



# Annual Report 2013



## Anti Malaria Campaign

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Anti Malaria Campaign  
Ministry of Health



## Anti Malaria Campaign

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2013

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## Foreword

The Anti Malaria Campaign of the Ministry of Health, Sri Lanka is presenting the Annual Report on Malaria Elimination Programme for the year 2013. The Programme is responsible for the elimination of malaria from the country and to ensure malaria free Sri Lanka.

Anti Malaria Campaign is having public health service network through regional malaria offices and linkages with curative health sector for the treatment services. As the current challenge for the programme is imported cases, the campaign is conducting a vigilant case surveillance. Every diagnosed case of malaria is an medical emergency and should be treated immediately. In addition entomological and parasitological surveillance are carried out to strengthen the programme.

The report will facilitate programme managers to construct the policies and strategic plans to progress towards the goal as 'Malaria free Sri Lanka' in future.

**Dr Risintha Premaratne**

Director

Anti Malaria Campaign

## **Acknowledgements**

This report provides the progress of National Malaria Elimination Programme for the year 2013. Anti Malaria Campaign (AMC) is grateful to all the stakeholders of the Programme. The support given by the Government of Sri Lanka, Ministry of Health is highly appreciated and it is the sustained strength that had made the programme grow over the century.

The continuous technical inputs given by the Professionals from the technical support group should always be appreciated. AMC is extremely in depth for the Technical as well as the financial supports offered by the development partners; World Health Organization, Global Funds for Fight against AIDS, Tuberculosis and Malaria (GFATM), Tropical and Environment Disease Health Associates (TEDHA) and Lanka Jathika Sarvodaya Shramadana Sangamaya of Sri Lanka.

Consultant Community Physicians, Staff from entomological and parasitological unit need to be thankfully remembered for their inputs. The public health staff from all over the country who have always made immense efforts should be highly regarded. Staff of the statistic unit to be honoured for the effort they have taken to make the data management.

## Introduction

Considerable progress has been made against malaria since the beginning of the century with drastic decreases in cases and no indigenous case of malaria being reported since October 2012. Anti Malaria Campaign has been able to control indigenous transmission of malaria during the year 2013. However the number of imported malaria cases detected during this period, shows an increase when compared with the year 2012.

Currently, the biggest threat to the elimination efforts is the risk of resurgence due to imported malaria and the continuing receptivity in several parts of the country due to the persistence of malaria vectors and over the past six years, most of the imported malaria cases were being reported from foreign travellers or Sri Lankan nationals returning from malaria endemic countries. With enhanced parasitological surveillance, 95 cases were reported in 2013. The implications of the imported cases are discussed in the context of the challenges faced by the Anti Malaria Campaign (AMC) and measures taken to prevent the reintroduction of malaria.

During the period 2008–2012, the objectives of the national programme were the elimination of indigenous *Plasmodium falciparum* infections by end 2012 in non-conflict and transitional areas and the elimination of Indigenous *Plasmodium vivax* infection by the year 2012 in 75% of non-conflict and transitional areas of the country, while sustaining zero mortality due to malaria. With the end of the civil conflict, these objectives were reformulated as elimination of indigenous *P. falciparum* by the end of 2012 and indigenous *P. vivax* by the end of 2014.

The objectives and strategies of the Anti Malaria Campaign are as follows;

### Objectives

1. To eliminate indigenous *P. falciparum* malaria by 2012
2. To eliminate indigenous *P. vivax* malaria by 2014
3. To maintain zero mortality from malaria
4. To prevent the re-introduction of malaria into the country

### Strategies

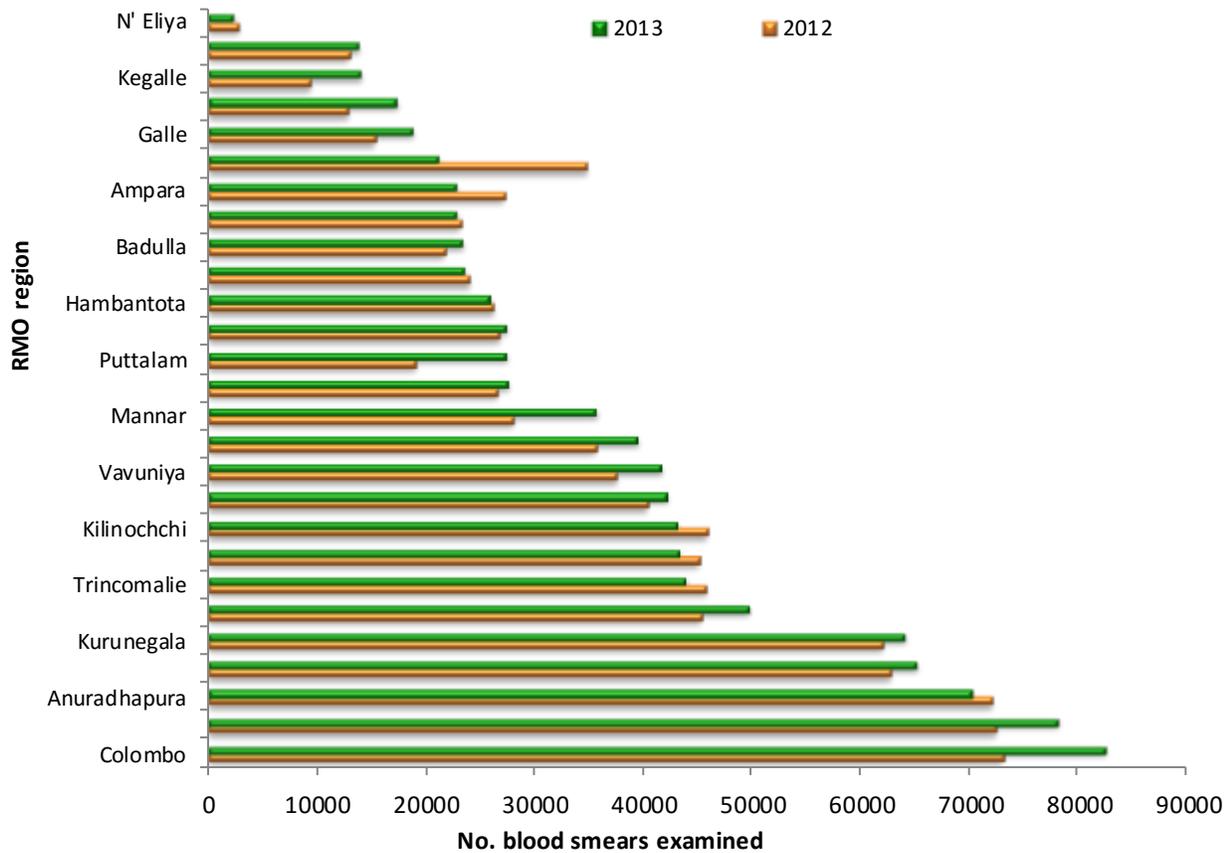
- To provide early diagnosis and prompt treatment of malaria patients and asymptomatic parasite carriers
- To plan and implement selective and sustainable vector control measures based on the principles of Integrated Vector Management
- Forecasting, early detection & prevention of outbreaks and the rapid & effective containment of outbreaks
- To reassess the country's malaria situation regularly, in particular the ecological, social and economic determinants of the disease and evaluation of malaria control activities
- Enhance community participation and partnership building for effective and sustainable malaria control
- Promotion of human resource development and capacity building
- Promotion of operational research

As first three objectives have thus far been achieved and Sri Lanka transitions to the Prevention of Re-introduction phase, the Anti Malaria Campaign is in the progress of developing new National Malaria Strategic Plan for Elimination and Prevention of Re-introduction 2014–2018, to take challenges due to imported malaria into account and outlines strategies and activities to address them.

## Epidemiology

Sri Lanka has reached the elimination status as there is no indigenous malaria cases since October 2012 and currently in the path of prevention of re-introduction phase.

A total number of 988 659 blood smears were examined during 2013 for the purpose of detection of malaria parasites by the departmental staff attached to the medical institutions and the Anti Malaria Campaign including its regional offices. Figure 1 shows the number of blood smears examined among districts during the years 2012 and 2013.



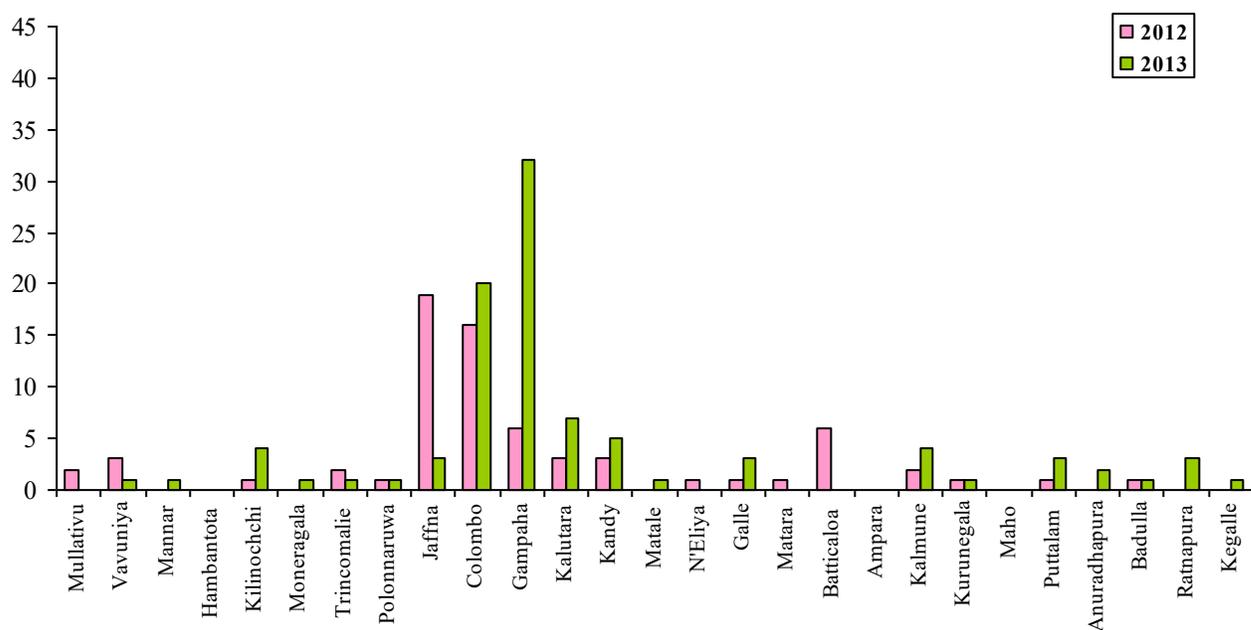
**Figure 1 : Number of blood smears examined among districts during the years 2012 and 2013**

Following this screening, 95 confirmed malaria cases were detected. This included 52 *P. vivax* infections , 42 *P. falciparum* infections and 1 *p.ovalae* infection. Table 1 shows the Proportion of *P. falciparum* and *P. vivax* for the past 10 years with budding of *P. ovalae* infection for the year 2005,2012 & 2013.

Year	Total cases	P. vivax		P. falciparum		Mixed		Other	
		No	%	No	%	No	%	No	%
2004	3720	3171	85	500	13.4	49(mixed)	1.6		
2005	1640	1506	92	94	5.8	39(mixed)	2.2	1(P.o)	0.06
2006	591	564	95	18	3.0	9(mixed)	1.9		
2007	198	191	96.4	6	3	1(mixed)	0.6		
2008	670	623	93	29	4.3	17(mixed)	2.5	1(P.m)	0.1
2009	558	529	95	21	3.8	8(mixed)	1.2		
2010	736	704	95.3	17	2.3	14(mixed)	2.2	1(P.m)	0.1
2011	175	158	90.3	12	6.8	5(mixed)	2.6		
2012	93	45	48.3	42	45.2	4(mixed)	4.3	2(P.o)	2.2
2013	95	52	54.7	42	44.2			1(P.o)	1.0

**Table 1: Proportion of *P. falciparum* , *P. vivax* and *P.ovalae* infections during the last 10 years (2004 - 2013)**

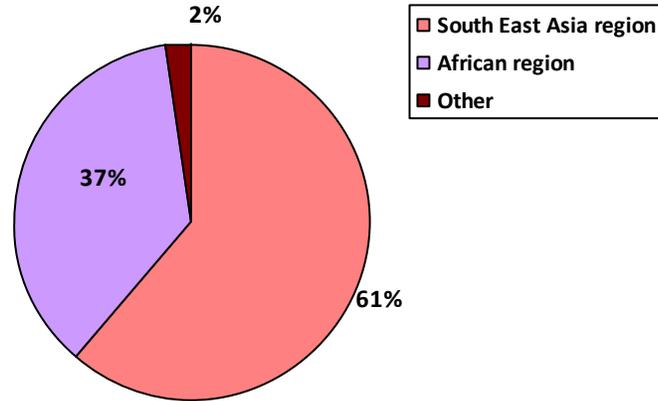
Figure 2 shows the district-wise comparison between the number of positive cases reported in the country in year 2012 and 2013. Majority of cases were reported from Western Province.



**Figure 2: District wise comparison of positive cases during the years 2012/2013**

### Imported malaria

There had been 26% rise in imported malaria. All the cases (95) were imported cases in 2013, compare to 75% were imported cases in 2012. .Majority of cases (61%) were imported from South East Asia region (Figure 3).Table 2 shows the type of infection by the country of origin.



**Figure 3: Imported malaria cases during the year 2013**

Country	P.v.	P.f.	P.o	Total
Angola		1		1
Cameroon		2		2
Equatorial Guinea		1		1
Ghana		4		4
Grande Comoren		1		1
Guinea		1		1
Haiti		2		2
India	32	6		38
Kenya		3		3
Liberia		2		2
Mali		1		1
Myanmar	3			3
Mozambique		1	1	2
Nigeria		1		1
Pakistan	17			17
Sierra Leone		11		11
Sudan		2		2
Tanzania		1		1
Uganda		2		2
<b>Total</b>	<b>52</b>	<b>42</b>	<b>1</b>	<b>95</b>

**Table 2: Distribution of imported cases by type and country of origin during 2013**

## **Chemoprophylaxis**

The Anti Malaria Campaign provided chemoprophylaxis to travellers to malaria endemic countries based on WHO guidelines. AMC headquarters has provided chemoprophylaxis for 1284 persons during the year 2013. Mefloquine (4795 tablets) and Chloroquine (1131 tablets) were issued to them depending on the country they visited. Majority of these travelers were males and above 18 years old.

## **Mortality**

When compared with other South-East Asian countries, mortality due to malaria in Sri Lanka is extremely low. No deaths due to malaria were reported in the year 2013.

## **Information management**

Network facilities were already established between the Anti Malaria Campaign Headquarters and the Regional Malaria Offices with the assistance of the Global Fund. Information regarding positive cases was transmitted to AMC Headquarters through a web based system established at AMC Headquarters. Furthermore, all malaria cases and potential vector breeding sites were mapped with the GIS.

To enhance the case surveillance from the private sector, communication cell at the AMC Headquarters was maintained with the assistance of Global Fund.

## **Prevention and control of epidemics/outbreaks**

The following strategies are used to forecast epidemics.

- Regular observation of fever incidence/ and malaria morbidity in Medical Institutions.
- Monitoring of vector densities (larval and adult) in sentinel stations and by random spot checks.
- There were no epidemics reported in the year 2013.

## **Status of drug resistance and drug policy**

All the *P. falciparum* and *P. vivax* positive patients were followed-up for one month to detect resistant strains of the parasite to artemether-lumefantrin and chloroquine respectively. There were no resistant *P. falciparum* and *P. vivax* cases detected during year 2013.

## **Programme priorities**

Prevention of re-introduction of malaria cases has been identified as the priority. Malaria prevention among security forces, internally displaced populations in the Northern Province, and in the bordering provinces was also considered as a programme priority during the year 2013.

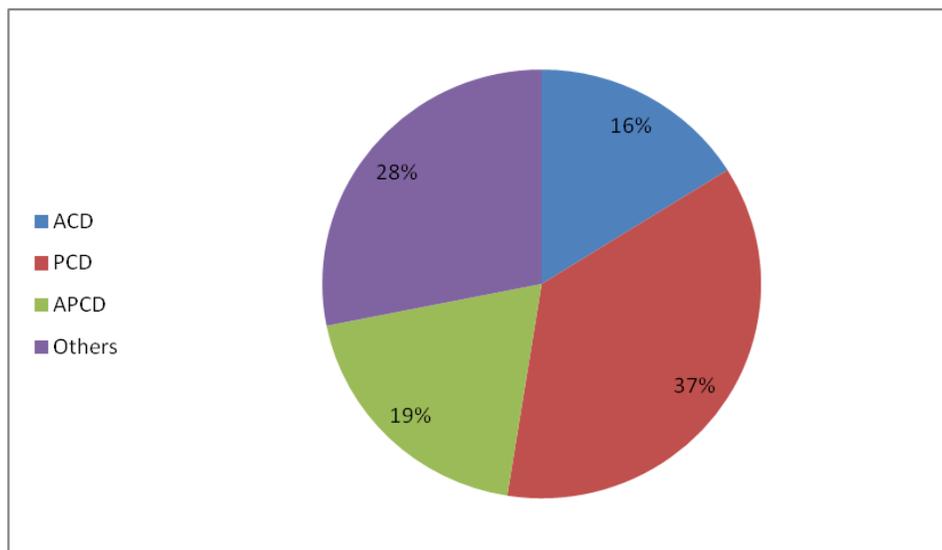
## Parasitological Surveillance

The Parasitological Surveillance in the country is implemented mainly through screening of individuals attending to medical institutions and village level screening in malarious localities. Screening done at medical institutions is categorized as Passive Case Detection (PCD), which includes medical institutions where there is no Public Health Laboratory Technician (PHLT)/ Public Health Field Officer (PHFO). Activated Passive Case Detection (APCD) includes medical institution where there is either a PHLT and/or a PHFO. Active Case Detection (ACD) is done by village level screening and Mobile Malaria Clinics. Microscopy is the main diagnostic method for the parasitological surveillance while Rapid Diagnostic tests (RDTs) are also being used as a supplementary tool.

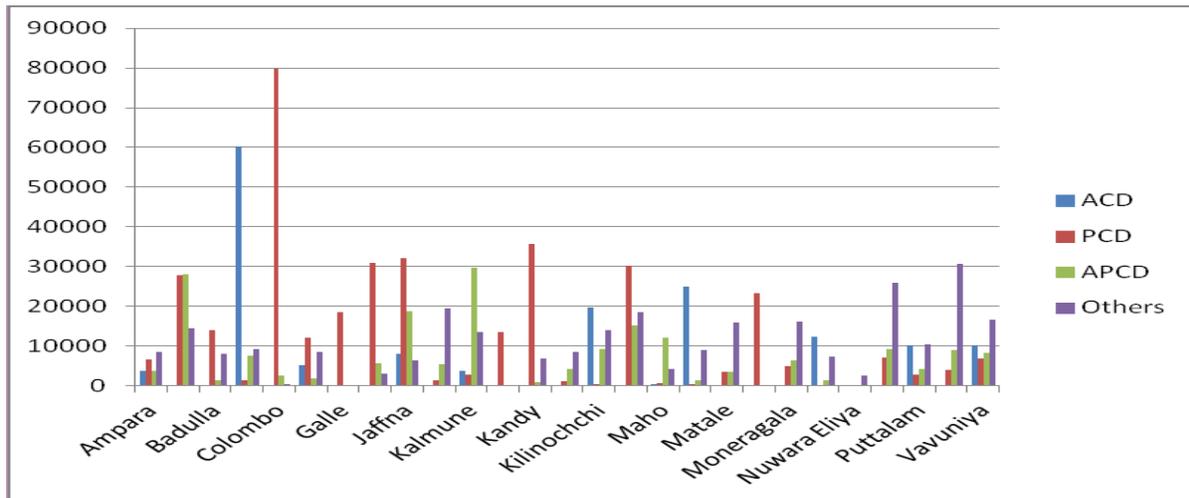
### Screening of suspected malaria patients

The Anti Malaria Campaign recommends screening for all fever patients who seek medical treatment from an APCD institution. However, the number of blood smears taken in such institutions has decreased over the years, as the malaria disease burden has fallen down drastically. Therefore, Active case detection (ACD) through Mobile Malaria Clinics are conducted as a measure to detect malaria cases early and enable to detect asymptomatic parasite carriers thereby preventing transmission.

The total number of blood smears examined by PHLTT attached to the Anti Malaria Campaign in each district/RMO region is given in Table 3, while the percentage wise data are shown in Figures 4 and 5 respectively.



**Figure 4: Proportion of individuals screened for malaria by the case detection categories during 2013**



**Figure 5: Number of individuals screened for malaria by the case detection categories among districts/RMO region during 2013**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Ampara	2396	2417	1567	1416	2239	1729	1967	2058	1754	1733	1906	1652	22834
Anuradhapura	6418	5616	5283	5274	6324	5572	5470	6020	5928	6603	5691	6054	70253
Badulla	1819	1946	1670	1744	2140	2039	2206	1818	2033	2184	1592	2224	23415
Batticaloa	6108	4866	7159	7153	7299	6068	7818	6909	6845	6617	5997	5369	78208
Colombo	5961	7592	7034	6521	7541	6849	6855	7341	6937	7024	5918	6989	82562
Embilipitiya	2266	2347	1826	1834	2345	2225	2606	2653	2817	2244	2225	2222	27610
Galle	1296	1558	1204	1419	1886	1344	1789	1897	1371	1757	1477	1810	18808
Gampaha	3136	4009	4262	3231	4064	2379	3737	2074	2617	3969	3552	2479	39509
Hambantota	2240	2028	2059	1595	2085	2084	2053	3538	2200	1889	1669	2540	25980
Jaffna	4309	2867	4531	5540	5765	6136	5908	5691	5394	6480	5345	7244	65210
Kalmune	4347	4367	4240	4012	4431	4480	4052	4107	3863	4012	3899	3906	49716
Kalutara	655	1125	1261	1076	1564	907	1026	1522	813	1305	1359	1210	13823
Kandy	3320	3693	3801	3224	3822	3618	3665	3361	3496	3747	3533	4066	43346
Kegalle	521	1005	1009	777	607	1025	1258	1270	1611	1648	1482	1826	14039
Kilinochchi	3349	2366	3187	3659	3753	3546	3404	4544	3951	3705	3792	3900	43156
Kurunegala	4799	4523	5168	5100	5645	6030	5575	5380	5690	5483	4952	5745	64090
Maho	1404	1347	1428	1452	1910	1742	1624	1538	1198	1266	1220	1264	17393
Mannar	2135	2602	2941	3265	2497	3278	2975	2705	3233	3368	3018	3738	35755
Matale	1739	1908	1788	1586	2443	2180	2494	1597	1361	1931	1643	2265	22935
Matara	1934	1988	1910	1651	2080	1782	1549	1836	2780	2393	2051	1610	23564
Moneragala	2683	1539	1719	2062	1917	2569	2669	3544	2299	2157	2190	2082	27430
Mullativu	1580	1396	1869	1670	1682	1715	1820	2186	1998	1645	1556	2093	21210
N'Eliya	260	1	286	246	248	237	273	180	203	148	168	193	2443
Polonnaruwa	3157	2938	3039	2899	3456	3141	3990	3875	4003	4788	4057	2869	42212
Puttalam	1476	2044	2346	1947	1878	2238	2333	2048	2308	2811	2886	3151	27466
Trincomalee	3316	2590	4158	3875	4701	4180	3646	4320	3146	3564	3168	3324	43988
Vavuniya	2283	2456	2741	2771	3307	4040	3293	3957	4610	4356	4097	3793	41704
<b>Total</b>	<b>74907</b>	<b>73134</b>	<b>79486</b>	<b>76999</b>	<b>87629</b>	<b>83133</b>	<b>86055</b>	<b>87969</b>	<b>84459</b>	<b>88827</b>	<b>80443</b>	<b>85618</b>	<b>988659</b>

**Table 3: Total number of blood smears screened among the districts during the year 2013**

### Provision of laboratory items

The Central laboratory distributes laboratory items required for malaria microscopy to regional malaria offices. Some laboratory items issued during the year 2013 are given in Table 4.

District	Glass Slides	Lancets	Methanol (L)	Giemsa (L)	Ethanol (L)	RDT Kits	Anisol (L)
Ampara	10000.00	6000.00				660.00	
Anuradhapura	15000.00	17000.00	7.50	12.00	2.5	900.00	5.00
Badulla	5000.00	5000.00				120.00	
Batticaloa	15000.00	42200.00	3.00	8	.2	660	3.00
Gampaha	250.00	1200.00		0.75	0.25	420.00	1.00
Hambantota	20000.00	30000.00	2.50	9.00		1320.00	2.00
Jaffna	20000.00	46500.00	1.00	3.00	0.70	2160.00	1.00
Kalmune	10000.00	15000.00				480	5.00
Kandy	5000.00	12000.00	2.50	4.00	0.50	600.00	6.00
Kegalle	4500.00	8000.00		3		480.00	
Kilinochchi	5000.00	20000.00		3.00		360.00	
Kurunegala	7500.00	14600.00	2.50			360	
Maho			2.5	3		120.00	1.00
Mannar	7500.00	5400.00			2.50	120.00	
Matale	9500.00	17000.00	2.5		2.50	660.00	2.00
Monaragala	10000.00		2.5	0.5		240.00	1.00
Polonnaruwa	15000.00	19000.00	4.5	7.00	0.70	840.00	3.00
Puttalam	5000.00	10000.00		12		600.00	1.00
Ratnapura	5000.00	10000.00		3.00	2.50	480.00	2.00
Trincomalee	10000.00	26000.00	5.00	11.00		480.00	1.00
Vavuniya	5000.00	31000.00					
Total	184250.00	335900.00	24.00	52.75	9.65	10560.00	34.00

**Table 4: Laboratory items distributed during the year 2013**

### **Activities related to quality assurance of malaria microscopy**

Discussions were initiated with ACT Malaria for development of Standard Operating Procedures for malaria microscopy and training of Public Health Laboratory Technicians on quality assurance and quality control of malaria microscopy.

Meanwhile, reference slides were prepared and distributed to the Laboratory technicians and a proficiency assessment was also carried out

### **In-service training programmes conducted by the AMC Directorate for Laboratory Technicians**

The Anti Malaria Campaign annually conduct tow day in-service training programmes for Laboratory Technicians doing malaria microscopy. During the year 2013, (four) such training programmes were conducted in the periphery to train the PHLTT in Anuradhapura, Polonnaruwa, Kandy, Jaffna, Vavuniya, Mannar, Trincomalee and Batticaloa. A special training programme was conducted utilizing WHO funds to train 100 PHLTT in microscopical diagnosis of human and simian malaria, *Babesia* and *Leishmania*. Furthermore, based on the results of the proficiency assessment, a refresher training programme was conducted for Laboratory Technicians in the Kalmune and Ampara RMO regions.

### **Special parasitological surveillance activities carried out by the Anti Malaria Campaign**

During the year 2013, the Anti Malaria Campaign conducted special screening programmes at the Bandaranaike International Airport to screen military personnel returning from UN peace keeping missions and special groups returning from malaria endemic countries when informed by IOM. In addition special risks groups were also screened.

## Vector surveillance

Entomological surveillance played a vital role in monitoring the vector densities throughout the country despite the setting of malaria free status in the country during 2013. The routine entomological monitoring at the sentinel sites was continued in the previous malaria endemic areas, whereas random spot checks were conducted in receptive and vulnerable areas and focal investigations were carried out in areas where imported malaria cases had been reported.

Thirty two entomological teams engaged in the entomological surveillance and they have carried out entomological investigations according to the guidelines for malaria entomological surveillance of AMC. A total of 866 entomological surveys were carried out throughout the year as 599 sentinel surveys and 267 spot surveys. The number of sentinel sites monitored was 63 in 55 MOH areas. Two biannual review meetings were conducted at national level to review the entomological surveillance activities carried out at regional level.

The results of the entomological surveys acquired in 2013 are as follows.

### Larval surveys

Larval surveys were conducted in all sentinel sites and spot investigations to monitor larval densities and breeding site preferences of malaria vector mosquitoes. Figure 6 shows the results of larval surveys carried out in all RMO regions showing breeding habitat preferences of major malaria vector and secondary vectors.

The most preferred breeding site of *An. culicifacies* was river bed pools, while second and third most preferred breeding sites were wells and temporary water collections respectively. *An. subpictus* was common in temporary water collections, marshy lands, river bed pools and pits. *An. varuna* was abundant in river margins and paddy fields and *An. annularis* was abundant in tank margins.

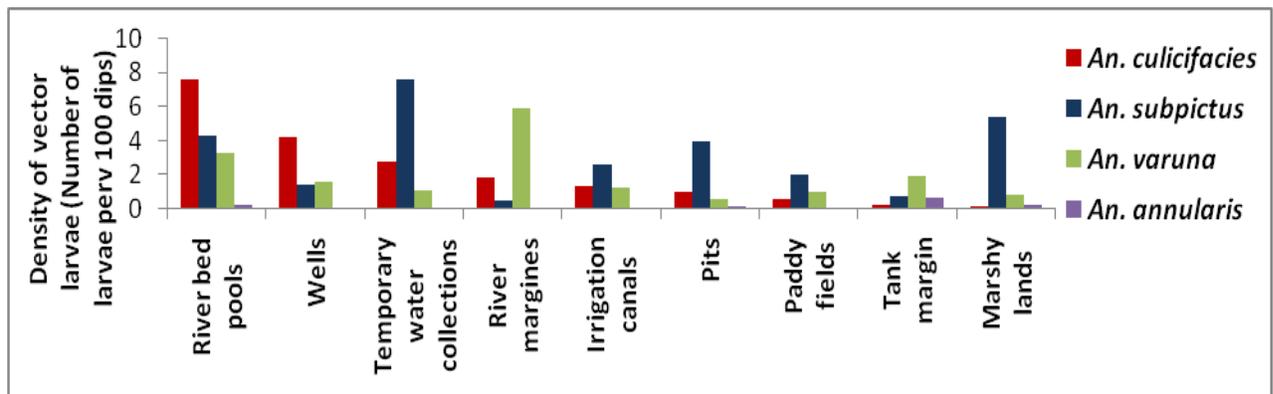


Figure 6: Mean density of major and secondary malaria vector larvae in different breeding habitats

Figure 7 shows a comparison of larval densities of major vector and the secondary vectors by the districts, where Moneragala had the highest densities of vector larvae. Maho, Kilinochchi, Trincomalee and Batticaloa had the subsequent highest larval densities. Highest density of *An. culicifacies* larvae was recorded from Moneragala, Trincomalee and Kilinochchi districts, whereas highest density of *An. subpictus* was recorded from Maho region of Kurunegala district, Kilinochchi and Batticaloa districts. In thirteen regions mean density of *An. subpictus* larvae was higher than *An. culicifacies* mean density in 2013.

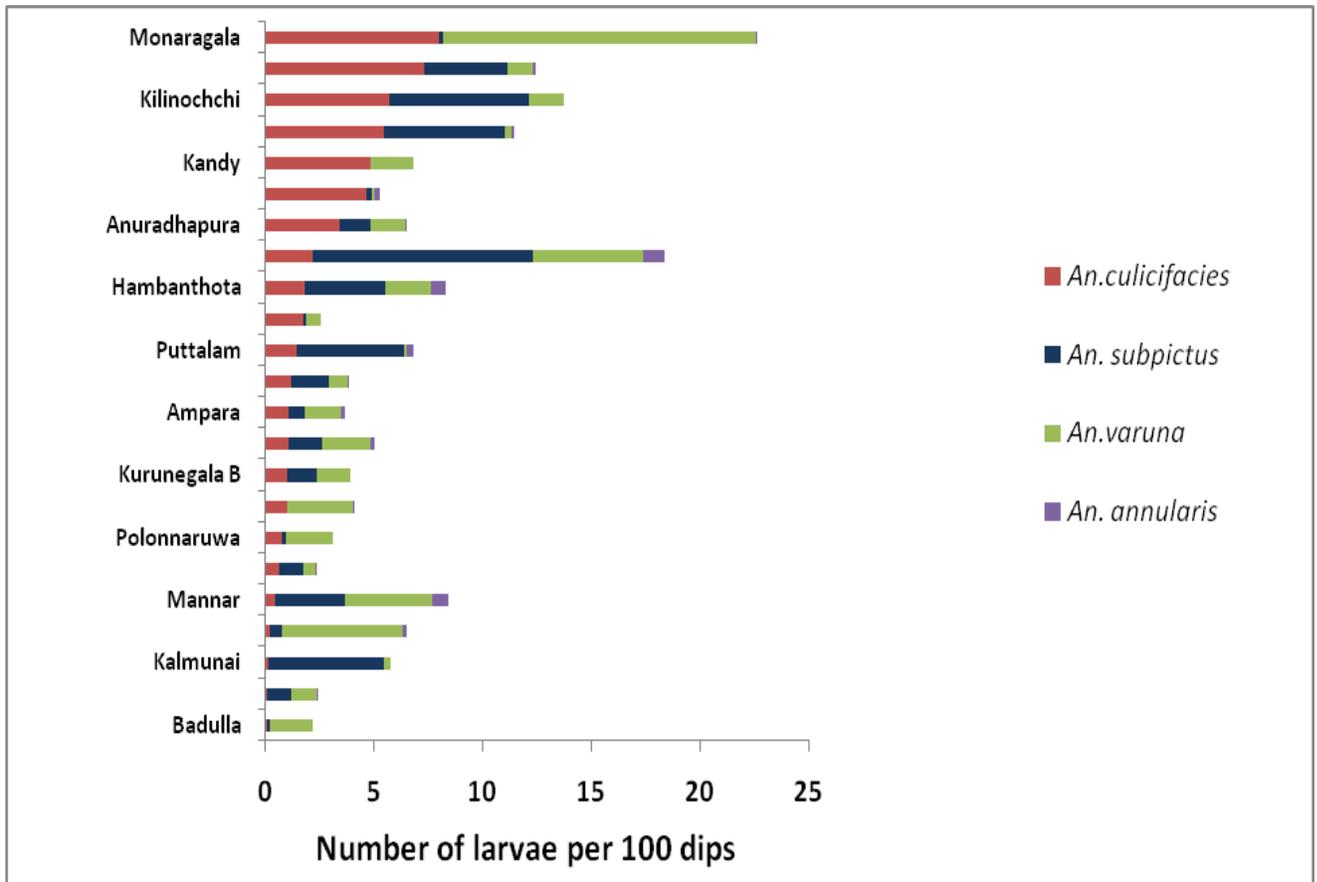
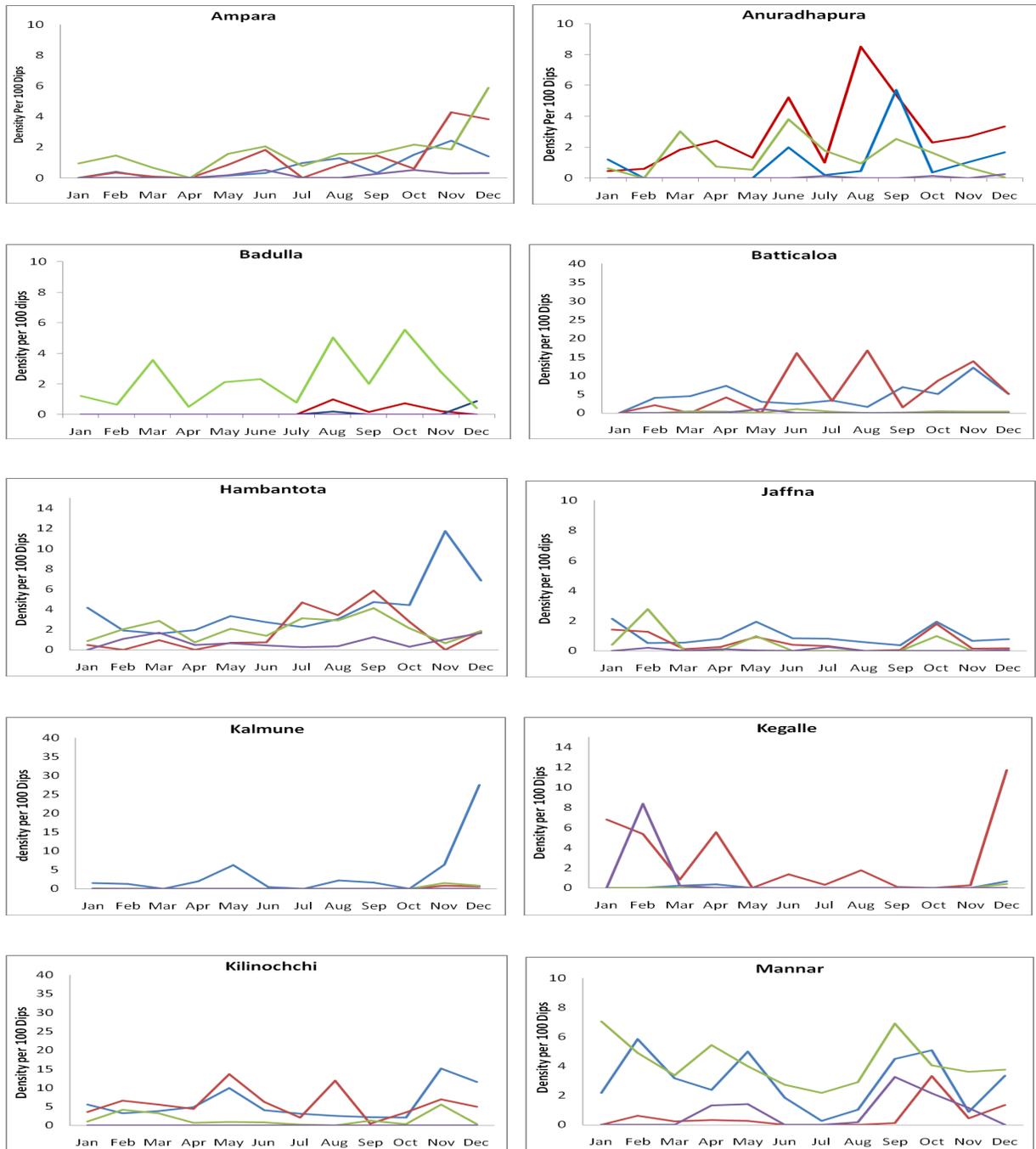


Figure 7: Mean larval density of malaria vector larvae in RMO Regions

In all RMO regions the malaria vector breeding had seasonal fluctuations. Figure 8 shows the trends of malaria vector densities in 2013. In the Northern Province *An. subpictus* density was higher than *An. culicifacies* density except in Kilinochchi district.



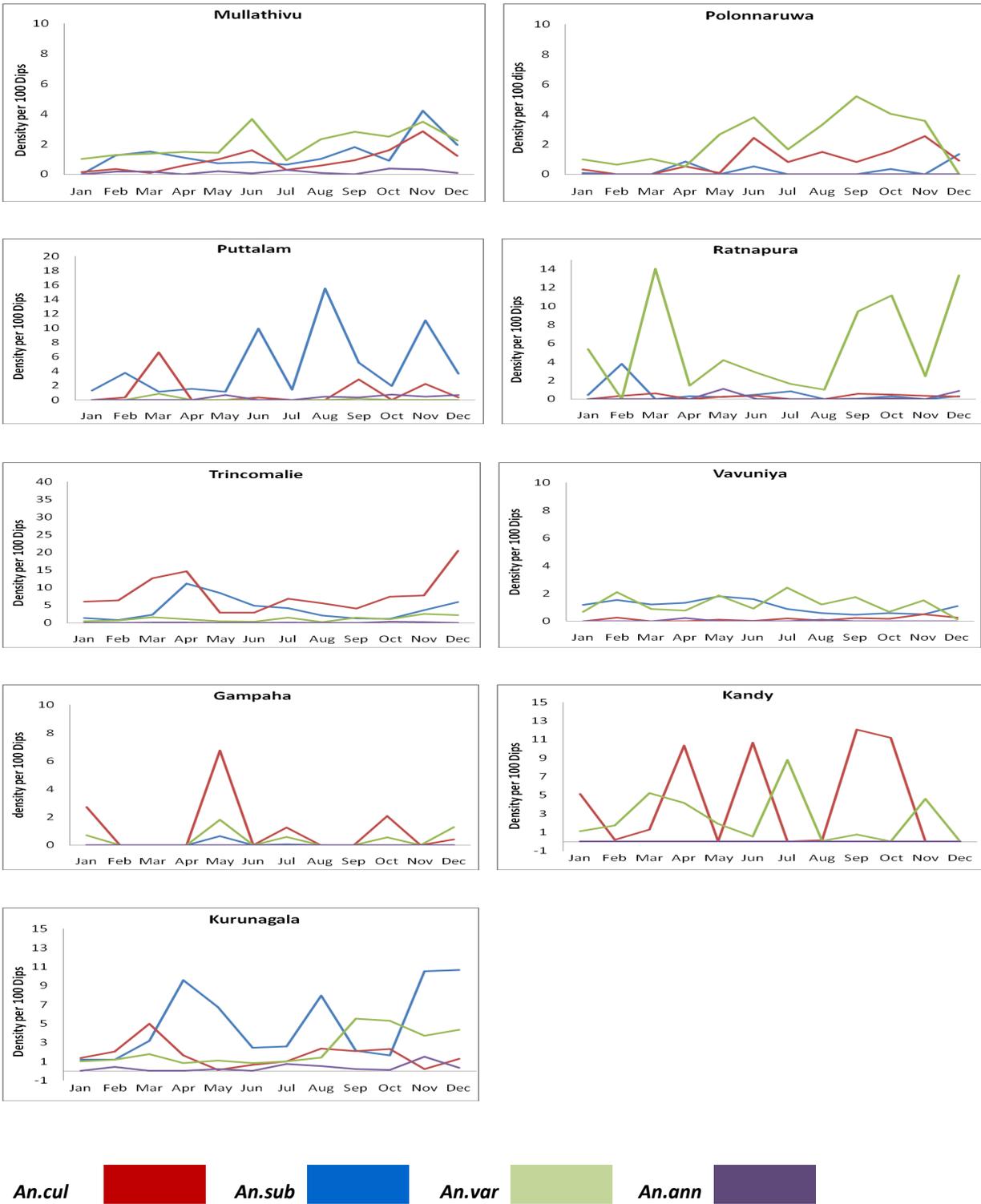


Figure 8: Trends of larval density in 21 RDHS areas

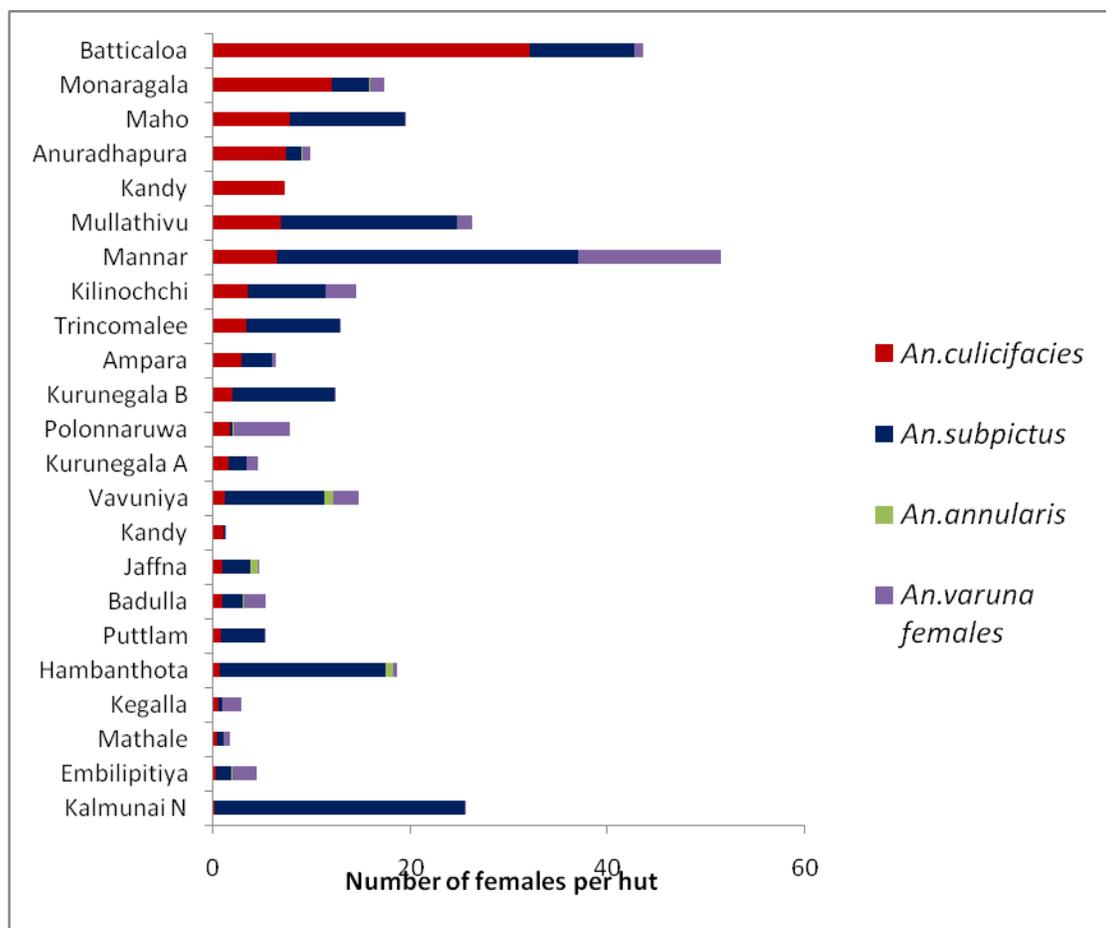
### **Cattle Baited Hut Collections**

Figure 9 shows the mean density of major vector adults caught by cattle baited huts in 57 MOH areas which were considered as sentinel MOH areas. Vavunathivu MOH had the highest mean adult female density of *An. culicifacies* having a density of more than 20 females per hut. Sewanagala, Chenkaladi and Nochchiyagama MOH areas recorded a density of 10-20 females per hut and there were twelve MOH areas having a density more than 5 females per hut.

**Figure 9: Map showing mean adult female density of *An. culicifacies* in sentinel MOH areas.**

Results of cattle baited hut technique is often used as an indicator for prevalence of indoor biting and resting vector populations.

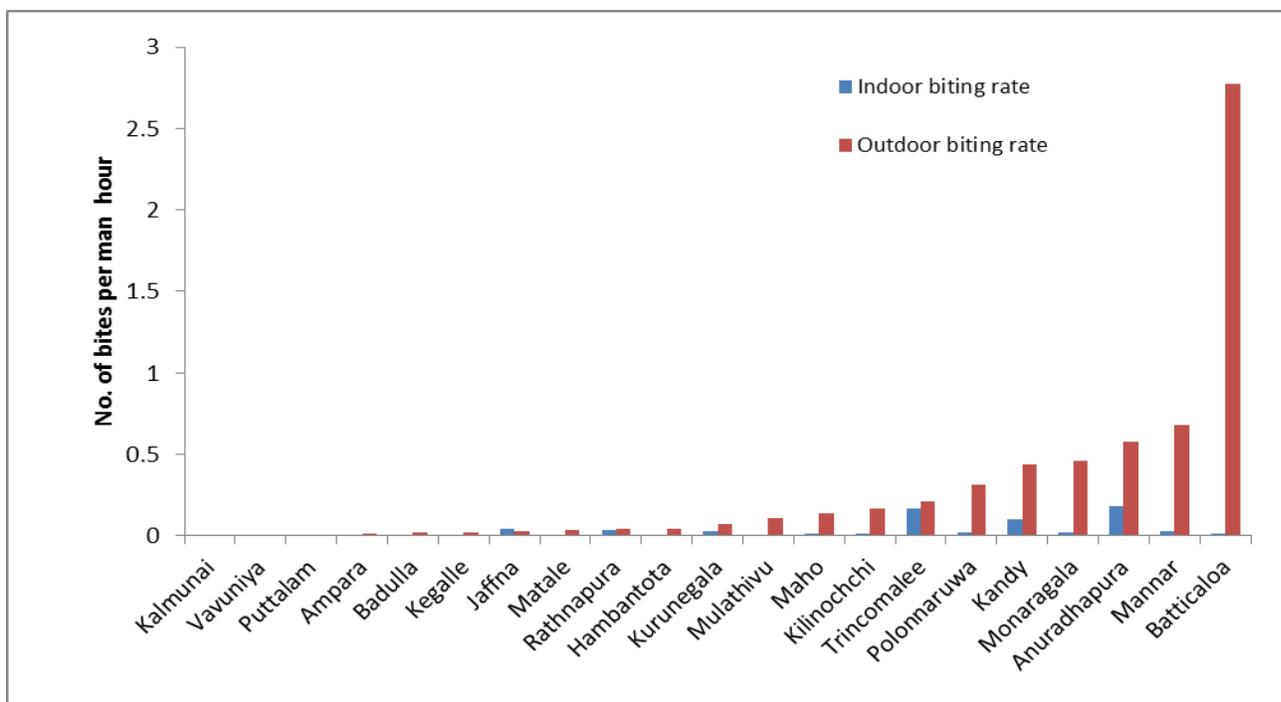
Figure 10 depicts the abundance of major malaria vector and secondary vectors in 22 RMO regions in 2013. Batticaloa district recorded the highest density of *An. culicifacies* followed by Moneragala and Maho, whereas highest density of *An. subpictus* was recorded by Mannar district followed by Kalmunai RMO region of Ampara district and Mullaitivu district.



**Figure 10: Mean density of malaria vector females caught in cattle baited hut collections in RMO regions, 2013**

### Human Landing Catches

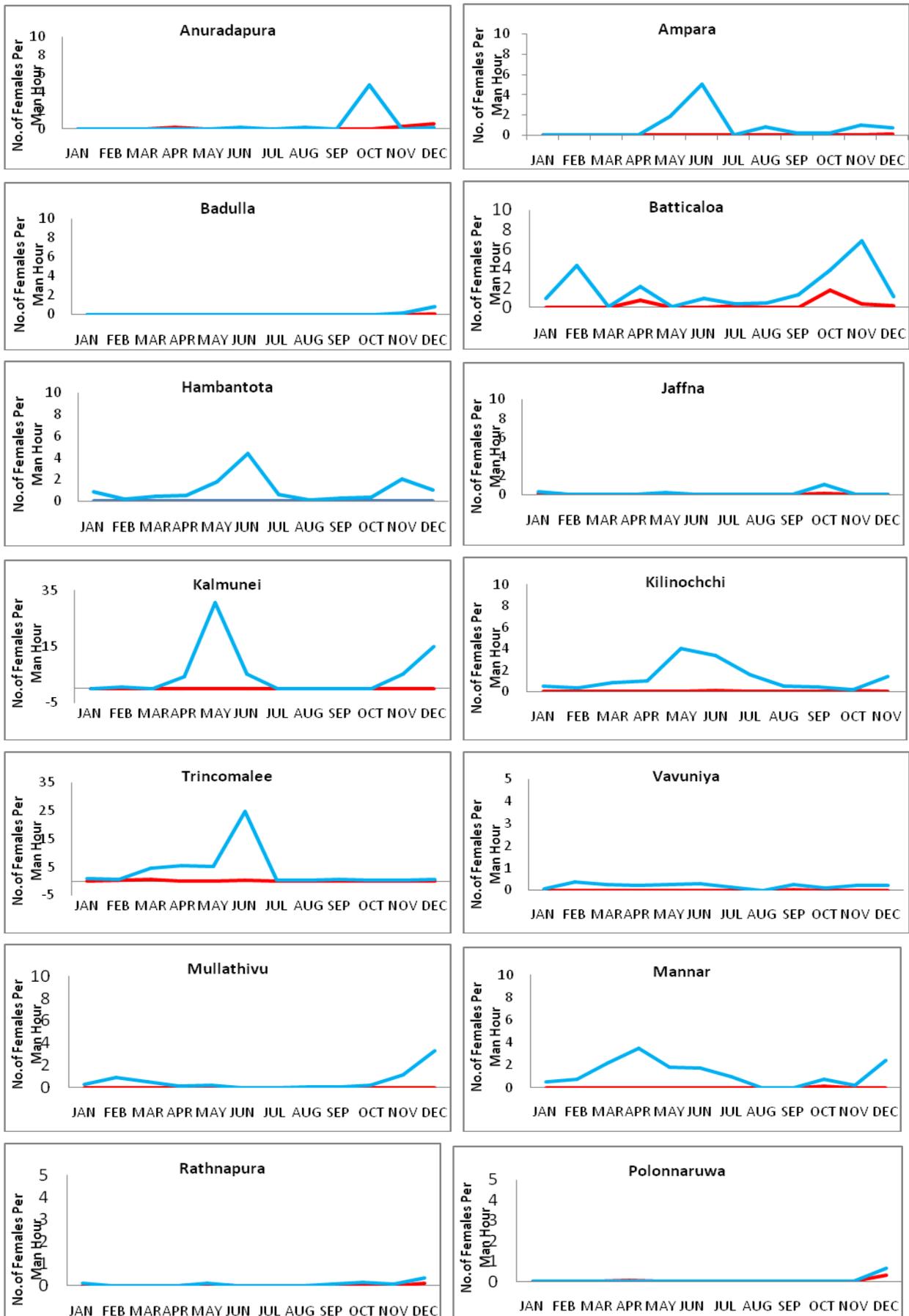
Human landing catches served as a good indicator of assessing the risk of malaria transmission and results of partial night (6.00 p.m. to 9.00 p.m.) human landing catches in 22 RMO regions are as follows. The same biting pattern of *An. culicifacies* observed in the previous years 2011 and 2012 was observed in 2013, indicating that outdoor biting is higher than indoor biting except in the Jaffna district of Northern Province (Figure 11). Batticaloa district recorded the highest outdoor biting rate of *An. culicifacies* followed by Mannar, Anuradapura and Moneragala districts. Highest indoor biting rate of *An. culicifacies* was recorded from Trincomalee district followed by Anuradapura and Kandy districts.



**Figure 11: Human biting rate of *An. culicifacies* in 22 RMO regions**

### Indoor Hand collections

Indoor hand collections were carried out in all RMO regions to find out the prevalence of indoor resting vector species. This technique provides useful information such as seasonality of indoor resting of vectors and their resting sites inside human dwellings. In all RMO regions it was observed that density of indoor resting *An. subpictus* was higher than indoor resting *An. culicifacies*. The trends of indoor resting densities of these two species are shown in Figure 12. It can be clearly seen that in some regions there are two peaks occurring in indoor resting densities of *An. subpictus* through the year. In Polonnaruwa, Anuradapura, Baticaloa, Jaffna, Mullaitivu and Badulla a peak indoor resting density was recorded in the latter part of the year.



*An.cul*



*An.sub*



Figure 13: Trends of indoor resting densities of *An. culicifacies* and *An. subpictus* in RMO Regions

## Insecticide Resistance Monitoring

In 2013 susceptibility status of thirteen Anopheline species was tested using standard WHO insecticide susceptibility kits for discriminative dosages of eleven insecticides. Table 5 shows insecticide susceptibility and resistance levels of *An. culicifacies* tested for more than 50 mosquitoes per assay in seven MOH areas.

Class	Insecticide Type Name	MOH areas for which status reported		
		Confirmed Resistance	Possible Resistance	Susceptibility
PY	Permethrin		Buttala, Nochchiyagama	Vavunathivu, Sevanagala
PY	Deltamethrin		Sevanagala	Vavunathivu, Sevanagala
PY	Lambdacyhalothrin			Medagama, Vavunathivu
PY	Cyfluthrin	Buttala		Medagama
OP	Malathion	Vavunathivu, Sevanagala	Sevanagala	
OP	Fenitrothion		Sevanagala	
C	Bendiocarb	Vavunathivu		
C	Propoxur			Rikillagaskada, Vavunathivu
OC	DDT	Vavunathivu, Kilinochchi		

**Table 5: Susceptibility status of *An. culicifacies* to different insecticides**

*An. culicifacies* populations in Vavunathivu MOH area was resistant to insecticides belonging to three classes namely organochlorines, organophosphates and carbamates. Resistance to Malathion was observed in Sevanagala MOH area while possible resistance to fenitrothion and Deltamethrin was also observed. Buttala MOH area was the only MOH area in which resistance to a pyrethroid insecticide (Cyfluthrin) was observed.

Table 6 shows insecticide susceptibility and resistance levels of *An. subpictus* tested for more than 50 mosquitoes per assay in seventeen MOH areas.

Class	Insecticide Type Name	MOH areas for which status reported		
		Confirmed Resistance	Possible Resistance	Susceptibility
PY	Permethrin	Lunugamvehera, Addalachenai		Vellavelly
PY	Deltamethrin	Lunugamvehera, Addalachenai	Wariyapola	
PY	Bifenthrin			Puttlam, Addalachenai
PY	Lambdacyhalothrin	Addalachenai	Poonakary	Adampan, Madu
PY	Cyfluthrin	Lunugamvehera		Anamaduwa, Puttlam
OP	Malathion	Lunugamvehera, Tissamaharama		Muthur, Vaharei, Point Pedro
OP	Fenitrothion	Ampan		Akkarachennai
C	Bendiocarb	Muthur, Point Pedro		
C	Propoxur	Lunugamvehera		Pallai, Kilinochchi, Nikaweratiya, Muthur
OC	DDT		Point Pedro	Muthur

**Table 6 Susceptibility status of *An. subpictus* to different insecticides**

*An. subpictus* populations tested in Lunugamvehera MOH area showed resistance for three classes of insecticides namely organophosphates, carbamates and pyrethroides. In Addalachenai MOH area resistance for three pyrethroid insecticides were observed namely for Permethrin, Deltamethrin and Lambdacyhalothrin. *An. subpictus* populations tested in Wariyapola showed possible resistance to Deltamethrin and in Poonakary MOH area showed possible resistance to Lambdacyhalothrin. Susceptibility to DDT was observed in Muthur MOH area of Trincomalee district.

### **Training on Entomology**

One Entomologist and two Entomological Assistants attached to AMC HQ received three foreign funded (International Atomic Energy Agency) international training opportunities in 2013 on Sterile Insect Technique. Entomology Division of AMC HQ carried out two international training programmes for two officers from North Korea and for eight officers from Nepal on Malaria Entomology and Vector Control with collaboration of the WHO in 2013.

## Vector Control Activities

Integrated vector management is the main strategy of malaria vector control in Sri Lanka. Integral components of this strategy are the rational use of insecticides in rotation for Indoor Residual Spraying (IRS), distributing Long Lasting Insecticide treated Nets (LLINs), breeding and introduction of larvivorous fish, environmental modulation and modification through the filling of abandoned gem pits and space spraying for special occasions. Tables 7 and 8 show the insecticides that had been used for indoor residual spraying in different districts.

District	Deltamethrin	Cyfluthrin	Etofenprox	Lambda-cyhalothrin	Bifenthrin
Matale			Ö		
Jaffna			Ö		
Mannar			Ö		
Kilinochchi	Ö				Ö
Mullativu	Ö	Ö			
Ampara					Ö
Kalmune	Ö				
Trincomalie	Ö				
Maho				Ö	
Puttalam					Ö
Polonnaruwa	Ö				
Ratnapura	Ö				

**Table 7: Insecticides usage in different districts for indoor residual spraying during 2013**

During the year 2013, the total number of houses fully sprayed was 14,690, partially sprayed was 494 and the total population covered was 51831. Table 7 shows the usage of insecticides during 2013.

Insecticides	Usage during 2013 (kg)
Deltamethrin 5% wdp	1092.26
Bifenthrin10% wdp	34.14
Lambda-cyhalothrin 10% wdp	60.25
Etofenprox 20% wdp	147.3
Cyfluthrin 10% wdp	1.8

**Table 8: Utilization of insecticides for malaria vector control operations in 2013**

Larvivorous fish were introduced in to wells and abandoned gem-pits as a biological method of vector control.

## Infrastructure and Human Resources

At the end of year 2013, AMC Headquarters had following category of staff. The below Table 9 shows the number of staff in each category as at the end of year 2013.

Category of staff	Approved cadre	In position	
		Male	Female
Administrative Grade MOO	2	2	0
Community Physicians	3	1	1
Parasitologist	1	0	1
Entomologist	2	0	2
MOO Gr I	5	2	0
MOO Gr II		0	1
MOO Preliminary		0	0
Accountant	1	0	1
Development Officer	5	0	4
Development Assistant	4	2	2
Health Education Officer	1	0	0
Information, Communication & Technology Officer	1	0	0
Information, Communication & Technology Assistant	2	0	1
Public Management Assistant Services	17	3	6
Public Health inspectors	2	2	0
Planning & Programme Assistant	1	0	0
Entomological Assistant	6	4	2
Entomological Assistant (Special Grade)	1	0	0
Medical Supplies Assistant	3	0	0
Medical Record Assistant	1	0	0
Medical Laboratory Technicians	3	0	0
Public Health Field Assistant	10	2	1
Public Health Laboratory Technicians (Special Grade)	2	0	0
Public Health Laboratory Technicians	22	4	8
Cinema Operator	1	1	0
Driver	19	16	0
K.K.S.	1	1	0
Roneo Operator	0	0	0
Lab Orderly	3	0	1
Spray Machine Operator	19	8	0
Saukya Karya Sahayaka (Junior)	20	29	5
Saukya Karya Sahayaka (Ordinary)	25	3	3
Labourer (Casual)	0	4	0
Registered Medical officer	1	1	0
Ward Clerk	0	0	1
Lift operator	2	2	0
<b>Total</b>	<b>186</b>	<b>87</b>	<b>40</b>

**Table 9: Staff position at Anti Malaria Campaign Headquarters during the year 2013**

## Vehicles

Adequate number of vehicles in good condition is an important factor in effective malaria control activities throughout the country including the north and east. In 2013 AMC Headquarters had the following number of vehicles (Table 10).

Type	Reg. No.	Road Worthy	Available at HQ
Mitsubishi Fuso Lorry	42-1607	Yes	Yes
Mitsubishi Fuso Lorry	42-9399	Yes	Yes
Mitsubishi Fuso Lorry	LC-0249	Yes	Yes
Mitsubishi Pajero jeep	32-6520	Yes	Yes
Mitsubishi L300	GP-2558	Yes	Yes
Mitsubishi L300	GP-2556	Yes	Yes
Mitsubishi Double-cab	JL 8129	Yes	Yes
Mitsubishi Double-cab	PE-8966	Yes	Yes
Mitsubishi Double-cab	PE-8972	Yes	Yes
Mitsubishi Double-cab	PE-8974	Yes	Yes
Mitsubishi Double-cab	PE-8975	Yes	Yes
Mitsubishi Double-cab	PF-2025	Yes	Yes
Toyota D/Cab	GQ-2646	Yes	Yes
Nissan Caravan	NA-3117	Yes	Yes
Nissan Van	NB-4567	Yes	Yes
Nissan Van	NB-4568	Yes	Yes
Micro D/Cab	PB 6537	Yes	Yes

**Table 10: Vehicles available at Anti Malaria Campaign Headquarters**

## Drugs

A buffer stock of antimalarial drugs to face any emergency is available in the Headquarters. The following table shows the distribution of drugs for districts in the year of 2013

Recipient	Chloroquine tablets	Primaquine tablets	Quinine tablets	Quinine injection
Ampara	1000			
Anuradhapura	3000	3000		20
Badulla	300		100	20
Colombo	4500	1278	145	98
Hambantota	2000	500	50	40
Kandy	1500	1250	130	80
Kegalle	500			
Kurunegala	2000	500	50	10
Matale	1300		50	10
Moneragala	2000			
Puttalam	1000	1000		20
Trincomalie	200	250		
Vavuniya	200			
Batticaloa	1050	50	25	2
Jaffna	1800			
Polonnaruwa			20	
Other institutions	9700	450	75	26
Total	32050	8278	645	326

**Table 11: Distribution of anti malarial drugs from headquarters by recipient**

## Buildings

The Anti Malaria Campaign Headquarters is located at the Public Health Complex at 555/5, Elvitigala Mawatha, Colombo 5. The Director's room, Deputy Director's room, Project Director's room of GFATM, Community Physicians' room, Medical Officers' room, GFATM project office, library, computer room, telephone exchange and auditorium are in the 3rd floor. The Administration branch, finance branch, record room and stores are located in the 5<sup>th</sup> floor. The Central Parasitology Laboratory and Entomology Laboratory are located in the 6th floor.

## Foreign Funded Projects

During the year 2013, GFATM and WHO assisted malaria elimination activities in Sri Lanka.

### **Assistance from the Global Fund to fight AIDS, Tuberculosis and Malaria (GFATM)**

During the year 2013, National Malaria Elimination Programme continued to receive support from the GFATM in the form of one grant for malaria elimination under the Round 8. The Round 8 project is jointly implemented through a partnership between the Ministry of Health, Tropical Disease Environment Associates (TEDHA) and Lanka Jathika Sarvodaya Shramadana Sangamaya of Sri Lanka.

### **GFATM Round 8 Malaria Elimination Project**

This project aims at scaling up efforts of the National Malaria Control Programme and focus on elimination of *P. falciparum* malaria by end of 2012 and elimination of *P vivax* malaria by end of 2014. Round 8 GFATM Project covers all the districts in the country.

The following activities were carried out during the year 2013 under this project.

### **Conducting malaria mobile clinics**

Two thousand six hundred and seventy nine malaria mobile clinics were conducted (101% of target achieved) to reduce malaria transmission among vulnerable and mobile populations through early detection and treatment. A total of 200,547 blood smears were examined from all project districts and no positive cases detected.

In general, the criteria for selection of a site to conduct mobile malaria clinics were:

- malaria case/s reported from the locality
- remote areas with poor access to health care institutions (>10 kms from an institution)
- traditionally malarious areas
- mobile high risk occupational groups – (eg. chena cultivators, gem miners, people working in quarry pits)
- development areas
- new settlers

### **Distribution of Rapid Diagnostic Test-kits (RDTs) to improve diagnostic facilities**

A total of 35,000 Rapid Diagnostic Test kits were purchased and distributed to districts for enhancing malaria diagnosis. These RDTs were mainly distributed to medical institutions without a Public Health Laboratory Technician to carry out microscopy. In addition other government medical institutions in project districts were also provided with RDTs to strengthen diagnosis and management of malaria patients.

**Enhanced entomological surveillance**

Ten additional days per month were funded through the project to augment the entomology component of the Provincial Malaria Control Programme with a view to forecasting and preventing malaria outbreaks and epidemics.

**Strengthening of entomological and parasitological laboratories at district level by providing necessary equipment & consumables**

Hand lenses, digital hygrometers, dissecting sets, forceps, larval vial tubes and chemicals for entomological investigations were purchased during this period for strengthening of regional laboratories.

**District level in-service training programmes**

Malaria field staff (PHII, PHFOO, PHLTs, PHFO & SMOO) were trained on malaria elimination activities.

Monthly review meetings were carried with the participation of Regional Malaria Officers, Technical Staff of AMC Headquarters and representatives from Sarvodaya and TEDHA, at Anti Malaria Campaign Headquarters assess to the progress of malaria elimination activities qualitatively and quantitatively.