

Table S1. Characteristics of the marine samples used for isolation of Actinobacteria in this study.

Sample	Sampling site	Zone		Depth	Coordinates
C1	Chañaral de Aceituno	South side of The Window	Marine sediment	31.5	29°2'32.27"S 71°34'28.69"W
C2		The nameless		34.1	29°1'10.98"S 71°34'23.43"W
C3	Island	Walls of Neptune	Marine sponge	(31.5)	29°2'54.42"S 71°34'28.69"W
C4		The Canon		(34.1)	29°1'23.02"S 71°33'57.85"W
V1	Valparaíso	Carvallo Beach	Marine sediment	0	33°1'8.69"S; 71°38'32.38"W
V2				0	33°1'8.69"S 71°38'32.38"W
V3					Undetermined
V4					Undetermined
V5		Portales Beach	Marine sediment	0	33°2'0.47"S 71°35'42.36"W
V6				0	33°2'0.47"S 71°35'42.36"W
V7		Punta Ángeles	Marine sediment	28.4	33°1'12,21"S 71°38'56,41"W
V8		Lighthouse		19.2	33°1'12,21"S 71°38'56,41"W
V9				10.0	33°1'12,21"S 71°38'56,41"W
V10		Torpederas Beach	Marine sediment	29.4	33°1'11.05"S 71°38'43.25"W
V11				19.1	33°1'11.05"S 71°38'43.25"W
V12				6.7	33°1'11.05"S 71°38'43.25"W
I1	Easter Island	Motu Nui Islet	Marine sediment	35	27°12'01.07"S 109°27'12.30"W
I2			Marine sponge	23	27°12'01.07"S 109°27'12.30"W
I3				23	27°12'01.07"S 109°27'12.30"W
I4		Ovahe Beach	Marine sediment	0	27°04'26.01"S 109°19'51.01"W
I5		Terevaka	Marine sediment	22	27°5'13.55"S; 109°24'59.58"W
I6			Marine sponge	22	27°5'13.55"S; 109°24'59.58"W
I7				2	27°5'13.55"S; 109°24'59.58"W
I8				32	27°5'13.55"S; 109°24'59.58"W
E1	Chiloé Island	Quellón	Sea Urchin		Undetermined
H1	Huinay	Lilihuapi Island	Marine sediments	11.3	42°20'634"S; 72°27'429"W
H2		Tambor Waterfall	Marine sediments	6.1	42°24'161"S; 72°25'235"W
H3		Punta Llonco	Marine sediments	25.1	42°22' 32"S; 72°25' 4'W
H4		Lloncochaigua River mouth	Marine sediments	0.25	42°22' 37"S; 72°27'25'W
G1	Penas Gulf		Marine sediment	70	47°53'19,26"S; 74°33'0' W
G2			Marine sediment	850	47°59'41"S; 73°46'39'W'

Appendix B

References

- [1] WHO, "Antimicrobial Resistance," 2014.
- [2] O. Genilloud, "The re-emerging role of microbial natural products in antibiotic discovery," *Antonie van Leeuwenhoek, Int. J. Gen. Mol. Microbiol.*, vol. 106, no. 1, pp. 173–188, 2014.
- [3] D. J. Newman and G. M. Cragg, "Natural Products as Sources of New Drugs from 1981 to 2014," *J. Nat. Prod.*, vol. 79, no. 3, pp. 629–661, 2016.
- [4] I. Joint, M. Mühling, and J. Querellou, "Culturing marine bacteria - An essential prerequisite for biodiscovery: Minireview," *Microb. Biotechnol.*, vol. 3, no. 5, pp. 564–575, 2010.
- [5] P. G. Williams, "Panning for chemical gold: marine bacteria as a source of new therapeutics," *Trends Biotechnol.*, vol. 27, no. 1, pp. 45–52, 2009.
- [6] T. J. Mincer, P. R. Jensen, C. a Kauffman, and W. Fenical, "Widespread and Persistent Populations of a Major New Marine Actinomycete Taxon in Ocean Sediments Widespread and Persistent Populations of a Major New Marine Actinomycete Taxon in Ocean Sediments," *Society*, vol. 68, no. 10, pp. 5005–5011, 2002.
- [7] A. Prieto, L. Villarreal, S. Forschner, A. Bull, J. Stach, D. Smith, D. Rowley, and P. Jensen, "Targeted search for actinomycetes from near-shore and deep sea marine sediments," *FEMS*, vol. 84, no. 3, pp. 510–518, 2014.
- [8] M. Goodfellow and H. P. Fiedler, "A guide to successful bioprospecting: Informed by actinobacterial systematics," *Antonie van Leeuwenhoek, Int. J. Gen. Mol. Microbiol.*, vol. 98, no. 2, pp. 119–142, 2010.
- [9] A. T. Bull, J. E. . Stach, A. C. Ward, and M. Goodfellow, "Marine actinobacteria: perspectives, challenges, future directions," *Antonie Van Leeuwenhoek*, vol. 87, no. 1, pp. 65–79, 2005.
- [10] D. S. Dalisay, D. E. Williams, X. L. Wang, R. Centko, J. Chen, and J. Raymond, "Marine Sediment-Derived Streptomyces Bacteria from British Columbia , Canada Are a Promising Microbiota Resource for the Discovery of Antimicrobial Natural Products," *PLoS One*, vol. 8, no. 10, pp. 1–14, 2013.
- [11] M. Donia and M. T. Hamann, "Marine natural products and their potential applications as anti-infective agents," *Lancet Infect. Dis.*, vol. 3, no. 6, pp. 338–348, 2003.
- [12] K. Duncan, B. Haltli, K. a. Gill, and R. G. Kerr, "Bioprospecting from marine sediments of New Brunswick, Canada: Exploring the relationship between total bacterial diversity and actinobacteria diversity," *Mar. Drugs*, vol. 12, no. 2, pp. 899–925, 2014.

- [13] A. Penesyan, S. Kjelleberg, and S. Egan, "Development of novel drugs from marine surface associated microorganisms," *Mar. Drugs*, vol. 8, no. 3, pp. 438–459, 2010.
- [14] J. Vicente, A. Stewart, B. Song, R. T. Hill, and J. L. Wright, "Biodiversity of Actinomycetes Associated with Caribbean Sponges and Their Potential for Natural Product Discovery," *Mar. Biotechnol.*, vol. 15, no. 4, pp. 413–424, 2013.
- [15] A. P. Graça, J. Bondoso, H. Gaspar, J. R. Xavier, M. C. Monteiro, M. De La Cruz, D. Oves-Costales, F. Vicente, and O. M. Lage, "Antimicrobial activity of heterotrophic bacterial communities from the marine sponge *Erylus discophorus* (Astrophorida, Geodiidae)," *PLoS One*, vol. 8, no. 11, 2013.
- [16] N. F. Montalvo, N. M. Mohamed, J. J. Enticknap, and R. T. Hill, "Novel actinobacteria from marine sponges," *Antonie van Leeuwenhoek, Int. J. Gen. Mol. Microbiol.*, vol. 87, no. 1, pp. 29–36, 2005.
- [17] T. R. a Thomas, D. P. Kavlekar, and P. a. LokaBharathi, "Marine drugs from sponge-microbe association - A review," *Mar. Drugs*, vol. 8, no. 4, pp. 1417–1468, 2010.
- [18] S. T. Khan, J. Musarrat, A. a. Alkhedhairy, and S. Kazuo, "Diversity of bacteria and polyketide synthase associated with marine sponge *Haliclona* sp.," *Ann. Microbiol.*, vol. 64, no. 1, pp. 199–207, 2014.
- [19] J. W. Blunt, B. R. Copp, M. H. G. Munro, P. T. Northcote, and M. R. Prinsep, "Marine natural products.," *Nat. Prod. Rep.*, vol. 27, no. 2, pp. 165–237, 2016.
- [20] J. W. Blunt, B. R. Copp, M. H. G. Munro, P. T. Northcote, and M. R. Prinsep, "Marine natural products.," *Nat. Prod. Rep.*, vol. 22, no. 1, pp. 15–61, 2015.
- [21] A. P. Graça, F. Viana, J. Bondoso, M. I. Correia, L. Gomes, M. Humanes, A. Reis, J. R. Xavier, H. Gaspar, and O. M. Lage, "The antimicrobial activity of heterotrophic bacteria isolated from the marine sponge *Erylus deficiens* (Astrophorida, Geodiidae)," *Front. Microbiol.*, vol. 6, no. May, 2015.
- [22] J. Selvin, S. Joseph, K. R. T. Asha, W. a. Manjusha, V. S. Sangeetha, D. M. Jayaseema, M. C. Antony, and a. J. Denslin Vinitha, "Antibacterial potential of antagonistic *Streptomyces* sp. isolated from marine sponge *Dendrilla nigra*," *FEMS Microbiol. Ecol.*, vol. 50, no. 2, pp. 117–122, 2004.
- [23] N. L. Thakur and W. E. G. Muller, "Biotechnological potential of marine sponges," *Curr. Sci.*, vol. 86, no. 11, pp. 1506–1512, 2004.
- [24] A. Undabarrena, F. Beltrametti, F. P. Claverias, M. Gonzalez, E. R. B. Moore, M. Seeger, and B. Camara, "Exploring the diversity and antimicrobial potential of marine actinobacteria from the comau fjord in Northern Patagonia, Chile," *Front. Microbiol.*, vol. 7, no. JUL, pp. 1–16, 2016.

- [25] F. P. Claverías, A. Undabarrena, M. González, M. Seeger, and B. Cámara, "Culturable diversity and antimicrobial activity of Actinobacteria from marine sediments in Valparaíso bay, Chile," *Front. Microbiol.*, vol. 6, no. JUL, pp. 1–11, 2015.
- [26] A. Undabarrena, J. A. Ugalde, M. Seeger, and B. Cámara, "-Genomic data mining of the marine actinobacteria *Streptomyces* sp. H-KF8 unveils insights into multi-stress related genes and metabolic pathways involved in antimicrobial synthesis," *PeerJ*, vol. 5, p. e2912, 2017.
- [27] A. Undabarrena, J. a. Ugalde, E. Castro-Nallar, M. Seeger, and B. Cámara, "Genome Sequence of *Streptomyces* sp. H-KF8, a Marine Actinobacterium isolated from a Northern Chilean Patagonian Fjord," *Genome Announc. Am. Soc. Microbiol.*, vol. 5, no. 6, pp. 8–9, 2017.
- [28] T. Gregersen, "Rapid Method for Distinction of Gram-Negative from Gram-Positive Bacteria," *Eur. J. Appl. Microbiol. Biotechnol.*, vol. 5, no. 9, pp. 123–127, 1978.
- [29] J. E. M. Stach, L. a. Maldonado, A. C. Ward, M. Goodfellow, and A. T. Bull, "New primers for the class Actinobacteria: Application to marine and terrestrial environments," *Environ. Microbiol.*, vol. 5, no. 10, pp. 828–841, 2003.
- [30] E. Moore, A. Arnscheidt, A. Krüger, C. Strömpl, and M. Mau, "Simplified protocols for the preparation of genomic DNA from bacterial cultures," *Mol. Microb. Ecol. Man.*, pp. 3–18, 2004.
- [31] D. Lane, *Nucleic Acid Techniques in bacterial systematics*. 1991.
- [32] M. Haber and M. Ilan, "Diversity and antibacterial activity of bacteria cultured from Mediterranean Axinella spp. sponges," *J. Appl. Microbiol.*, vol. 116, no. 3, pp. 519–532, 2013.
- [33] K. Gagnon, C. D. Chadwell, and E. Norabuena, "Measuring the onset of locking in the Peru-Chile trench with GPS and acoustic measurements," *Nature*, vol. 434, no. 7030, pp. 205–208, 2005.
- [34] R. H. Baltz, "Marcel Faber Roundtable: Is our antibiotic pipeline unproductive because of starvation, constipation or lack of inspiration?," *J. Ind. Microbiol. Biotechnol.*, vol. 33, no. 7, pp. 507–513, 2006.
- [35] a. Lazzarini, L. Cavaletti, G. Toppo, and F. Marinelli, "Rare genera of actinomycetes as potential producers of new antibiotics," *Antonie van Leeuwenhoek, Int. J. Gen. Mol. Microbiol.*, vol. 78, no. 3–4, pp. 399–405, 2000.
- [36] P. A. Jose and S. R. D. Jebakumar, "The evolving role of natural products in drug discovery," *Nat. Rev. Drug Discov.*, vol. 4, no. 3, pp. 206–220, 2013.
- [37] W. Fenical, "Chemical studies of marine bacteria: developing a new resource," *Chem. Rev.*, vol. 93, no. 5, pp. 1673–1683, 1993.
- [38] W. Fenical and P. R. Jensen, "Developing a new resource for drug discovery: marine actinomycete bacteria," *Nat. Chem. Biol.*, vol. 2, no. 12, pp. 666–673, 2006.

- [39] N. a Magarvey, J. M. Keller, V. Bernan, M. Dworkin, D. H. Sherman, N. a Magarvey, J. M. Keller, V. Bernan, M. Dworkin, and D. H. Sherman, "Isolation and Characterization of Novel Marine-Derived Actinomycete Taxa Rich in Bioactive Metabolites Isolation and Characterization of Novel Marine-Derived Actinomycete Taxa Rich in Bioactive Metabolites †," *Appl. Environ. Microbiol.*, vol. 70, no. 12, pp. 7520–7529, 2004.
- [40] P. R. Jensen, T. J. Mincer, P. G. Williams, and W. Fenical, "Marine actinomycete diversity and natural product discovery," *Antonie van Leeuwenhoek, Int. J. Gen. Mol. Microbiol.*, vol. 87, no. 1, pp. 43–48, 2005.
- [41] H. Bredholdt, O. a. Galatenko, K. Engelhardt, E. Fjærvik, L. P. Terekhova, and S. B. Zotchev, "Rare actinomycete bacteria from the shallow water sediments of the Trondheim fjord, Norway: Isolation, diversity and biological activity," *Environ. Microbiol.*, vol. 9, no. 11, pp. 2756–2764, 2007.
- [42] E. A. Gontang, W. Fenical, and P. R. Jensen, "Phylogenetic diversity of gram-positive bacteria cultured from marine sediments," *Appl. Environ. Microbiol.*, vol. 73, no. 10, pp. 3272–3282, 2007.
- [43] J. León, L. Liza, and I. Soto, "Actinomycetes bioactivos de sedimento marino de la costa central del Perú," *Rev. Peru Biol.*, vol. 14, no. 2, pp. 259–270, 2007.
- [44] L. A. Maldonado, J. E. M. Stach, A. C. Ward, A. T. Bull, and M. Goodfellow, "Characterisation of micromonosporae from aquatic environments using molecular taxonomic methods," *Antonie van Leeuwenhoek, Int. J. Gen. Mol. Microbiol.*, vol. 94, no. 2, pp. 289–298, 2008.
- [45] M. Yuan, Y. Yu, H. R. Li, N. Dong, and X. H. Zhang, "Phylogenetic diversity and biological activity of actinobacteria isolated from the chukchi shelf marine sediments in the arctic ocean," *Mar. Drugs*, vol. 12, no. 3, pp. 1281–1297, 2014.
- [46] G. Wang, "Diversity and biotechnological potential of the sponge-associated microbial consortia," *J. Ind. Microbiol. Biotechnol.*, vol. 33, no. 7, pp. 545–551, 2006.
- [47] U. Hentschel, M. Schmid, M. Wagner, L. Fieseler, C. Gernert, and J. Hacker, "Isolation and phylogenetic analysis of bacteria with antimicrobial activities from the Mediterranean sponges *Aplysina aerophoba* and *Aplysina cavernicola*," *FEMS Microbiol. Ecol.*, vol. 35, no. 3, pp. 305–312, 2001.
- [48] U. R. Abdelmohsen, S. M. Pimentel-Elardo, A. Hanora, M. Radwan, S. H. Abou-El-Ela, S. Ahmed, and U. Hentschel, "Isolation, phylogenetic analysis and anti-infective activity screening of marine sponge-associated actinomycetes," *Mar. Drugs*, vol. 8, no. 3, pp. 399–412, 2010.
- [49] T. K. Kim, M. J. Garson, and J. a Fuerst, "Marine actinomycetes related to the '*Salinospora*' group from the Great Barrier Reef sponge *Pseudoceratina clavata*," *Environ. Microbiol.*, vol. 7, p. , 2005.

- [50] Z. Y. Li and Y. Liu, "Marine sponge *Craniella austrialiensis*-associated bacterial diversity revelation based on 16S rDNA library and biologically active Actinomycetes screening, phylogenetic analysis," *Lett. Appl. Microbiol.*, vol. 43, no. 4, pp. 410–416, 2006.
- [51] S. Jiang, W. Sun, M. Chen, S. Dai, L. Zhang, Y. Liu, K. J. Lee, and X. Li, "Diversity of culturable actinobacteria isolated from marine sponge *Haliclona* sp," *Antonie van Leeuwenhoek, Int. J. Gen. Mol. Microbiol.*, vol. 92, no. 4, pp. 405–416, 2007.
- [52] H. Zhang, Y. K. Lee, W. Zhang, and H. K. Lee, "Culturable actinobacteria from the marine sponge *Hymeniacidon perleve*: Isolation and phylogenetic diversity by 16S rRNA gene-RFLP analysis," *Antonie van Leeuwenhoek, Int. J. Gen. Mol. Microbiol.*, vol. 90, no. 2, pp. 159–169, 2006.
- [53] E. Z. O. Radjasa, A. Sabdono, J. Zocchi, "Richness of secondary metabolites-producing from marine bacteria associated with sponges.pdf," *Int. J. Pharmacol.*, vol. 3, no. 3, pp. 275–279, 2007.
- [54] U. R. Abdelmohsen, C. Yang, H. Horn, D. Hajjar, T. Ravasi, and U. Hentschel, "Actinomycetes from red sea sponges: Sources for chemical and phylogenetic diversity," *Mar. Drugs*, vol. 12, no. 5, pp. 2771–2789, 2014.
- [55] I. Schneemann, K. Nagel, I. Kajahn, A. Labes, J. Wiese, and J. F. Imhoff, "Comprehensive investigation of marine actinobacteria associated with the sponge *halichondria panicea*," *Appl. Environ. Microbiol.*, vol. 76, no. 11, pp. 3702–3714, 2010.
- [56] R. M. Matobole, L. J. Van Zyl, S. Parker-nance, M. T. Davies-coleman, and M. Trindade, "Antibacterial Activities of Bacteria Isolated from the Marine Sponges *Isodictya compressa* and *Higginsia bidentifera* Collected from Algoa Bay, South Africa," pp. 8–10, 2017.
- [57] M. G. Watve, R. Tickoo, M. M. Jog, and B. D. Bhole, "How many antibiotics are produced by the genus *Streptomyces*?" *Arch. Microbiol.*, vol. 176, no. 5, pp. 386–390, 2001.
- [58] R. E. de L. Procópio, I. R. da Silva, M. K. Martins, J. L. de Azevedo, and J. M. de Araújo, "Antibiotics produced by *Streptomyces*," *Brazilian J. Infect. Dis.*, vol. 16, no. 5, pp. 466–471, 2012.
- [59] J. Bérdy, "Thoughts and facts about antibiotics: Where we are now and where we are heading," *J. Antibiot. (Tokyo)*, vol. 65, no. 8, pp. 441–441, 2012.