

**Title**

The bagworm genome reveals a unique fibroin gene that provides high tensile strength

**Author**

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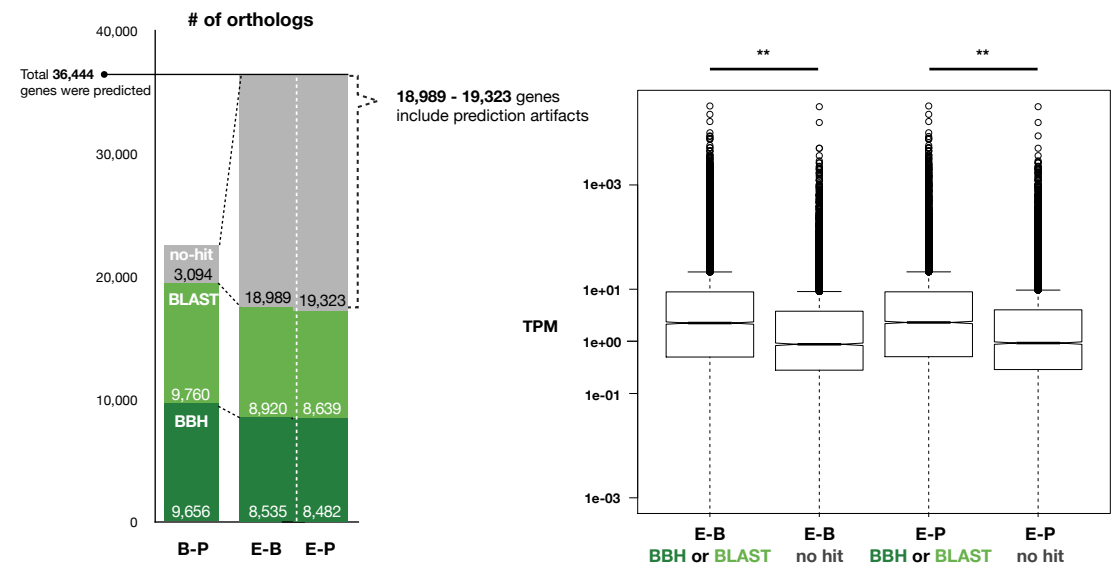
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**Supplementary Figure:**



Supplementary Fig 1: Left bar graph compares the number of homologue and orthologue genes with closely related insects (*E. variegata* vs *B. mori* : E-B, *E. variegata* vs *P. xylostella* : E-P, and *B. mori* vs *P. xylostella* : B-P). The orthologs were identified using BLAST search by 1.0e-20 threshold (BLAST) or by bidirectional best hits (BBH). The boxplot represents the TPM comparison among each gene group. Many low-expression genes are categorized in no-hit genes (\*\*: t-test p-value < 1e-05).

Supplementary Tables:

Supplementary Table 1: Summary statistics of MinION reads

| Direct-DNA               | DRR138626     |
|--------------------------|---------------|
| Read number              | 1,727,147     |
| Total read length (bp)   | 6,559,894,057 |
| Longest read length (bp) | 175,683       |
| N50 (bp)                 | 15,283        |
| N90 (bp)                 | 2,105         |

Supplementary Table 2: GenomeScope results

| (k = 21)                   |     |             |             |
|----------------------------|-----|-------------|-------------|
| Property                   | min | max         |             |
| Heterozygosity             |     | 0.92%       | 0.93%       |
| Genome Haploid Length (bp) |     | 707,234,363 | 708,715,363 |
| Genome Repeat Length (bp)  |     | 123,767,267 | 124,026,445 |
| Genome Unique Length (bp)  |     | 583,467,095 | 584,688,918 |
| Model Fit                  |     | 97.45%      | 98.90%      |
| Read Error Rate            |     | 0.91%       | 0.91%       |

Supplementary Table 3: Summary of *Eumeta variegata* samples

| Sample ID | Geographical coordinate | Japanese prefecture | Purpose                                                             |
|-----------|-------------------------|---------------------|---------------------------------------------------------------------|
| 2961      | 35.376469, 139.242032   | Kanagawa            | Total RNA for cDNA sequencing and silk for mechanical property test |
| 2964      | 35.376469, 139.242032   | Kanagawa            | Total RNA for cDNA sequencing and silk for mechanical property test |
| 2947      | 35.813278, 140.403883   | Chiba               | Genomic DNA for direct DNA sequencing                               |

Supplementary Table 4: Datasets of mechanical property

| Organism                      | Taxonomy    |             | Common name                | Ultimate          | S.D. | Extensibility | S.D. | Young's          | S.D. | Toughness            | S.D. | Ref.                  |
|-------------------------------|-------------|-------------|----------------------------|-------------------|------|---------------|------|------------------|------|----------------------|------|-----------------------|
|                               | Order       | Family      |                            | Strength<br>(MPa) | (±)  | (%)           | (±)  | modules<br>(GPa) | (±)  | (MJm <sup>-3</sup> ) | (±)  |                       |
|                               |             |             | Bagworm                    |                   |      |               |      |                  |      |                      |      |                       |
| <i>Eumeta variegata</i>       | Lepidoptera | Psychidae   | (Oominoga in Japanese)     | 636               | 55   | 19.5          | 4.5  | 5.67             | 0.66 | 70.3                 | 66.0 | this study            |
| <i>Bombyx mori</i> (Japan)    | Lepidoptera | Bombycidae  | Silkworm                   | 400               | 110  | 26.8          | 5.8  | 5.13             | 1.60 | 71.0                 | 28.0 | Malay et al.,<br>2016 |
| <i>Bombyx mori</i> (Thailand) | Lepidoptera | Bombycidae  | Silkworm                   | 550               | 11   | 23.2          | 7.9  | 6.66             | 1.06 | 91.0                 | 42.0 | Malay et al.,<br>2016 |
| <i>Bombyx mori</i> (India)    | Lepidoptera | Bombycidae  | Silkworm                   | 570               | 12   | 24.5          | 10.1 | 8.61             | 2.19 | 103.0                | 57.0 | Malay et al.,<br>2016 |
| <i>Samia ricini</i>           | Lepidoptera | Saturniidae | Eri silkworm               | 380               | 12   | 33.9          | 11.4 | 4.61             | 2.01 | 78.0                 | 38.0 | Malay et al.,<br>2016 |
| <i>Antheraea yamamai</i>      | Lepidoptera | Saturniidae | Japanese oak silkworm      | 390               | 70   | 35.6          | 13.7 | 4.58             | 0.58 | 90.0                 | 43.0 | Malay et al.,<br>2016 |
| <i>Antheraea pernyi</i>       | Lepidoptera | Saturniidae | Chinese oak tasar silkworm | 340               | 80   | 26.7          | 8.4  | 4.72             | 1.73 | 60.0                 | 20.0 | Malay et al.,<br>2016 |
| <i>Antheraea assama</i>       | Lepidoptera | Saturniidae | Muga silkworm              | 360               | 10   | 29.2          | 10.7 | 4.31             | 1.15 | 68.0                 | 31.0 | Malay et al.,<br>2016 |

Supplementary Table 5: Fibroin gene data

| Superfamily      | Family           | Species                        | Common name              | Accession no.     | References              |
|------------------|------------------|--------------------------------|--------------------------|-------------------|-------------------------|
| <b>Tineoidea</b> | <b>Psychidae</b> | <b><i>Eumeta veriegata</i></b> | <b>Bagworm</b>           | <b>this study</b> | <b>this study</b>       |
| Bombycoidea      | Bombycidae       | <i>Bombyx mori</i>             | Silkworm                 | AF226688.1        | Zhou et al., 2000       |
| Bombycoidea      | Saturniidae      | <i>Samia ricini</i>            | Eri silkworm             | AB971865.1        | -                       |
| Bombycoidea      | Saturniidae      | <i>Antheraea assama</i>        | Muga silkworm            | AIN40502.1        | Gupta et al., 2015      |
| Bombycoidea      | Saturniidae      | <i>Antheraea yamamai</i>       | Japanese oak silkworm    | AB542805.1        | -                       |
| Papilionoidea    | Papilionidae     | <i>Papilio machaon</i>         | yellow swallowtail       | KPJ18030.1        | Li et al., 2015         |
| Papilionoidea    | Papilionidae     | <i>Papilio xuthus</i>          | Asian swallowtail        | KPJ01470.1        | Li et al., 2015         |
| Pyraloidea       | Pyalidae         | <i>Ephestia kuehniella</i>     | Mediterranean flour moth | AAP79133.1        | Fedic et al., 2003      |
| Yponomeutoidea   | Yponomeutidae    | <i>Yponomeuta evonymellus</i>  | Bird cherry ermine moth  | BAE97695.1        | Yonemura & Sehnal, 2006 |