Residual anofelism in the Northern Adriatic Sea littoral 50 years after malaria eradication

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The Northern Adriatic Sea littoral was heavily malarious; intensive land drainages, agricultural development and socioeconomic improvement were the key factors which led to malaria eradication, speeded up by indoor insecticide spraying, achieved soon after the World War II. Periodic regular observations on anophelism were carried out by the Istituto per la Lotta Antimalarica delle Venezie from middle 20's until early 60's. The main vector was Anopheles sacharovi, a species which typically bred in coastal brackish swamps; other species were An. atroparvus (which was a probable secondary vector) and the usually strictly zoophilic An. maculipennis, An. melanoon, An. messeae and An. subalpinus.

From 1995 to 1997 surveys were carried out in order to review the genus Anopheles in the coastal area of Friuli-Venezia Giulia and Veneto regions. A total of 11,346 females were collected from animal shelters (cowshed, pigsties, horsestables) of 52 sites along 180 km of coast crossing 5 provinces (from North: Gorizia, Udine, Venezia, Padova and Rovigo). All specimens belonging to the An. maculipennis complex were scored for the presence of the differential characters of An. sacharovi, the only species of the complex morphologically characterized at the adult stage. The examination of morphological characters of single egg batches obtained from field collected females was the main diagnostic tool for the other species. Species identification was subjected to confirmation by larval chetotaxy analysis (n. of branches of antepalme hairs of IV and V abdominal segments) in representative samples of laboratory-reared mature larvae, while biochemical analysis (enzyme electrophoresis) on some samples of identified females were performed in the laboratory of Prof. L. Bullini and Dr. R. Cianchi of the University of Rome "La Sapienza" and partly in our laboratory.

No An. sacharovi female was recorded. The examination of 6,352 single ovipositions obtained from 9,619 females led to the identification of three species of the An. maculipennis complex: An. atroparvus, An. maculipennis and An. messeae, and one of the An. claviger complex: An. claviger s.s. (tab. 1). Larval chetotaxy examination carried out on 1,626 larvae and the biochemical identification of 457 females confirmed the previous diagnosis based on egg characters.

The relative frequency of the species varied depending on the site: An. maculipennis was the most abundant species north of Venice; south of Venice, and particularly in the Po river delta, the most abundant species were An. atroparvus and, in some sites, An. messeae.

In view of the high density recorded for An. atroparvus in some sites (corresponding to various thousands females in a single animal shelter), the vectorial capacity values may be significant and should be assessed.


<table>
<thead>
<tr>
<th>Province (No. sites)</th>
<th>No. collected females</th>
<th>No. ovipositing females</th>
<th>No. ovipositions obtained</th>
<th>% atrop.</th>
<th>% macul.</th>
<th>% mess.</th>
<th>% clav.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gorizia (2)</td>
<td>206</td>
<td>153</td>
<td>87</td>
<td>1</td>
<td>91</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Udine (6)</td>
<td>1,398</td>
<td>1,380</td>
<td>759</td>
<td>2</td>
<td>93</td>
<td>0.1</td>
<td>4</td>
</tr>
<tr>
<td>Venezia (27)</td>
<td>6,009</td>
<td>5,398</td>
<td>3,514</td>
<td>20</td>
<td>75</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Padova (1)</td>
<td>79</td>
<td>79</td>
<td>52</td>
<td>42</td>
<td>29</td>
<td>29</td>
<td>-</td>
</tr>
<tr>
<td>Rovigo (16)</td>
<td>3,654</td>
<td>2,609</td>
<td>1,940</td>
<td>59</td>
<td>1</td>
<td>40</td>
<td>0.2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>11,346</td>
<td>9,619</td>
<td>6,352</td>
<td>29</td>
<td>55</td>
<td>14</td>
<td>2</td>
</tr>
</tbody>
</table>