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Anopheles subpictus

Abhayawardana et al (1996) found sibling B in coastal areas only, and sibling A predominating in inland areas.

Sibling B is a brackish water breeding species, and has been implicated in malaria transmission in India.

Later, Abhayawardena et al. (1999) found that all 4 known sibling species (A,B,C,D,) occur in the Chilaw area of NW Sri Lanka.

Coastal site: 74% B

Inland site: 73% C

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Anopheles subpictus (cont.)

Cattle-baited net traps:
Coastal site: 92% B Inland site: 69% C

Cattle-baited huts:
Coastal site: 63% C Inland site: 75% C

Indoor hand-aspirator collections:
Coastal site: 39% B, 45% C

Inland site: 80% C

Sibling C: MP sporozoite ELISA-positive

(Abhayawardena, unpublished data)

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Other Species

important

Anopheles annularis :
Two siblings, Status in Sri Lanka unknown

Anopheles barbirostris :
Two siblings, status in Sri Lanka unknown

Anopheles maculatus :
Nine siblings, status in Sri Lanka unknown

Towards a Risk Map for Southern Sri Lanka: Results from the Uda Walawe Region

Eveline Klinkenberg, Malaria Consultant, IWMI

In the Uda Walawe region six Divisional Secretary Divisions (DSs) were selected: Embilipitiya, Thanamalvilla, Sevenagala, Angunukolapelessa, Ambalantota and Sooriyawewa. All confirmed malaria cases, for these areas, reported to the government health facilities were collected for the period January 1991-August 2000. Data were also collected from health facilities just outside the six DSs. Malaria data from private clinics were unavailable and therefore could not be included. For each GN[2] the malaria incidence (number of cases per 1000 inhabitants) was calculated for each month in the period January 1991-August 2000. These malaria incidences were mapped using GIS software (ARCVIEW)

The malaria incidence pattern showed:

- an overall high incidence in the Thanamalvilla DS throughout the years studied
- some GNs with high incidence along the Ratnapura road
- relatively low incidence in the rest of the area
- no clear seasonal pattern in malaria incidence over the years studied

A second step, which is still ongoing, is to relate the malaria incidence pattern to possible explaining factors. Information on the following parameters is available: land use, presence of water bodies (rivers, streams, tanks), rainfall, socioeconomic data (percentage of families receiving "Janasaviya" or food stamps, being landless, having electricity, ownership of a house), control measures (spraying, use of bed nets), soil moisture data (from satellite images). Additional data are needed on type of house construction and entomology.

The first results of the statistical analysis show that malaria incidence is high in the *chena* (slash and burn) areas and low in the paddy and other crop and plantation areas. This could partly be explained by the lower socioeconomic status of people in *chena* areas. At first sight it is surprising that GNs where insecticide house spraying takes place and where people use more mosquito control measures have a high incidence of malaria. However, it is likely that these malaria control measures take place because of the high density of mosquitoes and of malaria.

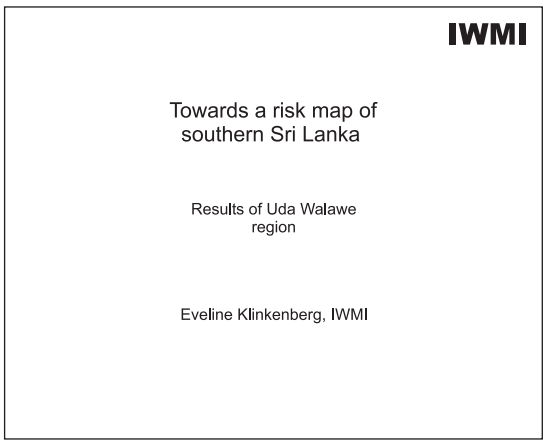
In Uda Walawe, *chena* cultivation is mainly practiced in the Thanamalvilla area. Comparing the presence of water bodies in the high and low incidence areas revealed that the Thanamalvilla area has a large number of abandoned tanks that are not present in the rest of the area. These tanks could serve as an additional breeding source for malaria vectors. During a field visit on

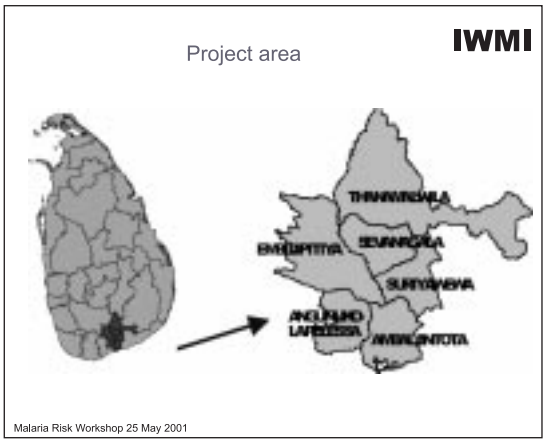
[2]GN is Grama Niladari, the smallest administrative unit in Sri Lanka.

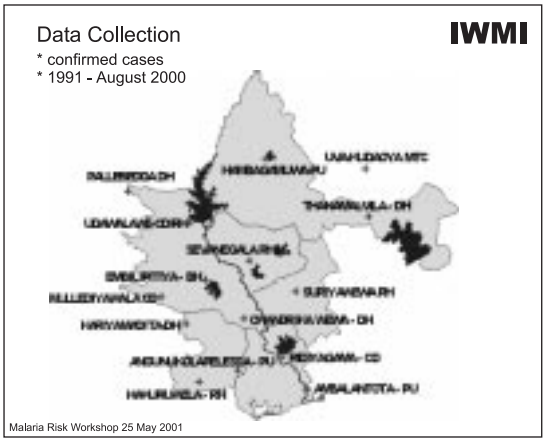
March 28, 2001 it was found that many of these tanks are, in fact, not abandoned but used by private users or groups of farmers. During this small survey of 8 tanks several anophelines were found breeding in the tanks (Klinkenberg 2001). The main vector for Sri Lanka, *An. culicifacies*, was not found, but several secondary vectors were identified, especially *An. annularis* and *An. vagus*. It could be that these secondary vectors are locally important in malaria transmission.

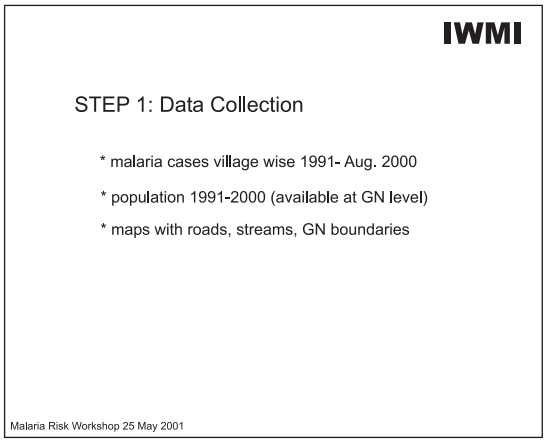
In the near future additional fieldwork will be carried out to investigate if there is a difference in the presence and density of vectors in high and low incidence areas.

PowerPoint slides presentation









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STEP 2: MAPPING

* locate all "malaria villages" names recorded versus official villages names
* all villages located with aid of GPS double names, GN name
* all villages assigned GN by location/official list
* map malaria incidence (# cases/ 1000 inhabitants) per GN

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Malaria per GN
Uda Walawe area 1991-2000

1991 total

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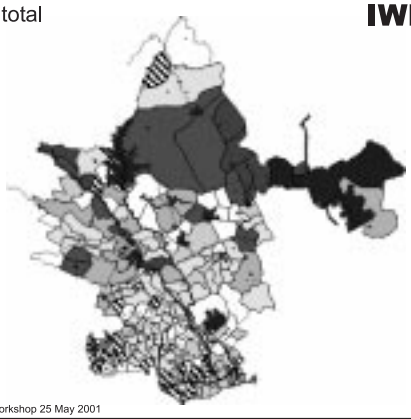

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Main observations

* Thanamalvilla DS throughout years highest incidence
* Some high incidence GNs along Ratnapura road
* Relatively low incidence in rest of the area
* No clear seasonal pattern

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Incidence maps can assist:

* Quick overview of data
* Targeting malaria control

STEP 3: ANALYSIS

* relate malaria incidence to potential determinants (risk factors)

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Collected parameters

* Land use (SD & LUPPD)
* Presence water bodies: rivers/streams/tanks (SD)
* Rainfall (MD, RS)
* Socio-economic data: %JS-FS, % landless, % electricity (C&S)
* Control measures (spraying, bednet) - incomplete (AMC/IWMI)
* Entomological data - few data only (AMC)
* Soil moisture (RS image)

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Results

Parameter	Criteria	Malaria incidence
% paddy per GN	<20% land cover >20% land cover	58 14
% Abandoned tanks per GN	<1% land cover >1% land cover	25 74
% families receiving JS or FS	<65% of families >65% of families	25 52
Spraying activities per GN	Spraying No spraying	63 19
Use of mosquito protection	Always Never/sometimes	18 8

JS =Janasavaya; FS = foodstamps

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Problems data collection/restriction data set

* Most parameters only available for one year
* Data not always available at GN level
* Use of private hospitals
  --> underestimate cases
* Chena not always clearly classified, scrub/forest areas also used for Chena
* Maps with different coordinate systems and boundary shapes

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Additional data necessary

* Type of housing - no data
* Entomological data
* Bednet use - control measures
* % people going to private facilities
  - underestimate - different per area
* Data from more rain stations

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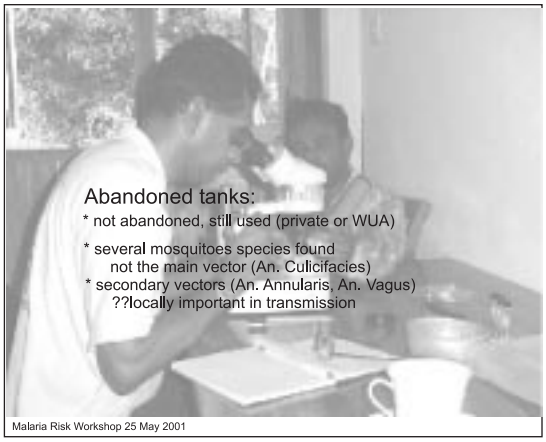
Characteristics Thanamalvilla area

* Mostly Chena cultivation
* Mainly scrub/forest area
* Little irrigation compared to rest of the area
* Large number abandoned tanks

Expect Chena area to be relatively dry, malaria confined to rainy season BUT no clear seasonal pattern visible

↳ Abandoned Tanks possible breeding source??



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Summary Embilipitiya Workshop

Main risk factors:

- different per DSD
- pooling rivers/streams
- imported cases from Chena area (Thanamalvilla)
- importance of construction phase of irrigation projects

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Role of risk mapping:

- Assist in planning malaria control
- More efficient use of resources
- Establishment TC and mobile clinics
- Identify risk factors

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NEXT Step

- Complete statistical analysis
- Fieldwork to locate breeding sources and investigate vector importance in high and low risk areas

Surveillance and Its Use in Malaria Control in Sri Lanka

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The primary objective of any disease control program is the reduction of morbidity and mortality. In order to prevent the occurrence of disease, a thorough understanding of the distribution of cases in a given geographic area is required. Surveillance is the ongoing systematic collection, analysis and interpretation of health data essential to the planning, implementation and evaluation of public health practice. In simple terms this means the collection of health data for action. Surveillance data can be used for planning future programs, implementation of plans, and monitoring and evaluation of activities. Surveillance is a cyclical process that involves collection of data, consolidation and evaluation of the data and dissemination of findings.

The major objective of the national malaria control program in Sri Lanka is the reduction of morbidity and mortality due to malaria. The strategies used to achieve these objectives include early diagnosis and prompt treatment of cases, selective use of integrated vector control methods, provision of chemoprophylaxis to high-risk groups, building and sustaining partnerships and community participation. Surveillance data is essential to the implementation, and monitoring and evaluation of these strategies.

The current surveillance system for malaria in Sri Lanka is a legacy of the eradication era. A number of deficiencies in the system have been highlighted, among which non-responsiveness to a control strategy, delays in the reporting system and the non-use of existing information in the planning process are the most important. A new computerized surveillance system is to be introduced rectifying some of the deficiencies in the current system.

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