both ends of Malaita were sampled because of the high volume of trade conducted between Honiara and these areas of Malaita.

Selection of diseases

Infections for serological testing were selected based on potential public health risk, potential economic importance and regional epidemiological significance. Solomon Islands does not export any livestock products, but does import layer chicks and occasional porcine and bovine breeding stock. Diseases included in the serological testing in 1998 are listed in Appendix B.

Classical swine fever has occurred twice in Pacific Island countries and territories (PICTs) this century, and contagious bovine pleuropneumonia was diagnosed in the Solomon Islands in 1912, but otherwise there have been no outbreaks or observations of OIE list A diseases in any of the 22 PICTs, including the Solomon Islands. No vesicular disease has been seen in pigs or cattle in the Solomon Islands, and we did not include these infections in our serological testing. We did include

classical swine fever, and for the poultry we included the two list A diseases: Newcastle disease and avian influenza. Cattle sera were tested for antibodies to bluetongue virus.

Serological testing for the mycoplasmas and salmonellas of poultry has poor specificity when preserved (frozen) serum is used; we therefore did not include these infections in the serological survey.

Blood samples

Blood was collected from adult pigs, goats, horses and cattle using evacuated 9ml tubes. Poultry were bled using 3ml syringes and 23g needles, and the blood was immediately transferred to a 5ml evacuated tube. After standing at ambient temperature for a few hours, samples were centrifuged where possible, the serum separated using disposable pipettes, then stored at -20°C . Sera were then taken to Suva, Fiji for distribution to laboratories. The laboratories and tests used for all the serum samples are given in Appendix B.

Samples were collected between March and August 1998. Each sample collected was related to the location, species, age, sex and living conditions of the animal. Any clinical signs or clinical history suggestive of disease were noted.

Analysis of results

Confidence levels for assertions of freedom from disease were arrived at using *FreeCalc*⁵.

Where prevalences in different populations are compared in the text, they are stated to be different when found to be so with a probability of 95% using the *chi-square* test. If they are stated not to be different, this means the probability of them being significantly different was less than 95%.

⁵ *FreeCalc* - Epidemiological software for surveys to detect disease (Cameron, 1996)

RESULTS AND DISCUSSION

Serological results are presented with the following discussion of each disease, and are also grouped together for convenient reference in Appendix C, where there is one table per species of livestock for diseases other than leptospirosis, and one per mammalian species for leptospirosis.

Diseases affecting multiple species

OIE list A diseases

No vesicular disease (foot and mouth disease; vesicular stomatitis; swine vesicular disease) has ever been reported in the Solomon Islands, nor has rift valley fever. These are infections with clear clinical signs which if present would almost certainly have been documented by veterinarians. We did not do serology for these diseases.

Bluetongue

There are no sheep in the country, so clinical bluetongue has not been recorded. We tested both goat and cattle populations for antibodies to bluetongue virus (BTV), and found positive titres in 11 of 259 cattle sera, but not in any of the 64 goat sera tested. Bovine results (C-ELISA at EMAI) were as follows:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	150	5	3
Herd 1	30	0	0
Herd 2	32	0	0
Herd 3	21	2	10
Herd 4	22	3	14
Herd 5	21	0	0
Herd 6	21	0	0
Makira, Herd 7	18	0	0
Temotu	23	2	9
Western, Herd 8	20	2	10
Central	48	2	4
Herd 9	41	2	5
All provinces	259	11	4

This test is highly specific, using a BTV-specific monoclonal antibody, and these results demonstrate the presence of BTV in the Solomon Islands.

The goat sera were less straightforward. They were tested initially by the AGID, and 7 gave positive results, all from the Central Islands (see Appendix C, Table 4). Subsequent testing using the C-ELISA showed them all to be negative for BTV antibodies. Further testing of the 7 BTV AGID-positive sera against related arbovirus antigens gave negative results in the AGID for EHD antibodies, but 4 positives in the AGID for antibodies to the Palyam group of viruses. These results suggest that there is no BTV infection in these goats, but that other arboviruses, including one from the Palyam group, are present.

OIE list B diseases

Rabies has never been reported in the Solomon Islands.

Johne's disease is discussed under *Goats* and *Cattle*; Q fever under *Goats*; and Aujeszky's disease under *Pigs*.

Leptospirosis

Leptospirosis testing was carried out by the WHO/FAO Collaborating Centre for Reference and Research on Leptospirosis of Queensland Health Scientific Services (QHL). The Centre uses a panel of 21 serovars representing 18 serogroups for antibody testing of sera from the tropics. There are over 200 serovars of the causative organism *Leptospira interrogans*, and these are classified into serogroups. Unfortunately serological cross-reactions are common with the MAT, and low titres (50 or less) may be associated with such cross reactions, poor serum quality, or natural agglutinins which are not induced by leptospiral infections, as well as vaccination (not applicable in the Solomon Islands), early serological response or declining titre.

De Fredrick & Reece (1980) reported positive serology results in cattle from the 1960s and 1970s. Antibodies were found to serovars *pomona*, *hardjo*, *autumnalis*, and *bratislava*, and inconclusive reactions (titres of less than 200) were recorded for *bataviae*, *canicola*, *grippotyphosa*, *icterohaemorrhagiae*, *javanica*, *tarassovi*, and *wolfii*. The prevalence of seropositivity was not reported. Clinical leptospirosis was not encountered.

Baker (1986) reported that clinical leptospirosis had not been seen in pigs either, but that serological titres against *pomona* were occasionally found.

In 1998 we tested all cattle, pig, horse and goat sera against each of the 21 serovars on QHL's panel. Results are summarised in Tables 6-9 of Appendix C, where any titre of 50 or greater is included as a positive reaction. Eighty-three per cent of 226 cattle had titres against one or more serovars, as did 71% of 31 horses, 16% of 63 goats, and 12% of 298 pigs. There were no positive titres for *pomona*, in contrast to the earlier findings. The most prevalent serovars were as follows:

Species	Seroprevalence % (any serovar)		Most prevalent serovars	
	Any titre	Titres >50	Serovar	Seroprevalence %
Cattle	83	79	<i>hardjo</i> <i>medanensis</i> <i>szwajizak</i> <i>tarassovi</i> <i>australis</i>	71 34 61 26 11
Goats	16	11	<i>hardjo</i>	11
Horses	71	61	<i>hardjo</i> <i>medanensis</i> <i>szwajizak</i> <i>tarassovi</i> <i>australis</i>	55 26 45 13 10
Pigs	12	7	<i>australis</i> <i>zanoni</i>	3 3

The prevalence of titres to any serovar of 100 or more among pigs was only 7%, and within the pig populations sampled it was not possible to say with confidence whether seropositivity was associated with any particular management system or province.

Serovar *hardjo* had the highest seroprevalence among all 3 species of herbivores, although the prevalence was notably lower among goats (11% as opposed to 71% in cattle and 55% in horses; see above). On one property with all 3 species, 67% of 33 cattle, 100% of 6 horses, and 27% of 26 goats were positive for *hardjo*.

All but 10 of 93 *medanensis* titres (across all species of livestock) were accompanied by higher *hardjo* titres, and none of the 10 was higher than 100. It is likely that all *medanensis* titres were due to cross-reactivity with antibodies to *hardjo*; both are in the *Sejroe* serogroup. Serovars *kremastos* and *szwajizak* are both in the *Hebdomadis* serogroup, but little cross-reactivity was seen in this case: only 6 of 161 sera positive for *szwajizak* also had titres to *kremastos*.

There was a strong association between *hardjo* and *szwajizak* titres in the cattle: those positive for *hardjo* were much more likely to be positive for *szwajizak*. Of 130 individuals with titres to both, 100 had higher titres to *hardjo* but 9 had higher titres to *szwajizak*. This suggests that the same animals were exposed to infection by both serovars, while others were exposed to neither

In no species could any serovar be associated with different management systems or with different provinces or islands.

During the survey in 1998 recent abortions in pigs were associated with a high titre (1600) against serovar *australis* in a small piggery in Western Province. This is the first record of clinical signs due to leptospirosis.

Echinococcosis

Neither hydatid cysts nor adult worms have been recorded in the Solomon Islands.

Screw-worm

Both de Fredrick & Reece (1980) and Baker & Polke (1986) state that neither screw-worm flies nor the disease had been reported in the Solomons, and neither has been reported since. It appears that the Solomon Islands are free of these flies.

Anthrax

Anthrax has not been reported in the Solomon Islands.

Cattle

Parasites

The following were reported by de Fredrick & Reece (1980):

	Internal Parasites	External Parasites	
	<i>Bunostomum phlebotomum</i>	<i>Haematobia</i> sp.*	
	<i>Ceylonocotyle streptocoelium</i>	<i>Haematopinus quadripertusus</i> †	
	<i>Cooperia</i> sp.	<i>Tabanus ceylonicus</i>	
	<i>Dictyocaulus viviparus</i>	<i>Cydistomyia solomensis</i>	
	<i>Haemonchus placei</i>		
	<i>Mecistocirrus digitatus</i>		<i>Moniezia</i>
<i>benedeni</i>	<i>Moniezia expansa</i>		
	<i>Neoascaris vitulorum</i>		
	<i>Oesophagostomum radiatum</i>		
	<i>Ostertagia ostertagi</i>		
	<i>Trichostrongylus axei</i>		
	<i>Trichuris globulosa</i>		
	<i>Trichuris ovis</i>		

* probably *H. exigua*

† tail louse, not recorded since 1975

One liver fluke (*Fasciola hepatica*) was found in an imported cow in 1965 (de Fredrick & Reece, 1980), but otherwise this parasite has not been seen in the Solomon Islands.

The absence of ticks on cattle has been noted in several studies (Osborne, 1960; de Fredrick & Reece, 1980; 1998 survey), although in the first half of the 20th century there were several reports of ticks on cattle in various locations (Guadalcanal; Russell Islands; Shortland Islands; see de Fredrick & Reece (1980) for references). Ticks were not identified on any of these occasions, and all were dealt with by slaughtering the herds involved. Despite the apparent absence of ticks, some serological findings of the 1998 survey suggest one or more species may be present (see below).

OIE list A diseases

Neither lumpy skin disease nor rinderpest has ever been recorded in the Solomon Islands. Contagious bovine pleuropneumonia (CBPP) was diagnosed clinically in 1912, and the entire herd was slaughtered. In 1980 de Fredrick & Reece reported testing 273 sera from 52 herds for antibodies to CBPP using the CFT. There were 6 positives from 5 herds, but this result was considered to be within the expected range of false positives. He also reported that no clinical cases had been seen, and post-mortem inspections of thousands of carcasses were all negative for CBPP lesions. The Solomon Islands are considered to be free of CBPP, and we did not test for this disease in 1998.

Enzootic bovine leukosis (EBL)

Clinical cases of this disease have not been recorded, but in 1998 serological testing of 259 cattle identified one herd with antibodies. All other cattle tested were negative. In the herd that tested positive, 7 of 21 animals bled had antibodies, and the herd is certainly infected; no clinical disease has been seen in this herd, but this is not unusual with EBL, since only a small proportion of infected animals develop clinical disease.

The ELISA used for testing the sera is highly specific and has good sensitivity. EBL is an infection which can be present at low prevalence in a herd, and the negative results from other herds only allow us to be confident that the prevalence in each of them is less than about 12%. Given the presence of infection in one herd and the common original source of many cattle in the Solomons, it is possible that other herds are also infected.

Infectious bovine rhinotracheitis (IBR)

There is considerable serological evidence for the presence of IBR in the Solomon Islands. De Fredrick & Reece (1980) reported finding 102 positive sera in 331 samples from 51 herds. Baker & Polke (1986) referred to 325 positive sera from 70 herds. In 1998 we found 137 seropositive animals out of 260 tested:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	151	89	59
Herd 1	30	17	57
Herd 2	33	29	88
Herd 3	21	1	5
Herd 4	22	21	95
Herd 5	21	7	33
Herd 6	21	12	57
Makira, Herd 7	18	1	6
Temotu	23	4	17
Western, Herd 8	20	7	35
Central	48	36	75
Herd 9	41	34	83
All provinces	260	137	53

Antibodies were found in all herds tested, although the apparent prevalence of seropositive animals varied greatly, from 5% to 95%.

IBR is endemic in the Solomon Islands.

Bovine pestivirus infection / bovine virus diarrhoea / mucosal disease (BVD)

De Fredrick & Reece (1980) reported testing 252 sera from 46 herds for antibody to bovine pestivirus, and finding 27 positives. He also said that clinical mucosal disease had been seen. In 1998 however we did not find any seropositive animals among the 260 tested for antibodies (see Appendix C, Table 2).

Pestivirus infection is maintained and transmitted in a population by persistently infected immunotolerant animals which may themselves develop mucosal disease. Such animals were clearly present in the cattle population in the 1970s. Cattle in contact with carriers will develop a transient, often symptomless, infection followed by the development of antibodies measurable using serological tests. The infection is easily spread, and in herds containing carriers one generally finds a high prevalence of seropositive animals. The ELISA used in 1998 testing is reasonably sensitive (1993) and the results allow 95% confidence that the prevalence in individual herds is less than 15%. If present in a herd we would expect an antibody prevalence of at least 15%, so it is highly likely that BVD is not present in these herds.

Given the history of both disease and positive serological findings, further testing would be desirable to give greater confidence that the infection is no longer present in the Solomon Islands. Cattle numbers have reduced considerably since the 1970s, and it is possible that all persistently infected animals have been culled fortuitously. It will certainly be sensible to ensure that no persistently infected animals are imported in the future.

Johne's disease (JD)

No clinical JD has been seen in the Solomon Islands, and serological testing in the 1970s found no animals with antibodies among 53 tested from 14 herds (de Fredrick & Reece, 1980). In 1998 we tested 260 sera for antibodies and found 6 positives and 2 weak positives (all 8 are shown as positive in the following summary).

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	151	5	3
Herd 1	30	2	7
Herd 2	33	0	0
Herd 3	21	0	0
Herd 4	22	2	9
Herd 5	21	0	0
Herd 6	21	1	5
Makira, Herd 7	18	0	0
Temotu	23	2	9
Western, Herd 8	20	1	5
Central	48	0	0
Herd 9	41	0	0
All provinces	260	8	3

The herds with the positive ELISA results have never had cattle with signs suggestive of JD. It was not possible in this study to attempt culture of *Mycobacterium paratuberculosis* from faeces, so interpretation must be based on clinical and serological findings.

Serological testing in the 1970s was with the CFT, which has poor specificity and very poor sensitivity for identifying infected animals. The ELISA used in 1998 is better, but is still not very sensitive (<50%), and its specificity is around 97% (Reichel et al., 1998). Taken together, the results above are exactly those to be expected from a test with 97% specificity used in a disease-free population: 3% false positives. Demonstration of freedom from Johne's disease requires repeated serological testing of large numbers of adult cattle, coupled with faecal culture and post-mortem investigation of suspect animals. Following the 1998 survey and earlier observations we can simply say that the results obtained are consistent with the Solomon Islands being free of bovine JD, and there is no evidence for its presence.

Brucellosis

Baker & Polke (1986) state that extensive testing, with slaughter of reactors and their offspring, had led to freedom from bovine brucellosis by 1986. There have been no clinical cases of brucellosis recorded since then. In 1998 we tested 261 cattle using the RBPT, and found no reactors. These results are consistent with continuing freedom from brucellosis.

Tuberculosis

Extensive testing with slaughter of reactors led to freedom from bovine tuberculosis by the mid-1980s. The last confirmed case was slaughtered in 1979. In 1998 we tested 931 adult animals using the single intradermal test in the caudal fold. There were no reactors:

Province	Property	No. tested	Herd size	% of herd tested	No. of Reactors
Guadalcanal	Herd 1	100	200	50	0
	Herd 3	25	35	71	0
	Herd 2	295	480	61	0
	Herd 4	120	180	67	0
	Herd 5	40	55	73	0
	Herd 6	30	54	56	0
Western	Herd 8	50	100	50	0
Central	Herd 9	194	436	44	0
Temotu	Herd 10	5	6	83	0
	Herd 11	15	25	60	0
	Herd 12	14	25	56	0
	Herd 13	13	15	87	0
	Herd 14	30	47	64	0
All provinces		931	1,658	56	0

These results are consistent with continuing freedom from bovine tuberculosis.

Anaplasmosis

There are no reports of anaplasmosis in the Solomon Islands. In 1998 we tested 231 bovine sera for antibodies to *Anaplasma* using the CAT, and found 5 reactors:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	126	2	2
Herd 1	28	0	0
Herd 2	15	0	0
Herd 3	19	1	5
Herd 4	20	1	5
Herd 5	20	0	0
Herd 6	21	0	0
Makira, Herd 7	18	0	0
Temotu	23	0	0
Western, Herd 8	20	1	5
Central	44	2	5
Herd 9	39	1	3
All provinces	231	5	2

When cattle are exposed to ticks infected with *Anaplasma marginale* a high proportion of them are infected and develop antibodies. These are detected by the card agglutination test

(sensitivity = 84%, specificity = 98% (Gonzalez et al., 1978). In endemic areas in the tropics one expects at least 60% of animals to be seropositive (Radostits et al., 1994). The results above are consistent with the country being free of anaplasmosis.

Babesiosis

There are no reports of babesiosis in the Solomon Islands. In 1998 we tested 231 sera for antibodies to both *Babesia bovis* using the ELISA and *B. bigemina* using the IFAT. All were negative for *B. bigemina*, but 16 were positive for *B. bovis*, and each of these positives was confirmed using the IFAT. The *B. bovis* results were as follows:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	126	10	8
Herd 1	28	3	11
Herd 2	15	1	7
Herd 3	19	1	5
Herd 4	20	1	5
Herd 5	20	2	10
Herd 6	21	2	10
Makira, Herd 7	18	0	0
Temotu	23	1	4
Western, Herd 8	20	0	0
Central	44	5	11
Herd 9	39	4	10
All provinces	231	16	7

The specificity of *B. bovis* serology is not well established. The consistently low prevalence of antibodies across each herd and province is surprising if infection is present, but it does fit with the low level of tick activity, if indeed there is any. These results are inconclusive. Further serology and examination of blood smears are needed if the presence or absence of *B. bovis* is to be decided definitively.

Theileriosis

There are no records of *Theileria* sp. in the Solomon Islands. The species most likely to be present is the benign *Theileria buffeli*, which is present elsewhere in the region, including Australia, whence Solomon Island cattle originate. *Amblyomma* ticks have been shown to transmit this parasite elsewhere, and one or more species of *Amblyomma* are present in the Solomon Islands. In 1998 we tested 231 bovine sera for antibodies, using the IFAT, and identified 38 reactors:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	126	25	20
Herd 1	28	0	0
Herd 2	15	0	0
Herd 3	19	7	37
Herd 4	20	7	35
Herd 5	20	2	10
Herd 6	21	9	43
Makira, Herd 7	18	7	39
Temotu	23	1	4
Western, Herd 8	20	1	5
Central	44	4	9
Herd 9	39	4	10
All provinces	231	38	16

As with the tests for babesiosis, the specificity of this test is not well established, and 16% false positives is a possible outcome. However, the higher apparent seroprevalence in some herds (3, 4, 6, 7) suggests that infection may well be present in those herds. Overall, the results are inconclusive.

Campylobacteriosis

Baker & Polke (1986) reported the testing of 1,500 vaginal mucus samples from over 80 herds, with a few samples giving positive reactions. There are no records of clinical campylobacteriosis in cattle, and it is unclear whether or not infection is present.

Trichomonosis

There have been no reported diagnoses of bovine trichomonosis, and *Tritrichomonas foetus* has not been found in the Solomon Islands. Over 500 bulls were tested in the 1970s and early 80s, and some motile protozoa were found (de Fredrick & Reece, 1980). There has been no more recent testing.

Other diseases

Infectious keratoconjunctivitis, ringworm and papillomatosis were all recorded by de Fredrick & Reece (1980). Footrot has never been reported. Both actinomycosis and actinobacillosis were stated by Baker & Polke (1986) to have occurred in the past, but not to have been seen for some years prior to their report.

Goats

Parasites

Baker & Polke (1986) reported the presence of *Oesophagostomum* spp. and *Moniezia* sp.

OIE list A diseases

Peste des petits ruminants has never been reported in the Solomon Islands, and does not occur in the region. The same is true of goat pox.

Caprine arthritis / encephalitis (CAE)

Clinical cases of this disease have not been recorded. In 1998 we tested 64 sera for antibodies to CAE, all with negative results. The sensitivity of this ELISA test is good (97% (Schroeder, 1985)), and the negative results in the 2 substantial herds sampled give confidence that CAE is not present at high prevalence, although it could still be present at low prevalence (less than 5%).

Brucellosis

Brucellosis has not been recorded in goats in the Solomon Islands. In 1998 all 63 sera tested were negative in the RBPT, which detects antibodies to both *Brucella melitensis* and *Brucella abortus*. It appears that the herds tested are free of brucellosis; further testing is necessary to prove the point.

Johne's disease

There are no records of clinical JD in the Solomon Islands. In 1998 we tested 64 sera with negative results. There is no suggestion that JD is present, but this is a test with very poor sensitivity, and to prove the case further testing would be necessary.

Toxoplasmosis

This infection is present throughout the Pacific, but there is no record of it being diagnosed in the Solomon Islands. In 1998 we tested 64 sera for antibodies, 54 of which gave positive results:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	26	19	73
Makira	1	1	100
Malaita	4	4	100
Temotu	9	7	78
Western	1	0	0
Central	23	23	100
All provinces	64	54	84

Toxoplasmosis is clearly endemic in the Solomon Islands. It is a zoonosis, and cats are the commonest source of infection for humans.

Q fever

This is a tick-transmitted rickettsial infection affecting various species, including goats, cattle and humans. In 1980 de Fredrick & Reece reported finding 3 cattle sera with antibodies among 116 tested. In 1998 we did not test cattle, but found 2 goats with antibodies in one herd on Guadalcanal:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	26	2	8
Makira	1	0	0
Malaita	4	0	0
Temotu	9	0	0
Western	1	0	0
Central	23	0	0
All Provinces	64	2	3

De Fredrick & Reece thought these 3 seropositive animals were false positives, and it is possible that despite these results there is no Q fever in the Solomon Islands.

Horses

Parasites

The following were reported by Baker & Polke (1986): ascarids; strongyles; *Gasterophilus* spp.; *Habronema* spp. Swamp cancer, which may be caused by *Habronema* or by fungal infections, is common.

OIE list A diseases

African horse sickness has not been reported, and is not recognised to be present in the region.

Sera from 31 horses on Guadalcanal and the Russell islands (Central Province) were tested for antibodies to the following diseases.

Equine infectious anaemia

All samples were negative.

Equine viral arteritis

All samples were negative.

Equine herpes viruses

Twenty two of the sera (71%) were positive:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Guadalcanal	11	7	64
Herd 9	20	15	75
All provinces	31	22	71

This test does not distinguish among the various equine herpes viruses, one or more of which could be present in these horses. Equine rhinopneumonitis virus antibodies have been identified elsewhere in the Pacific.

Pigs

Parasites

The following have been identified in the Solomon Islands (Baker & Polke, 1986; 1998 survey)

Parasite	Reference
Internal parasites:	
<i>Ascaris suum</i>	de Fredrick, 1971
<i>Ascarops dentata</i>	de Fredrick, 1971
<i>Ascarops strongylina</i>	de Fredrick, 1971
<i>Bourgelatia diducta</i>	de Fredrick, 1971
<i>Globocephalus</i> sp.	de Fredrick, 1971
<i>Metastrongylus apri</i>	de Fredrick, 1971
<i>Metastrongylus pudendotectus</i>	de Fredrick, 1971
<i>Oesophagostomum dentatum</i>	de Fredrick, 1971
<i>Oesophagostomum quadrispinulatum</i>	de Fredrick, 1971
<i>Setaria congolensis</i>	de Fredrick, 1971
<i>Stephanurus dentatus</i>	de Fredrick, 1971; Baker, 1985
<i>Trichuris suis</i>	de Fredrick, 1971
External parasites:	
<i>Amblyomma cyprium</i>	de Fredrick, 1971
<i>Amblyomma</i> sp.	1998 survey
<i>Haematopinus suis</i>	de Fredrick, 1971
<i>Sarcoptes scabiei</i>	Baker & Polke, 1986

The tick *Amblyomma cyprium* was found by de Fredrick on only one island (San Cristobal, Makira Province), but the *Amblyomma* of unidentified species found in 1998 was in Temotu Province.

Both Baker & Polke (1986) and de Fredrick (1971) state that biting flies worry pigs considerably, particularly the tabanids *Tabanus ceylonicus* and *Cydistomyia solomensis*, sand flies and mosquitoes.

OIE List A diseases

Neither African swine fever nor classical swine fever (CSF) has ever been reported in the Solomon Islands. In 1998 we tested 308 pig sera for antibodies to CSF, and all were negative (Appendix C, Table 3). This a highly contagious infection, and if it were present in the Solomon Islands we would expect to find at least 25% of village pigs with antibodies, and 50% of housed pigs. These results give us almost 100% confidence that CSF is not present in any commercial herd or in the village pig population of any province.

Brucellosis

Baker & Polke reported in 1986 that 2 serologically positive pigs were slaughtered, and that brucellosis had not been seen since then. De Fredrick (1971) refers to the testing of many pigs for brucellosis, all with negative results. In 1998 we tested 306 pig sera with negative results. These results are consistent with the country being free of porcine brucellosis, although the poor sensitivity of the test (79% Rogers et al., 1989) means that a low prevalence of infection could have been missed in any of the populations sampled.

Tuberculosis

De Fredrick (1971) reported that 2 cases of bovine TB were diagnosed in 1963, but it had not been seen since. Baker (1985) stated that the disease had not been seen in pigs subsequently.

Transmissible gastroenteritis (TGE)

TGE has not been diagnosed in the Solomon Islands. In 1998 we tested 308 sera for antibodies with negative results. This is a highly contagious viral infection, and if it were present a high proportion of pigs would have antibodies. The Solomon Islands are free of TGE.

Porcine respiratory and reproductive syndrome (PRRS)

PRRS has not been diagnosed in the Solomon Islands. In 1998 we tested 308 sera for antibodies with negative results. This is a highly contagious viral infection, and if it were present a high proportion of pigs would have antibodies. The Solomon Islands are free of PRRS.

Aujeszky's disease / pseudorabies

Aujeszky's disease has not been diagnosed in the Solomon Islands. In 1998 we tested 308 sera for antibodies with negative results. This is a contagious viral infection, and if it were present a substantial proportion of pigs would have antibodies, depending on housing and husbandry. The negative results allow 95% confidence that individual populations sampled do not have a seroprevalence as high as 15%. The results indicate that the Solomon Islands are probably free of Aujeszky's disease.

Porcine parvovirus

In 1986 Baker & Polke reported testing 185 sera for parvovirus antibodies, and finding one positive. In 1988 two hundred and fifty sera were tested, giving 4 positives from 2 herds (Anita, 1993). All pigs in both herds were slaughtered. In 1998 we tested 70 sera, and 50 were positive:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Choiseul	0	0	
Guadalcanal	52	38	73
wood/concrete pens	43	37	86
Herd 1	15	14	93
village pigs	9	1	11
Isabel	0	0	
Makira	0	0	
Malaita	0	0	
Rennell	10	7	70
Temotu	1	0	0
Western Province	0	0	
Shortland Is.	0	0	
Other islands	0	0	
Central Province	7	5	71
All provinces, concrete	32	27	84
All provinces, dirt pens	16	8	50
All provinces, tethered	2	0	0
All provinces, wood pens	17	14	82
All provinces, free range	3	1	33
All provinces, all pigs	70	50	71

This infection is clearly endemic in the Solomon Islands today, as elsewhere in the region.

Trichinosis

This disease has not been reported in the Solomon Islands. In 1998 we tested 308 sera for antibodies to *Trichinella spiralis*, with 5 positive reactions:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Choiseul	21	1	5
Guadalcanal	88	1	1
wood/concrete pens	69	0	0
Herd 1	15	0	0
village pigs	19	1	5
Isabel	24	1	4
Makira	23	0	0
Malaita	20	0	0
Rennell	10	0	0
Temotu	21	0	0
Western Province	68	2	3
Shortland Is.	22	0	0
Other islands	46	2	4
Central Province	33	0	0
All provinces, concrete	76	0	0
All provinces, dirt pens	56	1	2
All provinces, tethered	39	1	3
All provinces, wood pens	125	3	2
All provinces, free range	7	0	0
All provinces, all pigs	308	5	2

When these 5 sera were subsequently tested by immunoblot, only 3 were confirmed. These 3 are almost certainly genuinely infected pigs. The status of the other 2 (from Western Province) is unclear. We were not able to examine muscle tissue from these pigs for cysts. It appears that trichinosis is present in the Solomon Islands, and further work is needed to identify the species and pathogenicity of the parasite involved. This is an important zoonosis acquired by eating meat containing viable cysts. Human infection can be prevented by thorough cooking of meat.

Swine erysipelas

Baker (1985) reported the presence of clinical disease, but serology using the SAT on 100 sera failed to find any reactors. Clinical disease was again reported in 1998.

Haemagglutinating encephalomyelitis virus disease / vomiting and wasting disease

Baker reported in 1985 that testing of 150 sera for antibodies resulted in 2 reactors, and in 1988 some sera were tested with negative results (Anita, 1993). Clinical disease has not been identified.

Encephalomyocarditis

Serological testing in 1988 was negative (Anita, 1993).

Oedema disease

One case was reported by Baker in 1985.

Enzootic pneumonia

De Fredrick (1971) suspected that enzootic pneumonia occurred in Solomon Island pigs, but in 1986 Baker & Polke reported attempts to diagnose the disease in 10 pigs with consolidated lungs, in all of which the pathology was associated with either *Stephanurus dentatus* or *Metastrongylus* spp. He further stated that there was no clinical evidence for the disease. Clinical signs of enzootic pneumonia were seen in 1998.

Poultry

Two hundred and ninety eight chickens were bled for serology in 1998. Both village and commercial birds were included in the survey, which covered all 9 provinces. The numbers of samples and the husbandry systems of each population sampled are shown in Table 1 of Appendix C, as are the serology results. Poultry are not vaccinated in the Solomon Islands.

There are very few other records of poultry diseases.

Parasites

Heterakis gallinae, *Ascaris* spp., and *Oxyuris mansoni* were recorded by Baker & Polke (1986), who also said that mites were common in village birds. Both caecal and intestinal coccidiosis were stated by Baker & Polke to be a problem in broilers. Coccidiosis has also been diagnosed more recently.

OIE List A diseases

There have been no reports of either Newcastle disease (ND) or avian influenza (AI) in the Solomon Islands. All 298 sera collected in 1998 were negative when tested for antibodies to these two infections. Both are highly contagious infections of poultry, and seroprevalence is high where either of them is endemic. The total absence of haemagglutination inhibition (HI) titres for ND gives us almost 100% certainty that ND is not present in any of the layer flocks tested, since despite the poor sensitivity of the test (79% (Miers et al., 1983)) we would expect at least 50% of birds to have titres if infection were present. Similarly, in village birds we would expect at least 25% seropositivity, and the negative results obtained give us almost 100% certainty that ND is not present at this prevalence. Anita (1993) also reported negative serology for ND (number tested unknown).

Neither velogenic disease nor any of the lentogenic strains of ND found elsewhere in the region are present in the Solomon Islands.

Similarly we conclude that AI is not present in the Solomon Islands.

Infectious bronchitis (IB)

Almost all (98%) of the sera tested in 1998 were positive for IB antibodies:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Choiseul	23	22	96
Guadalcanal	76	75	99
Layers	53	53	100
Flock 1	13	13	100
Flock 2	20	20	100
Flock 3	20	20	100
Village chickens	23	22	96
Isabel	24	24	100
Makira	21	20	95
Malaita	20	20	100
Rennell	21	21	100
Temotu	20	18	90
Western Province	70	70	100
Shortland Islands	24	24	100
Other islands	46	46	100
Central Islands	23	23	100
All provinces	298	293	98

IB is endemic throughout the Solomon Islands.

Infectious bursal disease (IBD)

There are no reports of clinical disease, and Anita (1993) reported negative serological testing in 1988. Only 8 (3%) of the 298 sera tested for antibodies in 1998 gave positive results:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Choiseul	23	0	0
Guadalcanal	76	4	5
Layers	53	2	4
Flock 1	13	1	8
Flock 2	20	1	5
Flock 3	20	0	0
Village chickens	23	2	9
Isabel	24	1	4
Makira	21	0	0
Malaita	20	0	0
Rennell	21	1	5
Temotu	20	0	0
Western Province	70	0	0
Shortland Islands	24	0	0
Other islands	46	0	0
Central Islands	23	2	9
All provinces	298	8	3

This is a contagious disease that generally results in a seroprevalence of well over 20%. The ELISA is most commonly used to screen intensively managed flocks to assess their immunity, and its sensitivity and specificity for individual sera have not been published. Without this information it is impossible to interpret these results with confidence. It appears likely that there is no IBD in the Solomon Islands, but further investigations would be necessary to come to a definite conclusion.

Infectious laryngotracheitis (ILT)

All populations tested in 1998 contained reactors in the ELISA for antibodies to ILT, with an overall seroprevalence of 50%:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Choiseul	23	16	70
Guadalcanal	76	33	43
Layers	53	26	49
Flock 1	13	6	46
Flock 2	20	8	40
Flock 3	20	12	60
Village chickens	23	7	30
Isabel	24	12	50
Makira	21	13	62
Malaita	20	5	25
Rennell	21	15	71
Temotu	20	12	60
Western Province	70	35	50
Shortland Islands	24	13	54
Other islands	46	22	48
Central Islands	23	8	35
All provinces	298	149	50

ILT is clearly endemic throughout the Solomon Islands.

Avian encephalomyelitis

This viral infection is also present in the Solomon Islands, although serological results in 1998 varied considerably among provinces:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Choiseul	23	5	22
Guadalcanal	76	58	76
Layers	53	50	94
Flock 1	13	10	77
Flock 2	20	20	100
Flock 3	20	20	100
Village chickens	23	8	35
Isabel	24	15	63
Makira	21	20	95
Malaita	20	0	0
Rennell	21	1	5
Temotu	20	2	10
Western Province	70	2	3
Shortland Islands	24	1	4
Other islands	46	1	2
Central Islands	23	4	17
All provinces	298	107	36

Commercial layer flocks on Guadalcanal all had high seroprevalence (77–100%), and village chickens on the same island had 35% seroprevalence. Isabel and Makira provinces also had high seroprevalence, but in other provinces it was much lower. As with IBD, the precise specificity of this ELISA is unknown, so firm conclusions cannot be drawn about the presence or absence of the virus in Malaita, Rennell, Temotu and Western provinces. Further investigations would be necessary to unravel the inter-province differences.

Marek's disease

Baker & Polke reported visceral and neural lymphomatosis in an intensive layer flock in 1986. Serology in 1998 found antibodies to the virus at high prevalence in all populations tested:

Population	No. of samples		Apparent Prevalence %
	Tested	Positive	
Choiseul	23	13	57
Guadalcanal	76	53	70
Layers	53	39	74
Flock 1	13	6	46
Flock 2	20	13	65
Flock 3	20	20	100
Village chickens	23	14	61
Isabel	24	11	46
Makira	21	9	43
Malaita	20	13	65
Rennell	21	7	33
Temotu	20	8	40
Western Province	70	27	39
Shortland Islands	24	6	25
Other islands	46	21	46
Central Islands	23	20	87
All provinces	298	161	54

Marek's disease is certainly present throughout the Solomon Islands.

Fowl pox

Clinical fowl pox was recorded by Baker (1985) and by Anita (1993).

Other diseases

Anita reported negative serological results for the following in a 1988 survey:

- *Salmonella pullorum*
- Reovirus
- Egg drop syndrome 76

In the same survey 2 of 50 samples were positive for *Mycoplasma gallisepticum* antibodies, and 1 of 50 positive for *Mycoplasma synoviae*.



CONCLUSIONS

OIE List A diseases

With the exception of bluetongue virus, the Solomon Islands are free of the diseases on the OIE's List A, i.e. "communicable diseases which have the potential for very serious and rapid spread, irrespective of national borders, which are of serious socio-economic or public health consequence and which are of major importance in the international trade of livestock and livestock products". Bluetongue is a disease of sheep, and there are no sheep in the Solomon Islands. Clearly careful thought should be given to any proposals to introduce sheep to the country.

Public health and zoonoses

Zoonoses (diseases of animals transmissible to man) in Solomon Islands livestock include trichinosis and leptospirosis. Trichinosis deserves further investigation, particularly since most pigs are slaughtered with no opportunity for meat inspection.

Leptospirosis is a commonly found in the tropics, and is potentially an important public health problem in the Solomon Islands. Seroprevalence is very high among horses and cattle, and serovars *hardjo* and *szwajizak* are the most prevalent. Further investigations are needed to establish the detailed epidemiology of the serovars and mammalian hosts involved in Solomon Islands.

Protecting imported livestock from local diseases

Day-old layer chicks imported from overseas will generally be exposed to infections present in village poultry, so for optimal health and productivity they should be vaccinated against infectious bronchitis, infectious laryngotracheitis, avian encephalomyelitis and Marek's disease.

Both theileriasis and *Babesia bovis* may well be present in the Solomon Islands (although the *Theileria* strain may well be benign). Therefore care should be taken when introducing cattle into the country which are susceptible to tick-borne diseases.

Keeping exotic animal disease out of the Solomon Islands

Testing and quarantine procedures should be maintained to ensure imported livestock are free from exotic disease. Of particular importance in this respect are:

- rabies
- vesicular diseases
- Newcastle disease and avian influenza
- tuberculosis and brucellosis
- classical swine fever and African swine fever
- Aujeszky's disease
- ticks and tick-borne disease, especially anaplasmosis
- bovine pestivirus
- transmissible gastroenteritis and porcine respiratory and reproductive syndrome
- virulent infectious bursal disease
- caprine arthritis / encephalitis



REFERENCES

- ANITA, B. (1993). Solomon Islands. **In:** Animal quarantine in the Asia-Pacific region and its influence on trade for the Pacific nations. Proceedings of the Commonwealth Veterinary Association regional workshop, 15-17 June 1993. Wellington, New Zealand.
- ANON. (1985). Cattle Census 1984: Solomon Islands statistical bulletin 20/85. Ministry of Agriculture and Lands, Honiara, Solomon Islands.
- BAKER, A.A. (1985). Annual report of the Chief Veterinary Officer. Solomon Islands Government: Veterinary/Livestock Department, Ministry of Agriculture and Lands, Honiara.
- BAKER, A.A. & G. POLKE. (1986). The animal disease situation in the Solomon Islands – 1985. *Revue Élev. Méd. Vét. Nouv. Calédonie.* (8): 11-15.
- CAMERON, A.R. (1996). FreeCalc – Epidemiological software for surveys to detect disease.
- DE FREDRICK, D.F. & R.L. REECE. (1980). Diseases of cattle in the Solomon Islands. *Aust. Vet. J.* 56: 522-525.
- DE FREDRICK, D.F. (1971). Pig raising in the British Solomon Island Protectorate. Agricultural information service, Department of Agriculture, Honiara, Solomon Islands.
- GONZALEZ, E.F., R.F. LONG & R.A. TODOROVIC. (1978). Comparisons of the complement-fixation, indirect fluorescent antibody, and card agglutination tests for the diagnosis of bovine anaplasmosis. *Am. J. Vet. Res.* 39(9): 1538-1541.
- HORNER, G.W. & D.M. ORR. (1993). An enzyme-linked immunosorbent assay for detection of antibodies against bovine pestivirus. *NZ Vet. J.* 41(3): 123-125.
- MIERS, L.A. R.A. BANKOWSKI & Y.C. ZEE. (1983). Optimizing the enzyme-linked immunosorbent assay for evaluating immunity of chickens to Newcastle disease. *Avian Diseases.* 27(4): 1112-1125.
- RADOSTITS, O.M., D.C. BLOOD & C.C. GAY. (1997). *Veterinary medicine.* W.B. Saunders, London.
- REICHEL, M.P., G.W. DELISLE, A.H. JOHNS & D. COUSINS. (1998). Comparison of bacterial culture and serology for the diagnosis of Johne's disease in cattle. Proceedings of the OIE/WHO international congress on anthrax, brucellosis, CBPP, clostridial and mycobacterial diseases, Aug 9-15 1998, Berg-en-Dal, Kruger National Park, South Africa. 352-357.
- ROGERS, R.J., D.R. COOK, P.J. KETTERER, F.C. BALDOCK, P.J. BLACKALL & R.W. STEWART. (1989). An evaluation of three serological tests for antibody to *Brucella suis* in pigs. *Aust. Vet. J.* 66(3): 77-80.
- SCHROEDER, B.A., R.E. OLIVER & A. CATHCART. (1985). The development and evaluation of an ELISA for the detection of antibodies to caprine arthritis-encephalitis virus in goat sera. *NZ Vet. J.* 33: 213-215.



APPENDIX A : ABBREVIATIONS AND ACRONYMS

Laboratories

CAHL	Central Animal Health Laboratory MAF Quality Management Ward Street Upper Hutt NEW ZEALAND
EMAI	Elizabeth Macarthur Agricultural Institute New South Wales Agriculture Woodbridge Road Menangle New South Wales AUSTRALIA
FVPL	Koronivia Veterinary Pathology Laboratory Ministry Of Agriculture, Fisheries And Forests P.O. Box 77 Nausori Fiji
QHA	WHO Arbovirus Reference and Research Laboratory Queensland Health Scientific Services 39 Kessels Road Coopers Plains Queensland 4108 AUSTRALIA
QHL	WHO/FAO Collaborating Centre for Reference and Research on Leptospirosis Centre for Public Health Sciences 39 Kessels Road Coopers Plains Queensland 4108 AUSTRALIA
TFRC	Tick Fever Research Centre Queensland Department of Primary Industry 280 Grindle Road Wacol Queensland 4076 AUSTRALIA

General

OIE	Office International des Epizooties
PICT	Pacific Island countries and territories
RIPEL	Russell Islands Plantation Estates Ltd.
SPC	Secretariat of the Pacific Community



Laboratory tests

AGID	Agar Gel ImmunoDiffusion
CAT	Card Agglutination Test
C-ELISA	Competitive Enzyme-Linked Immunosorbent Assay
CFT	Complement Fixation Test
ELISA	Enzyme-Linked Immunosorbent Assay
HI	Haemagglutination Inhibition
IFAT	Indirect Fluorescent Antibody Test
LAT	Latex Agglutination
MAT	Microscopic Agglutination Test
RBPT	Rose Bengal Plate Test
SAT	Serum Agglutination Test
SNT	Serum Neutralisation Test

Diseases

AD	Aujeszky's Disease
AE	Avian Encephalomyelitis
AI	Avian Influenza
Brucella	Brucellosis
BT	Bluetongue
CAE	Caprine Arthritis and Encephalitis
CBPP	Contagious Bovine Pleuropneumonia
CSF	Classical Swine Fever / Hog Cholera
EIA	Equine Infectious Anaemia
IB	Infectious Bronchitis
IBD	Infectious Bursal Disease
IBR	Infectious Bovine Rhinotracheitis
ILT	Infectious Laryngotracheitis
JD	Johne's Disease
Lepto	Leptospirosis
MD	Marek's Disease
ND	Newcastle Disease
PRRS	Porcine Respiratory and Reproductive Syndrome
TB	Tuberculosis
TGE	Transmissible GastroEnteritis
TS	Trichinosis



APPENDIX B : DISEASES, LABORATORIES AND TESTS

Species	Laboratory*	Infectious agent*	Serological test*
Pig	CAHL	TGE PRRS Classical Swine Fever Aujeszky's Disease <i>Trichinella spiralis</i> Porcine parvovirus	ELISA ELISA ELISA ELISA ELISA / Western blot HI
	FVPL	Brucellosis	RBPT
	QHL	Leptospira panel	MAT
	QHA	Japanese Encephalitis	HAI
Horse	CAHL	Equine Infectious Anaemia Equine Herpes Equine Viral Arteritis	AGID SNT SNT
	QHL	Leptospira panel	MAT
	QHA	Japanese Encephalitis	HI
Chicken	CAHL	Infectious Bronchitis Infectious Bursal Disease Infectious Laryngotracheitis Newcastle Disease Avian Influenza Marek's Disease Avian Encephalomyelitis	ELISA ELISA ELISA HI AGID AGID AGID
Cattle	CAHL	IBR PESTIVIRUS L.C. Johne's Disease	ELISA ELISA ELISA
	TFRC	<i>Anaplasma</i> <i>Babesia bovis</i> <i>Babesia bigemina</i> <i>Theileria</i>	CAT ELISA / IFAT IFAT IFAT
	EMAI	Akabane Bluetongue EBL	ELISA ELISA ELISA
	FVPL	Brucellosis	RBPT
	QHL	Leptospira panel	MAT
Goat	CAHL	Toxoplasmosis Q Fever Bluetogues CAE Johne's Disease	LA CFT AGID / C-ELISA ELISA ELISA
	FVPL	Brucellosis	RBPT
	QHL	Leptospira panel	MAT
	QHA	Japanese Encephalitis	HI

* For explanation of abbreviations and acronyms, see Appendix A



APPENDIX C : SEROLOGICAL RESULTS

Poultry

Table 1. Numbers of sera tested and numbers giving positive results in tests for antibodies to each of 7 infections of poultry in different populations in the Solomon Islands

Population	Housing	Newcastle Disease		Avian Influenza		Infectious Bronchitis		Infectious Bursal Disease		Infectious Laryngotracheitis		Avian Encephalomyelitis		Infectious Marek's Disease	
		Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
Choiseul	Free range	23	0	23	0	23	22	23	0	23	16	23	5	23	13
Guadalcanal		76	0	76	0	76	75	76	4	76	33	76	58	76	53
Layers		53	0	53	0	53	53	53	2	53	26	53	50	53	39
Flock 1	Wood pens	13	0	13	0	13	13	13	1	13	6	13	10	13	6
Flock 2	Caged	20	0	20	0	20	20	20	1	20	8	20	20	20	13
Flock 3	Caged	20	0	20	0	20	20	20	0	20	12	20	20	20	20
Village chickens	Various	23	0	23	0	23	22	23	2	23	7	23	8	23	14
Isabel	Free range	24	0	24	0	24	24	24	1	24	12	24	15	24	11
Makira	Free range	20	0	21	0	21	20	21	0	21	13	21	20	21	9
Malaita	Free range	20	0	20	0	20	20	20	0	20	5	20	0	20	13
Rennell	Free range	21	0	21	0	21	21	21	1	21	15	21	1	21	7
Temotu	various	20	0	20	0	20	18	20	0	20	12	20	2	20	8
Western Province	Free range	70	0	70	0	70	70	70	0	70	35	70	2	70	27
Shortland Islands	Free range	24	0	24	0	24	24	24	0	24	13	24	1	24	6
Other islands	Free range	46	0	46	0	46	46	46	0	46	22	46	1	46	21
Central Islands	Free range	23	0	23	0	23	23	23	2	23	8	23	4	23	20
All provinces		297	0	298	0	298	293	298	8	298	149	298	107	298	161

Cattle

Table 2. Numbers of sera tested and numbers giving positive results in tests for antibodies to each of 11 infections of cattle in different populations in the Solomon Islands, 1998

Population	EBL [†]	IBR [†]	Pestivirus	Johne's Disease	Bluetongue	Theileria	Anaplasma	<i>Babesia bovis</i>	<i>Babesia bigemina</i>	Akabane	<i>Brucella</i>					
	Total Pos.*	Total Pos.	Total Pos.	Total Pos.	Total Pos.	Total Pos.	Total Pos.	Total Pos.	Total Pos.	Total Pos.	Total Pos.					
Guadalcanal	150	7	151	5	126	25	126	2	126	10	126	0	150	0	151	0
Herd 1	30	0	30	0	30	0	28	0	28	3	28	0	30	0	30	0
Herd 2	32	0	33	0	32	0	15	0	15	1	15	0	32	0	33	0
Herd 3	21	0	21	0	21	2	19	1	19	1	19	0	21	0	21	0
Herd 4	22	0	22	2	22	3	20	1	20	1	20	0	22	0	22	0
Herd 5	21	0	21	0	21	0	20	0	20	2	20	0	21	0	21	0
Herd 6	21	7	21	0	21	0	21	0	21	2	21	0	21	0	21	0
Makira, Herd 7	18	0	18	0	18	0	18	0	18	0	18	0	18	0	18	0
Temotu	23	0	23	0	23	2	23	0	23	1	23	0	23	0	23	0
Western, Herd 8	20	0	20	0	20	2	20	1	20	0	20	0	20	0	20	0
Central	48	0	48	0	48	2	44	2	44	5	44	0	48	0	48	0
Herd 9	41	0	41	0	41	2	39	1	39	4	39	0	41	0	41	0
All provinces	259	7	260	8	259	11	231	5	231	16	231	0	259	0	261	0

[†] See Appendix A for explanation of abbreviations

* Positive

Pigs

Table 3. Numbers of sera tested and numbers giving positive results in tests for antibodies to each of 8 infections of pigs in different populations in the Solomon Islands

Population	TGE†		PRRS†		Aujeszky's Disease		Classical Swine Fever		<i>Trichinella spiralis</i>		Japanese B Encephalitis		Brucella		Porcine parvovirus	
	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
Choiseul	21	0	21	0	21	0	21	0	21	1	0	0	21	0	0	0
Guadalcanal	88	0	88	0	88	0	88	0	88	1	0	51	86	0	52	38
wood/concrete pens	69	0	69	0	69	0	69	0	69	0	42	0	67	0	43	37
Herd 1	15	0	15	0	15	0	15	0	15	0	14	0	13	0	15	14
Village pigs	19	0	19	0	19	0	19	0	19	1	9	0	19	0	9	1
Isabel	24	0	24	0	24	0	24	0	24	1	0	0	24	0	0	0
Makira	23	0	23	0	23	0	23	0	23	0	0	0	23	0	0	0
Malaita	20	0	20	0	20	0	20	0	20	0	0	0	20	0	0	0
Rennell	10	0	10	0	10	0	10	0	10	0	10	0	10	0	10	7
Temotu	21	0	21	0	21	0	21	0	21	0	1	0	21	0	1	0
Western Province	68	0	68	0	68	0	68	0	68	2	0	0	68	0	0	0
Shortland Is.	22	0	22	0	22	0	22	0	22	0	0	0	22	0	0	0
Other islands	46	0	46	0	46	0	46	0	46	2	0	0	46	0	0	0
Central Province	33	0	33	0	33	0	33	0	33	0	6	0	33	0	7	5
All provinces, concrete	76	0	76	0	76	0	76	0	76	0	31	0	74	0	32	27
All provinces, dirt pens	56	0	56	0	56	0	56	0	56	1	16	0	56	0	16	8
All provinces, tethered	39	0	39	0	39	0	39	0	39	1	2	0	39	0	2	0
All provinces, wood pens	125	0	125	0	125	0	125	0	125	3	16	0	125	0	17	14
All provinces, free range	7	0	7	0	7	0	7	0	7	0	3	0	7	0	3	1
All provinces, all pigs	308	0	308	0	308	0	308	0	308	5	68	0	306	0	70	50

† See Appendix A for explanation of abbreviations

Goats

Table 4. Numbers of sera tested and numbers giving positive results in tests for antibodies to each of 7 infections of goats in different populations in the Solomon Islands

Population	Caprine Arthritis / Encephalitis		Brucella		Toxoplasma		Q fever		Johne's disease		Bluetongue virus		Japanese B encephalitis		
	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive	
Guadalcanal	26	0	26	0	26	19	2	26	0	26	0	26	0	26	0
Makira	1	0	1	0	1	1	0	1	0	1	0	1	0	0	0
Malaita	4	0	4	0	4	4	0	4	0	4	0	4	0	0	0
Temotu	9	0	9	0	9	7	0	9	0	9	0	8	0	0	0
Western	1	0	1	0	1	0	0	1	0	1	0	1	0	0	0
Central	23	0	23	0	23	23	0	23	0	23	0	23	0	0	0
All provinces	64	0	63	0	64	54	2	64	0	64	0	63	0	26	0

Horses

Table 5. Numbers of sera tested and numbers giving positive results in tests for antibodies to each of 4 infections of horses in different populations in the Solomon Islands

Population	Equine Infectious Anaemia		Equine Herpes viruses		Equine viral arteritis		Japanese B encephalitis	
	Tested	Positive	Tested	Positive	Tested	Positive	Tested	Positive
Guadalcanal	11	0	11	7	11	0	8	0
Central	20	0	20	15	20	0	0	0
All provinces	31	0	31	22	31	0	8	0

Cattle leptospirosis

Table 6. Numbers of sera reacting to 21 leptospiral serovars in the microscopic agglutination test, for different populations of cattle in the Solomon Islands, 1998.

Population	<i>Pomona</i>	<i>hardjo</i>	<i>tarassovi</i>	<i>grippityphosa</i>	<i>celledoni</i>	<i>copenhagani</i>	<i>australis</i>	<i>zanoni</i>	<i>robinsoni</i>	<i>canicola</i>	<i>kremastos</i>	<i>s2wajizak</i>	<i>medanensis</i>	<i>bulgarica</i>	<i>cynopteri</i>	<i>ballum</i>	<i>bataviae</i>	<i>djasiman</i>	<i>javanica</i>	<i>panama</i>	<i>shermani</i>	No. tested	No. positive (any serovar)	Apparent prevalence %
Guadalcanal	0	105	38	0	0	0	9	0	0	0	2	84	49	0	0	0	2	0	0	0	5	145	119	82
Herd 1	0	20	7	0	0	0	0	0	0	0	0	17	13	0	0	0	0	0	0	0	0	30	26	87
Herd 2	0	22	6	0	0	0	2	0	0	0	0	14	5	0	0	0	0	0	0	0	0	33	24	73
Herd 3	0	14	10	0	0	0	0	0	0	0	0	9	4	0	0	0	1	0	0	0	0	21	16	76
Herd 4	0	20	5	0	0	0	2	0	0	0	0	17	7	0	0	0	0	0	0	0	1	22	20	91
Herd 5	0	18	10	0	0	0	5	0	0	0	2	14	12	0	0	0	1	0	0	0	4	21	19	90
Herd 6	0	9	0	0	0	0	0	0	0	0	0	11	6	0	0	0	0	0	0	0	0	15	12	80
Makira, Herd 7	0	2	4	0	0	0	0	0	0	0	0	3	0	0	0	0	1	0	0	0	1	8	6	75
Temotu	0	4	1	0	0	0	2	2	2	0	0	5	1	0	0	0	0	0	0	0	0	12	7	58
Western, Herd 8	0	14	6	0	0	0	5	0	1	0	0	11	7	0	0	0	0	0	0	0	0	18	16	89
Central	0	35	10	0	0	0	9	1	0	0	3	35	20	0	0	0	1	0	0	0	1	43	40	93
Herd 9	0	32	8	0	0	0	8	1	0	0	3	32	19	0	0	0	0	0	0	0	0	38	36	95
All provinces	0	160	59	0	0	0	25	3	3	0	5	138	77	0	0	0	4	0	0	0	7	226	188	83

Pig leptospirosis

Table 7. Numbers of sera reacting to 21 leptospiral serovars in the microscopic agglutination test, for different populations of pigs in the Solomon Islands, 1998.

Population	<i>Pomona</i>	<i>hardjo</i>	<i>tarassovi</i>	<i>grippityphosa</i>	<i>celledoni</i>	<i>copenhageni</i>	<i>australis</i>	<i>zanoni</i>	<i>robinsoni</i>	<i>canicola</i>	<i>kremastos</i>	<i>szwajtzak</i>	<i>medanensis</i>	<i>bulgarica</i>	<i>cynopteri</i>	<i>ballum</i>	<i>bataviae</i>	<i>djasiman</i>	<i>javanica</i>	<i>panama</i>	<i>shermani</i>	No. tested	No. positive (any serovar)	Apparent prevalence %
Choiseul	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	18	1	6
Guadalcanal	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	88	3	3
wood/concrete pens	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69	3	4
Herd 1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	2	13
village pigs	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	0
Isabel	0	0	0	0	0	0	0	1	0	0	0	2	1	0	1	0	0	0	0	0	0	22	5	23
Makira	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	22	3	14
Malaita	0	0	0	0	0	0	4	0	0	0	0	0	0	0	1	0	0	0	0	0	1	20	6	30
Rennell	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	3	30
Temotu	0	0	0	0	0	0	0	3	0	0	0	0	0	0	2	0	0	0	0	0	0	18	4	22
Western Province	0	1	0	0	0	1	2	2	0	0	1	1	3	0	2	1	0	0	0	0	0	68	8	12
Shortland Is.	0	1	0	0	0	0	0	1	0	0	1	1	3	0	0	1	0	0	0	0	0	22	4	18
other islands	0	0	0	0	0	1	2	1	0	0	0	0	0	0	2	0	0	0	0	0	0	46	4	9
Central Province	0	0	0	0	0	0	1	1	0	0	0	3	1	0	0	0	0	0	0	0	0	32	4	13
All provinces, concrete	0	1	0	0	0	0	2	0	0	0	0	1	0	0	1	0	0	0	0	0	0	75	5	7
All provinces, dirt pens	0	0	0	0	0	1	3	1	0	0	0	0	0	0	1	1	0	0	1	1	0	55	6	11
All provinces, tethered	0	0	0	0	0	0	0	3	0	0	0	2	1	0	3	0	0	0	0	0	0	36	8	22
All provinces, wood pens	0	2	0	0	0	0	4	4	0	0	1	2	3	0	2	0	0	0	0	0	1	120	16	13
All provinces, free range	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	0	0
All provinces, all pigs	0	3	0	0	0	1	10	8	0	0	1	7	5	0	7	1	0	0	1	1	1	298	37	12

Goat leptospirosis

Table 8. Numbers of sera reacting to 21 leptospiral serovars in the microscopic agglutination test, for different populations of goats in the Solomon Islands, 1998.

Population	<i>Pomona</i>	<i>hardjo</i>	<i>tarassovi</i>	<i>grippityphosa</i>	<i>celledoni</i>	<i>copenhagani</i>	<i>australis</i>	<i>zanoni</i>	<i>robinsoni</i>	<i>canicola</i>	<i>kremastos</i>	<i>szwajzaki</i>	<i>medanensis</i>	<i>bulgarica</i>	<i>cynopteri</i>	<i>ballum</i>	<i>bataviae</i>	<i>djasiman</i>	<i>javanica</i>	<i>panama</i>	<i>shermani</i>	No. tested	No. positive (any serovar)	Apparent prevalence %
Guadalcanal	0	5	3	0	0	0	0	0	0	0	0	1	3	1	0	0	0	1	0	0	1	26	7	27
Makira	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Malaita	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Temotu	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	1	13
Western	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Central	0	2	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	23	2	9
All provinces	0	7	3	0	0	0	1	0	0	0	0	2	3	1	0	0	0	1	0	0	1	63	10	16

Horse leptospirosis

Table 9. Numbers of sera reacting to 21 leptospiral serovars in the microscopic agglutination test, for different populations of horses in the Solomon Islands, 1998.

Population	<i>Pomona</i>	<i>hardjo</i>	<i>tarasovi</i>	<i>grippityphosa</i>	<i>celledoni</i>	<i>copenhageni</i>	<i>australis</i>	<i>zanoni</i>	<i>robinsoni</i>	<i>canticola</i>	<i>kremastos</i>	<i>szwajzack</i>	<i>medanensis</i>	<i>bulgarica</i>	<i>cynopteri</i>	<i>ballum</i>	<i>bataviae</i>	<i>djasiman</i>	<i>javanica</i>	<i>panama</i>	<i>shermani</i>	No. tested	No. positive (any serovar)	Apparent prevalence %
Guadalcanal	0	10	2	0	0	2	1	0	1	0	0	8	6	1	2	0	0	2	1	0	0	11	10	91
Central	0	7	2	0	0	0	2	0	0	0	0	6	2	1	1	0	0	0	0	0	0	20	12	60
All provinces	0	17	4	0	0	2	3	0	1	0	0	14	8	2	3	0	0	2	1	0	0	31	22	71

