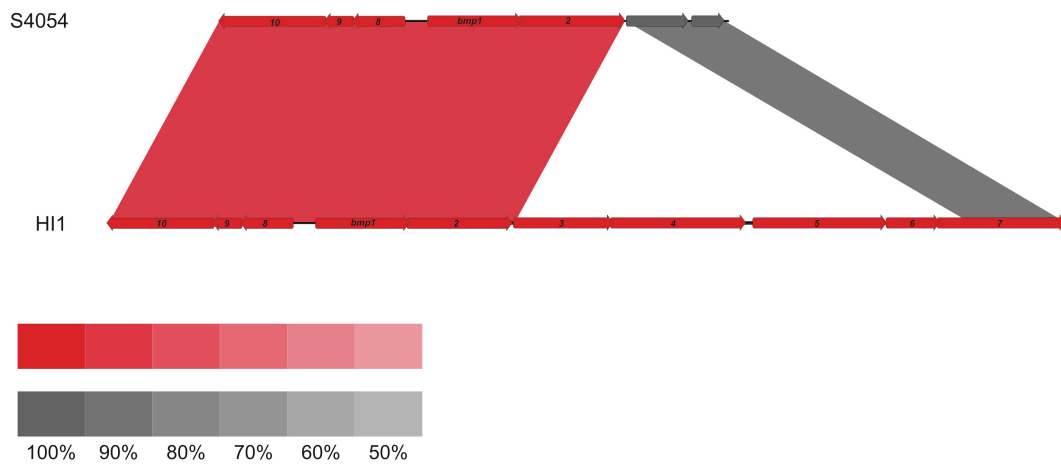


**Figure S1. Detection of pentabromopseudilin by LCMS.** Strains isolated as part of this study were screened for pentabromopseudilin production. (A) Extracted ion chromatograms for the mass of pentabromopseudilin (553.67 g/mol) from a strain with version A of the BGC (CNY-791, top) and one that lacks the BGC (CNY-943, middle). Pentabromopseudilin standard (bottom). All strains containing *bmp* version A produced pentabromopseudilin with an absolute intensity of at least  $1.4 \times 10^6$  (B) Isotopic pattern of a pentabromopseudilin standard and the compound detected from strain CNY-791 (C).



**Figure S2. Evidence for partial loss of the *bmp* cluster.** A region immediately downstream of *bmp2* in strain S4054 (version E) has high sequence identity to a portion of *bmp7* in strain HI1 (version A), supporting gene loss in S4054.

**Table S1. Source of *Pseudoalteromonas* strains isolated as part of this study.**

Strain ID	Sample Location	Sample Type
CNY-791	Santa Catalina Island, California	Green alga
CNY-846	La Jolla, California	Plankton tow
CNY-848	La Jolla, California	Seawater
CNY-849	La Jolla, California	Seawater
CNY-905	Santa Catalina Island, California	Red alga
CNY-942	La Jolla, California	Plankton tow
CNY-943	La Jolla, California	Plankton tow
CNY-992	Coral Coast, Fiji	Green alga
CNY-993	Coral Coast, Fiji	Red alga
CNY-996	Coral Coast, Fiji	Brown alga
CNY-997	Coral Coast, Fiji	Red alga
CNZ-001	Coral Coast, Fiji	Green alga
CNZ-002	Coral Coast, Fiji	Green alga
CNZ-004	Coral Coast, Fiji	Red alga
CNZ-006	Coral Coast, Fiji	Red alga
CNZ-010	Coral Coast, Fiji	Green alga
CNZ-012	Coral Coast, Fiji	Red alga

**Table S2. Type strains without published genome sequences.**

Strain ID	Species	16S accession number	<i>gyrB</i> accession number
DSM 14585	<i>agarivorans</i>	AJ417594	KF793928
LMG 22059T	<i>aliena</i>	AY387858	FR668563
LMG 18002T	<i>antarctica</i>	X98336	FR668564
NCIMB 14688	<i>arabiensis</i>	AB576636	N/A
ATCC 19262	<i>atlantica</i>	X82134	AB100885
ATCC 33046	<i>aurantia</i>	X82135	AF007275
KCTC 12274	<i>byunsanensis</i>	DQ011289	N/A
DSM 6820T	<i>carrageenovora</i>	X82136	FR668560
ATCC 43337	<i>denitrificans</i>	X82138	N/A
KCTC 22219	<i>donghaensis</i>	FJ754319	N/A
LMG 2866T	<i>espejana</i>	X82143	FR668566
LMG 19697T	<i>issachenkonii</i>	AF316144	FR668568
JCM 15903	<i>lipolytica</i>	FJ404721	N/A
LMG 19692	<i>maricaloris</i>	AF144036	N/A
NCIMB 1770	<i>mariniglutinosa</i>	AJ507251	N/A
LMG 2227T	<i>nigrifaciens</i>	X82146	FR668569
LMG 19696T	<i>paragorgicola</i>	AY040229	FR668570
DSM 14001T	<i>peptidolytica</i>	AF007286	FR668573
CIP 105820	<i>pydzensis</i>	U85855	N/A
LMG 19699	<i>ruthenica</i>	AF316891	N/A
SE3	<i>shioyasakiensis</i>	AB720724	N/A
ATCC 51193	<i>tetradonis</i>	AF214730	N/A
LMG 19694T	<i>translucida</i>	AY040230	FR668571
NCIMB 13762	<i>ulvae</i>	AF172987	N/A
Y2T	<i>xiamenensis</i>	JN188399	N/A
E418	<i>xishaensis</i>	JQ237129	N/A

**Table S3. *Pseudoalteromonas* genomes used in this study.** Type strains indicated in bold. Roman numerals (I-XXVIII) correspond to the 28 ANI groups (95%) that lack type strains (from Fig. 3). Asterisks (\*) indicate 95% ANI groups where type strain genome sequences were unavailable.

Strain	Species	<i>Bmp</i> version	Genome size (Mb)	Coverage	No. of contigs	G+C content (%)	Number of coding sequences	GenBank accession number
10-33	<i>P. marina</i>	n/a	4.20	109.1x	29	39.7	3805	LOFI01000000
13-15	<i>P. sp. VIII</i>	n/a	4.10	unknown	2	39.8	3709	FSRF01000000
23 GOM1509m	<i>P. issachenkonii</i> * (sp. X)	n/a	4.06	unknown	31	40.2	3689	JADO01000000
2ta16	<i>P. sp. XXV</i>	A	6.36	50.0x	137	42.3	5477	AUSV00000000
2ta6	<i>P. elyakovii/piscicida</i>	n/a	5.48	unknown	83	43.3	4797	JGI Taxon ID: 2505119014
520P1 No. 412	<i>P. denitrificans</i> * (sp. I)	n/a	5.25	10.5x	299	35.0	4911	BBIN01000000
520P1 No. 423	<i>P. denitrificans</i> * (sp. I)	n/a	5.34	25x	2	35.2	5021	BBZB01000000
6BO GOM1096m	<i>P. issachenkonii</i> * (sp. X)	n/a	4.06	unknown	34	40.2	3691	JIAM01000000
A 37-1-2	<b><i>P. arctica</i></b>	n/a	4.62	221x	152	39.0	4173	AHBY02000000
A2	<i>P. issachenkonii</i> * (sp. X)	n/a	4.18	286x	57	40.1	3838	JPMC01000000
A757	<i>P. sp. III</i>	D	5.13	230x	82	43.0	4532	QNQN00000000
AC163	<i>P. distincta/flavipulchra</i>	n/a	4.78	100x	565	39.1	4331	AUTK01000000
ANT/505	<i>P. distincta/flavipulchra</i>	n/a	4.49	16.6x	142	39.3	4187	ADOP01000000
ATCC 14393	<b><i>P. haloplanktis</i></b>	n/a	5.02	104x	56	40.8	4402	AHCA01000000
ATCC 29581	<i>P. xiamenensis</i> * (sp. XXVIII)	n/a	4.05	unknown	61	41.9	3614	CAPN01000000
ATCC 700518	<b><i>P. distincta</i></b>	n/a	4.53	383x	32	39.2	4038	JWIG01000000
ATCC 700519	<b><i>P. elyakovii</i></b>	n/a	5.45	314x	25	43.3	4767	JWIH01000000

BSi20311	<i>P. sp. IX</i>	n/a	3.98	23x	195	40.3	3664	BADU01000000
BSi20429	<i>P. arctica</i>	n/a	4.50	19x	121	39.0	3990	BADV01000000
BSi20439	<i>P. sp. IX</i>	n/a	3.88	21x	243	40.2	3600	BADW01000000
BSi20480	<i>P. marina</i>	n/a	4.15	17x	201	39.6	3937	BADX01000000
BSi20495	<i>P. fuliginea</i>	n/a	4.83	18x	222	38.9	4323	BADY01000000
BSi20652	<i>P. sp. XI</i>	n/a	4.25	15x	298	38.9	4056	BADT01000000
BSw20308	<i>P. fuliginea</i>	n/a	4.76	85x	146	38.9	4186	AMYA01000000
CGCMCC 1.8499	<i>P. donghaensis/lipolytica*</i> (sp. XVIII)	n/a	4.54	unknown	52	41.5	4032	FPAZ01000000
CP76	<i>P. ruthenica*</i> (sp. V)	n/a	4.01	18x	120	47.6	3672	AOPM00000000
CPMOR-1	<i>P. sp. XXII</i>	A	5.97	100x	105	42.0	5255	AUYC00000000
CPMOR-2	<i>P. luteoviolacea</i>	A	5.85	100x	155	41.7	5057	AUYA01000000
D2	<b><i>P. tunicata</i></b>	n/a	4.98	unknown	42	39.9	4400	AAOH01000000
DSM 15748	<b><i>P. fuliginea</i></b>	n/a	4.77	430x	314	38.9	4147	JJNZ01000000
DSM 17587	<b><i>P. marina</i></b>	n/a	4.17	243x	69	39.6	3794	AHCB02000000
DSM 6061	<b><i>P. luteoviolacea</i></b>	A	5.89	100x	168	41.8	5113	AUYB01000000
DSM 6065	<b><i>P. undina</i></b>	n/a	4.00	255x	49	39.9	3638	AHCF02000000
DSM 6842	<b><i>P. rubra</i></b>	n/a	5.95	183x	194	47.8	5003	AHCD02000000
DSM 8771	<b><i>P. citrea</i></b>	n/a	5.32	149x	223	41.1	4552	AHBZ02000000
DSM 26666	<i>P. issachenkonii*</i> (sp. X)	n/a	4.02	unknown	19	40.2	3657	FPAR01000000
DSM 6059	<i>P. sp. II</i>	n/a	6.09	unknown	130	34.7	5399	FOLO01000000
DSM 6065	<b><i>P. undina</i></b>	n/a	4.00	255x	49	39.9	3638	AHCF02000000
ECSMB14103	<i>P. marina</i>	n/a	4.12	12x	32	39.7	3801	JWGY01000000

H103	<i>P. carrageenovora</i> * (sp. VII)	n/a	4.42	167.8x	21	39.4	3938	LOFG01000000
H105	<i>P. sp. XV</i>	n/a	4.47	93.4x	26	40.3	4087	LOFH01000000
H33	<i>P. sp. XXIV</i>	n/a	6.12	100x	151	42.0	5213	AUXZ01000000
H33-S	<i>P. sp. XXIV</i>	n/a	6.12	100x	143	42.0	5204	AUXY01000000
HI1	<i>P. sp. XXII</i>	A	6.07	100x	10	42.2	5313	JWIC01000000
JCM 20779	<b><i>P. piscicida</i></b>	n/a	5.28	196x	207	43.2	4729	AHCC02000000
JG1	<i>P. elyakovii/piscicida</i>	n/a	5.50	112x	118	42.3	4862	AJMP01000000
NCIMB 2033	<b><i>P. flavipulchra</i></b>	n/a	4.50	159x	40	39.2	4032	JTDZ01000000
NCIMB 1942	<i>P. sp. XXVII</i>	C	5.48	100x	226	42.0	4985	AUXT01000000
NCIMB_1944	<i>P. sp. XXV</i>	A	6.36	100x	107	42.3	5450	AUXS01000000
NCIMB_2035	<i>P. sp. XXVII</i>	C	5.50	100x	263	42.1	5039	JPWZ01000000
ND6B	<i>P. issachenkonii</i> * (sp. X)	n/a	4.24	523x	90	40.4	3849	JQFL01000000
NJ631	<i>P. elyakovii/piscicida</i>	n/a	5.35	108x	55	43.4	4690	AKXJ01000000
NW 4327	<i>P. atlantica</i> * (sp. VI)	n/a	4.48	195x	129	40.9	3995	AZIO01000000
O-BC30	<b><i>P. phenolica</i></b>	A	4.76		282	40.5	5082	RCWG00000000
OCN003	<b><i>P. piratica</i></b>	n/a	4.82	142x	2	40.0	4384	CP009888, CP009889
OCN096	<i>P. sp. XXI</i>	n/a	5.82	80x	460	47.8	5614	LFZX01000000
PAMC_22718	<i>P. issachenkonii</i> * (sp. X)	n/a	4.18	131.35x	56	40.2	3896	AJTK01000000
PS5	<i>P. peptidolytica</i> * (sp. IV)	D	5.08		267	42.5	4540	RCSQ00000000
R3	<i>P. sp. XX</i>	n/a	5.84	364.1x	39	47.6	5002	LJDF01000000
S2040	<i>P. elyakovii/piscicida</i>	n/a	5.00	97x	126	43.4	4372	JXXW01000000
S2292	<i>P. fuliginea</i>	n/a	4.73	382x	281	38.9	4125	JXYD01000000
S2471	<i>P. sp. XIX</i>	n/a	5.76	104x	165	48.9	4836	JXYA01000000

S2607	<i>P. sp. XXVI</i>	A	5.94	100x	73	42.2	5105	AUXV01000000
S2724	<i>P. elyakovii/piscicida</i>	n/a	5.20	101x	205	43.3	4575	JXXX01000000
S3137	<i>P. ruthenica*</i> (sp. V)	n/a	4.07	136x	37	47.4	3744	JXXZ01000000
S3258	<i>P. ruthenica*</i> (sp. V)	n/a	4.07	134x	45	47.4	3745	JXXY01000000
S3431	<i>P. fuliginea</i>	n/a	4.20	130x	165	38.9	3690	JJNY01000000
S4047-1	<i>P. sp. XXIII</i>	E	6.06	100x	180	41.6	5210	AUXU01000000
S4054	<i>P. sp. XXIII</i>	E	6.06	100x	219	41.6	5207	AUXW01000000
S4060_1	<i>P. sp. XXVI</i>	A	5.95	100x	74	42.2	5213	AUXX01000000
S8_38	<i>P. arctica</i>	n/a	4.98	100x	80	39.2	4435	AUTS01000000
S8_8	<i>P. arctica</i>	n/a	4.91	100x	79	39.2	4383	AUTR01000000
S816	<i>P. atlantica*</i> (sp. VI)	n/a	4.42	130x	133	40.9	4127	APME01000000
SCSIO_04301	<i>P. donghaensis/lipolytica*</i> (sp. XVIII)	n/a	4.73	145.0x	20	41.3	4198	JGI Taxon ID: 2568526619
SCSIO_11900	<i>P. issachenkonii*</i> (sp. X)	n/a	3.72	183.0x	22	40.5	3525	JEMJ01000000
SM9913	<i>P. issachenkonii*</i> (sp. X)	n/a	4.04	unknown	2	40.3	3686	CP001796, CP001797
TAB23	<i>P. arctica</i>	n/a	5.14	100x	367	39.1	4771	AUTP01000000
TAC125	<i>P. nigrifaciens*</i> (sp. XIII)	n/a	3.85	unknown	2	40.1	3480	CR954246, CR954247
TAE56	<i>P. arctica</i>	n/a	4.60	100x	163	39.0	4221	AUTN01000000
TAE79	<i>P. distincta/flavipulchra</i>	n/a	5.05	100x	298	39.3	4819	AUTL01000000
TAE80	<i>P. distincta/flavipulchra</i>	n/a	4.97	100x	360	39.3	4750	AUTM01000000
TB13	<i>P. arctica</i>	n/a	4.73	100x	254	39.1	4384	AUTJ01000000
TB25	<i>P. distincta/flavipulchra</i>	n/a	4.65	100x	458	39.2	4224	AUTI01000000
TB41	<i>P. issachenkonii*</i> (sp. X)	n/a	4.63	100x	122	40.3	4237	AUTH01000000



TB51	<i>P. atlantica</i> * (sp. VI)	n/a	4.63	100x	369	40.9	4365	AUTO01000000
TB64	<i>P. sp. XII</i>	n/a	4.69	100x	275	37.9	4367	AUTQ01000000
UCD_SED14	<i>P. sp. XIV</i>	n/a	4.81	133.86x	111	39.9	4306	LHPH01000000
UCD_SED8	<i>P. undina</i>	n/a	4.02	377x	33	40.0	3628	LITK01000000
UCD_SED9	<i>P. sp. XIV</i>	n/a	4.85	177x	101	39.7	4303	LITL01000000
UCD-33C	<i>P. arabiensis/shioyasakiensis</i> * (sp. XVII)	n/a	4.47	90x	48	41.3	3951	LJTB01000000
UCD-48B	<i>P. arabiensis/shioyasakiensis</i> * (sp. XVI)	n/a	4.59	96x	69	41.1	4109	LJTC01000000
UST010723-006	<b><i>P. spongiae</i></b>	n/a	4.72	217x	56	40.8	4241	AHCE02000000

**Table S4. PCR primer sequences.**

Gene	Forward primer sequence	Reverse primer sequence	T <sub>m</sub> (°C)
16S	5' GGCAGCAGTGGGGAATAT 3'	5' GGTTATCACCGGCAGTCTC 3'	55
<i>gyrB</i>	5' THGGBGAYACNGAYGATG 3'	5' GGRTCCATNGBGTYTCCC 3'	53
<i>pyrH</i>	5' GTAGARYTMGACRTAGAAGTRGGT 3'	5' GTDCCYTCNTCTTCVCCCATR 3'	52
<i>recA</i>	5' GGHCCWGARTCDTCRGGTAA 3'	5' GGHGGNGCHACYTTGTTYT 3'	52
<i>rpoD</i>	5' CVCCDGATGCYGATGARYT 3'	5' GCYTTNGCTTCDATYTGA 3'	55
<i>bmp2</i>	5' GAYGTHGTYATTATTGGYAGYGG 3'	5' CATYTGYTTTRCGRTCCTAYTCTT 3'	52
<i>bmp5</i>	5' GCAGTSATHGGKGCTGGTTTATC 3'	5' GGCCARGARCTDATRTTKGG 3'	52
<i>1942bmp1</i>	5' AGGCGCCGGGTTTAAGCAGC 3'	5' TCGCGGGTAACCACGACCAA 3'	55
<i>2035bmp1</i>	5' AGGCGCCGGGTTTAAGCAGC 3'	5' TCGTGGTTACCCGCGACAAACA 3'	55