Supporting Information for

A Multidimensional Framework for Assessing Riverine Health Risks from *Acinetobacter* Species: Integrating Pathogenicity, Resistome-Mobilome-Virulome Signatures, and Abundance

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Contents of Supplementary Files

Tables:

Figures:

References

Table S1. Genomic characteristics of *Acinetobacter* MAGs recovered from the Yangtze River.

Bins	Classification	Completeness (%)	Contamination (%)	Length	N50
YZ_Bin1	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	78.37	4.557	2 166 392	2 686
YZ_Bin2	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	59.24	5.172	1 729 485	3 166
YZ_Bin3	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	69.93	5.172	2 604 785	2 771
YZ_Bin4	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter lwoffii	74.36	6.466	2 495 845	2 277
YZ_Bin5	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	80.76	4.502	2 299 159	3 312
YZ_Bin6	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	98.3	3.712	2 991 833	13 190
YZ_Bin7	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	83.6	6.995	2 435 433	2 716
YZ_Bin8	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002367455	99.55	0.054	2 951 287	117 370
YZ_Bin9	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	79.01	5.82	2 294 625	3 044
YZ_Bin10	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	87.13	5.837	2 489 189	3 725

YZ_Bin11	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	88.89	6.156	2 585 875	4 803
YZ_Bin12	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	51.44	0	2 169 776	2 302
YZ_Bin13	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	80.46	4.88	2 300 118	3 311
YZ_Bin14	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	72.62	4.863	2 215 025	3 442
YZ_Bin15	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	54.31	9.482	2 267 137	3 142
YZ_Bin16	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	71.55	1.724	2 150 243	2 881
YZ_Bin17	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter idrijaensis	90.2	8.677	2 643 205	5 445
YZ_Bin18	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter schindleri	73.97	6.392	2 024 637	5 036

YZ_Bin19	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter schindleri	67.58	5.172	3 526 155	8 735
YZ_Bin20	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	56.5	2.586	2 352 810	2 987
YZ_Bin21	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	59.27	9.482	2 123 249	3 273
YZ_Bin22	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	98.57	2.53	3 446 190	25 525
YZ_Bin23	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	82.87	8.018	2 585 431	3 187
YZ_Bin24	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	85.44	8.249	2 406 868	2 422
YZ_Bin25	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	68.87	3.734	1 787 995	2 785
YZ_Bin26	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	81.34	6.65	2 552 894	2 849

YZ_Bin27	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	90.1	5.098	2 648 735	4 363
YZ_Bin28	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	89.15	7.175	2 887 533	3 461
YZ_Bin29	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	72.05	5.114	2 105 095	2 925
YZ_Bin30	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	86.62	6.239	2 678 226	4 075
YZ_Bin31	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	98.51	1.438	3 256 731	14 552
YZ_Bin32	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	68.03	2.825	1 949 598	2 885
YZ_Bin33	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	96.55	6.583	2 863 451	2 917
YZ_Bin34	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	88.22	5.182	2 788 241	4 016

YZ_Bin35	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	75.52	5.624	2 278 904	2 842
YZ_Bin36	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	75.38	6.938	2 293 836	2 739
YZ_Bin37	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	86.13	4.803	2 721 489	3 133
YZ_Bin38	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	63.55	3.448	2 116 305	2 596
YZ_Bin39	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	66.6	4.435	1 778 430	2 631
YZ_Bin40	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	74.65	5.711	2 159 020	4 064
YZ_Bin41	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	84	6.921	2 543 848	3 076
YZ_Bin42	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	85.54	6.167	2 833 738	3 280

YZ_Bin43	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	52.07	2.901	1 589 533	2 597
YZ_Bin44	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	85.65	5.453	2 461 654	5 006
YZ_Bin45	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	70.17	3.448	2 361 906	3 263
YZ_Bin46	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	81.95	3.635	2 535 452	3 409
YZ_Bin47	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	62.92	2.621	1 803 798	2 559
YZ_Bin48	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	76.37	4.115	2 032 648	2 181
YZ_Bin49	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	81.83	6.165	2 774 333	3 159
YZ_Bin50	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	60.62	1.891	1 619 655	2 608

YZ_Bin51	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	56.55	0.862	1 792 513	2 558
YZ_Bin52	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter johnsonii	73.74	3.463	1 966 445	4 015
YZ_Bin53	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	53.81	1.126	1 484 285	2 480
YZ_Bin54	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	81.3	5.285	3 013 086	2 388
YZ_Bin55	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	77.13	7.019	2 667 774	3 123
YZ_Bin56	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	77.63	5.778	2 646 261	3 007
YZ_Bin57	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	87.26	6.03	2 792 036	3 995
YZ_Bin58	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	69.29	3.98	2 308 546	2 694

YZ_Bin59	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	74.32	4.801	2 397 652	3 425
YZ_Bin60	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	93.93	6.676	3 244 495	4 665
YZ_Bin61	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	51.33	4.31	2 571 660	3 723
YZ_Bin62	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tandoii	78.04	6.896	3 294 847	4 175
YZ_Bin63	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp003105055	51.2	1.724	2 665 304	9 089
YZ_Bin64	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	69.63	0	2 613 897	3 862
YZ_Bin65	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	65.97	2.987	1 807 416	2 597
YZ_Bin66	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	67.29	6.54	2 297 286	2 999

YZ_Bin67	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	80.61	5.127	2 451 620	2 936
YZ_Bin68	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	79.28	5.218	2 429 857	3 237
YZ_Bin69	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	86.02	7.212	2 647 091	3 694
YZ_Bin70	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	92.41	4.529	3 427 256	10 623
YZ_Bin71	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	72.21	4.101	2 127 029	2 883
YZ_Bin72	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	83.24	3.244	2 440 829	4 109
YZ_Bin73	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	69.48	6.281	2 299 266	2 852
YZ_Bin74	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	62.53	3.448	2 440 529	2 426

YZ_Bin75	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	85.67	7.772	2 812 359	3 497
YZ_Bin76	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	61.36	0	1 670 224	2 533
YZ_Bin77	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	75.67	3.097	2 267 154	2 892
YZ_Bin78	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	78.82	4.375	2 386 854	3 331
YZ_Bin79	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	52.74	0	2 333 135	2 696
YZ_Bin80	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	59.48	1.724	2 547 865	2 865
YZ_Bin81	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	50.39	8.058	1 768 361	2 386
YZ_Bin82	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	74.64	8.494	2 368 418	3 062

YZ_Bin83	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter bohemicus	53.44	0	1 801 767	2 711
YZ_Bin84	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter albensis	91.23	2.657	2 718 604	3 667
YZ_Bin85	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter albensis	62.41	3.448	2 199 327	8 459
YZ_Bin86	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter albensis	97.89	4.205	3 222 333	7 569
YZ_Bin87	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	73.75	3.322	2 187 646	3 081
YZ_Bin88	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	88.3	4.404	2 667 328	4 646
YZ_Bin89	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	89.15	6.645	2 832 643	4 251
YZ_Bin90	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	82.29	8.631	3 175 641	3 509

YZ_Bin91	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	75.86	1.724	2 518 897	4 937
YZ_Bin92	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	81.22	3.6	2 320 022	4 650
YZ_Bin93	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	81.79	3.098	2 396 630	3 657
YZ_Bin94	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	68.73	8.62	2 462 394	3 155
YZ_Bin95	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	89.7	6.273	2 770 303	4 168
YZ_Bin96	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	88.91	7.313	2 874 159	4 720
YZ_Bin97	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	61.04	2.894	1 602 680	2 715
YZ_Bin98	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	90.76	6.02	2 841 746	4 627

YZ_Bin99	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	86.6	8.464	2 923 027	3 823
YZ_Bin100	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	53.42	2.408	1 466 251	3 106
YZ_Bin101	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	90.13	6.136	2 958 066	5 558
YZ_Bin102	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	95.61	7.794	3 035 592	6 948
YZ_Bin103	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter sp002135245	89.57	8.648	2 912 592	4 850
YZ_Bin104	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter kookii	80.14	5.318	2 248 670	3 195
YZ_Bin105	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter kookii	75.69	5.908	2 203 648	2 053
YZ_Bin106	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter kookii	64.1	3.448	2 307 398	3 220

YZ_Bin107	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter kookii	54.46	6.896	1 837 403	3 340
YZ_Bin108	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter kookii	63.38	5.339	2 084 250	3 777
YZ_Bin109	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter kookii	50.39	6.896	2 270 323	3 076
YZ_Bin110	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter radioresistens	80.82	2.063	2 552 525	3 153
YZ_Bin111	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter radioresistens	98.17	0.913	2 858 537	33 719
YZ_Bin112	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	74.31	5.459	2 207 781	2 123
YZ_Bin113	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	92.93	5.587	2 843 570	7 108
YZ_Bin114	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	84.94	3.894	2 491 065	3 723

YZ_Bin115	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	76.1	4.454	2 236 946	2 794
YZ_Bin116	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	94.07	3.743	2 766 187	6 279
YZ_Bin117	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	91.98	4.401	2 719 431	5 254
YZ_Bin118	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	91.22	3.432	2 646 768	7 028
YZ_Bin119	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	89.63	4.952	2 842 080	4 400
YZ_Bin120	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	94.77	5.717	2 968 584	4 593
YZ_Bin121	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	76.9	2.963	2 382 009	2 432
YZ_Bin122	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	66.35	8.283	2 082 726	2 706

YZ_Bin123	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	91.91	3.403	2 866 545	4 857
YZ_Bin124	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	85	5.291	2 551 158	2 549
YZ_Bin125	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	55.83	1.073	1 280 132	4 867
YZ_Bin126	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter tjernbergiae	85.06	9.108	2 775 086	3 415
YZ_Bin127	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter parvus	59.19	0	2 245 032	6 783
YZ_Bin128	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter junii	68.04	4.142	1 794 905	5 216
YZ_Bin129	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter junii	82.7	3.189	2 138 686	2 915
YZ_Bin130	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter junii	91.19	3.502	3 238 880	8 922

YZ_Bin131	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter junii	74.13	6.034	2 900 347	3 600
YZ_Bin132	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter calcoaceticus	79.47	2.071	2 761 215	5 063
YZ_Bin133	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter pittii	85.75	6.312	2 661 383	3 543
YZ_Bin134	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter pittii	74.19	5.144	2 486 402	3 285
YZ_Bin135	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter pittii	99.63	1.232	3 940 067	36 383
YZ_Bin136	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter pittii	65.63	3.568	1 950 513	2 494
YZ_Bin137	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter baumannii	52.53	0	2 157 202	3 896
YZ_Bin138	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter baumannii	87.87	2.39	3 348 634	10 967

YZ_Bin139	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__Acinetobacter soli	99.28	0.821	3 360 041	102 397
YZ_Bin140	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	51.74	3.121	1 780 959	1 504
YZ_Bin141	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	59.14	6.897	1 759 188	2 500
YZ_Bin142	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	54.25	3.521	1 441 500	2 002
YZ_Bin143	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	54.69	5.591	1 918 743	2 521
YZ_Bin144	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	50.1	0	1 450 782	2 217
YZ_Bin145	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	54.76	7.064	1 947 736	1 533
YZ_Bin146	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	67.5	2.543	1 957 145	1 898

YZ_Bin147	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	65.72	7.123	2 514 917	2 630
YZ_Bin148	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	55.96	2.588	1 460 298	1 604
YZ_Bin149	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	76.12	9.573	2 788 998	3 042
YZ_Bin150	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	51.18	2.386	1 532 609	1 488
YZ_Bin151	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	69.58	6.339	1 982 096	1 759
YZ_Bin152	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	71.96	4.321	2 075 176	1 893
YZ_Bin153	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	74.71	4.77	2 014 279	2 013
YZ_Bin154	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	71.34	5.537	2 149 822	1 929

YZ_Bin155	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	81.87	9.561	2 293 955	1 849
YZ_Bin156	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	51.72	4.482	827 066	1 915
YZ_Bin157	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	63.59	5.047	1 708 353	1 873
YZ_Bin158	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	53.83	1.902	1 420 104	1 600
YZ_Bin159	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	60.3	3.224	1 609 899	1 716
YZ_Bin160	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	62.48	6.28	1 894 740	1 672
YZ_Bin161	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	53.58	1.453	2 514 464	3 732
YZ_Bin162	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	90.45	5.777	2 883 550	5 843

YZ_Bin163	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	65.75	1.675	1 889 376	1 952
YZ_Bin164	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	56.7	3.569	1 675 509	1 537
YZ_Bin165	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	50.35	6.791	1 750 907	1 529
YZ_Bin166	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	61.79	3.025	1 860 530	1 732
YZ_Bin167	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	50.65	1.502	1 598 361	1 500
YZ_Bin168	d__Bacteria;p__Proteobacteria;c__Gammaproteobacteria;o__Pseudomonadales;f__Moraxellaceae;g__Acinetobacter;s__	85.75	2.729	2 393 319	5 336

Table S2. Pathogenicity classification list of *Acinetobacter* species.

Species (validly published and correct species name) (*n* = 87)	Species category	Source of strain isolation	Symptoms of human infection	Reference
Acinetobacter albensis	Potentially opportunistic pathogens	Natural soil, water ecosystems, CRC-specific microbial species (cases of strain infection), spleen in rainbow trout (cases of strain infection)		(Krizova et al., 2015), (Yan et al., 2024), (Saticioglu, 2020)
Acinetobacter amyesii	Environmental non-pathogens	Soil, water environment, animals		(Nemec et al., 2022a)
Acinetobacter apis	Environmental non-pathogens	Intestinal tract of honeybee (*Apis mellifera*)		(Kim et al., 2014)
Acinetobacter baretiae	Environmental non-pathogens	Gut and mouthparts of honeybee (*Apis mellifera*)		(Alvarez-Perez et al., 2021)
Acinetobacter baumannii	Opportunistic pathogens	Soil, water, animals, vegetables, human (blood, urine, sputum) (cases of strain infection), hospital environment (ventilator, bed railing)	Nosocomial infections (ventilator-associated pneumonia, bloodstream infections, skin and soft tissue infections), community-acquired infections	(Bouvet and Grimont, 1986), (Fournier and Richet, 2006), (Jiang et al., 2015)
Acinetobacter baylyi	Opportunistic pathogens	Soil, human (cloudy secretion and pus from surgical incision) (cases of strain infection)	Bacteremia, cerebral hemorrhage	(Chen et al., 2008), (Zhou et al., 2011), (Alvarez-Buylla et al., 2012)

Acinetobacter beijerinckii	Opportunistic pathogens	Human (sputum, peritoneal dialysis fluid, gall, throat swab, perineal swab, feces, skin) (cases of strain infection), equine (airways) (cases of strain infection), hospital environment, soil, water	Ventilator-associated pneumonia (VAP), endocarditis	(Nemec et al., 2009), (Turton et al., 2010), (Teng et al., 2022)
Acinetobacter bereziniae	Opportunistic pathogens	Human (rectal swabs, blood)	Bacteremia	(Kuo et al., 2010), (Mo et al., 2023), (Merlino et al., 2023)
Acinetobacter bohemicus	Environmental non-pathogens	Soil or water ecosystems		(Krizova et al., 2014)
Acinetobacter boissieri	Environmental non-pathogens	Floral nectar of *Fritillaria lusitanica* Wikstr		(Alvarez-Perez et al., 2013)
Acinetobacter bouvetii	Environmental non-pathogens	Activated sludge		(Carr et al., 2003)
Acinetobacter brisouii	Environmental non-pathogens	Wetland		(Anandham et al., 2010),
Acinetobacter calcoaceticus	Opportunistic pathogens	Human (skin, blood, pus, pharyngeal, vaginal, rectal)	Nosocomial infection, necrotizing fasciitis	(Buxton et al., 1978), (Retailliau et al., 1979), (Nonaka et al., 2014)
Acinetobacter celticus	Environmental non-pathogens	Natural soil and water ecosystems		(Radolfova-Krizova et al., 2016a)
Acinetobacter chengduensis	Environmental non-pathogens	Hospital sewage, coastal water		(Qin et al., 2020), (Correa et al., 2021)

Acinetobacter chinensis	Environmental non-pathogens	Hospital sewage		(Hu et al., 2019)
Acinetobacter colistiniresistens	Opportunistic pathogens	Human (blood, eye, skin, pleural fluid, wound, feces)	Infections (septicemia)	(Muzahid et al., 2023), (de Paula-Petroli et al., 2022)
Acinetobacter corruptisaponis	Environmental non-pathogens	Spoiled bath lotion		(Wang et al., 2024d)
Acinetobacter courvalinii	Opportunistic pathogens	Soil, human (wounds, blood, urine)	Wound infections	(Dey et al., 2020), (Nemec et al., 2016), (De Vos et al., 2016), (Sykes et al., 2024), (Sykes, 2024)
Acinetobacter cumulans	Environmental non-pathogens	Hospital sewage		(Qin et al., 2019)
Acinetobacter defluvii	Environmental non-pathogens	Hospital sewage		(Hu et al., 2017)
Acinetobacter dispersus	Potentially opportunistic pathogens	Sewage water, Human (wound, ulcer)		(Nemec et al., 2016)
Acinetobacter entericus	Environmental non-pathogens	Gut of plastic-eating insect (*Zophobas atratus*) larvae		(Dong and Yang, 2023)
Acinetobacter equi	Environmental non-pathogens	Horse feces		(Poppel et al., 2016)

Acinetobacter faecalis	Environmental non-pathogens	Cattle feces, elephant feces		(Kyselkova et al., 2024),
Acinetobacter gandensis	Environmental non-pathogens	Horse, cattle		(Smet et al., 2014)
Acinetobacter geminorum	Potentially opportunistic pathogens	Human throat swabs		(Wolf et al., 2021)
Acinetobacter gerneri	Environmental non-pathogens	Activated sludge		(Carr et al., 2003)
Acinetobacter guerrae	Environmental non-pathogens	Raw meat		(Carvalheira et al., 2020)
Acinetobacter guillouiae	Opportunistic pathogens	Human (Urine, blood, sputum, feces, conjunctival swab), activated sludge, soil,	Wound infections	(Nemec et al., 2010), (Jung et al., 2015), (Tjernberg and Ursing, 1989)
Acinetobacter gyllenbergii	Opportunistic pathogens	Human (blood, urine, sputum, vaginal swab, throat swab)	Postoperative endophthalmitis, acute suppurative infections	(Nemec et al., 2009), (Di W, 2021), (Pluquet et al., 2011), (Fu et al., 2022)
Acinetobacter haemolyticus	Opportunistic pathogens	Human (sputum), wastewater, polluted soil	Endocarditis, infections	(Bai et al., 2020), (Castro-Jaimes et al., 2020), (Martinez et al., 1995)
Acinetobacter halotolerans	Environmental non-pathogens	Soil		(Dahal et al., 2017)

Acinetobacter harbinensis	Environmental non-pathogens	River water		(Li et al., 2014a)
Acinetobacter higginsii	Potentially opportunistic pathogens	Human (clinical origin)		(Nemec et al., 2023)
Acinetobacter ihumii	Potentially opportunistic pathogens	Human (blood)		(Yacouba et al., 2022)
Acinetobacter indicus	Opportunistic pathogens	Hexachlorocyclohexane dump site, nasal swabs of calves, human (peritoneal dialysis fluid, wound, nasopharyngeal swab)	Infections	(Malhotra et al., 2012), (Bello-Lopez et al., 2020), (Acolatse et al., 2022), (Nakagawa et al., 2019), (Mahmud et al., 2023)
Acinetobacter johnsonii	Opportunistic pathogens	Human (cerebrospinal fluid, peritoneal fluid), rainbow trout (*Oncorhynchus mykiss*)	Blood flow infection, meningitis	(Seifert et al., 1993), (Bi et al., 2023), (Gutierrez-Gaitan et al., 2022), (Rodriguez et al., 2014)
Acinetobacter junii	Opportunistic pathogens	Human (blood), hospital environment (aerators), animals, water	Bacteremia, ocular infections	(Kappstein et al., 2000), (Aguilar-Vera et al., 2024), (Linde et al., 2002)

Acinetobacter kanungonis	Environmental non-pathogens	Skin of freshwater pufferfish (*Tetraodon cutcutia*)		(Das et al., 2021)
Acinetobacter kookii	Environmental non-pathogens	Soil, Rothschild's giraffe (*Giraffa camelopardalis rothschildi*) calf		(Choi et al., 2013), (Schwarz et al., 2020)
Acinetobacter lactucae	Potentially opportunistic pathogens	Iceberg lettuce, human (wound)	Infections	(Rooney et al., 2016), (Alonso et al., 2023)
Acinetobacter lanii	Environmental non-pathogens	Feces of *Equus kiang*, hospital wastewater		(Zhu et al., 2021a), (Xu et al., 2024a)
Acinetobacter larvae	Environmental non-pathogens	Larval gut of *Omphisa fuscidentalis*		(Liu et al., 2017)
Acinetobacter lwoffii	Opportunistic pathogens	Human (blood, urine), chicken, bee, channel catfish (*Ictalurus punctatus*)	Nosocomial infections (septicemia, pneumonia, meningitis, urinary tract infections, skin, wound infections, gastroenteritis), bacteremia, multiple septic complications	(Ku et al., 2000), (Regalado et al., 2009), (Moreira Silva et al., 2012), (Cao et al., 2016)
Acinetobacter modestus	Potentially opportunistic pathogens	Hospitalized pet cat (nasal secretions), human (urine, blood), murine crypts, sewage water		(Sakuma et al., 2023), (Nemec et al.,

				2016), (Stedman et al., 2019)
Acinetobacter nectaris	Environmental non-pathogens	Floral nectar of plants		(Alvarez-Perez et al., 2013)
Acinetobacter nematophilus	Environmental non-pathogens	Unidentified soil-borne nematode		(Machado, 2023)
Acinetobacter nosocomialis	Opportunistic pathogens	Human (blood, fluid from affected organ or peritoneal space)	Nosocomial infections (bacteremia), community-acquired infections	(Chusri et al., 2014), (Nithichanon et al., 2022), (Kuo et al., 2013)
Acinetobacter oleivorans	Environmental non-pathogens	Rice paddy		(Kang et al., 2011)
Acinetobacter parvus	Opportunistic pathogens	Human (blood, ear, eye, skin), ear of a dog with refractory otitis media, plughole	Nosocomial infections (blood stream infection, sepsis), community-acquired infections (bacteremia, pneumonia)	(Nemec et al., 2003), (Gaillard et al., 2012), (Choi et al., 2012)
Acinetobacter pecorum	Environmental non-pathogens	Chickens, sheep		(Pallen, 2024)
Acinetobacter piscicola	Environmental non-pathogens	Diseased farmed Murray cod (*Maccullochella peelii peelii*)		(Liu et al., 2018b)
Acinetobacter pittii	Opportunistic pathogens	Hospital environment (laryngoscope blades, patient lifting equipment, door handles), human (blood, urine, wounds, blood, skin,	Nosocomial infections (ventilator associated pneumonia, bloodstream infections, skin and soft tissue	(Wisplinghoff et al., 2012), (Bello-Lopez et al., 2024), (Sun et

		cerebrospinal fluid, sinus specimens), effluent, paleosol, river, digested sludge, soil	infections, wound infections, urinary tract infections, secondary meningitis), community-acquired infections (pneumonia, bacteremia, skin, soft tissue, ocular infections, secondary meningitis, endocarditis)	al., 2025), (Hrenovic et al., 2014)
Acinetobacter pollinis	Environmental non-pathogens	Floral nectar		(Alvarez-Perez et al., 2021)
Acinetobacter populi	Environmental non-pathogens	Symptomatic bark of *Populus* × *euramericana* canker		(Li et al., 2015b)
Acinetobacter portensis	Environmental non-pathogens	Raw meat, milking environment samples		(Carvalheira et al., 2020), (Li et al., 2022b)
Acinetobacter pragensis	Environmental non-pathogens	Soil and water ecosystems		(Radolfova-Krizova et al., 2016b)
Acinetobacter proteolyticus	Potentially opportunistic pathogens	Human (ear, wound, blood)		(Nemec et al., 2016)
Acinetobacter pseudolwoffii	Environmental non-pathogens	Domestic animals, permafrost sediments		(Sladecek et al., 2023), (Mindlin et al., 2020)

Acinetobacter puyangensis	Environmental non-pathogens	Healthy and diseased part of *Populus* × *euramericana* canker bark		(Li et al., 2013)
Acinetobacter qingfengensis	Environmental non-pathogens	*Populus* × *euramericana* canker bark, drinking tap water		(Li et al., 2014b), (Khan and Mustafa, 2021)
Acinetobacter radioresistens	Opportunistic pathogens	Human (blood, tracheal aspirate, bronchoalveolar lavage), cotton, soil, murine colonic crypts	Nosocomial infections (bloodstream infections, bacteremia, pneumonia), community-acquired infections (bacteremia)	(Wang et al., 2019), (Lazarev et al., 2022), (Lopes et al., 2019), (Nishimura et al., 1988), (Saffarian et al., 2017)
Acinetobacter rathckeae	Environmental non-pathogens	Floral nectar		(Alvarez-Perez et al., 2021)
Acinetobacter rudis	Environmental non-pathogens	Raw milk, raw wastewater, Kutch mangrove rhizosphere		(Vaz-Moreira et al., 2011), (Chinmay, 2023)
Acinetobacter schindleri	Opportunistic pathogens	Human (blood, urine, nasal swab, ear, skin, throat, endotracheal tube), *Pangasius sutchi*-infected red eye, *Andrias davidianus*	Infections (bacteremia)	(Nemec et al., 2001), (Montana et al., 2018), (Yaikhan et al., 2024), (Wang et

				al., 2024a), (Mastan, 2013)
Acinetobacter sedimenti	Environmental non-pathogens	Beach sediment		(Zheng et al., 2022)
Acinetobacter seifertii	Opportunistic pathogens	Human (blood, respiratory tract, ulcer), hospital environments, black-necked swan, sweet potato	Infections (blood stream infection)	(Kishii et al., 2016), (Barth et al., 2025), (Koizumi et al., 2019), (Narciso AC, 2017), (Wang et al., 2025)
Acinetobacter shaoyimingii	Environmental non-pathogens	Feces of *Equus kiang*		(Zhu et al., 2021b)
Acinetobacter sichuanensis	Environmental non-pathogens	Hospital sewage		(Qin et al., 2018)
Acinetobacter silvestris	Environmental non-pathogens	Soil, water		(Nemec et al., 2022b)
Acinetobacter soli	Opportunistic pathogens	Soil, human (sputum, rectum)	Nosocomial infections (blood stream infection)	(Kim et al., 2008), (Endo et al., 2014), (Chen et al., 2014), (Shaban et al., 2021)
Acinetobacter stercoris	Environmental non-pathogens	Digestate of mesophilic German biogas plant storage tank		(Pulami et al., 2021)
Acinetobacter suaedae	Environmental non-pathogens	Rhizosphere soil		(Xu et al., 2024b)

Acinetobacter tandoii	Environmental non-pathogens	Gut of the termite, a contaminated river, a mangrove wetland ecosystem	(Van Dexter, 2019), (Ouyang et al., 2020), (Zhang et al., 2019)
Acinetobacter terrae	Environmental non-pathogens	Mud, soil, feces (sheep)	(Nemec et al., 2021)
Acinetobacter terrestris	Environmental non-pathogens	Feces (cow), mud (forest wetland), soil	(Nemec et al., 2021)
Acinetobacter thermotolerans	Environmental non-pathogens	Mixed feces from cattle farms	(Shestivska et al., 2024)
Acinetobacter tibetensis	Environmental non-pathogens	Soil under a greenhouse	(Pan et al., 2023)
Acinetobacter tjernbergiae	Environmental non-pathogens	Activated sludge, water treatment plants, tap water	(Carr et al., 2003), (Narciso-da-Rocha et al., 2013)
Acinetobacter towneri	Environmental non-pathogens	Hospital sewage, wine fecal sample, seawater	(Wang et al., 2020), (Cheng et al., 2021), (Maehana et al., 2021)

Acinetobacter ursingii	Opportunistic pathogens	Human (blood, urine, endotracheal tube)	Nosocomial infections (bacteremia, cholangitis, septicemia, blood stream infections, catheter-related bacteremia), hospital environment (swabs from inside shower head and wall and floor of shower bath), community-acquired bloodstream infection and severe sepsis	(Nemec et al., 2001),(Horii et al., 2011), (Mader et al., 2010), (Barrios et al., 2024)
Acinetobacter variabilis	Opportunistic pathogens	Human (blood, conjunctiva, urine, leg, peritoneal dialysis fluid), rectal swab of cow, soil	Infections	(Barrios et al., 2024), (Uechi et al., 2021), (Al-Salami et al., 2024)
Acinetobacter venetianus	Potentially opportunistic pathogens	Venice lagoon, human, contaminated water-bodies		(DiCello et al., 1997), (Goswami et al., 2015), (Bello-Lopez et al., 2020)
Acinetobacter vivianii	Potentially opportunistic pathogens	Soil, sewage water, human (blood, wound)	Infections	(Nemec et al., 2016), (Bae and Hong, 2024)

Acinetobacter wanghuae	Environmental non-pathogens	Feces of *Equus kiang*	(Zhu et al., 2021a)
Acinetobacter wuhouensis	Environmental non-pathogens	Hospital sewage	(Hu et al., 2018)

Table S3. Variations in *Acinetobacter* abundance across Yangtze River sections near YY, WH, JJ, and NJ during May–June 2020.

May–June 2020	Mean rank diff.	Adjusted *P*-value	Significance
YY vs. WH	-298.4	***	<0.001
YY vs. JJ	-243.1	***	<0.001
YY vs. NJ	-253	***	<0.001
WH vs. JJ	55.34	ns	>0.9999
WH vs. NJ	45.41	ns	>0.9999
JJ vs. NJ	-9.933	ns	>0.9999

Table S4. The pathogenicity weight (W_P) assigned to *Acinetobacter* MAGs.

Bins	**Annotated species**	**Species category**	**Wp**
YZ_Bin1	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin2	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin3	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin4	*Acinetobacter lwoffii*	Opportunistic pathogens	3
YZ_Bin5	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin6	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin7	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin8	*Acinetobacter sp002367455*	Environmental non-pathogens	1
YZ_Bin9	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin10	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin11	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin12	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin13	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin14	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin15	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin16	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin17	*Acinetobacter idrijaensis*	Environmental non-pathogens	1
YZ_Bin18	*Acinetobacter schindleri*	Opportunistic pathogens	3
YZ_Bin19	*Acinetobacter schindleri*	Opportunistic pathogens	3
YZ_Bin20	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin21	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin22	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin23	*Acinetobacter johnsonii*	Opportunistic pathogens	3

YZ_Bin24	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin25	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin26	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin27	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin28	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin29	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin30	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin31	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin32	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin33	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin34	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin35	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin36	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin37	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin38	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin39	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin40	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin41	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin42	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin43	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin44	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin45	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin46	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin47	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin48	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin49	*Acinetobacter johnsonii*	Opportunistic pathogens	3

YZ_Bin50	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin51	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin52	*Acinetobacter johnsonii*	Opportunistic pathogens	3
YZ_Bin53	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin54	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin55	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin56	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin57	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin58	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin59	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin60	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin61	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin62	*Acinetobacter tandoii*	Environmental non-pathogens	1
YZ_Bin63	*Acinetobacter sp003105055*	Environmental non-pathogens	1
YZ_Bin64	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin65	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin66	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin67	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin68	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin69	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin70	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin71	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin72	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin73	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin74	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin75	*Acinetobacter bohemicus*	Environmental non-pathogens	1

YZ_Bin76	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin77	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin78	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin79	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin80	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin81	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin82	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin83	*Acinetobacter bohemicus*	Environmental non-pathogens	1
YZ_Bin84	*Acinetobacter albensis*	Environmental non-pathogens	1
YZ_Bin85	*Acinetobacter albensis*	Environmental non-pathogens	1
YZ_Bin86	*Acinetobacter albensis*	Environmental non-pathogens	1
YZ_Bin87	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin88	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin89	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin90	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin91	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin92	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin93	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin94	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin95	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin96	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin97	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin98	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin99	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin100	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin101	*Acinetobacter sp002135245*	Environmental non-pathogens	1

YZ_Bin102	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin103	*Acinetobacter sp002135245*	Environmental non-pathogens	1
YZ_Bin104	*Acinetobacter kookii*	Environmental non-pathogens	1
YZ_Bin105	*Acinetobacter kookii*	Environmental non-pathogens	1
YZ_Bin106	*Acinetobacter kookii*	Environmental non-pathogens	1
YZ_Bin107	*Acinetobacter kookii*	Environmental non-pathogens	1
YZ_Bin108	*Acinetobacter kookii*	Environmental non-pathogens	1
YZ_Bin109	*Acinetobacter kookii*	Environmental non-pathogens	1
YZ_Bin110	*Acinetobacter radioresistens*	Opportunistic pathogens	3
YZ_Bin111	*Acinetobacter radioresistens*	Opportunistic pathogens	3
YZ_Bin112	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin113	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin114	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin115	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin116	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin117	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin118	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin119	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin120	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin121	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin122	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin123	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin124	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin125	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin126	*Acinetobacter tjernbergiae*	Environmental non-pathogens	1
YZ_Bin127	*Acinetobacter parvus*	Opportunistic pathogens	3

YZ_Bin128	*Acinetobacter junii*	Opportunistic pathogens	3
YZ_Bin129	*Acinetobacter junii*	Opportunistic pathogens	3
YZ_Bin130	*Acinetobacter junii*	Opportunistic pathogens	3
YZ_Bin131	*Acinetobacter junii*	Opportunistic pathogens	3
YZ_Bin132	*Acinetobacter calcoaceticus*	Opportunistic pathogens	3
YZ_Bin133	*Acinetobacter pittii*	Opportunistic pathogens	3
YZ_Bin134	*Acinetobacter pittii*	Opportunistic pathogens	3
YZ_Bin135	*Acinetobacter pittii*	Opportunistic pathogens	3
YZ_Bin136	*Acinetobacter pittii*	Opportunistic pathogens	3
YZ_Bin137	*Acinetobacter baumannii*	Opportunistic pathogens	3
YZ_Bin138	*Acinetobacter baumannii*	Opportunistic pathogens	3
YZ_Bin139	*Acinetobacter soli*	Opportunistic pathogens	3
YZ_Bin140	Unclassified species	Unclassified species	1
YZ_Bin141	Unclassified species	Unclassified species	1
YZ_Bin142	Unclassified species	Unclassified species	1
YZ_Bin143	Unclassified species	Unclassified species	1
YZ_Bin144	Unclassified species	Unclassified species	1
YZ_Bin145	Unclassified species	Unclassified species	1
YZ_Bin146	Unclassified species	Unclassified species	1
YZ_Bin147	Unclassified species	Unclassified species	1
YZ_Bin148	Unclassified species	Unclassified species	1
YZ_Bin149	Unclassified species	Unclassified species	1
YZ_Bin150	Unclassified species	Unclassified species	1
YZ_Bin151	Unclassified species	Unclassified species	1
YZ_Bin152	Unclassified species	Unclassified species	1
YZ_Bin153	Unclassified species	Unclassified species	1

YZ_Bin154	Unclassified species	Unclassified species	1
YZ_Bin155	Unclassified species	Unclassified species	1
YZ_Bin156	Unclassified species	Unclassified species	1
YZ_Bin157	Unclassified species	Unclassified species	1
YZ_Bin158	Unclassified species	Unclassified species	1
YZ_Bin159	Unclassified species	Unclassified species	1
YZ_Bin160	Unclassified species	Unclassified species	1
YZ_Bin161	Unclassified species	Unclassified species	1
YZ_Bin162	Unclassified species	Unclassified species	1
YZ_Bin163	Unclassified species	Unclassified species	1
YZ_Bin164	Unclassified species	Unclassified species	1
YZ_Bin165	Unclassified species	Unclassified species	1
YZ_Bin166	Unclassified species	Unclassified species	1
YZ_Bin167	Unclassified species	Unclassified species	1
YZ_Bin168	Unclassified species	Unclassified species	1

Table S5. Resistance risk weights (WG_{ARG}) assigned to ARGs detected in *Acinetobacter*.

ARGs carried by MAGs	WG_{ARG}	Highest level antibiotic group involved	Reference
abeS	1	Access group antibiotics or others	
adeA	3	**Reserve group:** Meropenem/vaborbactam, Tigecycline **Watch group:** Cefepime, Meropenem, Minocycline_oral, Netilmicin, Ticarcillin	(Dou et al., 2017a), (He et al., 2019), (Sugawara and Nikaido, 2014), (Dou et al., 2017b), (Nemec et al., 2007), (Xu et al., 2019), (Hocquet et al., 2007)
adeB	3	**Reserve group:** Eravacycline, Imipenem/cilastatin/relebactam, Meropenem/vaborbactam, Tigecycline **Watch group:** Ciprofloxacin, Cefepime, Meropenem, Minocycline_oral, Netilmicin, Ticarcillin	(Wen et al., 2020), (Gomis-Font et al., 2020), (Pal and Tripathi, 2019), (He et al., 2019), (Linkevicius et al., 2016), (Xu et al., 2021), (Sugawara and Nikaido, 2014), (Dou et al., 2017b), (Kyriakidis et al., 2021), (Nemec et al., 2007), (Xu et al., 2019), (Hocquet et al., 2007)
adeC	3	**Reserve group:** Imipenem/cilastatin/relebactam **Watch group:** Cefepime, Meropenem, Minocycline_oral, Ticarcillin	(Gomis-Font et al., 2020), (Sugawara and Nikaido, 2014), (Dou et al., 2017b), (Kyriakidis et al., 2021), (Xu et al., 2019), (Hocquet et al., 2007)
adeJ	3	**Reserve group:** Imipenem/cilastatin/relebactam, Meropenem/vaborbactam, Tigecycline **Watch group:** Levofloxacin, Meropenem	(Gomis-Font et al., 2020), (Liu et al., 2024), (Xie et al., 2025), (Abdelaal, 2020), (Kayama et al., 2015),
adeK	3	**Reserve group:** Tigecycline **Watch group:** Meropenem	(Xie et al., 2025), (Kayama et al., 2015), (Gholamreza Goudarzi, 2020),
aph(3'')-I	2	**Watch group:** Netilmicin, Streptoduocin, Streptomycin_IV	(Ramon-Garcia et al., 2006)

aph(6)-I	2	**Watch group:** Streptoduocin, Streptomycin_IV, Streptomycin_oral	(Srinivasan et al., 2008)
cmlA	2	**Watch group:** Kanamycin_IV, Kanamycin_oral	(Demydchuk et al., 1998)
*bla*CTX-M	3	**Reserve group:** Cefiderocol, Ceftazidime/avibactam **Watch group:** Azlocillin, Cefaclor, Cefamandole, Cefdinir, Cefepime, Cefixime, Cefmetazole, Cefonicid, Cefoperazone, Cefoselis, Cefotaxime, Cefotetan, Cefprozil, Ceftriaxone, Delafloxacin, Meropenem, Piperacillin	(Poirel et al., 2021), (Xu et al., 2022), (Patil et al., 2021), (McConnell et al., 2018), (Knothe et al., 1983), (McConnell et al., 2018), (Cabral et al., 2012), (Wu et al., 2018), (Aslan and Akova, 2019), (Alkhudhairy M K, 2019), (Chen et al., 2024), (Cheng et al., 2020), (Adegoke et al., 2020), (Xiaojie Qin, 2022), (McConnell et al., 2018), (Schito et al., 2009), (Dias Siqueira et al., 2014), (Tabbouche Sana, 2011), (Loncaric et al., 2013)
emrB	2	**Watch group:** Demeclocycline, Penimepicycline	(Lin et al., 2017)
macA	3	**Reserve group:** Eravacycline, Tigecycline **Watch group:** Erythromycin	(Wen et al., 2020), (Fitzpatrick et al., 2017)
major_facilitator_superfamily_transporter	3	**Reserve group:** Eravacycline, Minocycline_IV, Omadacycline, Tigecycline, Omadacycline **Watch group:** Azithromycin, Chlortetracycline, Demeclocycline, Erythromycin, Flurithromycin, Josamycin, Miocamycin, Metacycline, Minocycline_oral, Spiramycin, Lincomycin, Lymecycline, Oxytetracycline, Rolitetracycline, Sarecycline	(Taylor et al., 2019), (Sumyk et al., 2021), (Fiedler et al., 2016), (Kobashi et al., 2008), (Zeng et al., 2022), (Li et al., 2022a), (Burdett, 1993), (Varaldo et al., 2009), (Mazzariol et al., 2007), (Gattringer et al., 2004), (Descheemaeker et al., 2000), (Hung et al., 2008), (Zhang et al., 1992), (Ralhan et al., 2024), (Kwiecien et al., 2021), (Woodford, 2005), (Liu et al., 2012), (Chopra and Roberts, 2001), (Zhanel et al., 2019)

mdfA	2	**Watch group:** Norfloxacin, Tazobactam	(Swick et al., 2011), (Hubbard et al., 2020)
mdtK	1	Access group antibiotics or others	
mdtL	1	Access group antibiotics or others	
mexB	3	**Reserve group:** Aztreonam, Ceftazidime/avibactam, Ceftolozane/tazobactam, Imipenem/cilastatin/relebactam, Meropenem/vaborbactam **Watch group:** Cefixime, Meropenem	(Ma et al., 2021), (Xiong et al., 2022), (Haidar et al., 2017), (Rapsinski et al., 2025), (Pal and Tripathi, 2019), (Mini, 2022), (Yamochi et al., 2025)
mexE	2	**Watch group:** Ciprofloxacin, Levofloxacin, Norfloxacin	(Rehman et al., 2021), (Wang et al., 2024b), (Hooper and Jacoby, 2015)
mexT	1	Access group antibiotics or others	
multidrug_ABC_transporter	3	**Reserve group:** Eravacycline, Imipenem/cilastatin/relebactam, Meropenem/vaborbactam, Tigecycline **Watch group:** Cefepime, Cefamandole, Cefoperazone, Ciprofloxacin, Levofloxacin, Meropenem, Minocycline_oral, Netilmicin, Ticarcillin	(Zeng et al., 2022), (Rapsinski et al., 2025), (Dou et al., 2017b), (Lin et al., 2015), (Sugawara and Nikaido, 2014), (Lin et al., 2009), (Xu et al., 2021), (Abdelaal, 2020), (Kyriakidis et al., 2021), (Nemec et al., 2007), (Xu et al., 2019), (Hocquet et al., 2007)
multidrug_transporter	3	**Reserve group:** Aztreonam, Ceftazidime/avibactam, Ceftolozane/tazobactam, Imipenem/cilastatin/relebactam, Meropenem/vaborbactam, Polymyxin-B_IV, Polymyxin-B_oral, Tigecycline **Watch group:** Cefcapene-pivoxil, Cefminox, Ciprofloxacin, Clarithromycin, Fleroxacin, Sulbenicillin, Tazobactam, Demeclocycline	(Ma et al., 2021), (Xiong et al., 2022), (Haidar et al., 2017), (Rapsinski et al., 2025), (Pal and Tripathi, 2019), (Ahmed et al., 2020), (Trimble et al., 2016), (Lin et al., 2015), (Zwama et al., 2019), (Kameyama et al., 2015), (van der Putten et al., 2019), (Tran Thanh et al., 2014), (Urban-Chmiel et al., 2022), (Yamasaki et al., 2011), (Holden et al., 2025), (Kocsis et al., 2021)

ompR	1	Access group antibiotics or others	
oprM	3	**Reserve group:** Aztreonam, Ceftazidime/avibactam, Faropenem, Imipenem/cilastatin/relebactam **Watch group:** Azithromycin, Azlocillin, Carbenicillin, Carindacillin, Cefepime, Cefpodoxime-proxetil, Cefsulodin, Ceftazidime, Ceftizoxime, Cinoxacin, Ciprofloxacin, Doripenem, Fleroxacin, Grepafloxacin, Isepamicin, Meropenem, Norfloxacin, Panipenem, Sulbenicillin, Temocillin, Ticarcillin	(Ma et al., 2021), (Xiong et al., 2022), (Okamoto et al., 2002b), (Rapsinski et al., 2025), (Gillis et al., 2005), (Laborda et al., 2019), (Dean et al., 2003), (Bush, 2010), (Hocquet et al., 2006), (Le Thomas et al., 2001), (Du et al., 2010), (Tafti et al., 2020), (Avakh et al., 2023), (Yu et al., 2025), (Falagas et al., 2012), (Dupont et al., 2005), (Hassuna et al., 2020), (Swick et al., 2011), (Okamoto et al., 2002a), (Li et al., 2015a), (Chalhoub et al., 2017), (Hocquet et al., 2007)
*bla*OXA-134	1	Access group antibiotics or others	
*bla*OXA-211	1	Access group antibiotics or others	
*bla*OXA-212	1	Access group antibiotics or others	
*bla*OXA-23	3	**Reserve group:** Ceftazidime/avibactam, Imipenem/cilastatin/relebactam, Meropenem/vaborbactam **Watch group:** Biapenem, Cefbuperazone, Cefoperazone, Cefotetan, Doripenem, Ertapenem, Meropenem, Ticarcillin	(Savov et al., 2019), (Koh et al., 2007), (Liu et al., 2024), (Bubpamala et al., 2018), (Anggraini et al., 2022), (Liu et al., 2016), (Yang et al., 2015), (Esterly et al., 2010), (Hou and Yang, 2015), (Veloo et al., 2019), (Nigro et al., 2015)
*bla*OXA-332	1	Access group antibiotics or others	
*bla*OXA-333	1	Access group antibiotics or others	
*bla*OXA-334	1	Access group antibiotics or others	
*bla*OXA-335	1	Access group antibiotics or others	

*bla*OXA-352	1	Access group antibiotics or others	
*bla*OXA-359	1	Access group antibiotics or others	
*bla*OXA-360	1	Access group antibiotics or others	
*bla*OXA-361	1	Access group antibiotics or others	
*bla*OXA-51	3	**Reserve group:** Ceftazidime/avibactam, Imipenem/cilastatin/relebactam, Meropenem/vaborbactam **Watch group:** Cefoperazone, Cefotetan, Ertapenem, Meropenem	(Savov et al., 2019), (Hu et al., 2007), (Shahcheraghi et al., 2011), (Lai et al., 2019), (Yang et al., 2015), (Hou and Yang, 2015), (Veloo et al., 2019)
*bla*OXA-90	3	**Reserve group:** Ceftazidime/avibactam, Imipenem/cilastatin/relebactam, Meropenem/vaborbactam **Watch group:** Cefoperazone, Cefotetan, Ertapenem, Meropenem	(Savov et al., 2019), (Hu et al., 2007), (Shahcheraghi et al., 2011), (Lai et al., 2019), (Yang et al., 2015), (Hou and Yang, 2015), (Veloo et al., 2019)
sul2	2	**Watch group:** Oxytetracycline	(Zhang et al., 2024)
tet39	1	Access group antibiotics or others	
tetR	3	**Reserve group:** Minocycline_IV **Watch group:** Minocycline_oral, Oxytetracycline	(Sumyk et al., 2021), (Wang et al., 2024c), (Herbert et al., 2022)
tolC	3	**Reserve group:** Tigecycline **Watch group:** Cefepime, Cinoxacin, Ciprofloxacin, Sulbenicillin, Temocillin, Tobramycin	(Korczak et al., 2024), (Liu et al., 2018a), (Cuesta Bernal et al., 2021), (van der Putten et al., 2019), (Avakh et al., 2023), (Gravey et al., 2024), (Alarfaj et al., 2022)

Table S6. Risk classification of *Acinetobacter* MAGs in the Yangtze River based on different clustering methods.

Method	**Low risk→Medium-low risk**	**Medium-low risk→Medium-high risk**	**Medium-high risk→High risk**
Distribution	5.928	10.592	18.925
Jenks	13.853	34.710	76.031
CDF	6.120	8.682	21.498
GMM	6.965	15.486	40.745
Median-based integration	6.542	13.039	31.122

Table S7. Classification of risk-weighted burdens across Yangtze River sampling points using different clustering methods.

Method	Low risk→Medium-low risk	Medium-low risk→Medium-high risk	Medium-high risk→High risk
Distribution	0.00179967	0.00673687	0.02521874
Jenks	0.19168026	0.80397028	1.82162191
CDF	0.00179924	0.00484141	0.02335936
GMM	0.00565907	0.02719392	0.20514281
Median-based integration	0.00372937	0.01696539	0.11518078

Table S8. Single risk scores for *Acinetobacter* MAGs identified in the Yangtze River.

Bins	Species	Risk	Risk level
YZ_Bin10	*Acinetobacter idrijaensis*	3.186391216	Low risk
YZ_Bin100	*Acinetobacter sp002135245*	3.408239965	Low risk
YZ_Bin2	*Acinetobacter idrijaensis*	3.487421211	Low risk
YZ_Bin63	*Acinetobacter sp003105055*	3.487421211	Low risk
YZ_Bin14	*Acinetobacter idrijaensis*	3.839603729	Low risk
YZ_Bin16	*Acinetobacter idrijaensis*	3.890756252	Low risk
YZ_Bin94	*Acinetobacter sp002135245*	4.089481203	Low risk
YZ_Bin109	*Acinetobacter kookii*	4.140633725	Low risk
YZ_Bin144	Unclassified species	4.214419939	Low risk
YZ_Bin81	*Acinetobacter bohemicus*	4.214419939	Low risk
YZ_Bin15	*Acinetobacter idrijaensis*	4.214419939	Low risk
YZ_Bin72	*Acinetobacter bohemicus*	4.441663721	Low risk
YZ_Bin104	*Acinetobacter kookii*	4.515449935	Low risk
YZ_Bin82	*Acinetobacter bohemicus*	4.742693716	Low risk
YZ_Bin85	*Acinetobacter albensis*	4.742693716	Low risk
YZ_Bin61	*Acinetobacter tandoii*	4.793846239	Low risk
YZ_Bin83	*Acinetobacter bohemicus*	4.918784976	Low risk
YZ_Bin7	*Acinetobacter idrijaensis*	5.043723712	Low risk
YZ_Bin97	*Acinetobacter sp002135245*	5.117509926	Low risk
YZ_Bin73	*Acinetobacter bohemicus*	5.117509926	Low risk
YZ_Bin65	*Acinetobacter bohemicus*	5.168662449	Low risk
YZ_Bin76	*Acinetobacter bohemicus*	5.344753708	Low risk
YZ_Bin143	Unclassified species	5.344753708	Low risk
YZ_Bin107	*Acinetobacter kookii*	5.418539922	Low risk
YZ_Bin125	*Acinetobacter tjernbergiae*	5.418539922	Low risk
YZ_Bin140	Unclassified species	5.520844967	Low risk
YZ_Bin80	*Acinetobacter bohemicus*	5.520844967	Low risk
YZ_Bin106	*Acinetobacter kookii*	5.696936226	Low risk
YZ_Bin11	*Acinetobacter idrijaensis*	5.719569918	Low risk
YZ_Bin158	Unclassified species	5.77072244	Low risk
YZ_Bin66	*Acinetobacter bohemicus*	5.857872616	Low risk
YZ_Bin168	Unclassified species	5.895661177	Low risk
YZ_Bin56	*Acinetobacter tandoii*	6.049118744	Low risk
YZ_Bin159	Unclassified species	6.117509926	Low risk
YZ_Bin157	Unclassified species	6.122904958	Low risk
YZ_Bin13	*Acinetobacter idrijaensis*	6.186391216	Low risk
YZ_Bin8	*Acinetobacter sp002367455*	6.186391216	Low risk
YZ_Bin79	*Acinetobacter bohemicus*	6.196691172	Low risk
YZ_Bin9	*Acinetobacter idrijaensis*	6.219814971	Low risk
YZ_Bin1	*Acinetobacter idrijaensis*	6.270967494	Low risk
YZ_Bin68	*Acinetobacter bohemicus*	6.298996217	Low risk
YZ_Bin53	*Acinetobacter tandoii*	6.321629909	Low risk

YZ_Bin142	Unclassified species	6.372782431	Low risk
YZ_Bin12	*Acinetobacter idrijaensis*	6.372782431	Low risk
YZ_Bin87	*Acinetobacter sp002135245*	6.497721168	Low risk
YZ_Bin95	*Acinetobacter sp002135245*	6.600026213	Medium-low risk
YZ_Bin108	*Acinetobacter kookii*	6.612359948	Medium-low risk
YZ_Bin145	Unclassified species	6.666973003	Medium-low risk
YZ_Bin141	Unclassified species	6.72496495	Medium-low risk
YZ_Bin147	Unclassified species	6.72496495	Medium-low risk
YZ_Bin77	*Acinetobacter bohemicus*	6.72496495	Medium-low risk
YZ_Bin98	*Acinetobacter sp002135245*	6.821874963	Medium-low risk
YZ_Bin150	Unclassified species	7.052323884	Medium-low risk
YZ_Bin152	Unclassified species	7.077147468	Medium-low risk
YZ_Bin3	*Acinetobacter idrijaensis*	7.089481203	Medium-low risk
YZ_Bin102	*Acinetobacter sp002135245*	7.122904958	Medium-low risk
YZ_Bin156	Unclassified species	7.151781086	Medium-low risk
YZ_Bin96	*Acinetobacter sp002135245*	7.17726262	Medium-low risk
YZ_Bin78	*Acinetobacter bohemicus*	7.202086204	Medium-low risk
YZ_Bin5	*Acinetobacter idrijaensis*	7.299353514	Medium-low risk
YZ_Bin59	*Acinetobacter tandoii*	7.304391249	Medium-low risk
YZ_Bin67	*Acinetobacter bohemicus*	7.451963677	Medium-low risk
YZ_Bin91	*Acinetobacter sp002135245*	7.496276775	Medium-low risk
YZ_Bin6	*Acinetobacter idrijaensis*	7.576902414	Medium-low risk
YZ_Bin71	*Acinetobacter bohemicus*	7.628054936	Medium-low risk
YZ_Bin163	Unclassified species	7.701841151	Medium-low risk
YZ_Bin17	*Acinetobacter idrijaensis*	7.816479931	Medium-low risk
YZ_Bin146	Unclassified species	7.817510157	Medium-low risk
YZ_Bin75	*Acinetobacter bohemicus*	7.838908302	Medium-low risk
YZ_Bin103	*Acinetobacter sp002135245*	7.849903686	Medium-low risk
YZ_Bin88	*Acinetobacter sp002135245*	7.965082585	Medium-low risk
YZ_Bin69	*Acinetobacter bohemicus*	8.031389977	Medium-low risk
YZ_Bin86	*Acinetobacter albensis*	8.085057903	Medium-low risk
YZ_Bin92	*Acinetobacter sp002135245*	8.192326367	Medium-low risk
YZ_Bin154	Unclassified species	8.230114928	Medium-low risk
YZ_Bin101	*Acinetobacter sp002135245*	8.399366762	Medium-low risk
YZ_Bin149	Unclassified species	8.479992401	Medium-low risk
YZ_Bin74	*Acinetobacter bohemicus*	8.493356363	Medium-low risk
YZ_Bin62	*Acinetobacter tandoii*	8.531144923	Medium-low risk
YZ_Bin161	Unclassified species	8.544508885	Medium-low risk
YZ_Bin55	*Acinetobacter tandoii*	8.582297446	Medium-low risk
YZ_Bin70	*Acinetobacter bohemicus*	8.582297446	Medium-low risk
YZ_Bin122	*Acinetobacter tjernbergiae*	8.604931138	Medium-low risk
YZ_Bin18	*Acinetobacter schindleri*	8.65608366	Medium-low risk
YZ_Bin105	*Acinetobacter kookii*	8.707236183	Medium-low risk
YZ_Bin148	Unclassified species	8.774182972	Medium-low risk

YZ_Bin99	*Acinetobacter sp002135245*	8.774182972	Medium-low risk
YZ_Bin115	*Acinetobacter tjernbergiae*	8.832174919	Medium-low risk
YZ_Bin93	*Acinetobacter sp002135245*	8.934479964	Medium-low risk
YZ_Bin90	*Acinetobacter sp002135245*	9.008266178	Medium-low risk
YZ_Bin155	Unclassified species	9.253238727	Medium-low risk
YZ_Bin153	Unclassified species	9.273937919	Medium-low risk
YZ_Bin84	*Acinetobacter albensis*	9.302456749	Medium-low risk
YZ_Bin112	*Acinetobacter tjernbergiae*	9.360448696	Medium-low risk
YZ_Bin89	*Acinetobacter sp002135245*	9.512661518	Medium-low risk
YZ_Bin151	Unclassified species	9.697476345	Medium-low risk
YZ_Bin118	*Acinetobacter tjernbergiae*	9.786417429	Medium-low risk
YZ_Bin64	*Acinetobacter bohemicus*	9.802211696	Medium-low risk
YZ_Bin126	*Acinetobacter tjernbergiae*	9.911356165	Medium-low risk
YZ_Bin116	*Acinetobacter tjernbergiae*	10.01366121	Medium-low risk
YZ_Bin123	*Acinetobacter tjernbergiae*	10.13859995	Medium-low risk
YZ_Bin160	Unclassified species	10.36835913	Medium-low risk
YZ_Bin117	*Acinetobacter tjernbergiae*	10.56456868	Medium-low risk
YZ_Bin114	*Acinetobacter tjernbergiae*	10.76329363	Medium-low risk
YZ_Bin162	Unclassified species	10.9167512	Medium-low risk
YZ_Bin120	*Acinetobacter tjernbergiae*	10.96790372	Medium-low risk
YZ_Bin121	*Acinetobacter tjernbergiae*	11.11596625	Medium-low risk
YZ_Bin57	*Acinetobacter tandoii*	11.31469121	Medium-low risk
YZ_Bin113	*Acinetobacter tjernbergiae*	11.64374993	Medium-low risk
YZ_Bin60	*Acinetobacter tandoii*	11.64374993	Medium-low risk
YZ_Bin119	*Acinetobacter tjernbergiae*	11.74605497	Medium-low risk
YZ_Bin124	*Acinetobacter tjernbergiae*	11.96741361	Medium-low risk
YZ_Bin58	*Acinetobacter tandoii*	11.99593244	Medium-low risk
YZ_Bin54	*Acinetobacter tandoii*	12.72293117	Medium-low risk
YZ_Bin110	*Acinetobacter radioresistens*	13.25709009	Medium-high risk
YZ_Bin40	*Acinetobacter johnsonii*	13.85326494	Medium-high risk
YZ_Bin48	*Acinetobacter johnsonii*	15.64325982	Medium-high risk
YZ_Bin167	Unclassified species	16.81241237	Medium-high risk
YZ_Bin52	*Acinetobacter johnsonii*	16.86288036	Medium-high risk
YZ_Bin50	*Acinetobacter johnsonii*	16.98473391	Medium-high risk
YZ_Bin165	Unclassified species	17.2841386	Medium-high risk
YZ_Bin51	*Acinetobacter johnsonii*	17.68698353	Medium-high risk
YZ_Bin47	*Acinetobacter johnsonii*	18.65944491	Medium-high risk
YZ_Bin43	*Acinetobacter johnsonii*	18.74353108	Medium-high risk
YZ_Bin24	*Acinetobacter johnsonii*	19.27180486	Medium-high risk
YZ_Bin44	*Acinetobacter johnsonii*	19.40907733	Medium-high risk
YZ_Bin23	*Acinetobacter johnsonii*	19.46535431	Medium-high risk
YZ_Bin45	*Acinetobacter johnsonii*	19.4931635	Medium-high risk
YZ_Bin4	*Acinetobacter lwoffii*	19.64662107	Medium-high risk
YZ_Bin39	*Acinetobacter johnsonii*	19.77956037	Medium-high risk

YZ_Bin25	*Acinetobacter johnsonii*	19.95353621	Medium-high risk
YZ_Bin22	*Acinetobacter johnsonii*	20.17489485	Medium-high risk
YZ_Bin128	*Acinetobacter junii*	20.63526755	Medium-high risk
YZ_Bin164	Unclassified species	21.4198674	Medium-high risk
YZ_Bin34	*Acinetobacter johnsonii*	21.5508084	Medium-high risk
YZ_Bin36	*Acinetobacter johnsonii*	21.59007352	Medium-high risk
YZ_Bin166	Unclassified species	21.60145297	Medium-high risk
YZ_Bin111	*Acinetobacter radioresistens*	22.20243346	Medium-high risk
YZ_Bin139	*Acinetobacter soli*	23.10552345	Medium-high risk
YZ_Bin32	*Acinetobacter johnsonii*	23.25898102	Medium-high risk
YZ_Bin41	*Acinetobacter johnsonii*	23.25898102	Medium-high risk
YZ_Bin19	*Acinetobacter schindleri*	23.70316863	Medium-high risk
YZ_Bin29	*Acinetobacter johnsonii*	23.92019409	Medium-high risk
YZ_Bin21	*Acinetobacter johnsonii*	24.09416993	Medium-high risk
YZ_Bin27	*Acinetobacter johnsonii*	24.35252978	Medium-high risk
YZ_Bin49	*Acinetobacter johnsonii*	25.06006164	Medium-high risk
YZ_Bin42	*Acinetobacter johnsonii*	25.54426352	Medium-high risk
YZ_Bin130	*Acinetobacter junii*	26.12170855	Medium-high risk
YZ_Bin38	*Acinetobacter johnsonii*	26.34306719	Medium-high risk
YZ_Bin20	*Acinetobacter johnsonii*	26.69736513	Medium-high risk
YZ_Bin33	*Acinetobacter johnsonii*	26.95689746	Medium-high risk
YZ_Bin35	*Acinetobacter johnsonii*	27.43970663	Medium-high risk
YZ_Bin31	*Acinetobacter johnsonii*	28.08134609	Medium-high risk
YZ_Bin28	*Acinetobacter johnsonii*	28.52406337	Medium-high risk
YZ_Bin26	*Acinetobacter johnsonii*	29.49652476	Medium-high risk
YZ_Bin129	*Acinetobacter junii*	29.61699617	Medium-high risk
YZ_Bin127	*Acinetobacter parvus*	30.26234227	Medium-high risk
YZ_Bin30	*Acinetobacter johnsonii*	30.37033523	Medium-high risk
YZ_Bin37	*Acinetobacter johnsonii*	31.3867909	High risk
YZ_Bin131	*Acinetobacter junii*	32.28988089	High risk
YZ_Bin46	*Acinetobacter johnsonii*	34.70989113	High risk
YZ_Bin137	*Acinetobacter baumannii*	44.44495881	High risk
YZ_Bin132	*Acinetobacter calcoaceticus*	55.74241136	High risk
YZ_Bin138	*Acinetobacter baumannii*	56.06242091	High risk
YZ_Bin136	*Acinetobacter pittii*	57.39802947	High risk
YZ_Bin133	*Acinetobacter pittii*	61.66678859	High risk
YZ_Bin134	*Acinetobacter pittii*	62.02541971	High risk
YZ_Bin135	*Acinetobacter pittii*	76.03067189	High risk

Table S9. Spatiotemporal differences in *Acinetobacter* risk levels across Yangtze River sections near YY, WH, JJ, and NJ during May–June 2020.

May–June 2020	Mean rank diff.	Adjusted *P*-value	Significance
YY vs. WH	-275.8	***	<0.001
YY vs. JJ	-227.5	***	<0.001
YY vs. NJ	-240.4	***	<0.001
WH vs. JJ	48.26	ns	>0.9999
WH vs. NJ	35.32	ns	>0.9999
JJ vs. NJ	-12.93	ns	>0.9999

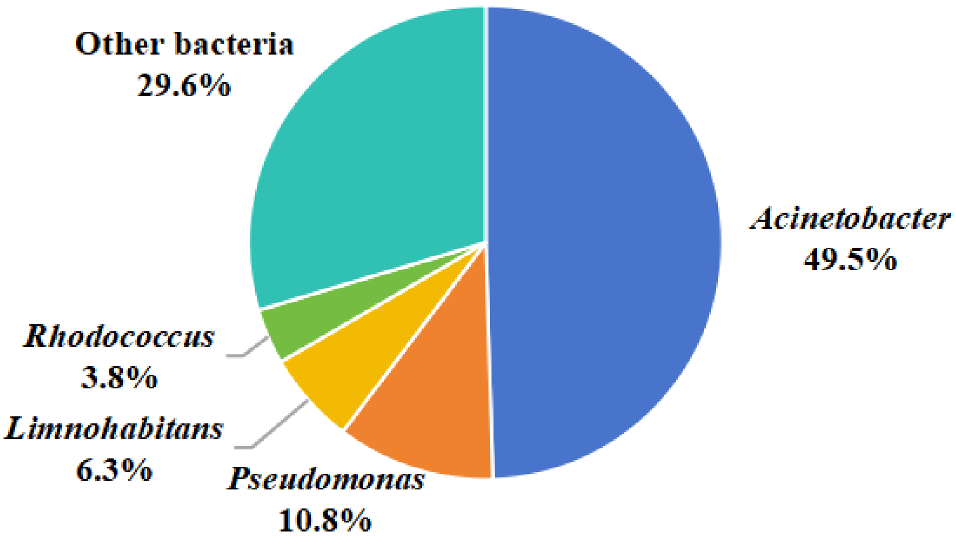

Figure S1. High-risk microorganisms in the Yangtze River co-harboring ARGs, VFGs, and MGEs.

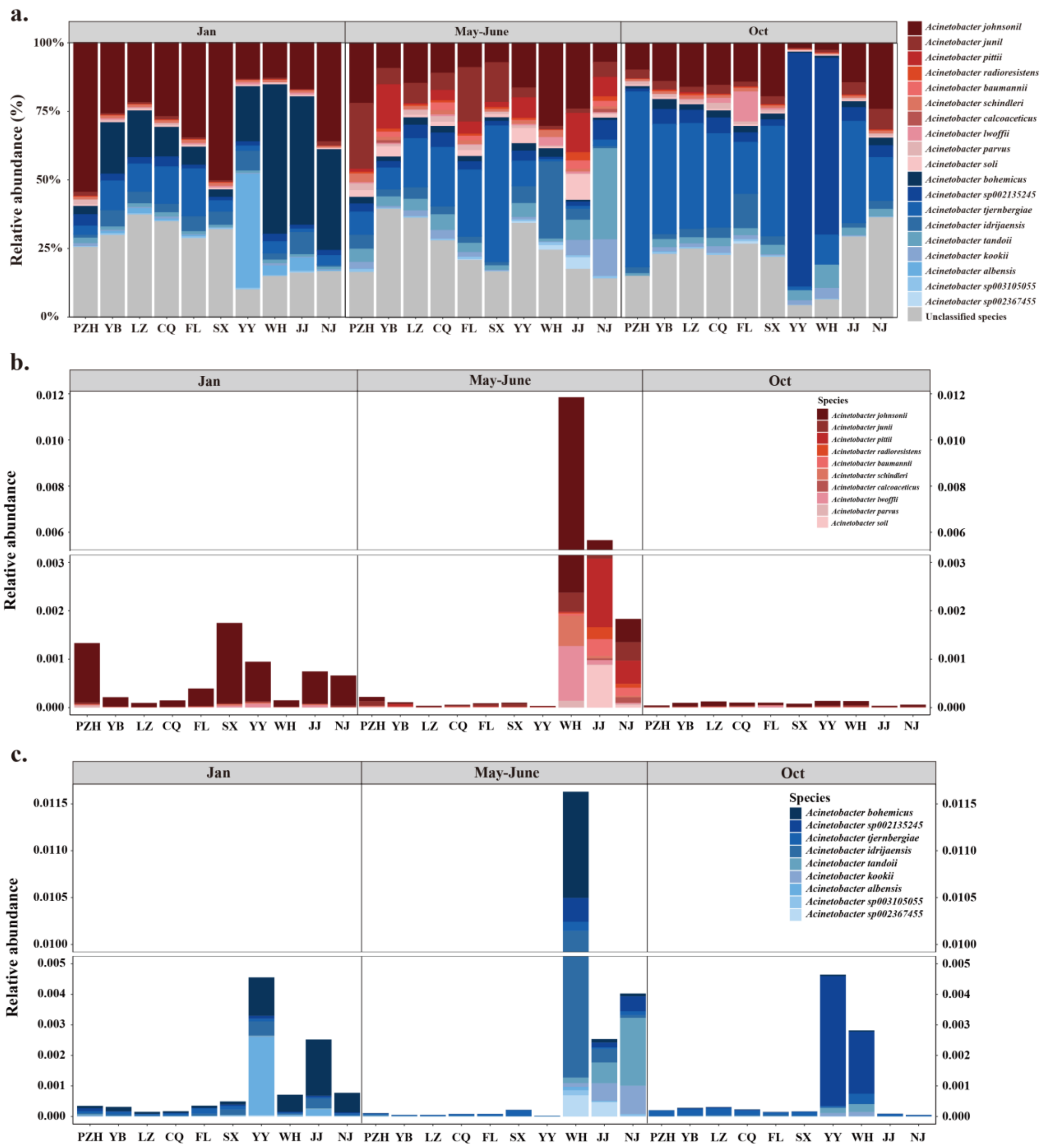

Figure S2. Changes in *Acinetobacter* abundance in the Yangtze River. (a) Changes in *Acinetobacter* relative abundance in different urban sections of the Yangtze River. (b) Abundance of opportunistic pathogenic *Acinetobacter* in different urban sections of the Yangtze River. (c) Abundance of environmental non-pathogenic *Acinetobacter* in different urban sections of the Yangtze River.

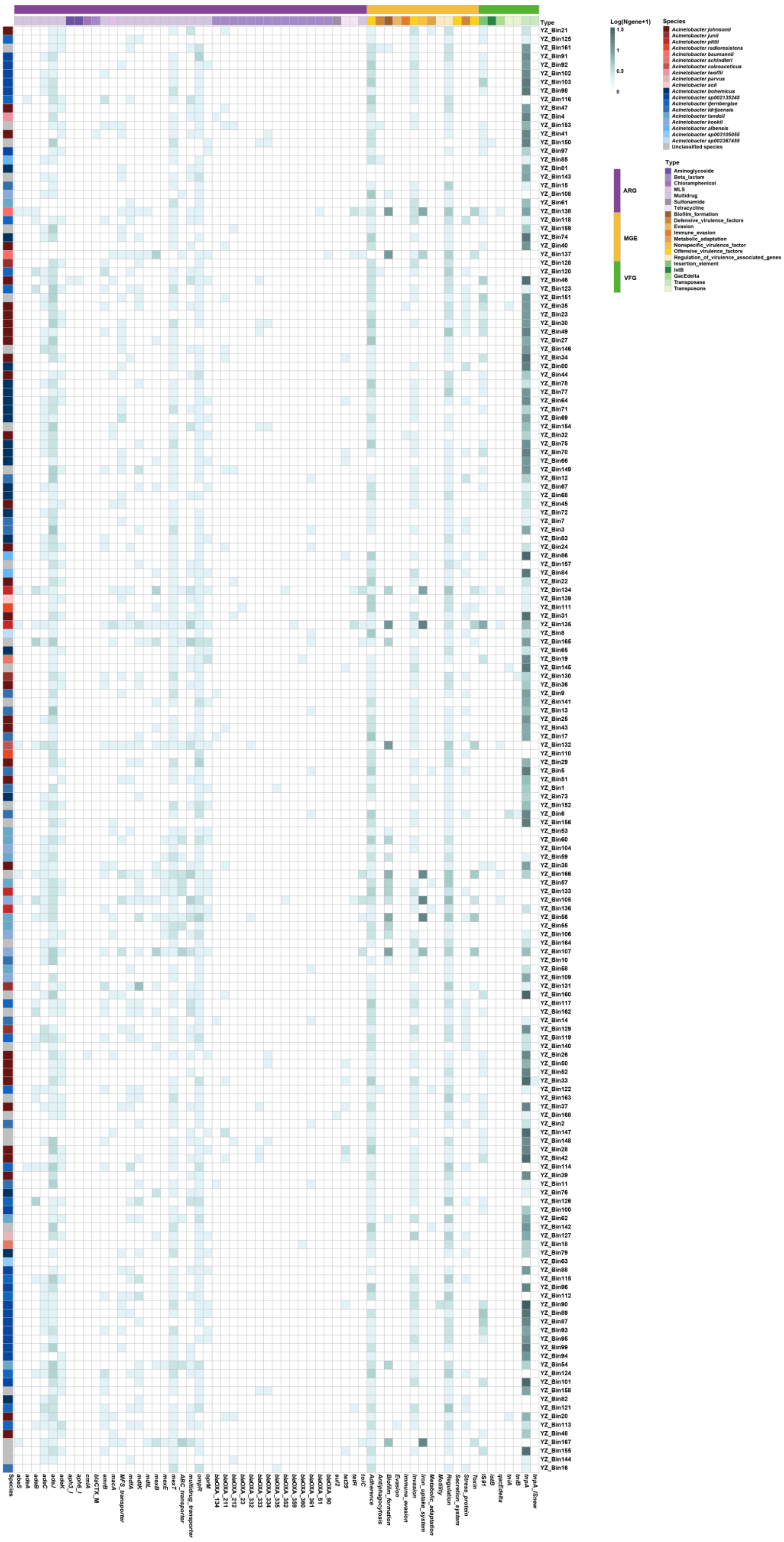

Figure S3. Genomic profiles of 168 *Acinetobacter* MAGs from the Yangtze River.

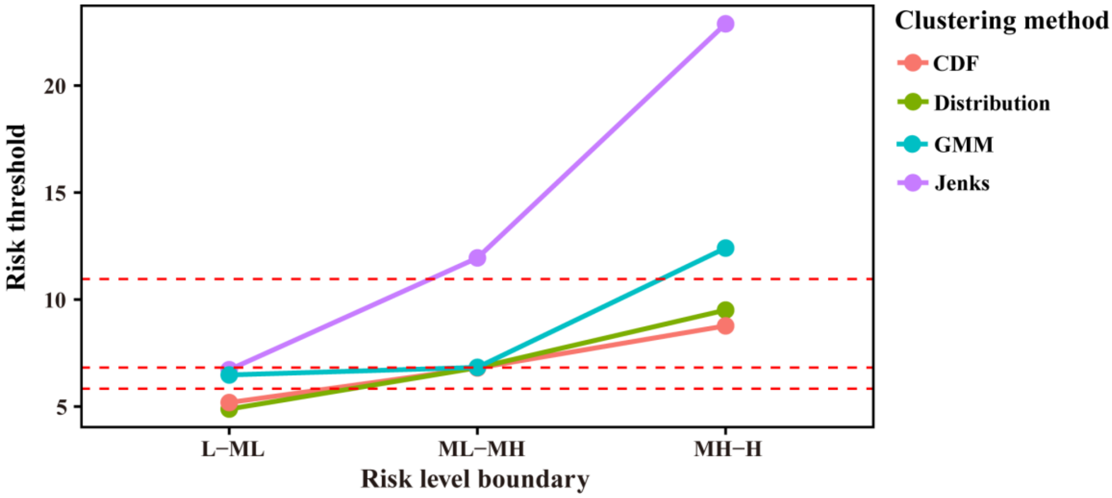

Figure S4. Risk clustering of *Acinetobacter* MAGs from the Yangtze River using a multi-model threshold determination approach. Optimal classification threshold was determined using a median integration strategy; red dotted line represents final adopted threshold. CDF: cumulative distribution function, Distribution: probability distribution fitting, GMM: Gaussian mixture model, Jenks: Jenks natural break analysis. L-ML: boundary between low and medium-low risk, ML-MH: boundary between medium-low and medium-high risk, MH-H: boundary between medium-high and high risk.

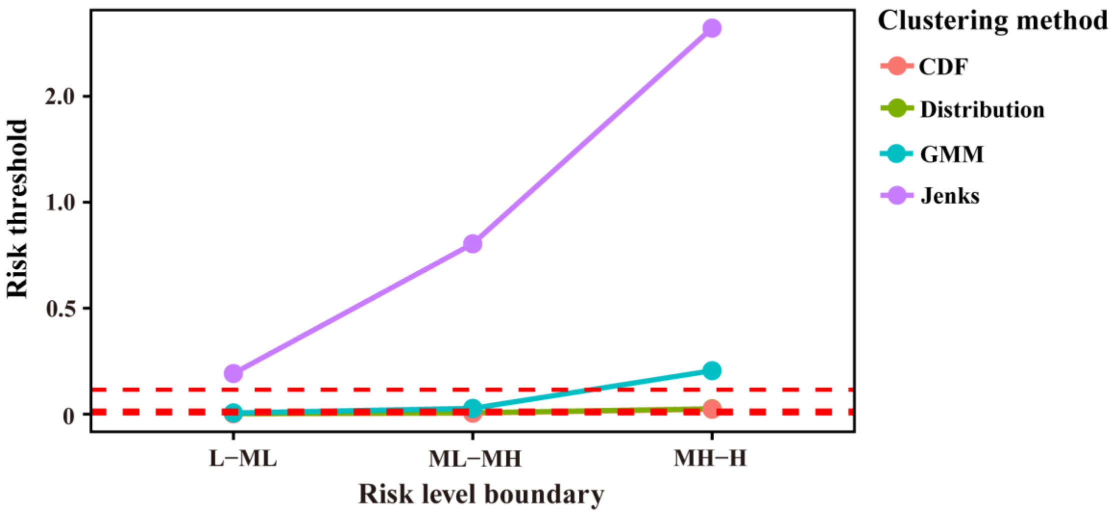

Figure S5. Clustering of risk-weighted burdens across Yangtze River sampling points based on multi-model threshold analysis. Optimal classification threshold was determined using a median integration strategy; red dotted line represents final adopted threshold. CDF: cumulative distribution function, Distribution: probability distribution fitting, GMM: Gaussian mixture model, Jenks: Jenks natural break analysis. L-ML: boundary between low and medium-low risk, ML-MH: boundary between medium-low and medium-high risk, MH-H: boundary between medium-high and high risk.

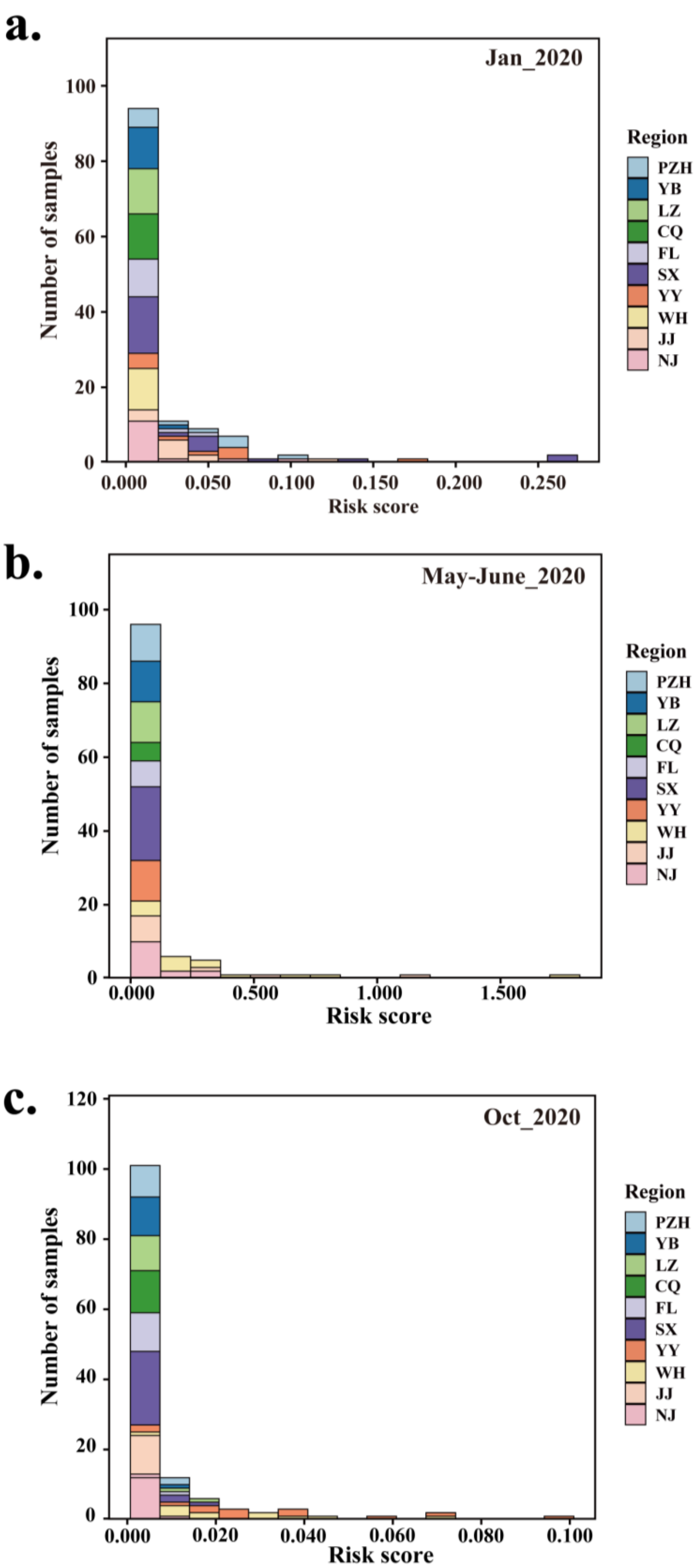

Figure S6. Spatiotemporal variation in risk-weighted burden within urban sections of the Yangtze River. (a) Dry season. (b) Wet season. (c) Normal water flow season.

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