



# Annual Report 2014



## Anti Malaria Campaign

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Anti Malaria Campaign  
Ministry of Health



## Anti Malaria Campaign

No. 555/5 ,  
3rd Floor,  
Public Health Building,  
Narahenpita,  
Sri Lanka.

Telephone : +94 11 58408/2368173/2368174

Fax : +94 11 2 368 360

e-Mail : [antimalariacampaignsl@gmail.com](mailto:antimalariacampaignsl@gmail.com)

Website : <http://www.malariacampaign.gov.lk>

2014

# Contributors

Dr Risintha Premaratne, Director, Anti Malaria Campaign

Dr Devani Ranaweera, Consultant Community Physician, Anti Malaria Campaign

Dr Manjula Danansuriya, Consultant Community Physician, Anti Malaria Campaign

Dr I E Gunaratne, Senior Registrar, Community Medicine, Anti Malaria Campaign

Dr M Marasinghe, Registrar, Community Medicine, Anti Malaria Campaign

Dr Hamsanathy Jeevatharan, Registrar, Community Medicine, Anti Malaria Campaign

Dr Priyani Dharmawardena, Medical Officer, Anti Malaria Campaign

Dr L R Gunasekara, Medical Officer, Anti Malaria Campaign

Dr P H P D Somaratne, Medical Officer, Anti Malaria Campaign

Dr U Tittagala, Registered Medical Officer, Anti Malaria Campaign

Ms Kumudu Gunasekera, Parasitologist, Anti Malaria Campaign

Ms Mihirini Hewavitharane, Entomologist, Anti Malaria Campaign

Ms Jeewani Harishchandra, Entomologist, Anti Malaria Campaign

Staffs/Statistic Unit, Anti Malaria Campaign

Regional Malaria officers and staff

Project Director and staff, GFATM Project, Ministry of Health

**Texts were compiled by Anti Malaria Campaign Team**

**Supervised by Dr Risintha Premaratne, Director, Anti Malaria Campaign**

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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 2014. 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. It is the second year without the indigenous malaria in Sri Lanka. The programme is continuing the vigilant case surveillance for imported cases. Each diagnosed case of malaria is reviewed and entomological & parasitological investigations are done in the field. Entomological and parasitological surveillance are carried out to strengthen the programme as routine.

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 2014. 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 interrupt the 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, 49 cases were reported in 2014 compare to 95 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. These objectives were achieved before the stipulated period and Anti Malaria Campaign has to reorient the programme to prevent re-introduction of malaria. The National Malaria Strategic Plan for Elimination and Prevention of Re-introduction 2014–2018 is developed and according to this strategic plan the activities are re-oriented. The new vision, mission, objectives and strategies of the Anti Malaria Campaign are as follows;

### Vision

A Malaria Free Sri Lanka

### Mission

Plan and implement a comprehensive programme to sustain intensive surveillance and outbreak preparedness, prevention and rapid response for malaria elimination in Sri Lanka and to prevent re-introduction of malaria to Sri Lanka.

### Objectives of the Anti-Malaria Campaign

To sustain malaria free status by prevention of re-introduction of malaria to Sri Lanka

To obtain WHO certification of malaria elimination in Sri Lanka by the end of 2016

To maintain zero mortality due to malaria in Sri Lanka

**Strategic approaches:**

Guarantee all people have access to early case detection through reliable and accurate diagnostic services and prompt and effective treatment through strengthening of surveillance for malaria case detection;

Guarantee that health care staff are competent and maintain skills and quality diagnostic services to detect malaria cases early and to provide effective treatment to prevent deaths due to malaria;

Improve systems for outbreak forecasting, preparedness, prevention and response; and

Ensure the use of other appropriate and selective vector control methods with the aim of reducing local vector populations by strengthening of entomological surveillance and response through integrated vector control.

**Strategies**

Establishing a rigorous Quality Assurance programme for malaria elimination to ensure that cases are not being missed and interventions are carried out as planned with a view to ensure that malaria is not re-introduced in to the country.

Strengthening Information, Education and Communication activities so as to strengthen intersectoral collaboration for malaria elimination and to strengthen the knowledge within communities.

Improving programme management and performance to build capacity to ensure prevention of re-introduction of malaria in the country.

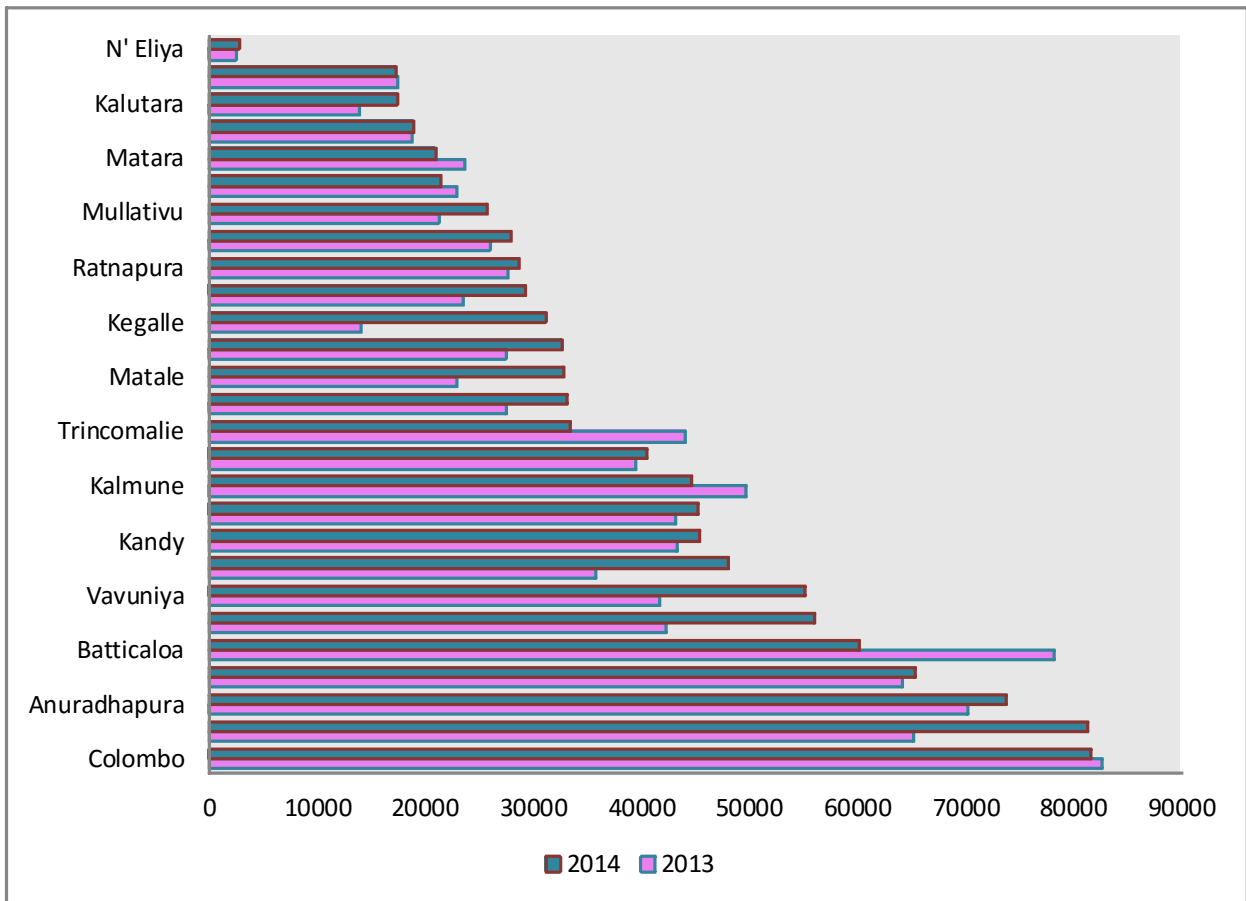
Engaging in operational and implementation research so as to provide evidence based guidance for future modifications of malaria elimination policies/strategies.

Monitoring and evaluation to ensure optimal programme implementation, management and performance which is a key element in obtaining performance based funding.

## 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 1,069,817 blood smears were examined during 2014 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 2013 and 2014.



**Figure 1: Number of Blood smear examined among district during the year 2013/2014**

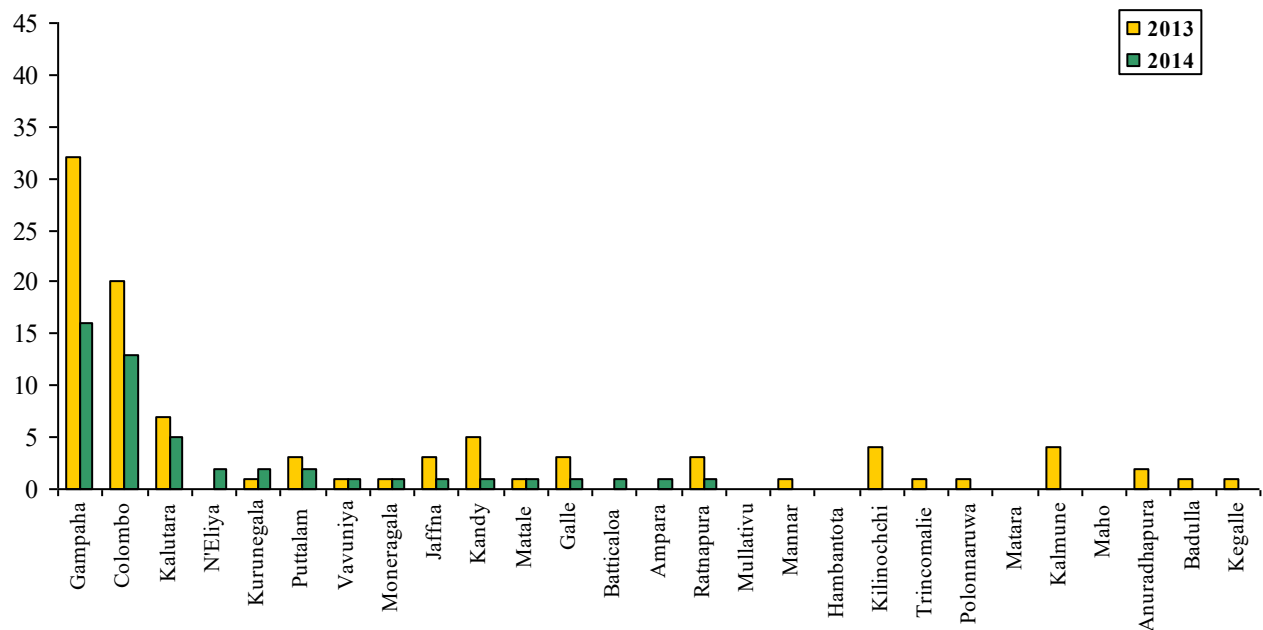
Following this screening, there were no indigenous malaria cases reported. Although 49 imported malaria cases were detected. This included 28 *P. vivax* infections, 20 *P. falciparum* infections and 1 *P. malariae* infection.

Year	Total cases	P. vivax		P. falciparum		Mixed		Other	
		No	%	No	%	No	%	No	%
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
2014	49	28	57.1	20	40.8			1(P.m)	2.0

**Table 1: Proportion of *P. falciparum* , *P. vivax* , *P.ovalae* and *P.malariae* infections during the last 10 years (2005 - 2014)**

Figure 2 shows the district-wise comparison between the number of positive cases reported in the country in year 2013 and 2014. Majority of cases were reported from Western Province.

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



### Imported malaria

The imported cases had been reduced from 95 cases in 2013 to 49 cases in 2014. Majority of cases (63%) were imported from South East Asia region (Figure 3). Table 2 shows the type of infection by the country of origin.

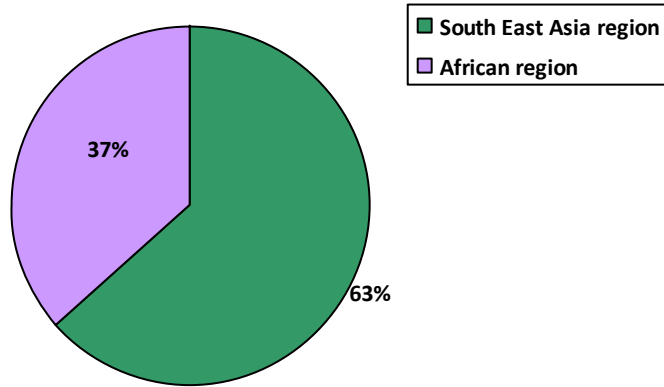


Figure 3: Imported malaria cases during the year 2014

Country of origin	Type of malaria			Total
	Pv	Pf	Pm	
<b>SEA Region</b>				<b>31</b>
<b>India</b>	20	3		<b>23</b>
<b>Myanmar</b>	1			<b>1</b>
<b>Indonesia</b>	1			<b>1</b>
<b>Pakistan</b>	6			<b>6</b>
<b>African Region</b>				<b>18</b>
<b>Burkina Faso</b>		1		<b>1</b>
<b>Gabon</b>		1		<b>1</b>
<b>Ghana</b>		1		<b>1</b>
<b>Kongo</b>		1		<b>1</b>
<b>Madagascar</b>		1		<b>1</b>
<b>Malawi</b>		1		<b>1</b>
<b>Mozambique</b>		1		<b>1</b>
<b>Nigeria</b>		4		<b>4</b>
<b>Sierra Leone</b>		3		<b>3</b>
<b>Sudan</b>		3		<b>3</b>
<b>Uganda</b>			1	<b>1</b>
<b>Total</b>	<b>28</b>	<b>20</b>	<b>1</b>	<b>49</b>

Table 2: Distribution of imported cases by type and country of origin during 2014

## **Chemoprophylaxis**

The Anti Malaria Campaign provided chemoprophylaxis to travellers to malaria endemic countries based on WHO guidelines. AMC headquarters has provided chemoprophylaxis for 1372 persons during the year 2014. Mefloquine (6962 tablets) and Chloroquine (1216 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 since the year 2008.

## **Information management**

All the monthly returns from regional malaria offices were computerized in the central information management unit at AMC/HQ.

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 hotline and 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 2014.

## **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 2014.

## **Programme priorities**

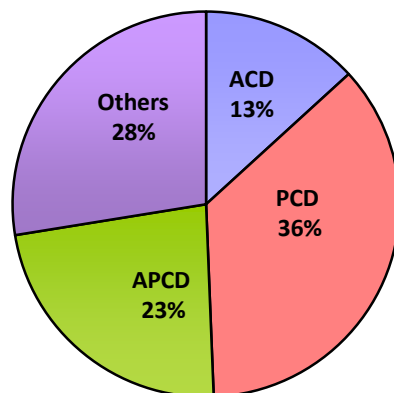
Prevention of re-introduction of malaria cases has been identified as the priority. Malaria prevention among security forces getting training in African countries and Haiti, Sri Lankan returnees from India, refugees and asylum seekers were considered as risk group and clinician awareness programme to early diagnosis and treatment is identified as priority during the year 2014.

## Parasitological Surveillance

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

### Screening of suspected malaria patients

In 2014, a total of 1070178 blood smears were examined by the Public Health Laboratory Technicians attached to Anti Malaria Campaign. District wise distribution of blood smears done is given in table 3 and the APCD/PCD/ACD/Other category blood smear percentages are given in figure 4.



**Figure 4: Category wise percentages of individuals screened by the Anti Malaria Campaign in the country - 2014**



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Ampara	1732	2291	1626	1758	1880	1898	1865	1486	1887	1602	1484	1827	21336
Anuradhapura	6460	5805	6442	5211	6039	5996	6099	6585	6598	6118	6229	6145	73727
Badulla	1995	1918	2317	1634	2195	2163	2045	3518	2886	2679	2565	3296	29211
Batticaloa	6436	5054	5350	4385	5664	4087	5026	6210	4988	4568	4791	3653	60212
Colombo	6581	7247	5157	4798	9901	7233	7008	6200	7514	6633	7986	5704	81962
Embilipitiya	2458	2034	2676	2127	2116	2246	2506	2473	2281	2354	2812	2584	28667
Galle	1200	1457	1312	1733	1487	1458	1723	1699	1842	1453	1454	2003	18821
Gampaha	2052	4528	4582	2365	4643	3658	4646	3416	2699	3217	1852	2761	40419
Hambantota	2219	2364	2362	1861	2318	2465	3494	2218	2160	1852	2310	2215	27838
Jaffna	6410	5626	6600	6169	6712	6911	7536	6844	7508	6819	6402	7760	81297
Kalmune	4055	3979	3692	3124	3798	3600	3275	3938	4087	3474	3930	3663	44615
Kalutara	887	1384	1054	824	1510	1094	1727	1453	2467	1019	2046	1916	17381
Kandy	2749	3391	3620	2571	3655	3910	4537	4560	3820	4617	4440	3554	45424
Kegalle	1990	2173	2419	2156	2707	2304	2437	3422	2994	3036	3032	2521	31191
Kilinochchi	3367	3672	3946	3268	3857	3883	3894	3664	2975	3205	5310	4118	45159
Kurunegala	5174	4700	5373	4428	5593	5736	5608	5230	6179	5536	5935	5814	65306
Maho	1396	1183	1280	1154	1322	1333	1353	1357	2037	1843	1397	1635	17290
Mannar	4337	4654	4868	4008	3881	4051	4418	3963	3966	2838	3465	3613	48062
Matale	2420	2434	2636	2507	2943	2672	2716	2662	3045	3002	2923	2860	32820
Matara	1762	2112	1303	1733	2008	1291	1708	1554	2042	1943	1960	1506	20922
Moneragala	2232	2217	2687	2355	2601	2845	4302	2672	2182	2780	3040	3097	33010
Mullativu	1859	2191	2343	1925	2365	2083	1581	1723	1269	1126	2943	4344	25752
N'Eliya	289	283	360	284	93	283	13	198	344	137	213	250	2747
Polonnaruwa	3188	4816	5808	4270	4644	4821	5288	5033	4518	4835	5131	3649	56001
Puttalam	2951	2647	3130	2431	3072	2528	2619	2326	2220	2657	3445	2586	32612
Trinco	2878	3199	3644	2590	2848	2690	3091	2605	2632	2535	1900	2721	33333
Vavuniya	4509	4561	5554	3770	4456	4753	4707	5001	4399	4168	4555	4630	55063
<b>Total</b>	<b>83571</b>	<b>87864</b>	<b>92097</b>	<b>75434</b>	<b>94253</b>	<b>87960</b>	<b>95181</b>	<b>92006</b>	<b>91539</b>	<b>86007</b>	<b>93504</b>	<b>90401</b>	<b>1070178</b>

**Table 3. Total number of blood smears screened by the Anti Malaria Campaign during the year 2014**

### 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 2014 are given in Table 4.

District	Glass Slides	Lancets	Methanol (L)	Giemsa (L)	Ethanol (L)	RDT Kits	Anisol (L)
Ampara	10000	25000		5		1180	3
Anuradhapura	9250	14400	2.5	11.5		2195	
Badulla	5000	12000		2	5	625	2
Batticaloa	15000	38600	2.5	2		370	
Gampaha	500	600	1	0.5	0.25	205	
Hambantota		20000	7.5	3		720	
Jaffna	12500	59600	1	2		1600	1.5
Kalmune	20000	30600		1		500	1
Kandy		5000		3		810	2
Kegalle	13000	25000	2.5	5.5		500	0.5
Kilinochchi		20000				1120	
Kurunegala	5000	17500	6.5	7		575	2.5
Maho	2500	13000	2.5	1		250	
Mannar	15000	42600			5	345	
Matale	20000	26000	2.5	4	0.6	895	
Monaragala	17500	20000	2.5	1.5		195	
Mulativu		10000				220	
Polonnaruwa	10000	45000	2.5	6		1060	
Puttalam	11250	13800	7.5	4		1260	
Ratnapura	5000	15000	2.5	2		680	
Trincomalee	17500	30000		3		250	
Vavuniya	5000	60600				250	

**Table 4. Laboratory items distributed**

### Activities related to quality assurance of malaria microscopy

With the assistance of ACTMalaria, Standard Operating Procedures for malaria microscopy were developed and a special 12 day in-service training programme was conducted for 25 Public Health Laboratory Technicians representing all the RMO regions and Central laboratory on quality assurance and quality control of malaria microscopy. A slide bank was also established at the central laboratory AMC HQ.

## Measures taken for implement a Quality Assurance and Quality Control system for malaria microscopy

Standard Operating procedures for malaria microscopy were developed with the assistance of ACTMalaria.

25 PHLTT were trained in QA/QC District where PHLTT were trained for Quality assurance and Quality Control.

Province	RMO Regions/Districts	Districts where QA/QC PHLTT are trained
	Central Laboratory	4 PHLTT trained
WP*	Gampaha	1 PHLT trained**
NP	Jaffna	1 PHLT trained
	Kilinochchi	1 PHLT trained
	Mulativu	Kilinochchi QA/QA to cover
	Mannar	Anuradhapura PHLT to cover
	Vavuniya	Jaffna PHLT to cover
NCP	Anuradhapura	1 PHLT trained
	Polonnaruwa	1 PHLT trained
NWP	Kurunegala	1 PHLT trained
	Maho	1 PHLT trained
	Puttalam	1 PHLT trained
CP	Kandy	1 PHLT trained
	Matale	1 PHLT trained
	Nuwara Eliya	Kandy PHLT to cover
SBP	Kegalle	1 PHLT trained
	Embilipitiya	1 PHLT trained
UP	Badulla	1 PHLT trained
	Moneragala	1 PHLT trained
SP	Hambantota	1 PHLT trained
	Matara	Hambantota PHLT to cover
	Galle	Hambantota PHLT to cover
EP	Trincomalee	1 PHLT trained
	Batticaloa	1 PHLT trained
	Ampara	1 PHLT trained
	Kalmune	1 PHLT trained

**Table 5. Number of PHLTT trained in QA/QC in districts**

Measures were also initiated to establish 21 regional QA/QC laboratories.

**In-service training programmes conducted by the AMC Directorate for Laboratory Technicians (to ensure quality assured and quality controlled malaria diagnostic service)**

Eighteen two-day In-service training programmes on malaria microscopy were conducted for PHLTT at AMC HQ and RMO regions. For Private Sector Laboratory Technicians 9 one-day in-service training programmes were conducted and 180 participants were trained. Out of the 9 training programmes 7 were conducted at AMC HQ and the other two programmes were conducted in Kandy and Jaffna. For MLTT 3 one day in-service training programmes were conducted in Jaffna, Polonnaruwa and Anuradhapura.

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

During the year 2014, 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

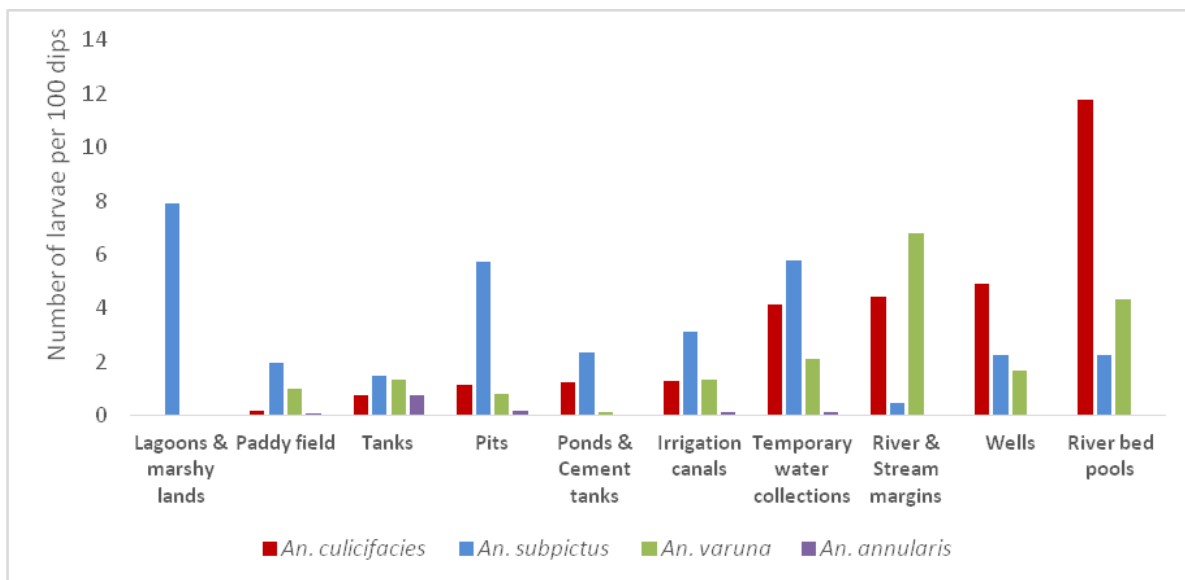
Entomological surveillance played a vital role in monitoring the vector densities throughout the country despite the setting of malaria free status in the country during 2014. The routine entomological monitoring at the sentinel sites was continued in the previous malaria endemic areas, whereas random spot checks were conducted in receptive and vulnerable areas and malaria case based entomological investigations were carried out in areas where imported malaria cases had been reported.

Thirty three entomological teams were 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 795 entomological surveys were carried out throughout the year as 492 sentinel surveys and 303 spot surveys. The number of sentinel sites monitored was 50 in 51 MOH areas. Two semiannual review meetings were conducted at national level to review the entomological surveillance activities carried out at regional level in 2014.

The results of the entomological surveys acquired in 2014 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 5 shows the results of larval surveys carried out in all RMO regions showing breeding habitat preferences of major malaria vector and secondary vectors.



**Figure 5. Relative density of major malaria vector larvae and secondary vector larvae in different breeding habitats - 2014**

Larval surveys during 2014 indicate that the highest density of *Anopheles culicifacies* was found in river bed pools. Wells, river and stream margins and temporary water collections are the other three main types of breeding sites which contributes to breeding of *Anopheles culicifacies* respectively. The main breeding sites of secondary malaria vector *Anopheles subpictus* are lagoons and marshy lands, various types of pits and temporary water collections. Main breeding sites of *Anopheles varuna* is river and stream margins while *Anopheles annularis* was abundant in tanks.

Larval surveys carried out in different districts surveyed for malaria vector larvae breeding sites in 2014 are summarized in figure 6. In many districts pools associated with river systems has contributed for malaria vector breeding.

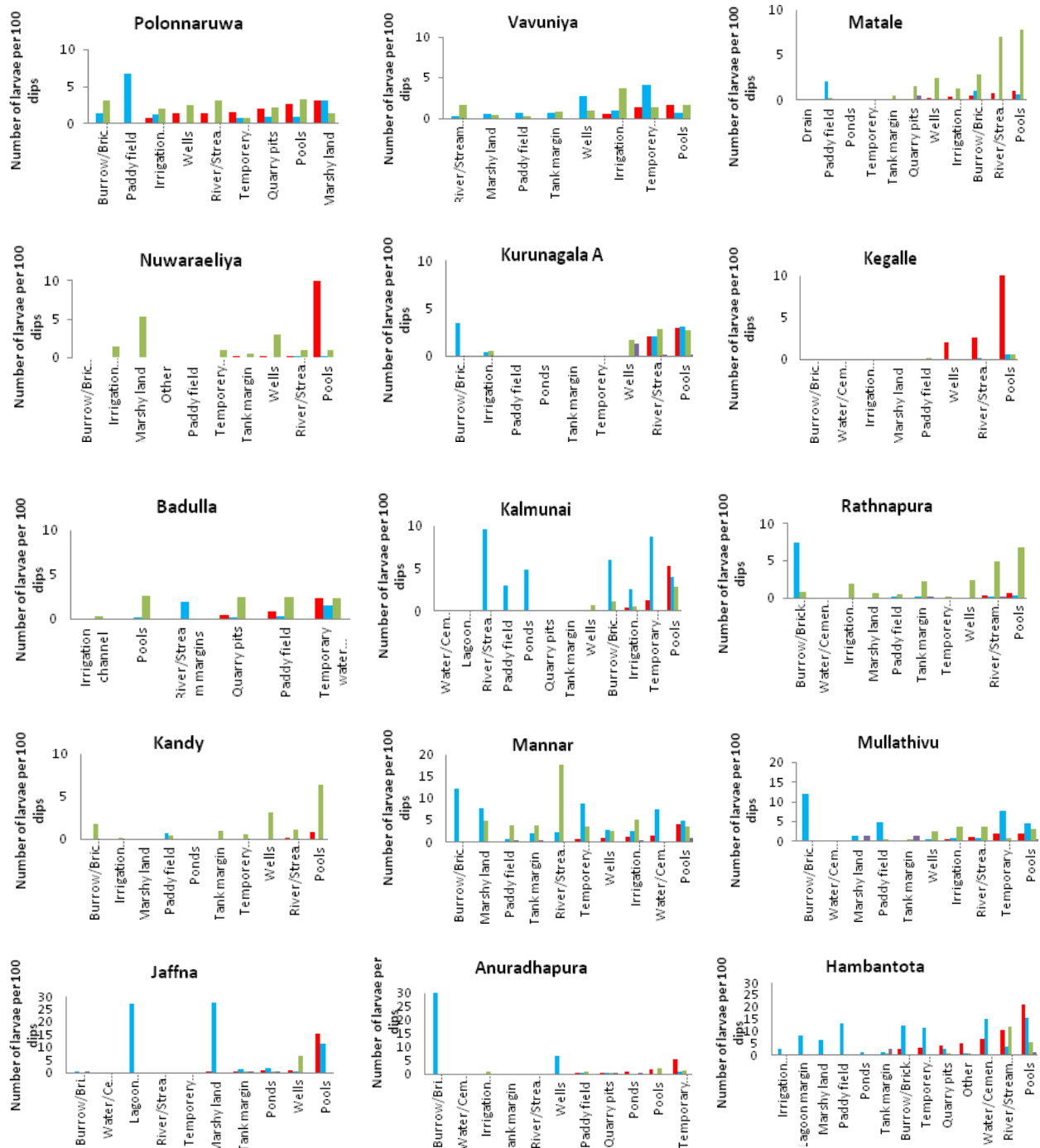


Figure 6. Relative density of malaria vector larvae in different breeding habitats in the Districts- 2014

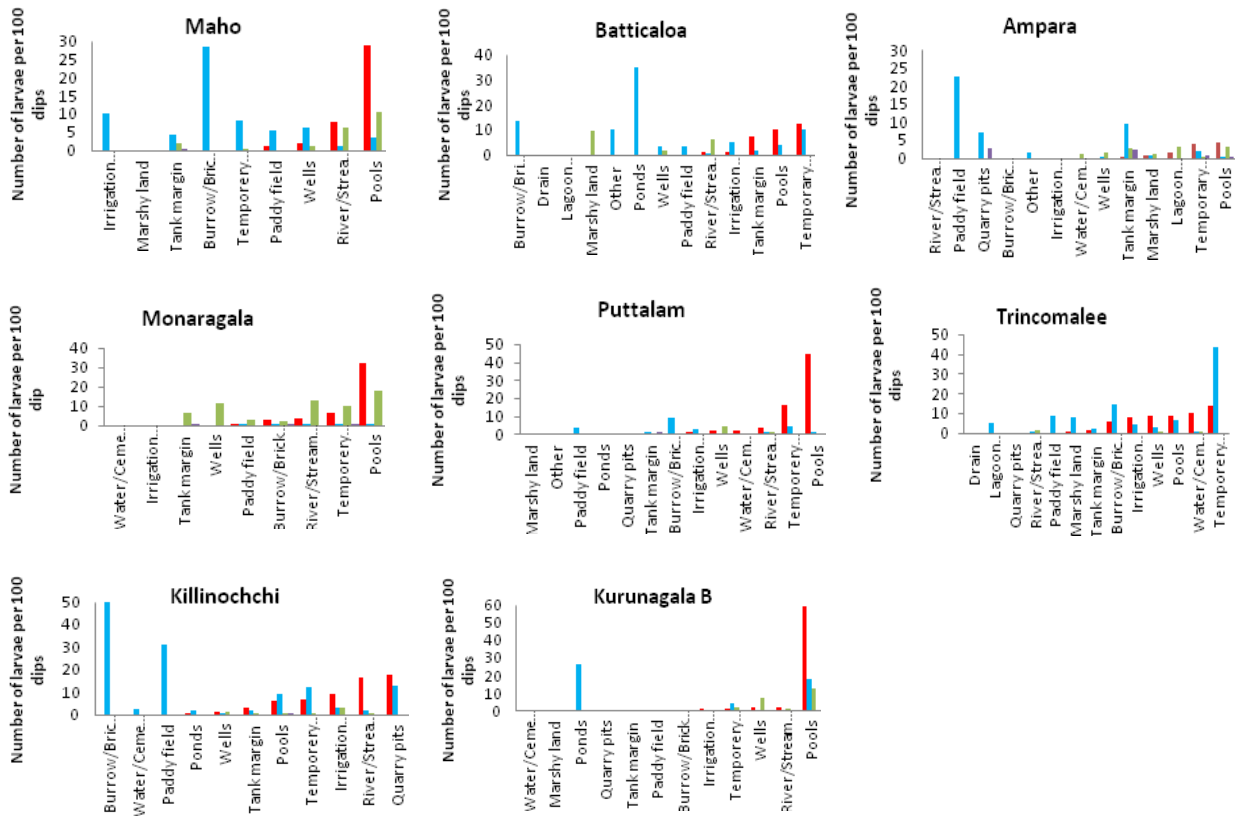
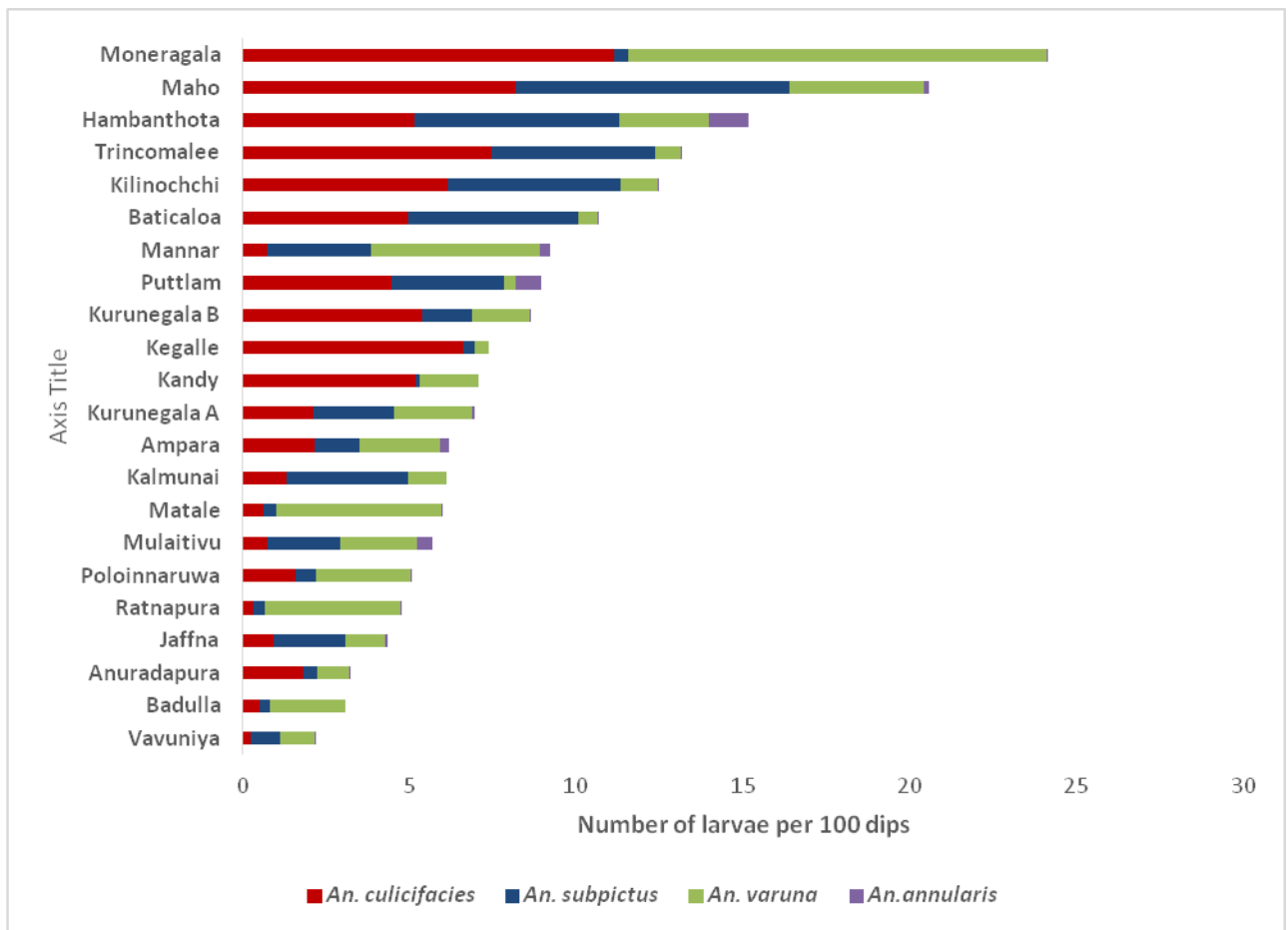


Figure 6. Relative density of malaria vector larvae in different breeding habitats in the Districts- 2014



**Figure 7. Larval densities of malaria vector larvae in 22 RMO Regions**

Comparison of larval densities of major vector and the secondary vectors by the districts is shown by figure 7. Moneragala had the highest densities of vector larvae while Maho, Hambanthota and Trincomalee had the subsequent highest larval densities. Highest densities of *An. culicifacies* larvae was recorded from Moneragala, Maho and Trincomalee districts, whereas highest densities of *An. subpictus* was recorded from Maho region of Kurunegala district, Hambanthota and Kilinochchi districts.



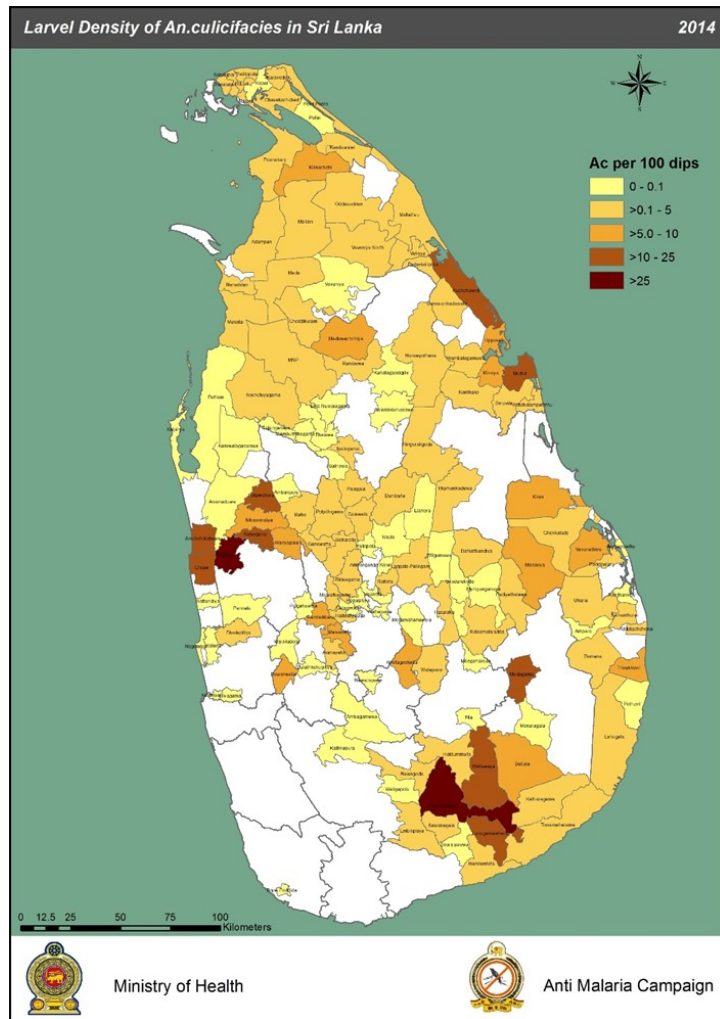
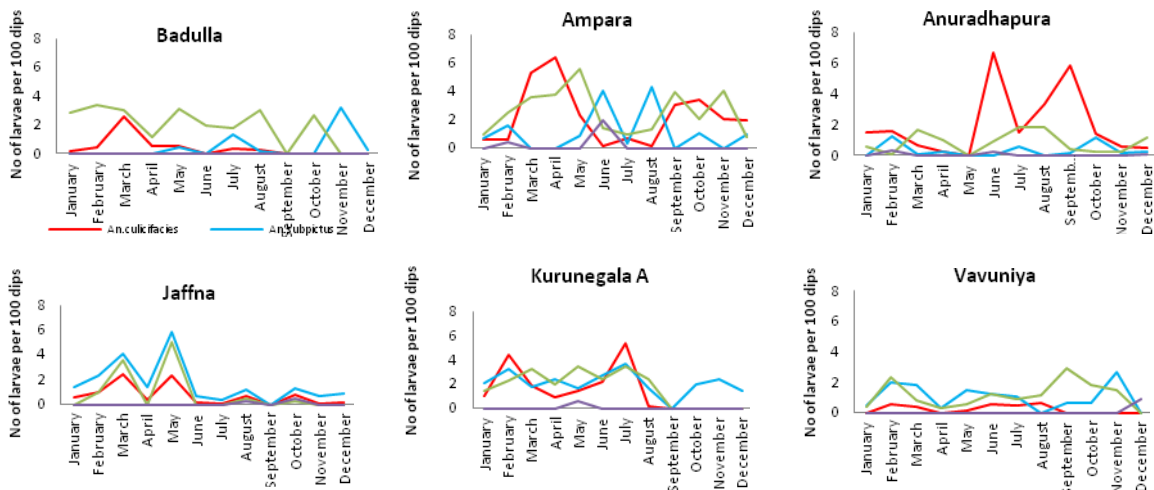


Figure 8. Map showing mean larval densities of *Anopheles culicifacies* in different MOH areas

The larval densities of *An. culicifacies* in 153 MOH areas surveyed in the country in 2014. Highest densities of *An. culicifacies* was recorded from Bingiriya MOH area of Kurunegala district and Thanamalwila MOH area of Moneragala district.

Figure 9. shows the trends of malaria vector densities in 23 districts in 2014



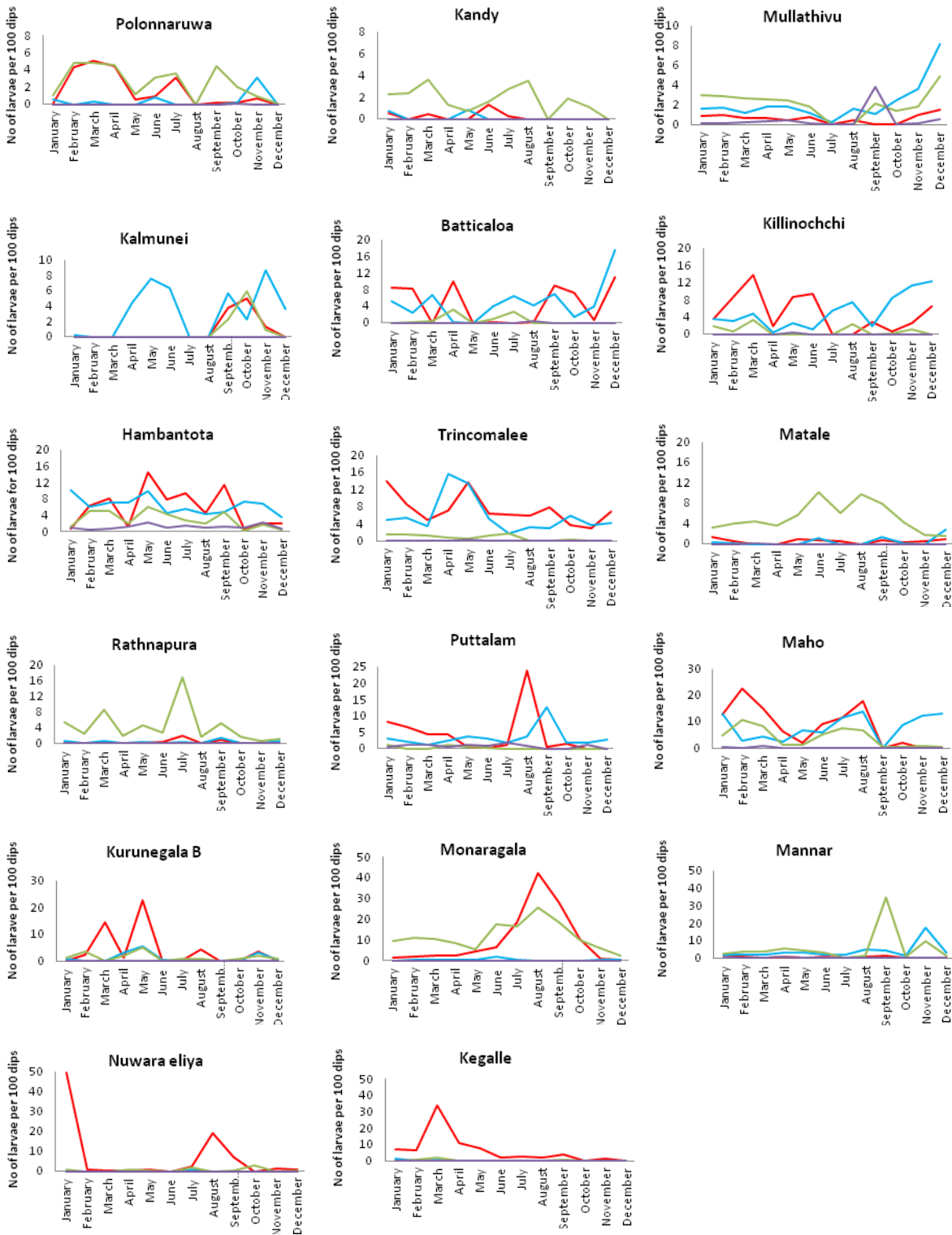
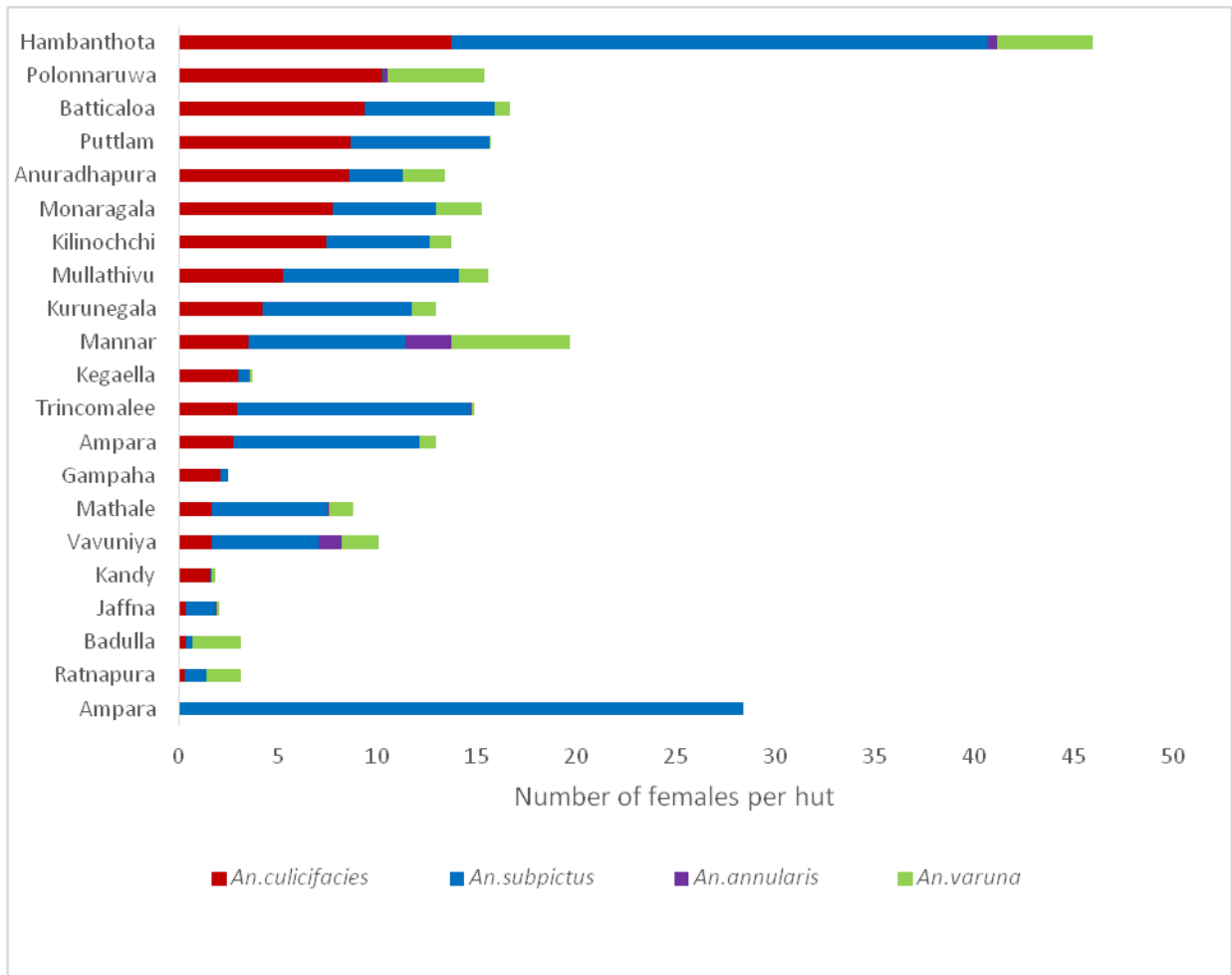


Figure 9. Monthly trends of malaria vector larvae densities in 2014



## Cattle Baited Hut Collections

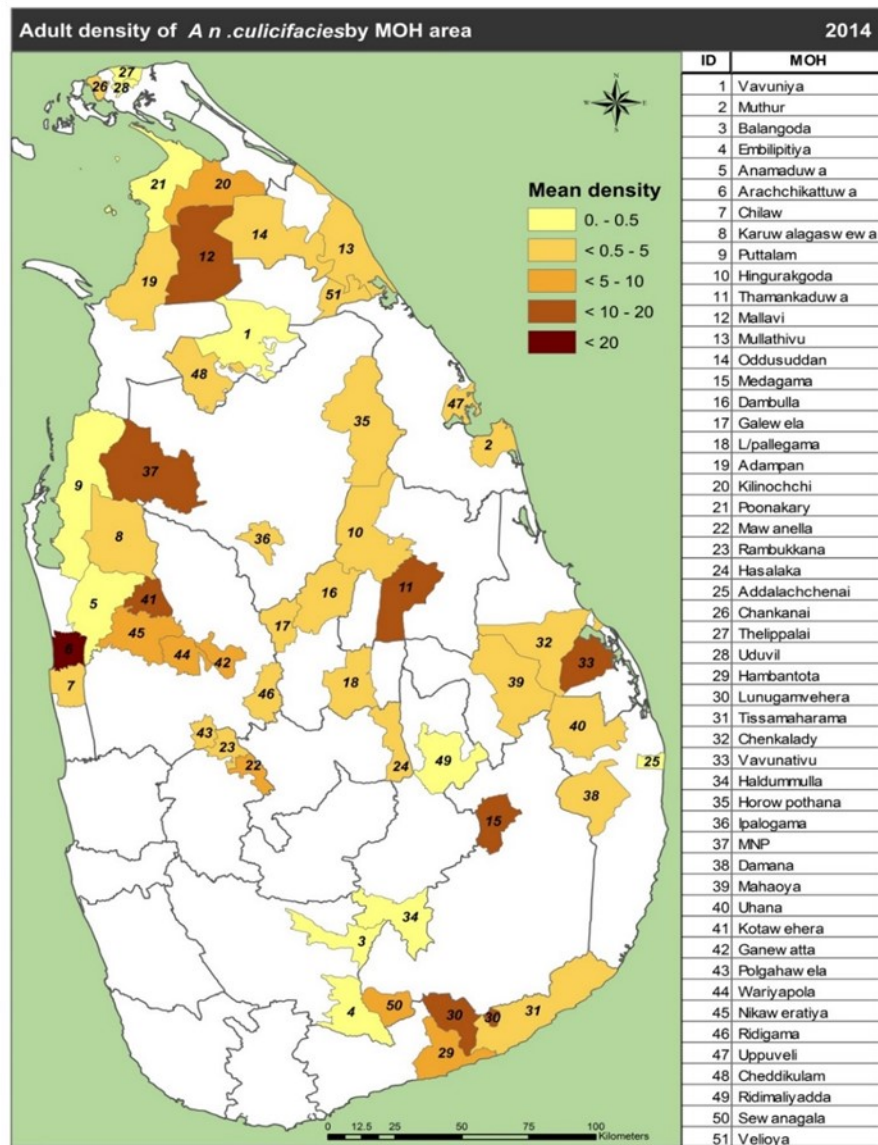


**Figure 10. Mean density of malaria vector females caught in cattle baited hut collections in different districts in 2014.**

Results of cattle baited hut technique is often used as an indicator for prevalence of indoor biting and resting vector populations. Figure 11. depicts the abundance of major malaria vector and secondary vectors in 22 RMO regions in 2014. Hambanthota district recorded the highest density of adult females caught *An. culicifacies* in cattle baited cadjan huts followed by Ampara and Maho. Highest density of *An. subpictus* was recorded by Ampara followed by Kalmunai Hambanthota and Trincomalee. *An. varuna* and *An. annularis* was recorded in low densities in cattle baited huts in 2014.

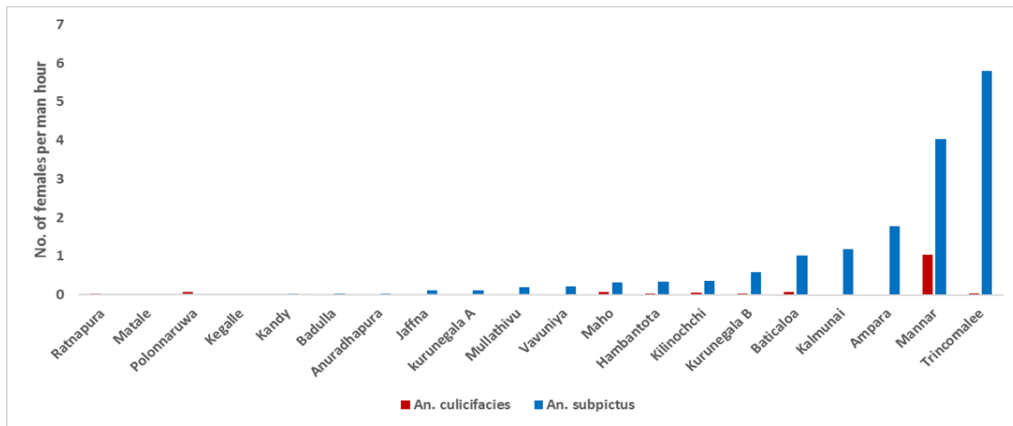
**Sentinel MOH areas.**

Figure 12 shows the map depicting mean density of major vector adults caught by cattle baited huts in 51 MOH areas which were considered as sentinel MOH areas. Arachchikattuwa MOH had the highest mean adult female density of *An. culicifacies* having a density of more than 20 females per hut. Lunugamvehera, Vavunathivu, Nuwaragampalatha cetral, Kotawehera, Mallavi Medagama and Thamankaduwa MOH areas recorded a density of 10-20 females per hut.



**Figure 11: Map showing mean adult female density of *An. culicifacies* in 2014**

## Indoor Hand Collections

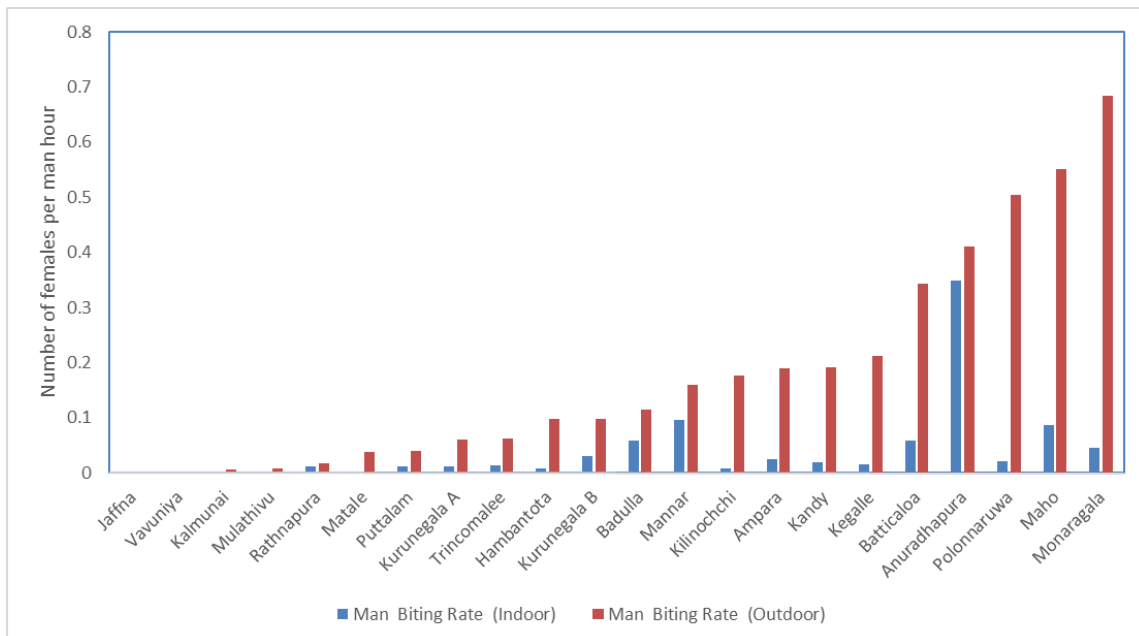


**Figure 12. Indoor resting densities of *Anopheles culicifacies* and *Anopheles subpictus* in RMO Regions**

Indoor hand collections were carried out in all RMO regions to find out the indoor resting vector species and resting surfaces of malaria vectors. This technique provides useful information such as seasonality of indoor resting of vectors and their resting sites inside human dwellings. In the twenty RMO regions where indoor hand collections were carried out it was observed that indoor resting *Anopheles subpictus* densities were higher than *Anopheles culicifacies* indoor resting densities. Highest density of *Anopheles subpictus* was recorded from Trincomalee followed by Mannar and Ampara. *Anopheles culicifacies* highest density was recorded from Mannar district.

## 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 was observed in 2014, indicating that outdoor biting is higher than indoor biting (Figure 13). Moneragala district recorded the highest outdoor biting rate of *An. culicifacies* followed by Maho, Polonnaruwa and Anuradhapura districts. Highest indoor biting rate of *An. culicifacies* was recorded from Anuradhapura district followed by Mannar and Maho districts.



**Figure 13. Human biting rate of *An. culicifacies* in 22 RMO regions**

Figure 15 depicts the monthly trends of *Anopheles culicifacies* human biting rates in 20 RMO regions. In other two areas namely Jaffna and Vavuniya human biting *Anopheles culicifacies* was not observed during 2014.

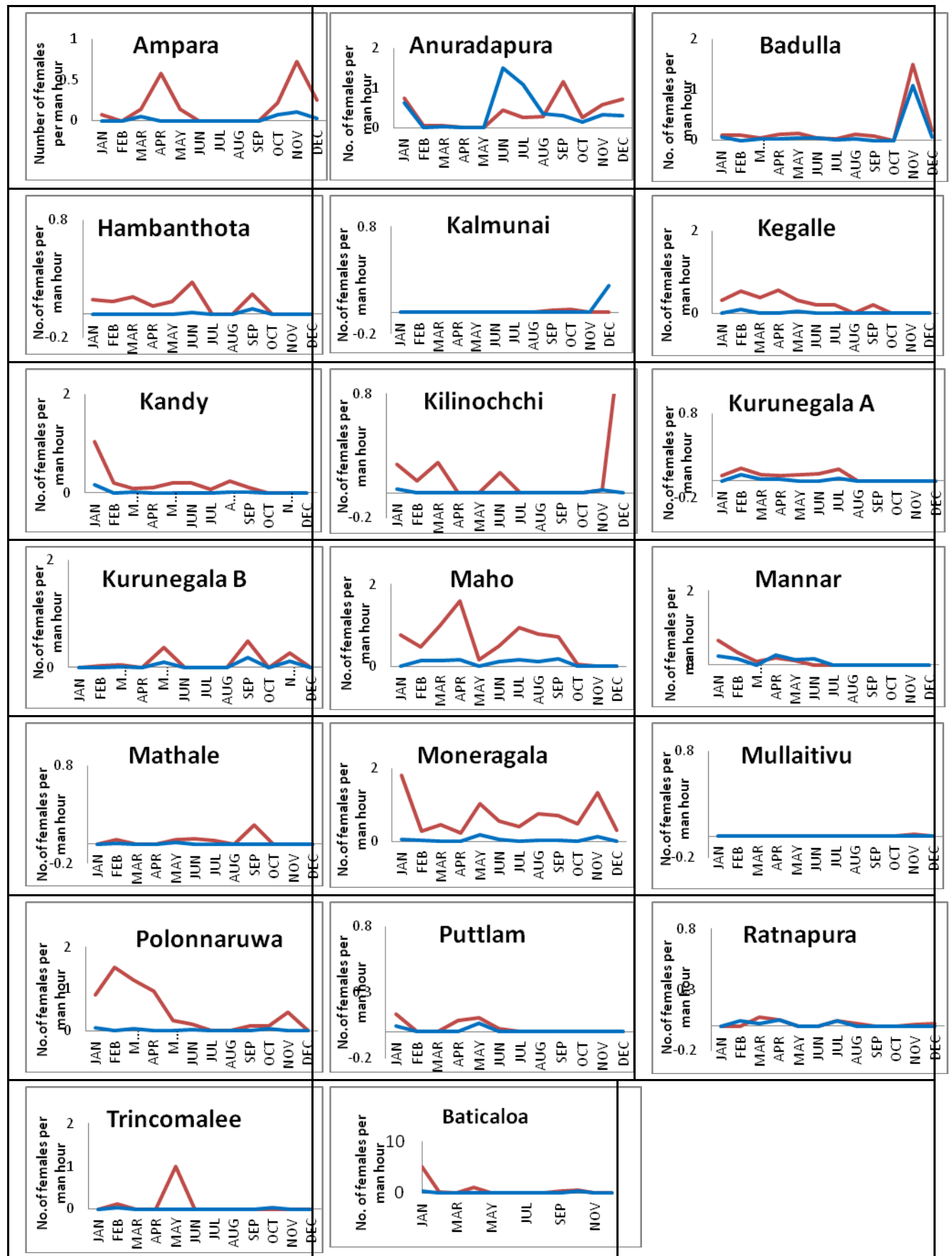


Figure 14 Monthly trends of *Anopheles culicifacies* human biting rates in different RMO Regions

## Insecticide Resistance Monitoring

In 2014 susceptibility status of eleven *Anopheles* species was tested using standard WHO insecticide susceptibility kits for discriminative dosages of eleven insecticides. Table 1 shows insecticide resistance status of *An. culicifacies* in different MOH areas. The susceptibility tests performed for more than fifty mosquitoes for tests are summarized and high resistance for Deltamethrin 0.05% was observed in *An. culicifacies* in Ganewatta MOH area of Kurunegala District.

Class	Insecticide & Concentration	Resistance status in different MOH areas		
		Susceptible	Moderate	High
PY	Cyfluthrin 0.15%	Lunugamvehera	Bingiriya	NR
PY	Deltamethrin 0.05%	Bingiriya Megadama Katharagama Lunugamvehera Vavunathivu Wellawaya	NR	Ganewatta
PY	Etofenprox 0.5%	Bingiriya	NR	NR
PY	Lambdacyhalothrin 0.05%	Lunugamvehera, Wellawaya, Vavunathivu	Medagama	NR
PY	Permethrin 0.75%	NR	Arachchikattuwa Bingiriya	NR
C	Propoxur 0.1%	Lunugamvehera	NR	NR

NR- No records

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

Table 7. shows insecticide resistance status of *An. subpictus* in different MOH areas. *An. subpictus* has reported high resistance to four types of pyrethroid insecticides.

Class	Insecticide & Concentration	Resistance status in different MOH areas		
		Susceptible	Moderate	High
PY	Cyfluthrin 0.15%	Point pedro	Poonakary	Lunugamvehera
PY	Deltamethrin 0.05%	Madu	Poonakary	Lunugamvehera
PY	Etofenprox 0.5%	Ganewatta	NR	NR
PY	Lambdacyhalothrin 0.05%	Hambanthota Kilinochchi	Point pedro Chenkaladi	Lunugamvehera
PY	Permethrin 0.75%	Hambanthota Nanadan Nikaweratiya	NR	Lunugamvehera Poonakary
C	Propoxur 0.1%	NR	NR	Kinniya Wariyapola
OP	Malathion 5.0%	Ariyampathi	NR	NR

NR- No records

**Table 7: Insecticide resistance status of *An. subpictus* in different MOH areas**

### Training on Entomology

During 2014, 51 Entomological Assistance were trained in two in-service training programmes funded by GFATM project at Wayamba training Institute of Wariyapola.



### **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.

## **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. There were no insecticides that had been used for indoor residual spraying in districts during the year 2014 .

Laviorous 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 2014, AMC Headquarters had following category of staff. The below Table 8 shows the number of staff in each category as at the end of year 2014.

Category Name	Approved cadre	In position
Director	1	1
Deputy Director	1	0
Medical Consultant	3	3
Medical Officer	5	3
Accountant	1	1
Entomologist	2	2
Parasitologist	1	1
RMO / AMC	1	1
Special Grade Entomological Assistant	1	0
Special Grade PHLT	2	0
Entomological Assistant	6	6
Medical Laboratory Technologist	3	0
Public Health Inspector	2	2
Public Health Laboratory Technician	22	12
Information and Communication Technology Assistant	2	1
Health Education Officer	1	0
Information and Communication Technology Officer	1	0
Development Assistant	4	3
Medical Records Assistant	1	0
Planning and Programme Assistant	1	0
Public Health Field Officer	10	4
Public Management Assistant	17	9
Medical Supplies Assistant	3	0
Telephone Operator	0	2
Cinema Operator	1	1
Health Driver	19	12
Lab Orderly	3	1
KKS	1	1
Lift Operator	2	2
Saukyaya Karyaya Sahakara (Junior)	20	12
Saukyaya Karyaya Sahakara (Junior) – Anuradhapura		20
Saukyaya Karyaya Sahakara (Ordinary)	25	6
Spray Machine Operator	19	8
Ward Clerk	0	1
Development officer	5	5
Casual Saukyaya Karyaya Sahakara (Junior)	0	3
<b>Total</b>	<b>186</b>	<b>123</b>

**Table 8: 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 . In 2014 AMC Headquarters had the following number of vehicles (Table 9).

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 9: 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 2014.

Recipient	Chloroquine tablets	Primaquine tablets	Quinine tablets	Quinine injection
Ampara	3000	-	-	-
Anuradhapura	900	500	100	40
Badulla	-	750	-	20
Colombo	4350	1050	190	150
Embilipitiya	1000	200	30	40
Hambantota	2000	1000	-	-
Kalmune	1000	750	-	30
Kandy	-	100	-	30
Kegalle	3000	500	-	50
Kilinochchi	-	-	20	40
Kurunegala	6700	2800	-	20
Maho	1000	-	-	-
Mannar	150	250	-	10
Matale	1000	250	-	-
Moneragala	-	500	-	5
Mullativu	2000	1000	-	-
Puttalam	-	550	-	-
Trincomalie	500	500	-	60
Vavuniya	-	-	-	10
Batticaloa	4000	550	-	50
Jaffna	1000	1000	-	30
Polonnaruwa	-	500	-	40
Other institutions	33050	200	700	120
<b>Total</b>	<b>64650</b>	<b>12950</b>	<b>1040</b>	<b>745</b>

**Table 10: 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 2014, 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 2014, National Malaria Elimination Programme continued to receive support from the GFATM in the form of one grant for malaria elimination under the Round 8.

#### **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 2014 under this project.

#### **Conducting malaria mobile clinics**

Two thousand six hundred and sixteen malaria mobile clinics were conducted to reduce malaria transmission among vulnerable and mobile populations through early detection and treatment. A total of 187,582 blood smears 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.