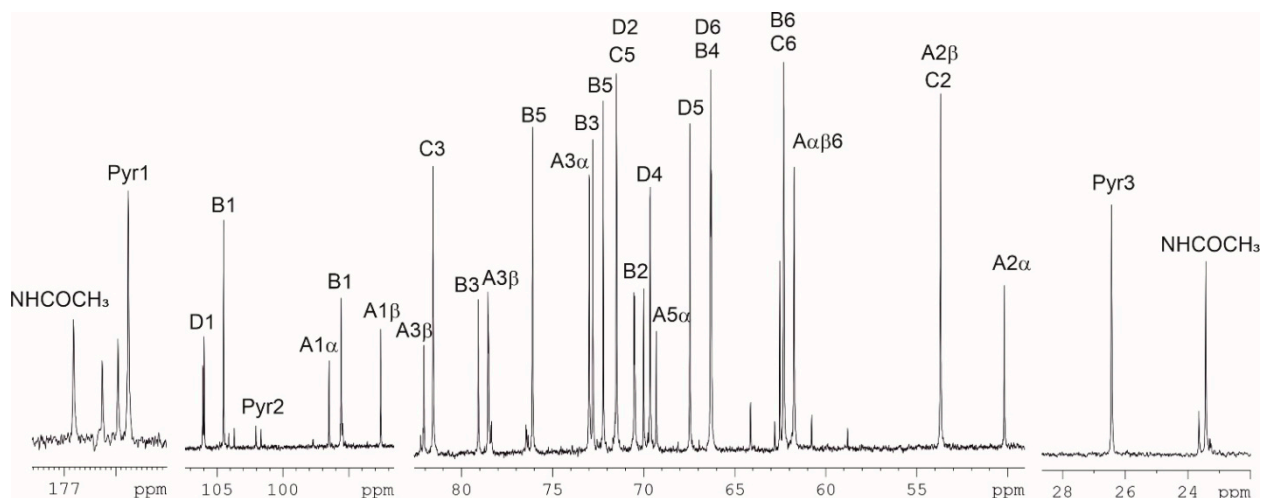
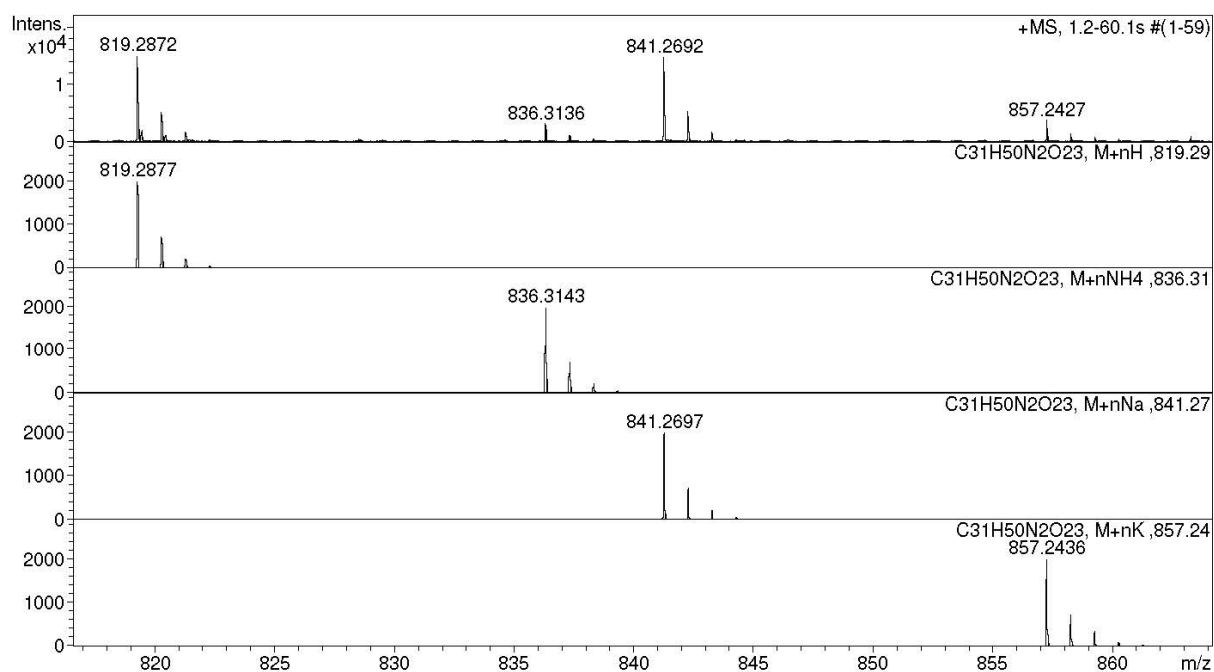


**Figure S3.** The  $^{13}\text{C}$  NMR spectrum of the **oligosaccharide 1 (OS1)** obtained after cleavage of K82 CPS of *A. baumannii* LUH5534 with recombinant protein Scipio\_gp39.



**Figure S4.** The positive ion mode HR ESI mass spectrum of the OS1.



**Table S1.** Results of ANI calculations with orthoANIu using genomes of phages Brutus and Scipio compare to 19,460 *Caudoviricetes* phage sequences contained in the NCBI Genome. Cells with the coverage values of 0.16 and more is highlighted with red background.

NCBI Accession	ANI	Aligned length, nt	Coverage genome 1	Coverage genome 2	Genome size, nt	NCBI Name	NCBI Taxonomy
phage Brutus							
MG366114	92.36	7076	0.1613	0.1692	41820	<i>Acinetobacter</i> phage PBAB08	<i>Myoviridae</i>
OP585104	92.35	13850	0.3158	0.3158	43860	<i>Acinetobacter</i> phage vB_AbaM_BP10	<i>Obolenskiviridae</i>
MN516421	90.47	18032	0.4111	0.4111	43860	<i>Acinetobacter</i> phage Bphi-R2919	<i>Obolenskiviridae</i>
MZ593728	90.34	16165	0.3686	0.3602	44880	<i>Acinetobacter</i> phage BUCT628	<i>Obolenskiviridae</i>
MZ618622	90.24	21498	0.4902	0.5018	42840	<i>Acinetobacter</i> phage Abp95	<i>Obolenskiviridae</i>
MN166083	90.22	19858	0.4528	0.4528	43860	<i>Acinetobacter</i> phage Abp9	<i>Obolenskiviridae</i>
KY829116	89.96	18862	0.4301	0.4203	44880	<i>Acinetobacter</i> phage WCHABP1	<i>Obolenskiviridae</i>
OM471864	89.86	14484	0.3302	0.3227	44880	<i>Acinetobacter</i> phage Cato	<i>Obolenskiviridae</i>
MN807295	89.70	700	0.0160	0.0172	40800	<i>Acinetobacter</i> phage vB_AbaP_APK116	<i>Autographiviridae</i>
HM368260	89.67	15024	0.3425	0.3348	44880	<i>Acinetobacter</i> phage AB1	<i>Obolenskiviridae</i>
JX976549	89.62	17528	0.3996	0.4092	42840	<i>Acinetobacter</i> phage vB_AbaM-IME-AB2	<i>Obolenskiviridae</i>
ON480525	89.42	18710	0.4266	0.4266	43860	<i>Acinetobacter</i> phage SHI	<i>Obolenskiviridae</i>
KJ817802	89.33	17000	0.3876	0.3876	43860	<i>Acinetobacter</i> phage YMC-13-01-C62	<i>Obolenskiviridae</i>
MZ712044	89.17	17473	0.3984	0.3807	45900	<i>Acinetobacter</i> phage BUCT629	<i>Obolenskiviridae</i>
ON237674	89.03	16122	0.3676	0.3592	44880	<i>Acinetobacter</i> phage Arbor	<i>Obolenskiviridae</i>
MN516422	88.95	18947	0.4320	0.4320	43860	<i>Acinetobacter</i> phage Bphi-R1888	<i>Obolenskiviridae</i>
KP861231	88.70	18160	0.4140	0.4140	43860	<i>Acinetobacter</i> phage YMC11/12/R1215	<i>Obolenskiviridae</i>
ON036883	88.68	15460	0.3525	0.3525	43860	<i>Acinetobacter</i> phage Scipio	<i>Obolenskiviridae</i>
MH853788	88.57	20282	0.4624	0.4419	45900	<i>Acinetobacter</i> phage vB_AbaM_IME512	<i>Obolenskiviridae</i>
MF346584	88.54	18159	0.4140	0.4046	44880	<i>Acinetobacter</i> phage AbP2	<i>Obolenskiviridae</i>
HE806280	88.29	14079	0.3210	0.3067	45900	<i>Acinetobacter</i> phage AP22	<i>Obolenskiviridae</i>
KP861229	88.16	17225	0.3927	0.3927	43860	<i>Acinetobacter</i> phage YMC11/12/R2315	<i>Obolenskiviridae</i>
KU510289	87.69	18851	0.4298	0.4200	44880	<i>Acinetobacter</i> phage LZ35	<i>Obolenskiviridae</i>
MH853787	87.47	17005	0.3877	0.3969	42840	<i>Acinetobacter</i> phage vB_AbaM_IME284	<i>Obolenskiviridae</i>
KY670595	87.39	23917	0.5453	0.5329	44880	<i>Acinetobacter</i> phage WCHABP12	<i>Obolenskiviridae</i>
OL743187	87.17	16174	0.3688	0.3688	43860	<i>Acinetobacter</i> phage vB_AbM_WUPSU	<i>Obolenskiviridae</i>
MH853786	87.06	20188	0.4603	0.4498	44880	<i>Acinetobacter</i> phage vB_AbaM_IME285	<i>Obolenskiviridae</i>
JX560521	72.88	8349	0.1904	0.1949	42840	<i>Acinetobacter</i> phage phiAC-1	<i>Myoviridae</i>
MN855951	69.80	567	0.0129	0.0695	8160	<i>Siphoviridae</i> sp.	<i>Siphoviridae</i>
MN855957	66.85	1108	0.0253	0.0572	19380	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
KP137437	66.70	561	0.0128	0.0108	52020	<i>Mannheimia</i> phage vB_MhS_1152AP2	<i>Siphoviridae</i>
KP137435	65.70	561	0.0128	0.0117	47940	<i>Mannheimia</i> phage vB_MhS_587AP2	<i>Siphoviridae</i>
KP137433	65.30	561	0.0128	0.0112	49980	<i>Mannheimia</i> phage vB_MhS_535AP2	<i>Siphoviridae</i>
KP137439	65.30	561	0.0128	0.0108	52020	<i>Mannheimia</i> phage vB_MhS_3927AP1	<i>Siphoviridae</i>
MT664721	64.60	828	0.0189	0.0232	35700	<i>Escherichia</i> phage vB_EcoM_APEC	<i>Podoviridae</i>
MN856055	64.35	1397	0.0319	0.0351	39780	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
KF669656	63.60	1342	0.0306	0.0337	39780	<i>Acinetobacter</i> phage Petty	<i>Autographiviridae</i>
MN856093	60.60	720	0.0164	0.0543	13260	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
MN856091	60.40	674	0.0154	0.0245	27540	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
MT028491	59.70	653	0.0149	0.0029	227460	<i>Ochrobactrum</i> phage vB_OspM_OC	<i>Myoviridae</i>
MN856109	56.50	762	0.0174	0.1067	7140	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
MN856004	54.00	756	0.0172	0.0176	42840	<i>Myoviridae</i> sp.	<i>Myoviridae</i>

phage Scipio							
MZ712044	91.76	13421	0.3060	0.2924	45900	<i>Acinetobacter</i> phage BUCT629	<i>Obolenskovirus</i>
KU510289	89.95	13900	0.3169	0.3097	44880	<i>Acinetobacter</i> phage LZ35	<i>Obolenskovirus</i>
MH853788	89.78	20329	0.4635	0.4429	45900	<i>Acinetobacter</i> phage vB_AbaM_IME512	<i>Obolenskovirus</i>
ON480525	89.74	18529	0.4225	0.4225	43860	<i>Acinetobacter</i> phage SHI	<i>Obolenskovirus</i>
JX976549	89.73	12816	0.2922	0.2992	42840	<i>Acinetobacter</i> phage vB_AbaM-IME-AB2	<i>Obolenskovirus</i>
KY670595	89.49	15520	0.3539	0.3458	44880	<i>Acinetobacter</i> phage WCHABP12	<i>Obolenskovirus</i>
ON036882	89.37	13748	0.3135	0.3063	44880	<i>Acinetobacter</i> phage Brutus	<i>Obolenskovirus</i>
KP861229	89.33	13371	0.3049	0.3049	43860	<i>Acinetobacter</i> phage YMC11/12/R2315	<i>Obolenskovirus</i>
MN516422	89.29	11937	0.2722	0.2722	43860	<i>Acinetobacter</i> phage Bphi-R1888	<i>Obolenskovirus</i>
MN516421	89.18	12472	0.2844	0.2844	43860	<i>Acinetobacter</i> phage Bphi-R2919	<i>Obolenskovirus</i>
KP861231	89.18	10826	0.2468	0.2468	43860	<i>Acinetobacter</i> phage YMC11/12/R1215	<i>Obolenskovirus</i>
MF346584	88.78	14478	0.3301	0.3226	44880	<i>Acinetobacter</i> phage AbP2	<i>Obolenskovirus</i>
MH853787	88.66	14908	0.3399	0.3480	42840	<i>Acinetobacter</i> phage vB_AbaM_IME284	<i>Obolenskovirus</i>
KY829116	88.54	20295	0.4627	0.4522	44880	<i>Acinetobacter</i> phage WCHABP1	<i>Obolenskovirus</i>
MZ593728	88.43	14472	0.3300	0.3225	44880	<i>Acinetobacter</i> phage BUCT628	<i>Obolenskovirus</i>
OL743187	88.35	15110	0.3445	0.3445	43860	<i>Acinetobacter</i> phage vB_AbM_WUPSU	<i>Obolenskovirus</i>
HM368260	87.69	17485	0.3987	0.3896	44880	<i>Acinetobacter</i> phage AB1	<i>Obolenskovirus</i>
OM471864	87.68	16067	0.3663	0.3580	44880	<i>Acinetobacter</i> phage Cato	<i>Obolenskovirus</i>
MN166083	87.54	21070	0.4804	0.4804	43860	<i>Acinetobacter</i> phage Abp9	<i>Obolenskovirus</i>
MZ618622	87.53	12777	0.2913	0.2982	42840	<i>Acinetobacter</i> phage Abp95	<i>Obolenskovirus</i>
HE806280	87.24	17233	0.3929	0.3754	45900	<i>Acinetobacter</i> phage AP22	<i>Obolenskovirus</i>
MG366114	87.13	7042	0.1606	0.1684	41820	<i>Acinetobacter</i> phage PBAB08	<i>Myoviridae</i>
MH853786	86.99	11154	0.2543	0.2485	44880	<i>Acinetobacter</i> phage vB_AbaM_IME285	<i>Obolenskovirus</i>
KJ817802	86.61	11909	0.2715	0.2715	43860	<i>Acinetobacter</i> phage YMC-13-01-C62	<i>Obolenskovirus</i>
ON237674	86.43	18503	0.4219	0.4123	44880	<i>Acinetobacter</i> phage Arbor	<i>Obolenskovirus</i>
OP585104	85.73	16683	0.3804	0.3804	43860	<i>Acinetobacter</i> phage vB_AbaM_BP10	<i>Obolenskovirus</i>
JX560521	70.87	12531	0.2857	0.2925	42840	<i>Acinetobacter</i> phage phiAC-1	<i>Myoviridae</i>
JF974295	67.60	525	0.0120	0.0129	40800	<i>Psychrobacter</i> phage pOW20-A	<i>Myoviridae</i>
MN166823	66.00	564	0.0129	0.0221	25500	<i>Klebsiella</i> phage ST512-KPC3phi13.5	<i>Myoviridae</i>
MT664721	65.90	913	0.0208	0.0256	35700	<i>Escherichia</i> phage vB_EcoM_APEC	<i>Podoviridae</i>
MN856093	60.50	721	0.0164	0.0544	13260	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
AP014629	59.10	746	0.0170	0.0174	42840	<i>Edwardsiella</i> phage GF-2	<i>Gofduovirus</i>
MH898687	59.00	746	0.0170	0.0183	40800	<i>Edwardsiella</i> phage Edno5	<i>Gofduovirus</i>
MN856055	58.70	778	0.0177	0.0196	39780	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
LR798197	58.60	609	0.0139	0.0146	41820	uncultured <i>Caudovirales</i> phage	<i>environmental samples</i>
MN855957	58.50	730	0.0166	0.0377	19380	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
MN856004	58.13	2163	0.0493	0.0505	42840	<i>Myoviridae</i> sp.	<i>Myoviridae</i>
MN855951	58.00	745	0.0170	0.0913	8160	<i>Siphoviridae</i> sp.	<i>Siphoviridae</i>
MG592584	57.30	627	0.0143	0.0143	43860	<i>Vibrio</i> phage 1.214.O._10N.222.54.F11	<i>Siphoviridae</i>
MG592398	56.90	630	0.0144	0.0144	43860	<i>Vibrio</i> phage 1.013.O._10N.286.54.F9	<i>Siphoviridae</i>
MN856109	55.90	759	0.0173	0.1063	7140	<i>Myoviridae</i> sp.	<i>Myoviridae</i>