Supplementary Material

Actinobacteria isolated from *Laminaria ochroleuca*: a source of new bioactive compounds

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Table S1. Taxonomic identification of the actinobacterial isolates recovered from *Laminaria ochroleuca* and corresponding GenBank accession number.

| Isolate | Part of *L. ochroleuca* from which it was isolated | Taxonomic Identification | Closest Relative | Similarity (%) | GenBank Accession Number |
|---------|-------------------------------------------------|--------------------------|------------------|----------------|--------------------------|
| KENR1  | Holdfast                                        | Streptomyces aureus      | 99               | MK254613       |
| KENR3  | Holdfast                                        | Streptomyces olivochromogenes | 99               | MK254601       |
| KENR4  | Holdfast                                        | Streptomyces olivochromogenes | 99               | MK254600       |
| KENR5  | Holdfast                                        | Streptomyces flavofuscus | 99               | MK254572       |
| KENR6  | Holdfast                                        | Streptomyces sampsonii   | 99               | MK254568       |
| KENR7  | Holdfast                                        | Streptomyces gougerotii  | 100              | MK254563       |
| KENR8  | Holdfast                                        | Streptomyces atratus     | 99               | MK254615       |
| KENR10 | Holdfast                                        | Streptomyces diastaticus | 99               | MK254610       |
| KENR11 | Holdfast                                        | Streptomyces diastaticus | 100              | MK254609       |
| KENR11A| Holdfast                                        | Streptomyces champavatii | 99               | MK254597       |
| KENR13 | Holdfast                                        | Streptomyces coelicolor | 100              | MK254596       |
| KENR13A| Holdfast                                        | Streptomyces champavatii | 99               | MK254595       |
| KENR13B| Holdfast                                        | Streptomyces exfoliates  | 99               | MK254594       |
| KENR13C| Holdfast                                        | Streptomyces diastaticus | 99               | MK254605       |
| KENR14 | Holdfast                                        | Streptomyces xiamenensis | 98               | MK254606       |
| KENR16A| Holdfast                                        | Streptomyces thermodiastaticus | 99       | MK254552       |
| KENR16B| Holdfast                                        | Streptomyces champavatii | 99               | MK254593       |
| KENR17A| Holdfast                                        | Streptomyces sampsonii   | 99               | MK254592       |
| KENR17B| Holdfast                                        | Streptomyces champavatii | 99               | MK254591       |
| KENR18 | Holdfast                                        | Streptomyces globisporus | 98               | MK254590       |
| KENR19 | Holdfast                                        | Streptomyces champavatii | 99               | MK254589       |
| KENR21 | Holdfast                                        | Streptomyces sampsonii   | 99               | MK254588       |
| KENR21A| Holdfast                                        | Streptomyces exfoliates  | 100              | MK254587       |
| KENR23A| Holdfast                                        | Streptomyces exfoliates  | 100              | MK254586       |
| KENR23B| Holdfast                                        | Streptomyces achromogenes | 99               | MK254620       |
| KENR23C| Holdfast                                        | Streptomyces champavatii | 100              | MK254585       |
| KENR23D| Holdfast                                        | Streptomyces coelicolor  | 99               | MK254584       |
| KENR24 | Holdfast                                        | Streptomyces champavatii | 99               | MK254583       |
| KENR25 | Holdfast                                        | Streptomyces sampsonii   | 99               | MK254582       |
| KENR26 | Holdfast                                        | Streptomyces cyaneofuscatus | 99             | MK254581       |
| KENR27 | Holdfast                                        | Streptomyces gougerotii  | 100              | MK254580       |
| KENR28 | Holdfast                                        | Streptomyces atratus     | 99               | MK254617       |
| KENR29 | Holdfast                                        | Nonomuraea coxensis     | 99               | MK254624       |
| KENR30 | Holdfast                                        | Nocardiosis prasina      | 99               | MK254627       |
| KENR31 | Holdfast                                        | Streptomyces camponoticapitus | 99       | MK254579       |
| KENR32 | Holdfast                                        | Streptomyces achromogenes | 99               | MK254619       |
| KENR33 | Holdfast                                        | Streptomyces fannensis   | 99               | MK254604       |
| KENR34 | Holdfast                                        | Streptomyces champavati  | 99               | MK254578       |
| KENR35 | Holdfast                                        | Streptomyces sampsonii   | 99               | MK254577       |
| KENR36 | Holdfast                                        | Streptomyces champavati  | 99               | MK254576       |
| KENR38 | Holdfast                                        | Streptomyces flavoeul    | 99               | MK254607       |
| KENR39 | Holdfast                                        | Rhodococcus erythropolis | 99               | MK254623       |
| KENR40 | Holdfast                                        | Streptomyces champavati  | 99               | MK254575       |
| KENR41 | Holdfast                                        | Streptomyces tendae      | 99               | MK254553       |
| KENR42 | Holdfast                                        | Streptomyces mirabilis   | 99               | MK254603       |
| KENR45A| Holdfast                                        | Streptomyces hebeiensis  | 98               | MK254574       |
| KENR47 | Holdfast                                        | Streptomyces coelicolor  | 100              | MK254573       |
| KENR49 | Holdfast                                        | Streptomyces atratus     | 99               | MK254616       |
| KENR50 | Holdfast                                        | Streptomyces sangliera   | 99               | MK254599       |
| KENR51 | Holdfast                                        | Streptomyces sangliera   | 99               | MK254598       |
| KENR52 | Holdfast                                        | Streptomyces mirabilis   | 99               | MK254602       |
| KENR55 | Holdfast                                        | Streptomyces albospinus  | 99               | MK254571       |
| KENR56 | Holdfast                                        | Streptomyces sampsonii   | 99               | MK254570       |
| KENR59 | Holdfast                                        | Streptomyces olivaceus   | 99               | MK254569       |
| KENR60 | Holdfast                                        | Streptomyces coelicolor  | 100              | MK254567       |
| KENR64 | Holdfast | Streptomyces olivaceus | 99  | MK254566 |
|--------|----------|------------------------|-----|----------|
| KENR65 | Holdfast | Streptomyces pratensis  | 99  | MK254565 |
| KENR69 | Holdfast | Streptomyces sampsonii  | 99  | MK254564 |
| KENR70 | Holdfast | Nocardiopsis prasina    | 99  | MK254626 |
| KENR71 | Holdfast | Streptomyces brevispora | 99  | MK254611 |
| KENR72 | Holdfast | Streptomyces aureus     | 99  | MK254612 |
| KENR74 | Holdfast | Streptomyces coelicolor | 99  | MK254562 |
| KENR75 | Holdfast | Streptomyces tendae     | 99  | MK254561 |
| KENR76 | Holdfast | Rhodococcus erythropolis| 99  | MK254622 |
| KENR77 | Holdfast | Streptomyces champavati | 99  | MK254560 |
| KENR78 | Holdfast | Rhodococcus erythropolis| 99  | MK254621 |
| KENR79 | Holdfast | Streptomyces coelicolor | 99  | MK254559 |
| KENR80 | Holdfast | Streptomyces coelicolor | 99  | MK254558 |
| KENR81 | Holdfast | Streptomyces champavati | 99  | MK254557 |
| KENR82 | Holdfast | Isoptericola chiayensis | 98  | MK254634 |
| KENR84 | Holdfast | Isoptericola chiayensis | 99  | MK254633 |
| KENR85 | Holdfast | Streptomyces diastaticus| 100 | MK254608 |
| KENR86 | Holdfast | Streptomyces coelicolor | 99  | MK254556 |
| KENR87 | Holdfast | Streptomyces xiamenensis| 99  | MK254551 |
| KENR89 | Holdfast | Streptomyces atratus    | 99  | MK254614 |
| KENR90 | Holdfast | Nocardiopsis prasina    | 98  | MK254625 |
| KENR91 | Holdfast | Streptomyces sampsonii  | 100 | MK254555 |
| KENR92 | Holdfast | Streptomyces fulissimus  | 99  | MK254554 |
| KENR93 | Holdfast | Microbacterium testaceum| 99  | MK254630 |
| KENR94 | Holdfast | Streptomyces champavati | 99  | MK254547 |
| KENS1  | Stipe    | Microbacterium testaceum| 98  | MK254629 |
| KENS2  | Stipe    | Microbispora bryophytorum| 100 | MK254628 |
| KENB1  | Blade    | Streptomyces atratus    | 99  | MK254618 |
| KENB3  | Blade    | Streptomyces shenzhenensis| 100| MK254550 |
| KENB5  | Blade    | Streptomyces atratus    | 99  | MK254549 |
| KENB6  | Blade    | Streptomyces sampsonii  | 99  | MK254548 |
| KENB7  | Blade    | Microbacterium testaceum| 98  | MK254631 |
| KENB8  | Blade    | Streptomyces champavati | 99  | MK254546 |
| KENB9  | Blade    | Streptomyces coelicolor | 99  | MK254545 |
| KENB10 | Blade    | Streptomyces sampsonii  | 99  | MK254632 |

*According to 16S ribosomal RNA (Bacteria and Archaea) database from NCBI BLAST.*
Table S2. GNPS dereplication results for the 35 actinobacterial crude extracts selected, indicating the compounds recorded for each one and the correspondent cosine score, which indicates the similarity of two MS/MS spectra from 0 (totally dissimilar) to 1 (completely identical).

| Strain   | Taxonomic Identification     | Compound              | Cosine | m/z error (ppm) | Lib m/z |
|----------|------------------------------|-----------------------|--------|----------------|---------|
| KENR6    | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.92   | 17             | 521.26  |
| KENR8    | *Streptomyces* atratus       | Antimycin A$_2$       | 0.91   | 12             | 535.27  |
| KENR11A  | *Streptomyces* sp.           | Antimycin A$_2$       | 0.93   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.91   | 17             | 521.26  |
| KENR13   | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.92   | 18             | 521.26  |
| KENR13A  | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 11             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.92   | 18             | 521.26  |
| KENR13B  | *Streptomyces* sp.           | Antimycin A$_2$       | 0.91   | 13             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.91   | 18             | 521.26  |
| KENR14   | *Streptomyces iamenensis*    | Antimycin A$_2$       | 0.91   | 12             | 535.27  |
| KENR17A  | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 13             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.91   | 17             | 521.26  |
| KENR18   | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.92   | 18             | 521.26  |
| KENR21A  | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.92   | 18             | 521.26  |
| KENR25   | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 13             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.91   | 18             | 521.26  |
| KENR29   | *Streptomyces* sp.           | Antimycin A$_2$       | 0.91   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.90   | 18             | 521.26  |
| KENR31   | *Streptomyces* sp.           | No match              | -      | -              |         |
| KENR33   | *Streptomyces lannensis*     | Antimycin A$_2$       | 0.92   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.92   | 18             | 521.26  |
| KENR35   | *Streptomyces* sp.           | Antimycin A$_3$       | 0.93   | 17             | 521.26  |
|          |                              | Antimycin A$_2$       | 0.92   | 11             | 535.27  |
| KENR49   | *Streptomyces atratus*       | Antimycin A$_2$       | 0.91   | 13             | 535.27  |
| KENR59   | *Streptomyces* sp.           | No match              | -      | -              | -       |
| KENR60   | *Streptomyces* sp.           | No match              | -      | -              | -       |
| KENR64   | *Streptomyces* sp.           | No match              | -      | -              | -       |
| KENR65   | *Streptomyces* sp.           | No match              | -      | -              | -       |
| KENR72   | *Streptomyces aureus*        | Antimycin A$_2$       | 0.92   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.90   | 18             | 521.26  |
| KENR74   | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 11             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.92   | 17             | 521.26  |
| KENR77   | *Streptomyces* sp.           | Antimycin A$_3$       | 0.92   | 11             | 521.26  |
|          |                              | Antimycin A$_2$       | 0.90   | 17             | 535.27  |
| KENR80   | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.91   | 17             | 521.26  |
| KENR81   | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 13             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.91   | 17             | 521.26  |
| KENR84   | *Isoptericola* sp.           | Antimycin A$_2$       | 0.92   | 13             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.91   | 17             | 521.26  |
| KENR85   | *Streptomyces* sp.           | No match              | -      | -              | -       |
| KENR86   | *Streptomyces* sp.           | No match              | -      | -              | -       |
| KENR91   | *Streptomyces* sp.           | No match              | -      | -              | -       |
| KENR94   | *Streptomyces* sp.           | Antimycin A$_3$       | 0.88   | 18             | 521.26  |
| KENS2    | *Microbispora bryophytorum*  | Antimycin A$_2$       | 0.90   | 12             | 535.27  |
| KENB1    | *Streptomyces* atratus       | No match              | -      | -              | -       |
| KENB3    | *Streptomyces* sp.           | Antimycin A$_2$       | 0.92   | 12             | 535.27  |
|          |                              | Antimycin A$_3$       | 0.92   | 18             | 521.26  |
| KENB9    | *Streptomyces* sp.           | Antimycin A$_2$       | 0.91   | 12             | 535.27  |
| KENB10   | *Streptomyces* sp.           | Antimycin A$_2$       | 0.88   | 17             | 535.27  |
Table S3. Dictionary of Natural Products dereplication results for the clusters selected for strains KENR85 and KENR91.

| Strain | Compound       | Molecular Formula | m/z Error ppm | Biological Activity | Biological Source                  |
|--------|----------------|-------------------|---------------|---------------------|------------------------------------|
| KENR85 | WS 5995B       | C_{19}H_{14}O_{6} | 0.9           | Antifungal          | Streptomyces auranticolor P5365    |
|        | Fluostatin A   | C_{19}H_{14}O_{6} | 0.9           | Antimicrobial       | Micromonospora rosaria N160        |
|        | Landomycin A   | C_{19}H_{14}O_{6} | 0.9           | Antibiotic          | Streptomyces cyanogenus S-136      |
|        | Tetragomycin   | C_{19}H_{14}O_{6} | 0.9           | Antimicrobial       | Streptomyces olivaceus             |
|        | Thiazostatin A | C_{19}H_{18}N_{2}S_{2} | 8.3       | Antioxidant         | Streptomyces matensis              |
|        | Thiazostatin A | C_{19}H_{18}N_{2}S_{2} | 8.3       | Antioxidant         | Streptomyces toluosus              |
| KENR86 | JBIR 107       | C_{24}H_{28}N_{2}O_{5} | 9.6           | Antibiotic          | Streptomyces tateyamensis NBRC 105047 |
|        | Streptophenazine A | C_{24}H_{28}N_{2}O_{5} | 9.6         | Antibacterial       | Streptomyces sp. HB202             |
|        | Streptophenazine B | C_{24}H_{28}N_{2}O_{5} | 9.6         | Antibacterial       | Streptomyces sp. HB202             |
|        | Streptophenazine G | C_{24}H_{28}N_{2}O_{5} | 9.6         | Antibacterial       | Streptomyces sp. HB202             |
Figure S1. Antimicrobial activity of actinobacterial strains isolated from *L. ochroleuca*. (A-E) Examples of inhibition halos against *C. albicans* and (F-G) against *S. aureus*. (A) Strain KENR13A, (B) strain KENR25, (C) strain KENR6, (D) strain KENR16B, (E) strain KENR21, (F) strain KENR64 and (G) strain KENR60.
Figure S2. GNPS molecular networking using MS/MS data from extracts KENR31, KENR59, KENR60, KENR64, KENR65, KENR85, KENR86, KENR91 and KENB1. The value indicated in each node corresponds to the precursor ion.