Mites and Other Filth in Dried Shrimp Imported into the United States From the Orient

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ABSTRACT

Fifty samples of dried shrimp imported into the United States from the Orient were examined for filth contamination. Twenty-one samples (42%) contained significant filth, including insect fragments, whole insects, mites, rodent hairs and feather fragments. Frequency of occurrence was tabulated for each type of filth. Mite contaminants included Lardoglyphus kanoi (Sasa and Ananuma) (Acarina:Acaridae) and house dust mites (Pyroglyphidae).

Whole small dried shrimps are gaining wide acceptance as an imported specialty food in the United States. Many dried shrimp products are imported from the Orient through ports of entry into California, where they are inspected by the U.S. Food and Drug Administration (FDA) before release for sale to the American public. FDA is responsible for intercepting imported foods which are contaminated with filth from arthropod and vertebrate pests of stored products. However, very little is known about the incidence and identity of the filth contaminants in dried shrimp. The object of this study was to determine the incidence and identity of the filth contaminants in dried shrimp entering the U.S. through California ports.

The mites (Acari) which were frequently found as contaminants of dried shrimp were primarily stored-product or other synanthropic species; their presence in food results from insanitary practices or conditions and could contribute significantly toward the regulatory actions taken by FDA against these products. Because the Agency recognizes the need for a full understanding of acarology as related to the enforcement of Federal food sanitation statutes (4), the traditional categories of mite contaminants in foods are being reevaluated with regard to their significance in human health and sanitation. It is hoped that this study will aid food sanitation control workers to detect and evaluate mite contamination of dried shrimp.

MATERIALS AND METHODS

From December 1980 through July 1981, 50 samples of small (2-5 cm) imported dried shrimps were examined for filth contamination. The samples, drawn from separate lots of product offered for entry into the U.S. at ports in California and Hawaii, consisted of dried shrimp with few or no added ingredients. Several varieties of shrimp were sampled, but because of the desiccated nature of the product, exact taxonomic identities could not be made. Collected samples were preserved at refrigeration temperature (2°C) until they were examined at an FDA laboratory in Los Angeles or San Francisco.

Each sample was separately examined by the Wildman trap flask technique (2). Since no official method of analysis for light filth in dried shrimp is available, the methodology varied between samples as did the amount of product examined per sample. The original containers were a variety of bulk and shelf-sized sealed plastic packages, which were inspected for damage or defects. Only intact packages were included in this study, and the contaminants found were assumed to be present in the products at the time of export.

RESULTS

Of the 50 samples examined, 21 (42%) were contaminated with filth. Of these samples, which were produced in 8 different geographic localities, at least one sample from each locality was contaminated. The area from which samples were received and the number of samples containing filth/number of samples collected were as follows: Hong Kong 2/15, Indonesia 2/2, Japan 1/10, Malaysia 1/1, Philippines Islands 2/2, Singapore 3/4, Taiwan 5/7 and Thailand 5/9. The contaminants included insect fragments, whole insects, mites, feather fragments and rodent hairs.

Table 1 presents the distribution of the types of filth found. Nineteen samples (38%) contained two groups of mites: the "acarid" (superfamily Acaroidea) and the house dust mites (family Pyroglyphidae). Other types of filth found were whole booklice (Psocoptera: Liposcelidae); whole dermestid larvae and dermestid fragments (family Dermestidae: Dermestes spp.); fragments and whole specimens of storage beetles other than dermestids, including flour beetles (Tenebrionidae: Tribolium spp.), grain beetles (Curculionidae: Cryptolestes spp. and Oryzaephilus sp.) and others (Trogositidae: Tenebroides sp. and Lophocateres sp.)...
FILTH IN IMPORTED DRIED SHRIMP

sp.); fly (Diptera) filth and vertebrate filth (feather fragments and rodent hairs). No filth was found in 29 of the 50 samples (58%).

Table 1 presents a frequency distribution for contaminants, of which insect fragments were the most frequently encountered. The numbers of insect fragments are based on a sample size of 3600 g of dried shrimp. Results from three samples of different sizes (1800 g, 3007 g and 3744 g) were extrapolated to fit this "standard" size. The numbers of insect fragments ranged from 0 to 576, with a mean insect fragment count of 63.3/3600 g. Most insect fragments were ants and various flying insects, such as thrips and aphids. The storage beetles, including dermestids, contributed fewer than 25 fragments to any particular sample. There is no apparent explanation for the presence of insect fragments in whole dried shrimp, except that the fragments may have originated from whole insect contaminants which were fragmented by manipulation of the product during the drying process.

The number of whole mites ranged from 0 to more than 40,000. Mites were found in 38% of the samples with a mean number of 1437/3600 g. Of these samples, 84% contained fewer than 100 mites. The most abundant mite was a dried seafood pest, Lardoglyphus konoi (Sasa and Asanuma) (Acaridae), which was found in 8 samples of dried shrimp in numbers ranging from 200 to 40,000. Suidasia pontifica Oudemans (Saproglyphidae), a cosmopolitan pest of stored foods, was found in 6 samples and ranged from 27 to 300. House dust mites of the genera Euroglyphus and Dermatophagoides (Pyroglyphidae) were found in 8 samples and ranged from 1 to 67. Other stored-product mites found were the brownlegged grain mite, Aleuroglyphus ovatus (Troupeau) (Acaridae), and the mold mite, Tyrophagus putrescentiae Schrank (Acaridae), with 10 and 4 mites, respectively, isolated from different samples. One sample from Thailand contained 68 carcasses of an intertidal or aquatic mite (probably family Halacaridae).

Table 2. Frequency distribution of contaminants in “standard” 3600-g samples of dried shrimp.

<table>
<thead>
<tr>
<th>Type of contaminant</th>
<th>No. of samples</th>
<th>% Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insect fragments</td>
<td>21</td>
<td>42</td>
</tr>
<tr>
<td>&quot;Acarid&quot; mites</td>
<td>13</td>
<td>26</td>
</tr>
<tr>
<td>House dust mites</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>Whole insects</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Fly</td>
<td>9</td>
<td>18</td>
</tr>
<tr>
<td>Vertebræ</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>No filth found</td>
<td>29</td>
<td>58</td>
</tr>
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Twenty-eight percent of the samples contained feather contaminants; feather fragments ranged from 0 to 21, with 1.5 as the mean number. Feather contamination suggests that the product was exposed to birds during harvesting or drying.

Twenty percent of the samples contained rodent hairs; rodent hair contamination ranged from 0 to 12, with 0.9 as the mean number. Since rodents do not occur in the shrimp’s natural habitat, the source of this contaminant would most likely be insanitary handling and processing practices.

The mean number of whole insects was 2.1, with a range of 0 to 24. Eleven samples (22%) contained whole insects, including booklice (Psocoptera:Liposcelididae), storage beetles, thrips, aphids, flies, rove beetles (Staphylinidae) and a spider.
DISCUSSION

Mites were the most prevalent pests of the dried shrimps examined. Although these mites are unfamiliar to many food sanitation control workers, they are generally commensal or synanthropic species, whose presence in a food product is related to insanitary manufacturing or storage practices. Hughes (3) reviews the morphology and biology of most of the species of mites found in dried shrimp. Because many of these mites are cosmopolitan and fairly distinctive in appearance, food analysts should be encouraged to anticipate their presence and to examine them closely in order to report their occurrence and significance accurately.

The most common mite pest of dried shrimp is *L. konoi*, which breeds in this and other dried seafoods. Table 3 shows the numbers of this mite found in the shrimp samples examined. Distinctive morphological characteristics separate *L. konoi* mites from others found in dried shrimp. The males are heteromorphic (Fig. 1) with the third pair of legs modified distally in two large terminal spines. Females have bifid (divided) claws on all legs; males have undivided claws on the unmodified legs. Adult size ranges from 0.4 to 0.6 mm. They are generally white to light yellow with the legs often darker.

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>Amt. examined (g)</th>
<th>No. of mites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>3600</td>
<td>40,000</td>
</tr>
<tr>
<td>Philippine Islands</td>
<td>3600</td>
<td>7,000</td>
</tr>
<tr>
<td>Philippine Islands</td>
<td>3744</td>
<td>6,000</td>
</tr>
<tr>
<td>Japan</td>
<td>3600</td>
<td>1,800</td>
</tr>
<tr>
<td>Malaysia</td>
<td>3600</td>
<td>600</td>
</tr>
<tr>
<td>Indonesia</td>
<td>1800</td>
<td>400</td>
</tr>
<tr>
<td>Singapore</td>
<td>3600</td>
<td>300</td>
</tr>
<tr>
<td>Indonesia</td>
<td>3007</td>
<td>200</td>
</tr>
</tbody>
</table>

**Table 3. Numbers of *L. konoi* mites found in imported dried shrimp samples.**

Countries with distributional records for *L. konoi* include England, Germany, India, Japan (3), Korea (1), Kenya, United States (R. Smiley, personal communication) and Taiwan (5). New records resulting from this study on dried shrimp include Indonesia, Malaysia, Philippine Islands and Singapore. *Lardoglyphus konoi* was also found in one sample of dried anchovies (20,000 in 900 g) from the Philippine Islands. An immature stage, the deutonymph, is often associated phoretically with dermestid beetle (*Dermestes* spp.) larvae, which were also found during this study but not always with *L. konoi*. Table 4 shows the association of *L. konoi* with other types of filth, some of which may represent undocumented phoretic hosts for this mite. The sanitary significance of *L. konoi* in dried shrimp is emphasized since no sample was found to contain *L. konoi* to the exclusion of other filth.

House dust mites (*Pyroglyphidae*) (Fig. 2) in dried shrimp are significant because they are a known source of human allergens and as such may be considered harmful or deleterious to the health of the consumer. They occur in habitats where static material may accumulate in and around buildings and thus may indicate insanitary conditions of manufacture or handling.

**Table 4. Distribution of filth recovered from samples infested with *L. konoi*.

<table>
<thead>
<tr>
<th>Type of filth</th>
<th>No. of samples</th>
<th>% Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>L. konoi</em></td>
<td>9</td>
<td>100%</td>
</tr>
<tr>
<td>Other &quot;acarid&quot; mites</td>
<td>5</td>
<td>56%</td>
</tr>
<tr>
<td><em>Pyroglyphidae</em></td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td><em>Liposcelidae</em>b</td>
<td>4</td>
<td>44%</td>
</tr>
<tr>
<td><em>Dermestidae</em>b</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Other beetles*c</td>
<td>5</td>
<td>56%</td>
</tr>
<tr>
<td>Fly*b</td>
<td>2</td>
<td>22%</td>
</tr>
<tr>
<td>Vertebrate*d</td>
<td>5</td>
<td>56%</td>
</tr>
</tbody>
</table>

*a*One Philippine Islands sample included dried anchovy.  
*b*Fragments and/or whole insects.  
*c*Tenebrionidae, Cucujidae, Trogositidae.  
*d*Rodent hairs and/or feather fragments.
Whatton (6) and Hughes (3) reviewed the morphology and biology of house dust mites, many of which are cosmopolitan. The genera found in dried shrimp, Dermatophagoides and Euroglyphus, are characterized by generally short body setae and profuse cuticular striations. The light brown carcasses of house dust mites often contrast with the white and pink shrimp. Adult size ranges from 0.2 to 0.4 mm. Specific identification of these mites requires a phase contrast microscope.

The possibility of contamination in the field cannot be reasonably applied to filth of terrestrial mites found in seafoods; therefore the sanitary significance of the presence of these creatures in seafoods is clear. The presence of a species of mite not found in the natural habitat of shrimp suggests insanitary handling of the product during manufacture or storage.

ACKNOWLEDGMENTS

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REFERENCES


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