<table>
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<th>項目</th>
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<td>タイ国と日本のトウゴウヤブカの形質の違いについて</td>
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<td>著者</td>
<td>森 章夫 武衛 和雄 PHAN-URAI, Prakong 藤田 紘一郎</td>
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サイト詳細

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Difference in Biological Characteristics between *Aedes togoi* Originated from Thailand and Japan

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**Abstract:** Some biological characteristics between strains of *Aedes togoi* from Chantaburi, Thailand, and Nagasaki, Japan, were compared. The larval plus pupal period of Chantaburi strain was longer than that of Nagasaki strain. At low temperature and short photoperiod, such as 21°C, 10 hr daylength or 15°C, 10 hr daylength, the fourth instar larvae of Nagasaki strain entered into larval diapause, while Chantaburi strain did not enter into diapause. The adult body size of Chantaburi strain was smaller than that of Nagasaki strain. The autogenous reproduction of Chantaburi strain was high even at any temperature. From these results, *Ae. togoi* seems to be an indigenous mosquito in Thailand, but not to be a stowaway in recent years from the temperate zone.

**Key words:** *Aedes togoi*, Geographical variation, Thailand, Japan.

**INTRODUCTION**

Recently, *Aedes togoi* has been collected from several places in Southeast Asia (Ramalingam, 1969) and North America (Sollers—Riedel, 1971). Ramalingam supposed that *Ae. togoi* in West Malaysia might have been introduced from Japan by Japanese ships in recent years, because this specise is primarily a mosquito of the temperate zone. However, he recognized slight morphological differences between *Ae. togoi* collected from West Malaysia and the laboratory colony originated from Taiwan. As the authors could collect *Ae. togoi* from rock pools at a small island in Thailand, the biological characteristics of this strain was compared with those of Japanese strain.

**MATERIALS AND METHODS**

Detailed histories of Thai (Chantaburi strain) and Japanese (Nagasaki strain) *Ae.*
Togoi used in the present experiment were described in the previous paper (Mori et al., 1985).

To compare biological characteristics of *Ae. togoi* between both strains, mosquitoes were reared in the insectaria with controlled environment of 15°C and 98% RH under 10 hr daylength, 21°C and 70% RH under 10 hr daylength, 25°C and 80% RH under 16 hr daylength, and 30°C and 90% RH under 16 hr daylength. One hundred first instar larvae of each strain, within 10 hr after hatch, were put in enamel pans (22×28×4 cm), which contained about 1,500 ml of water, at each condition. Equally mixed powder of Brewer's yeast and mouse pellets was served as the larval food. A suspension of 0.2g of this powder in water was added to each pan every day. Pupae were picked up and placed in cups with water for emergence. The resulting adults were provided with maintenance diet of 2% sugar solution. Females in 15°C and 21°C were killed 7 days after emergence, and wing length was measured and the number of ovarioles and mature eggs in one of two ovaries were counted. In this paper, producing mature eggs in the ovaries without blood meal is referred to as autogeny. Females in 25°C and 30°C were killed 3 days after emergence and treated as stated above.

**RESULTS**

Median period from egg hatch to adult emergence of both strains at various temperatures are given in Table 1. In Nagasaki strain, a few out of the larvae reared at 21°C under 10 hr daylength and most at 15°C under 10 hr daylength stopped their development at the fourth instar larvae. They were considered to have entered into diapause at low temperature and short photoperiod, because they never molted until environmental conditions were changed to high temperature and long photoperiod. These diapausing larvae were not included in the calculations in Table 1. The larval plus pupal period of both females and males of Chantaburi strain had a tendency to be longer than that of Nagasaki strain, especially in lower temperatures.

<table>
<thead>
<tr>
<th>Strain Temp.</th>
<th>Chantaburi</th>
<th>Nagasaki</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>30°C</td>
<td>9.60</td>
<td>10.14</td>
</tr>
<tr>
<td>25°C</td>
<td>13.67</td>
<td>14.91</td>
</tr>
<tr>
<td>21°C</td>
<td>20.83</td>
<td>23.15</td>
</tr>
<tr>
<td>15°C</td>
<td>35.10</td>
<td>39.12</td>
</tr>
</tbody>
</table>

Table 1. Median intervals in days from egg hatch to adult emergence of *Aedes togoi* originated from Chantaburi, Thailand, and from Nagasaki, Japan, at various temperatures.
Table 2 shows the rate of autogenous females, which produced mature eggs without blood meals. The rate became higher with decreasing temperature in both strains. The rate of autogenous females was very variable in Nagasaki strain ranging from 86.7% at 15°C to 0% at 30°C, while in Chantaburi strain the rate was 100% at 21°C and lower temperatures, and dropped to 80% at 30°C. The influence of temperature seems to be more significant in Nagasaki strain.

<table>
<thead>
<tr>
<th>Strain</th>
<th>Temp.</th>
<th>Chantaburi</th>
<th>Nagasaki</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30°C</td>
<td>80.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>25°C</td>
<td>96.7%</td>
<td>33.3%</td>
</tr>
<tr>
<td></td>
<td>21°C</td>
<td>100.0%</td>
<td>80.0%</td>
</tr>
<tr>
<td></td>
<td>15°C</td>
<td>100.0%</td>
<td>86.7%</td>
</tr>
</tbody>
</table>

The number of ovarioles in one of the two ovaries was shown in Table 3, and the number of mature eggs in the autogenous females in Table 4. In Chantaburi strain, the number of both ovarioles and mature eggs had a tendency to decrease with increasing temperature. At 25°C and lower temperatures, more than 70% follicles grew up to mature.

Table 3. Number of ovarioles (mean±S. D.) in an ovary of *Aedes togoi* originated from Chantaburi, Thailand, and from Nagasaki, Japan, at various temperatures

<table>
<thead>
<tr>
<th>Strain</th>
<th>Temp.</th>
<th>Chantaburi</th>
<th>Nagasaki</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30°C</td>
<td>73.9± 9.5</td>
<td>108.9±14.9</td>
</tr>
<tr>
<td></td>
<td>25°C</td>
<td>83.7±11.5</td>
<td>147.3±19.2</td>
</tr>
<tr>
<td></td>
<td>21°C</td>
<td>88.6±11.9</td>
<td>110.6±18.3</td>
</tr>
<tr>
<td></td>
<td>15°C</td>
<td>94.8±14.9</td>
<td>90.5±14.1</td>
</tr>
</tbody>
</table>

Table 4. Number of mature eggs (mean±S.D.) in autogenous females of *Aedes togoi* originated from Chantaburi, Thailand, and from Nagasaki, Japan, at various temperatures

<table>
<thead>
<tr>
<th>Strain</th>
<th>Temp.</th>
<th>Chantaburi</th>
<th>Nagasaki</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>30°C</td>
<td>19.5± 7.9</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>25°C</td>
<td>59.4± 9.7</td>
<td>35.9±18.0</td>
</tr>
<tr>
<td></td>
<td>21°C</td>
<td>77.4±12.8</td>
<td>33.4±13.7</td>
</tr>
<tr>
<td></td>
<td>15°C</td>
<td>71.7±11.3</td>
<td>26.0± 8.0</td>
</tr>
</tbody>
</table>
stage, and even at 30°C 26.4% of ovarioles included mature eggs. On the other hand, in Nagasaki strain, a clear Cline with temperature was not recognized in the number of ovarioles or mature eggs. The number eggs in Nagasaki strain was smaller than in Chantaburi strain at the same temperature, though the former had larger of ovarioles.

The wing length in both strains was given separately for autogenous and anautogenous females in Table 5. The wing length of females shortened with increasing temperature in both strain whether autogenous or not, but in Chantaburi strain it was considerably shorter than in Nagasaki strain in any conditions. The differences in wing length between autogenous and anautogenous females in each condition were not statistically significant.

Table 5. Wing length (mean [mm]±S. D.) of Aedes togoi females originated from Chantaburi, Thailand, and from Nagasaki, Japan, at various temperatures

<table>
<thead>
<tr>
<th>Temp.</th>
<th>Chantaburi</th>
<th>Nagasaki</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Autogenous</td>
<td>Anautogenous</td>
</tr>
<tr>
<td>30°C</td>
<td>2.85±0.10a</td>
<td>2.82±0.17a</td>
</tr>
<tr>
<td>25°C</td>
<td>3.35±0.12</td>
<td>3.10*</td>
</tr>
<tr>
<td>21°C</td>
<td>3.98±0.09</td>
<td>—</td>
</tr>
<tr>
<td>15°C</td>
<td>4.00±0.13</td>
<td>—</td>
</tr>
</tbody>
</table>

* Only one female emerged.

a, b, c, d: Values followed by the same letter are not significantly different at the 5% level (t-test).

DISCUSSION

O’Meara and Craing (1969) stated that the autogeny in Ae. atropalpus is controlled by a single dominant, autosomal gene. Both quantity and quality of larval food also influence the expression of autogeny in some mosquito species (Kardos, 1959; Lea, 1964; O’Meara and Krasnick, 1970; Tate and Vincent, 1963). Thomas and Leng (1972) showed the high rate of autogeny in Ae. togoi originated from West Malaysia. They indicated that polygenes influenced the autogeny in this species from the crossing experiment with an anautogenous strain from Taiwan. In the present experiment with Ae. togoi originated from Thailand and Japan, it became clear that the temperature in larval and pupal stages had remarkably influence on the expression of autogeny.

Laurence (1964) and Wada and Shirasaka (1972) said that the autogeny in Ae. togoi was found in the females with long wing. In the present experiment there was a tendency that the wing of autogenous females was longer than that of anautogenous females, though the statistical difference was not recognized between them. However, Thomas and Leng (1972) did not recognized the difference in wing length between autogenous and anautogenous females.
Under the same rearing condition, the interval between egg hatching to adult emergence of Chantaburi strain is longer than that of Nagasaki strain in any conditions. This is contrary to the results obtained in the experiments to compare Thai and Japanese strain of Culex tritaeniorhynchus (Mori et al., 1984) and Ae. albopictus (Mori and Phanthumachinda, 1982). It seems that Ae. togoi of Chantaburi strain requires longer larval period to take more nutrition for developing eggs autogenously.

Most remarkable difference between these two strains of Ae. togoi is that the fourth instar larvae of Nagasaki strain enter into diapause at the condition of low temperature and short photoperiod, while the larvae of Chantaburi strain do not enter into diapause at the same condition.

From these results, it becomes clear that some biological characteristics are different between Thai and Japanese Ae. togoi, and this species seems to be a indigenous mosquito in Thailand but not to be a stowaway in recent years from the temperate zone as Japan. However, Ae. togoi both in Thailand and Japan has the susceptibility to B. malayi (Mori et al., 1985).

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REFERENCES


タイ国と日本のトウゴウヤブカの形質の違いについて
森 章夫1, 武衛昭雄2, Prakong PHAN-URAI3, 藤田誠一郎4（‘長崎大学医学部医学教室
1大阪市立大学医学部医学教室, 2タイ国医学科学院衛生昆虫部）
近年、トウゴウヤブカが東南アジアで採集されるようになったが、これは日本から運ばれたものではないかとの説もあるので、この点を明らかにするためタイ国チャンナブリと長崎で得られた
トウゴウヤブカを同一条件で飼育し、両者の形態および生理、生態の比較を行った。チシ温度条件
て長崎系の方が幼虫・蛹期間は短いか、羽化成虫は大きく、卵巣細管数も多かった。しかし、
無吸血状態では成熟卵の形成頻度はチャンナブリ系の方が高いというが、雌あたりの成熟卵数
も多かった。また長崎系では無吸血での成熟卵形成における飼育温度の影響がチャンナブリ系
のものよりも大きかった。低温区で飼育した場合において長崎系は4令幼虫で休眠に入ることが
チャンナブリ系では休眠せずに羽化している。このようにチャンナブリ系の形質は長崎系のもの
とかなり異なっているので、トウゴウヤブカは以前からタイ国に分布していると考えられる。
熱帯医学 第27巻 第4号, 283-288頁, 1985年12月