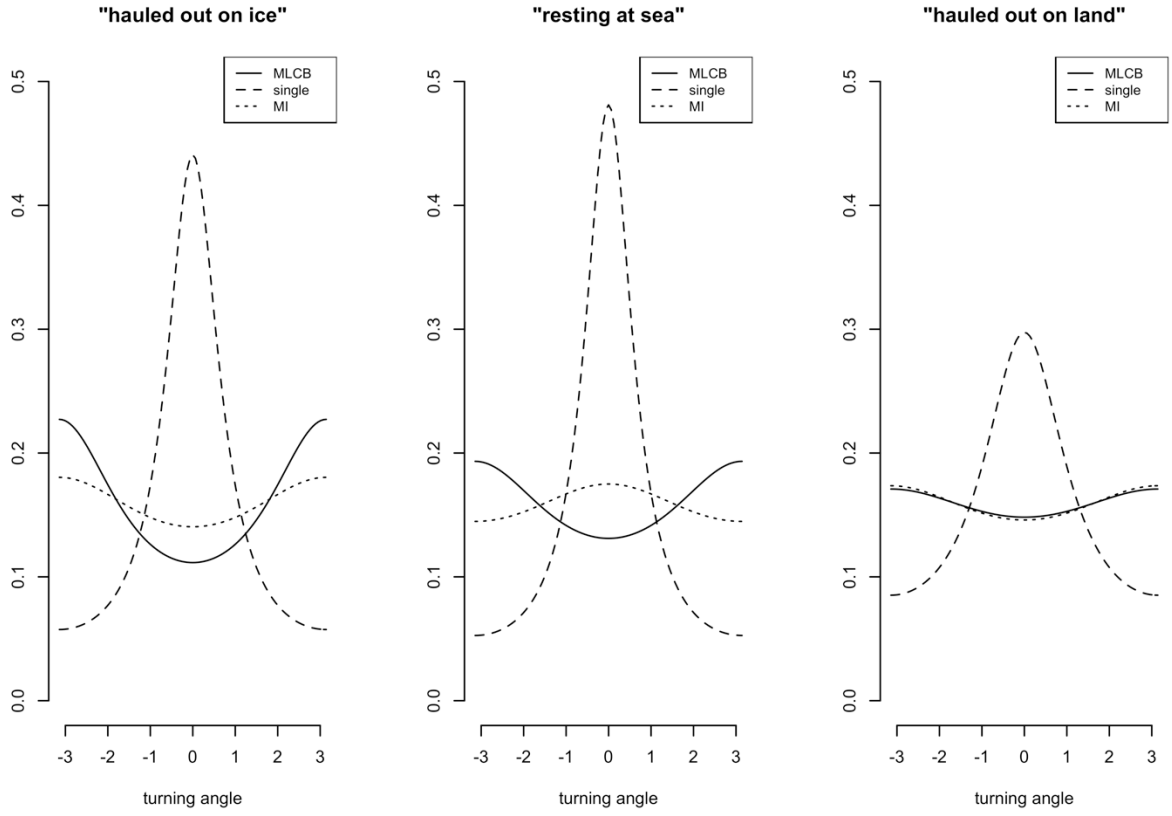
Appendix D. Additional results for the bearded seal example

Figure D1. Estimated state-dependent probability distributions for turning angle for $N = 7$ bearded seals using the single, multiple imputation (MI), and McClintock et al. (2017; MLCB) approaches. The six behavior states include "hauled out on ice", "resting at sea", "hauled out on land", "mid-water foraging", "benthic foraging", and "transit". Multiple imputation results are based on $n = 400$ realizations of the position process.


"hauled out on ice"
"resting at sea"
"hauled out on land"
MLCB
single
MI
0.0
0.1
0.2
0.3
0.4
0.5
-3
-2
-1
0
1
2
3
turning angle

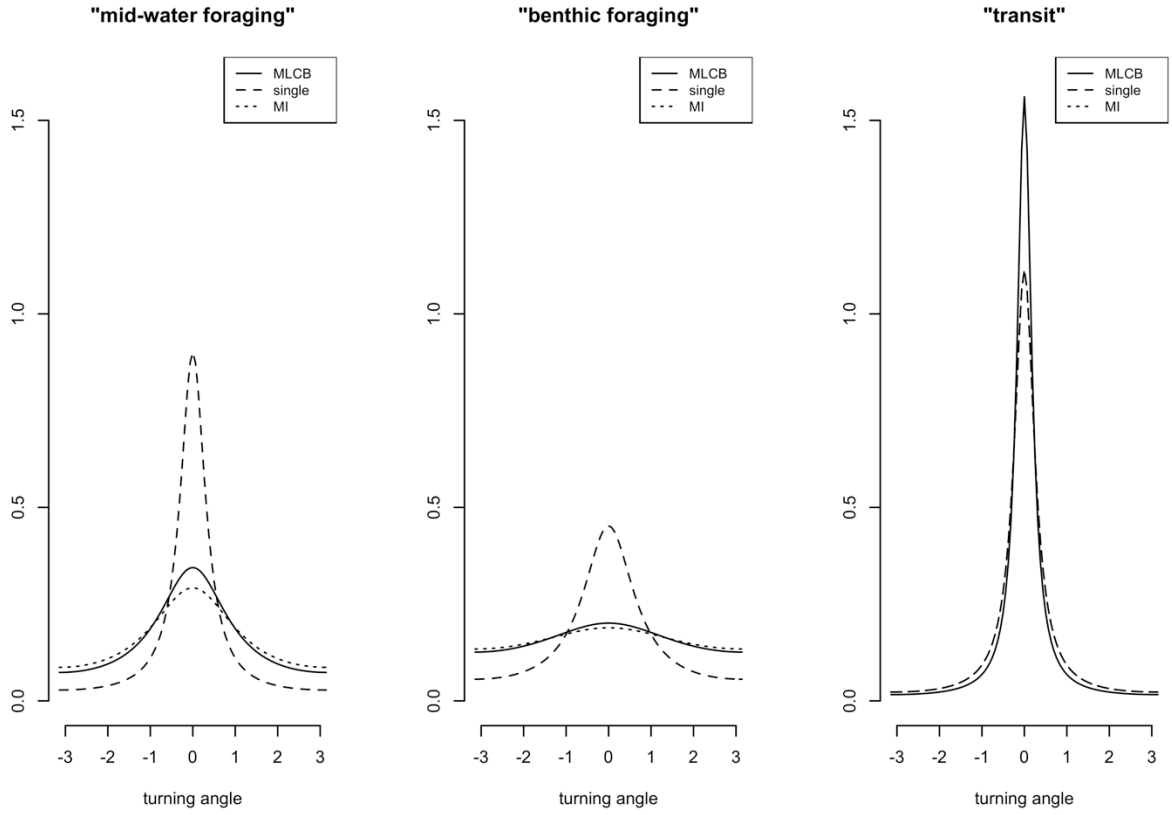

"mid-water foraging"
"benthic foraging"
"transit"
MLCB
single
MI
0.0
0.5
1.0
1.5
-3
-2
-1
0
1
2
3
turning angle

Figure D2. Estimated state-dependent probability distributions for dive time (top two rows) and dry time (bottom two rows) for $N = 7$ bearded seals using the single, multiple imputation (MI), and McClintock et al. (2017; MLCB) approaches. The six behavior states include "hauled out on ice", "resting at sea", "hauled out on land", "mid-water foraging", "benthic foraging", and "transit". Note the probability distributions for both dive and dry time are nearly identical among the three analyses. Multiple imputation results are based on $n = 400$ realizations of the position process.

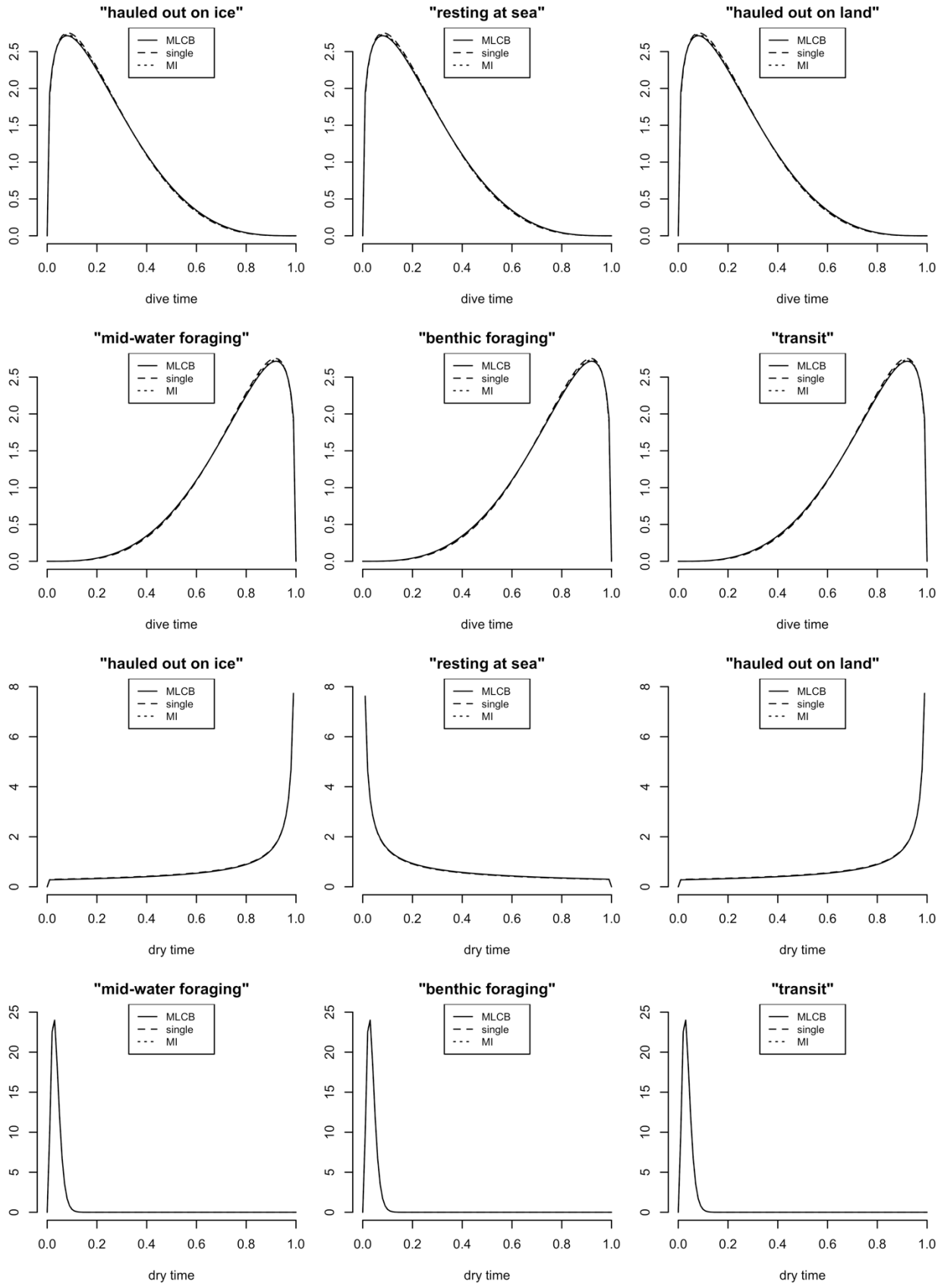

"hauled out on ice"
"resting at sea"
"hauled out on land"
"mid-water foraging"
"benthic foraging"
"transit"
MLCB
single
MI
dive time
dry time

Figure D3. Estimated state-dependent probability distributions for proportion of sea ice cover (top two rows) and proportion of land cover (bottom two rows) for $N = 7$ bearded seals using the single, multiple imputation (MI), and McClintock et al. (2017; MLCB) approaches. The six behavior states include "hauled out on ice", "resting at sea", "hauled out on land", "mid-water foraging", "benthic foraging", and "transit". Note that most of the probability distributions for both sea ice and land cover are nearly identical among the three analyses. Multiple imputation results are based on $n = 400$ realizations of the position process.

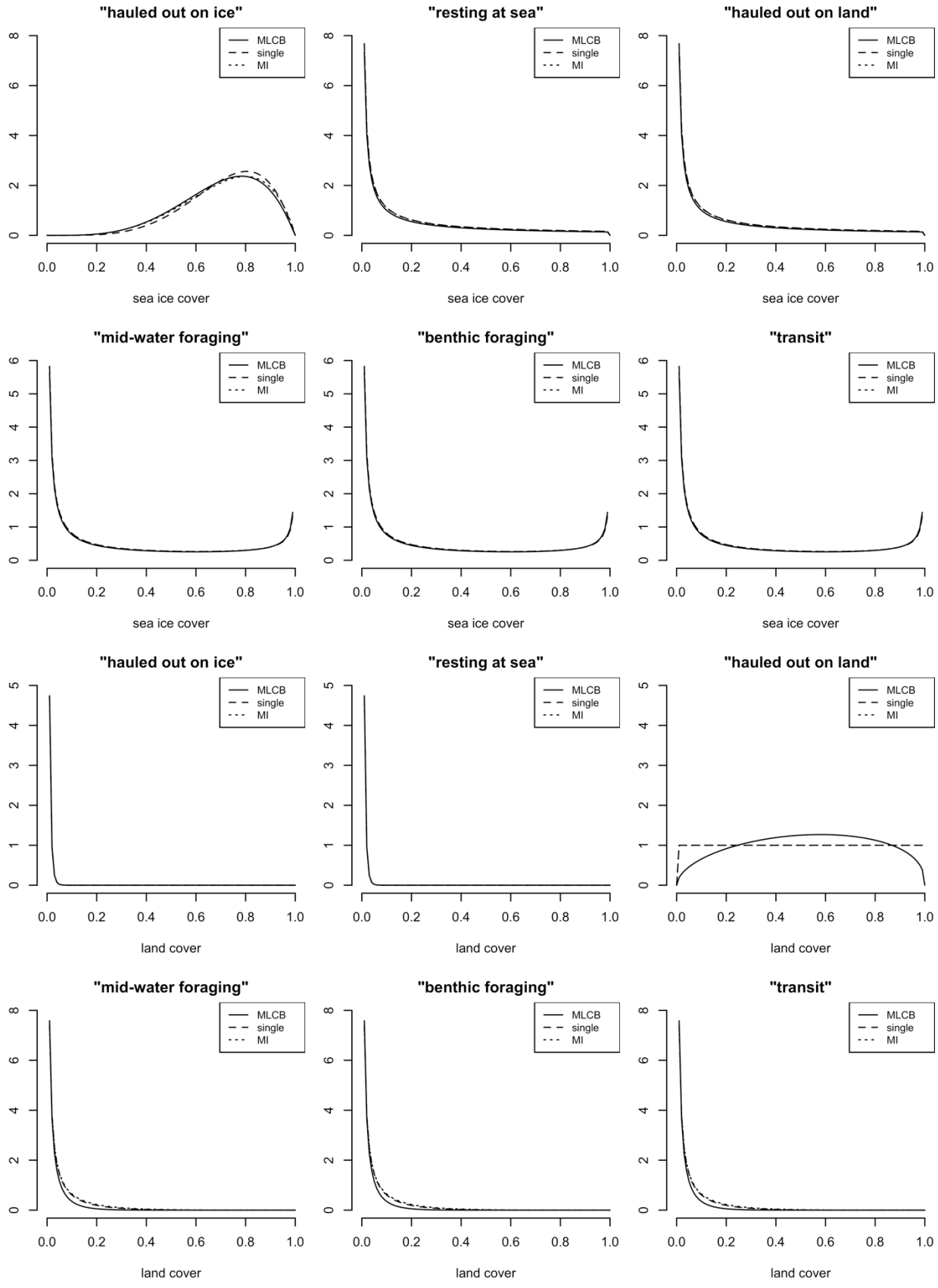

"hauled out on ice"
"resting at sea"
"hauled out on land"
"mid-water foraging"
"benthic foraging"
"transit"
"hauled out on ice"
"resting at sea"
"hauled out on land"
"mid-water foraging"
"benthic foraging"
"transit"
MLCB
single
MI
sea ice cover
land cover
0.0
0.2
0.4
0.6
0.8
1.0

Figure D4. Estimated state transition probabilities $(p_{l,k})$ for $N = 7$ bearded seals using the single, multiple imputation (MI), and McClintock et al. (2017; MLCB) approaches. The six behavior states include "hauled out on ice" (*I*), "resting at sea" (*S*), "hauled out on land" (*L*), "mid-water foraging" (*M*), "benthic foraging" (*B*), and "transit" (*T*). Each panel pertains to the *l*th row of the transition probability matrix for $l \in \{I, S, L, M, B, T\}$. For example, the top left panel contains the estimated transition probabilities from state $l = I$ (i.e., "hauled out on ice") at time t to state $k \in \{I, S, L, M, B, T\}$ at time $t + 1$. For the single and multiple imputation approaches, 95% *t*-distributed confidence intervals were calculated using a logit transformation. Multiple imputation results are based on $n = 400$ realizations of the position process.

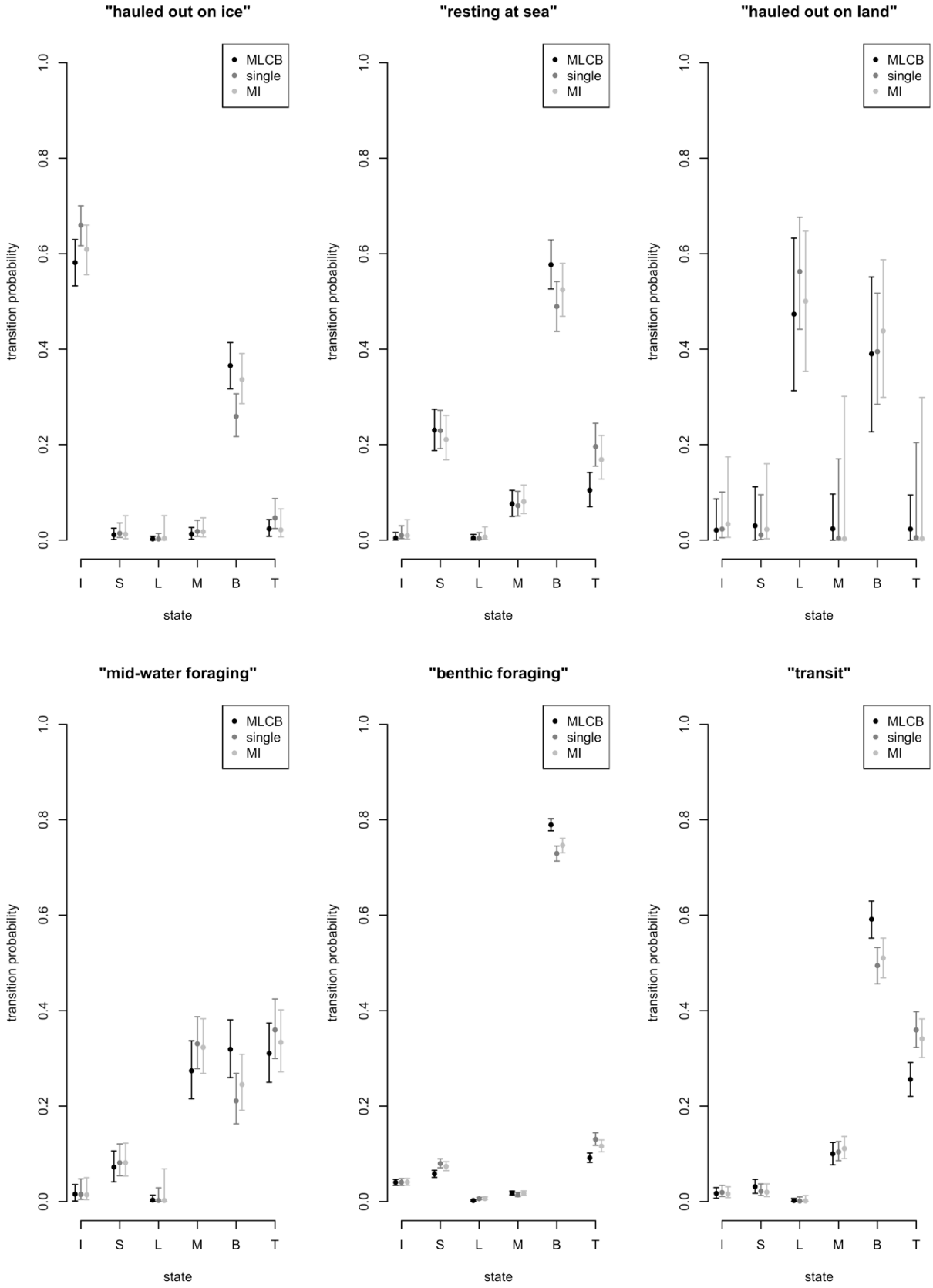

"hauled out on ice"
"resting at sea"
"hauled out on land"
"mid-water foraging"
"benthic foraging"
"transit"
MLCB
single
MI
transition probability
0.0
0.2
0.4
0.6
0.8
1.0
I
S
L
M
B
T
state

Figure D5. Predicted locations and states for an adult male bearded seal tag deployment from 25 June 2009 to 9 March 2010 near Alaska, USA, using the single (left panel) and multiple (right) imputation approaches. The sea ice concentration in 25x25km grid cells on 29 July 2009 indicate both approaches identified a mid-water foraging trip to the deeper Canada Basin waters off the Beaufort Shelf during which the animal hauled out on the northwardly receding sea ice edge. For the multiple imputation approach, the results from each of $n = 30$ realizations of the position process are plotted.

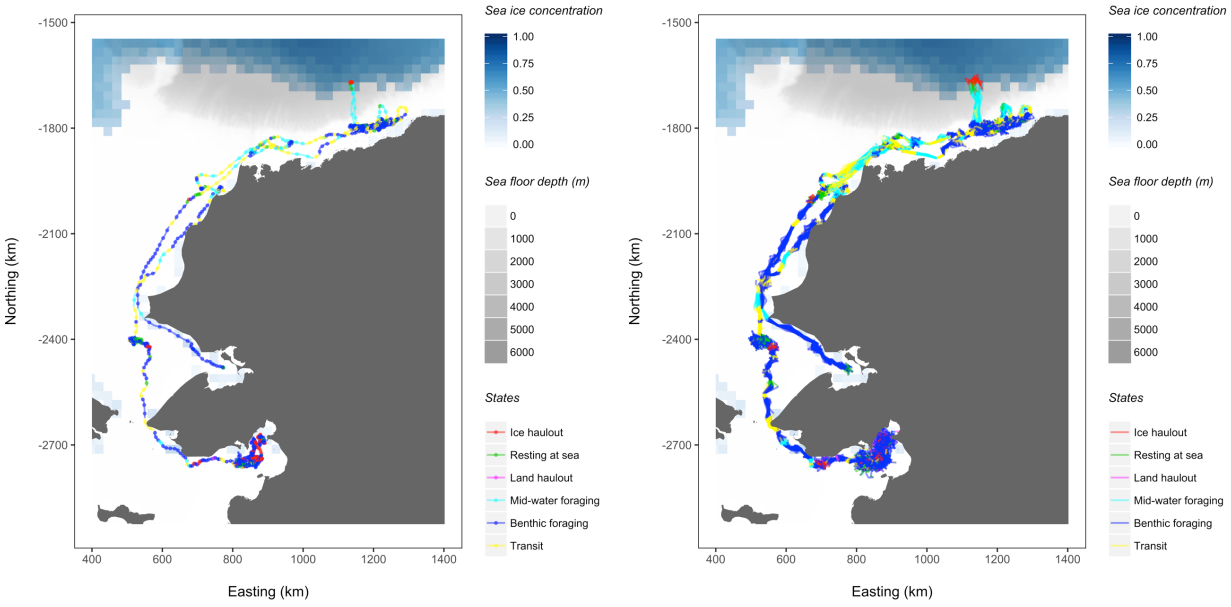


Figure D6. Predicted locations and states for an adult male bearded seal tag deployment from 25 June 2009 to 9 March 2010 near Alaska, USA, using the single (left panel) and multiple (right) imputation approaches. The sea ice concentration in 25x25km grid cells on 29 July 2009 indicate both approaches identified a mid-water foraging trip to the deeper Canada Basin waters off the Beaufort Shelf during which the animal hauled out on the northwardly receding sea ice edge. For the multiple imputation approach, the results from each of $n = 5$ realizations of the position process are plotted.