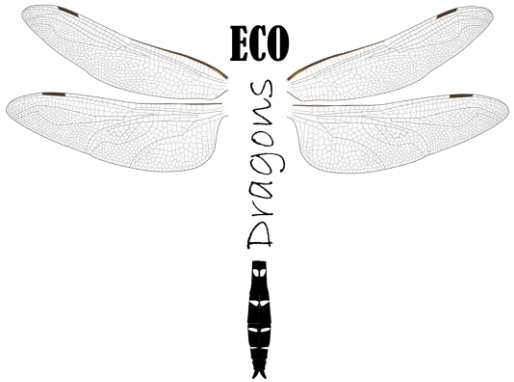
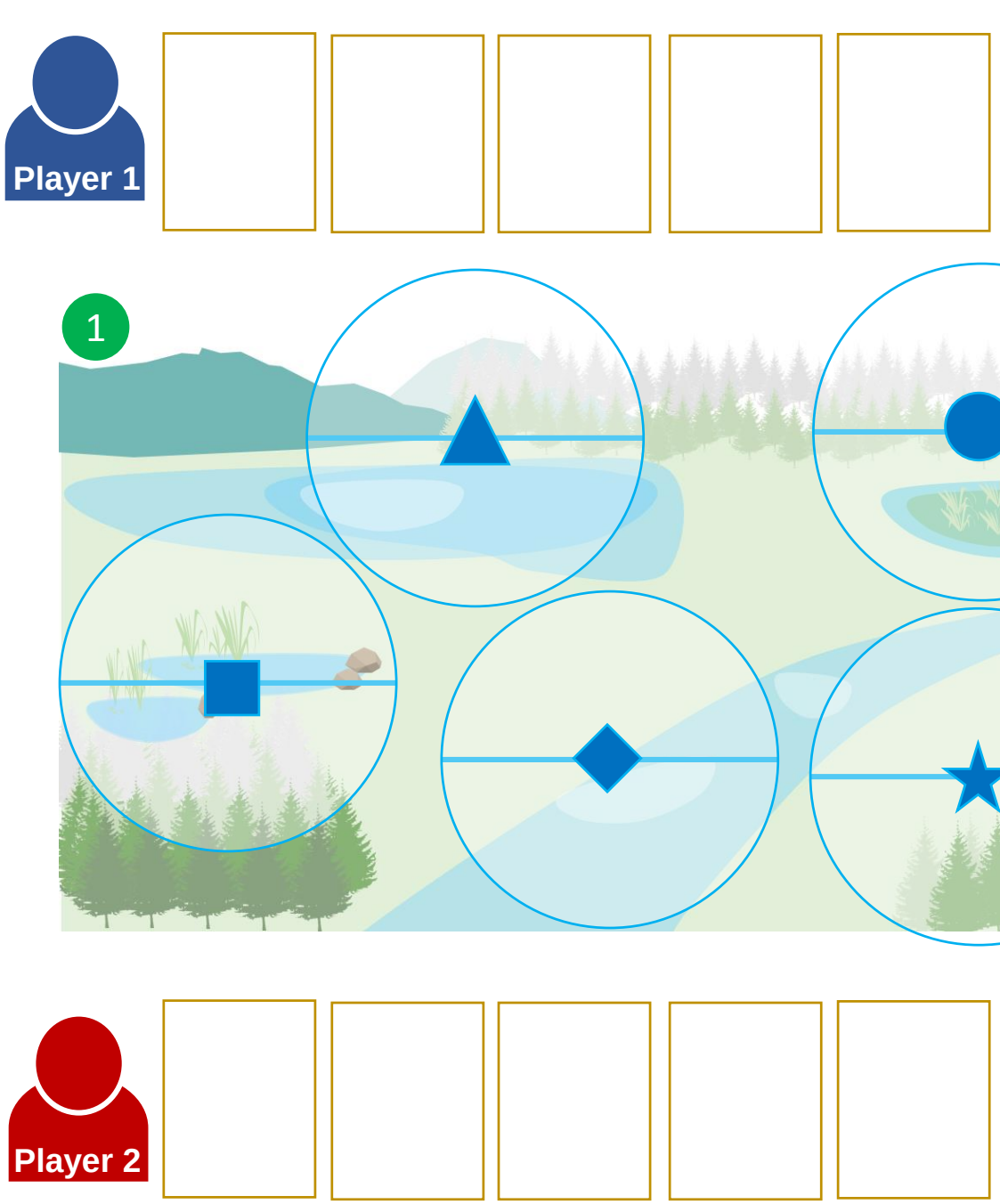
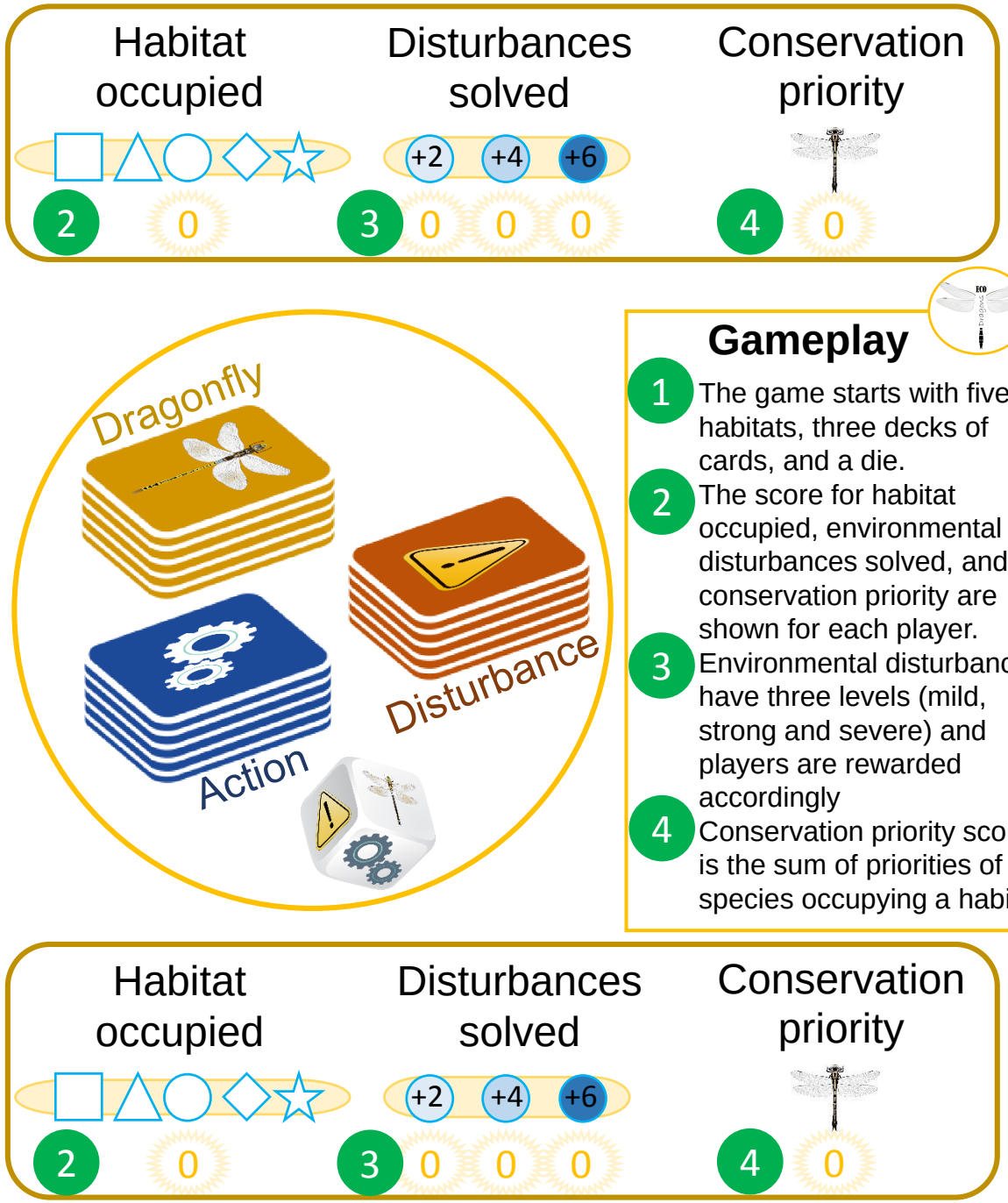
Supplementary material: Appendix 1

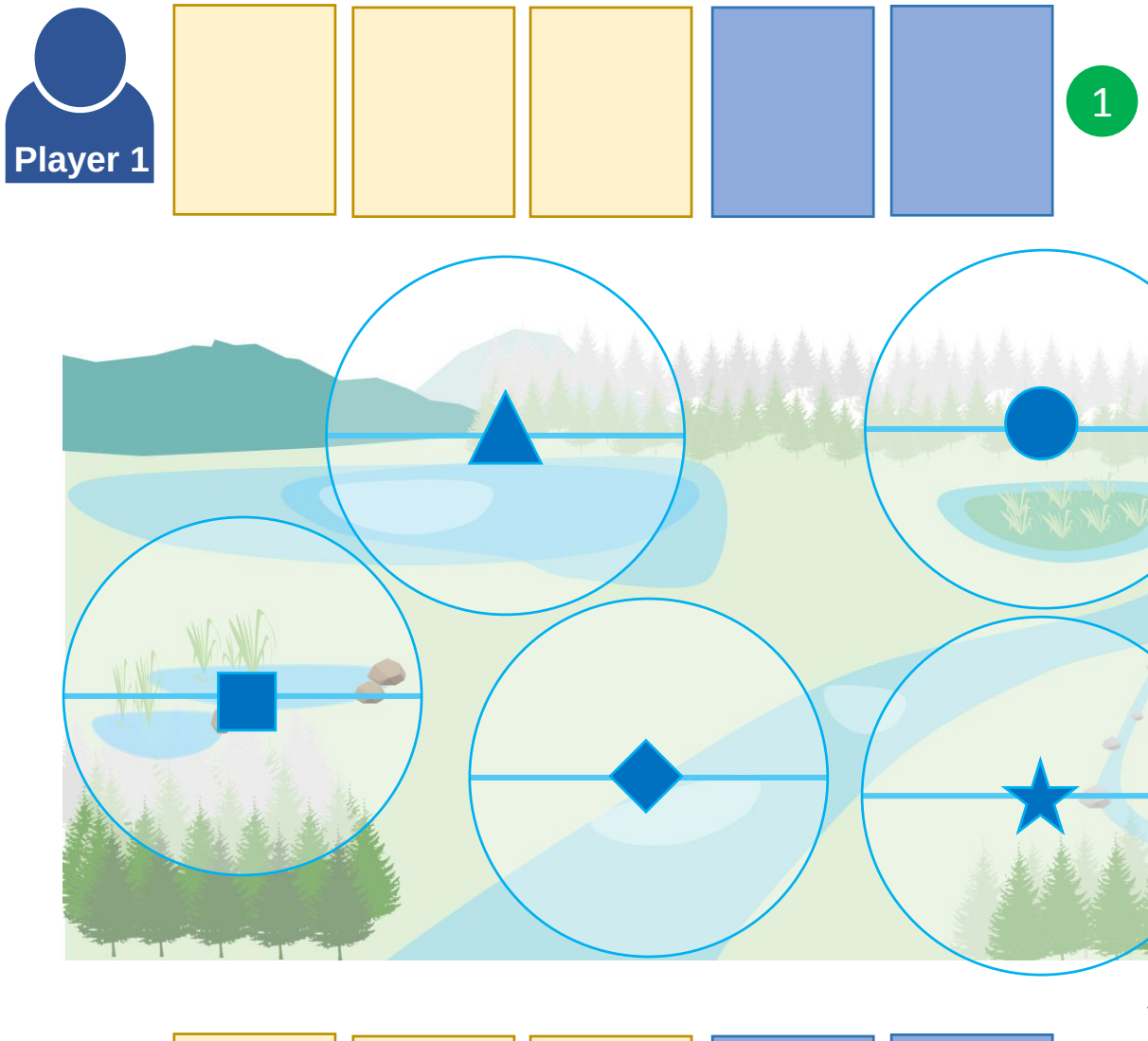
Khelifa R. & Mahdjoub H. (2021). EcoDragons: a game for environmental education and public outreach. *Insects*

Gameplay example




Player 1
1
Player 2


Habitat occupied
Disturbances solved
Conservation priority
+2
+4
+6
2
0
3
0
0
0
4
0
Dragonfly
Disturbance
Action
Gameplay
1 The game starts with five habitats, three decks of cards, and a die.
2 The score for habitat occupied, environmental disturbances solved, and conservation priority are shown for each player.
3 Environmental disturbances have three levels (mild, strong and severe) and players are rewarded accordingly
4 Conservation priority score is the sum of priorities of all species occupying a habitat
Habitat occupied
Disturbances solved
Conservation priority
+2
+4
+6
2
0
3
0
0
0
4
0



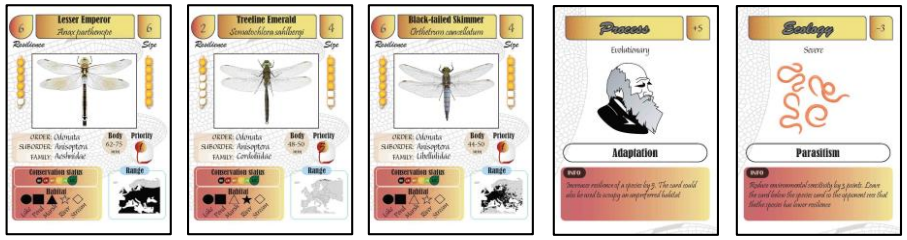
Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6	
	0 0 0	0

Gameplay

1. After shuffling the decks, five cards are drawn for each player at the start of the game: three dragonfly cards and two action cards

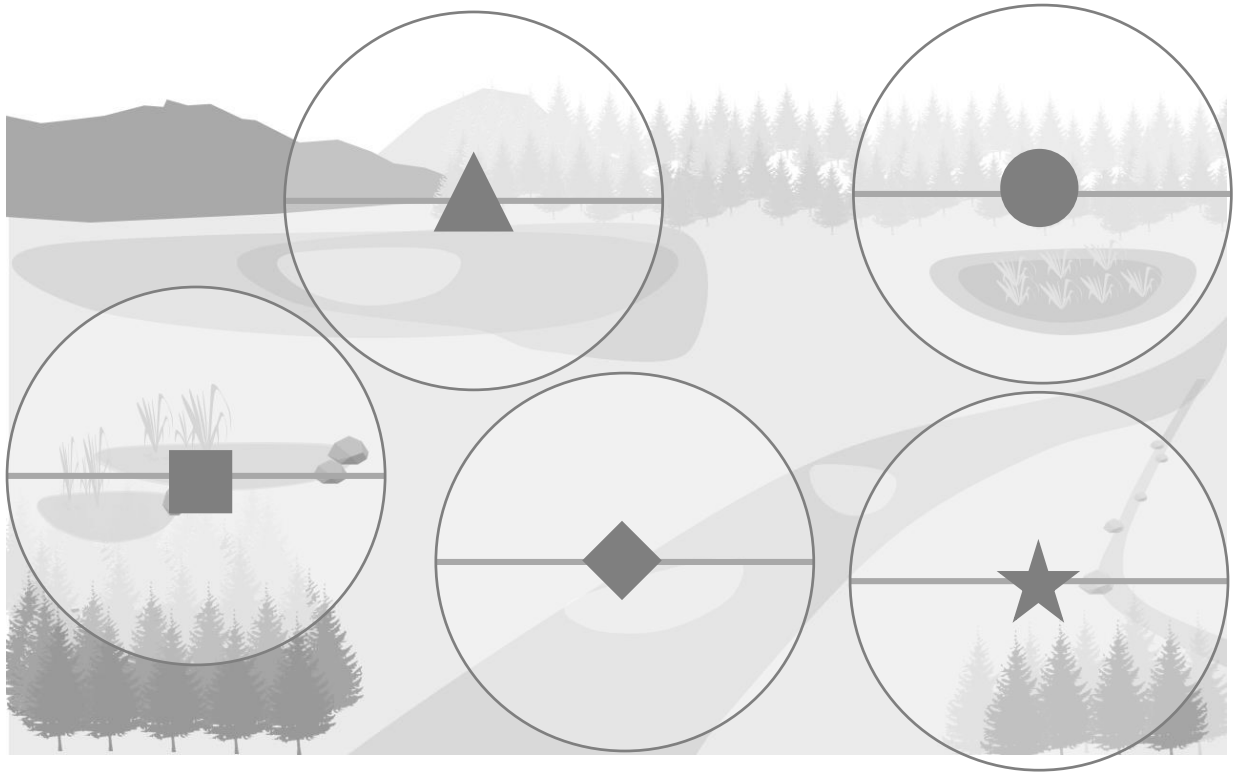
Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6	
	0 0 0	0

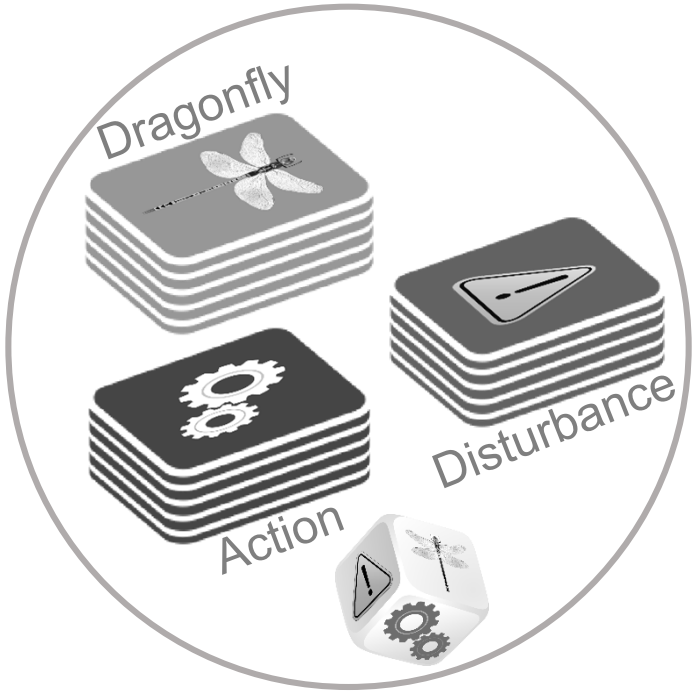
Player 1



1

Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6 0 0 0	0

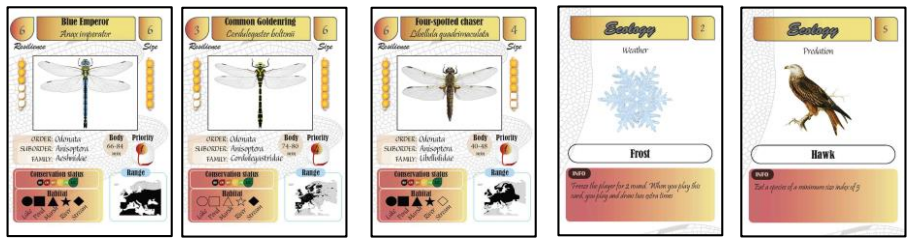




Gameplay

1 Each player has five cards (three dragonfly cards and two action cards)

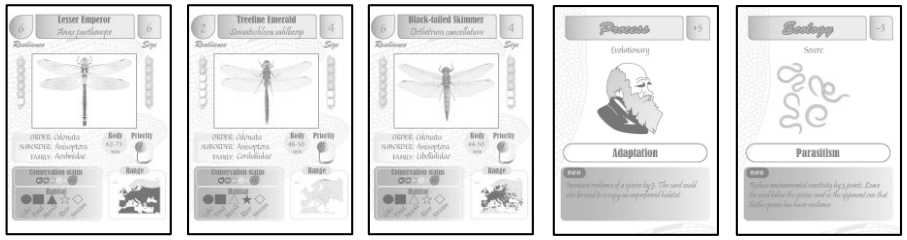
Player 2

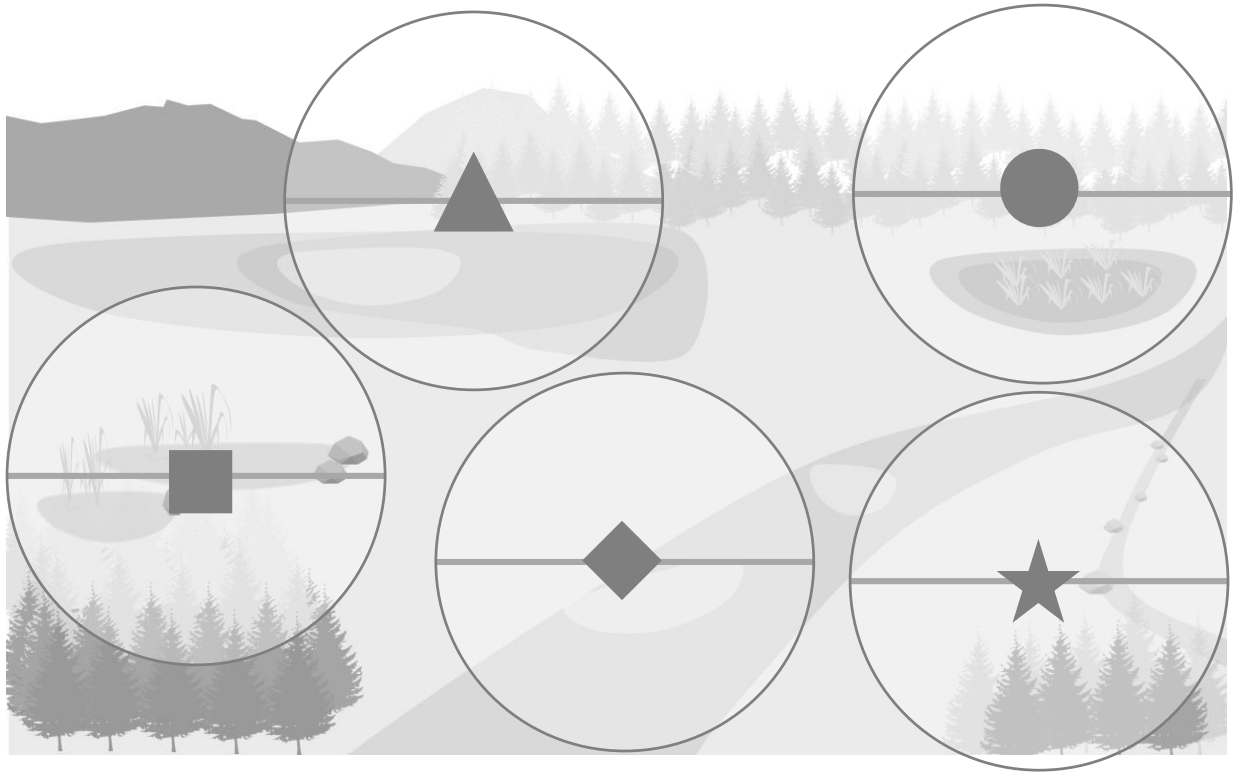


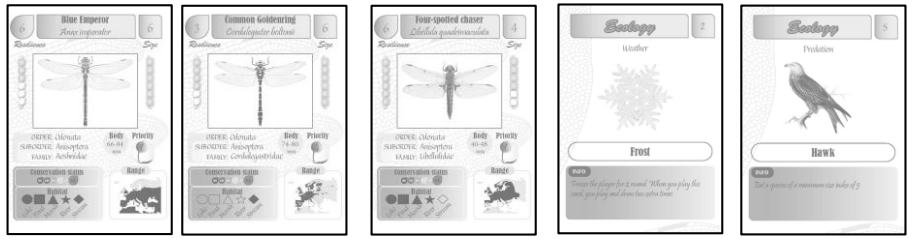
1

Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6 0 0 0	0

Player 1

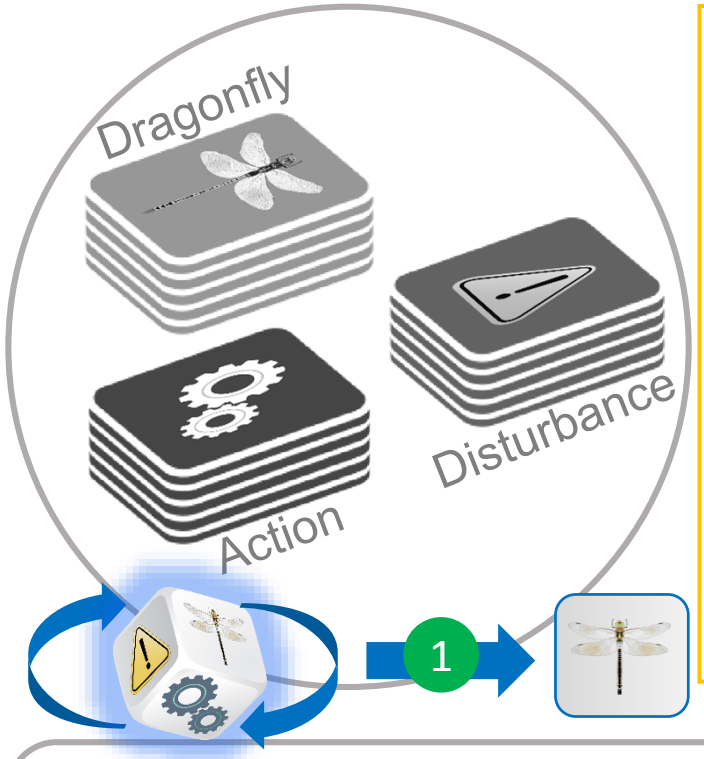






Player 2

Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6 → 0 0 0	0



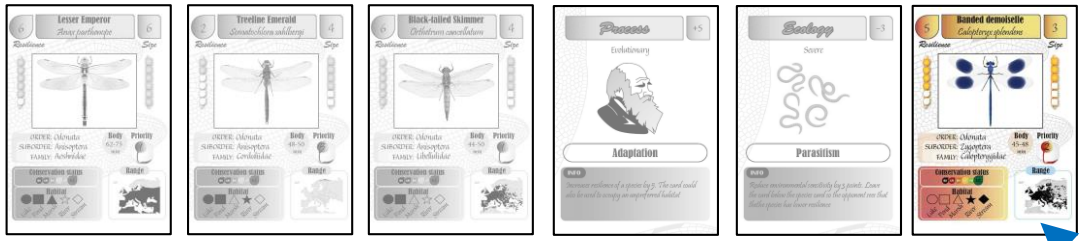
Gameplay

- Each player draws a card then plays a card (or pass)
- Before drawing a card, the die has to be rolled to determine which deck should be drawn (dragonfly, action, or disturbance)

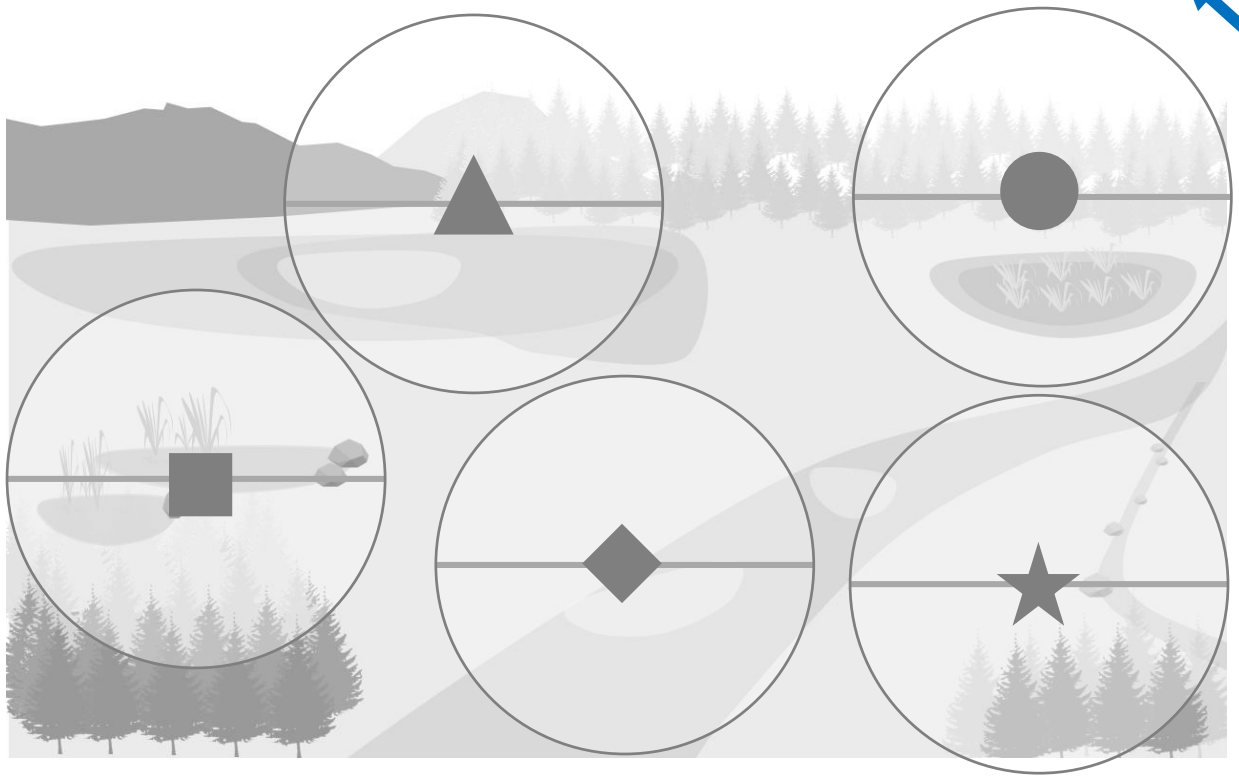
1 Here, the roll of die resulted in a dragonfly logo, which means that Player 1 has to draw a dragonfly card

Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6 → 0 0 0	0

Player 1



Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6	
	0 0 0	0



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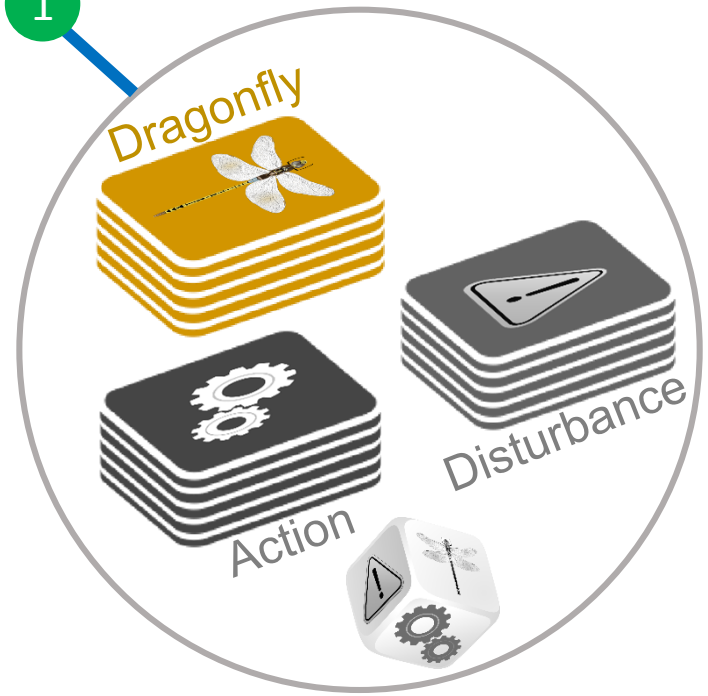
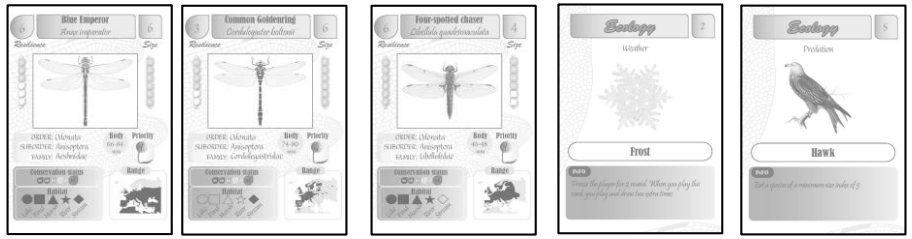


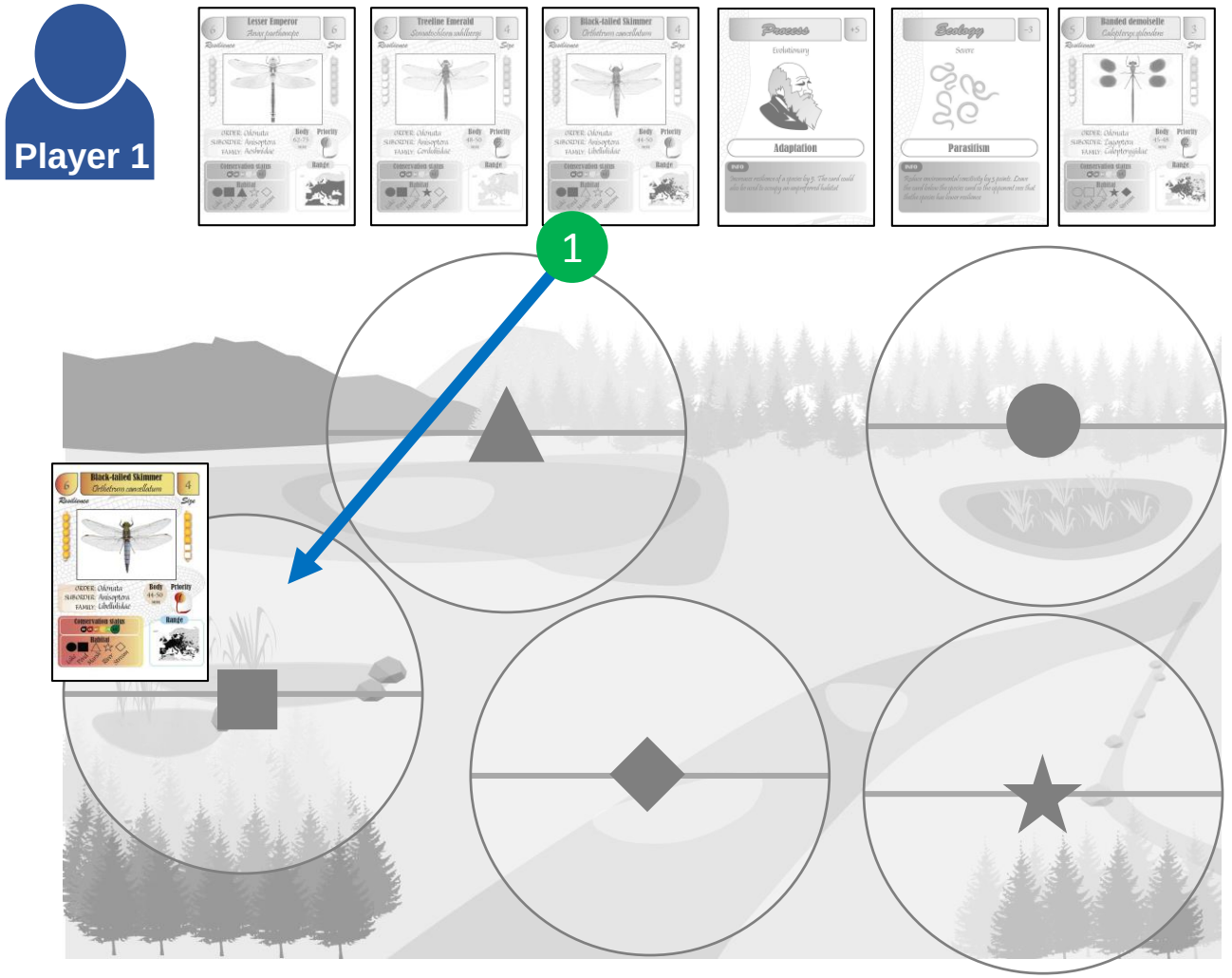
Gameplay

1 Player 1 draws a dragonfly card
- Player 1 obtained the ‘Banded Demoiselle’

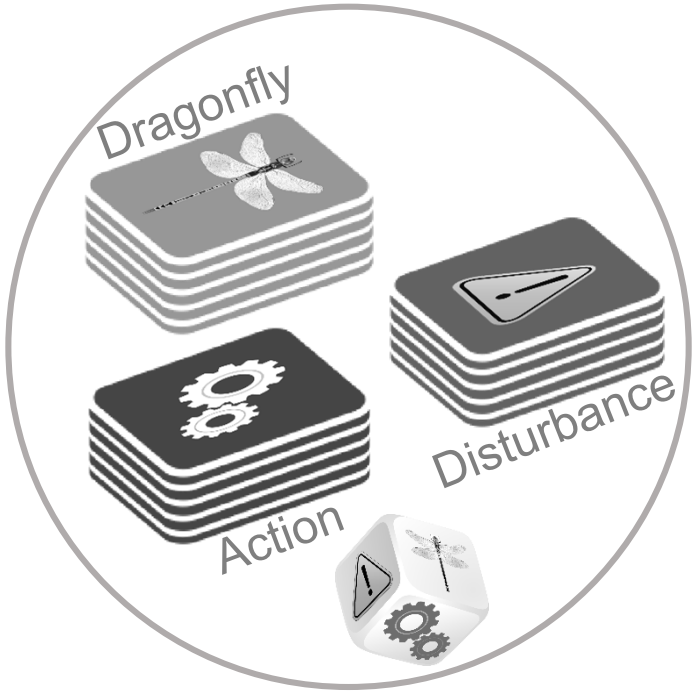
Player 2



Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6	
	0 0 0	0

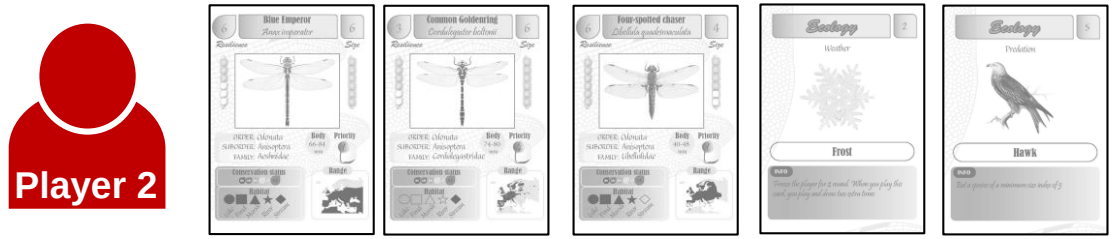


Habitat occupied	Disturbances solved	Conservation priority
1	0 0 0 (+2 +4 +6)	1



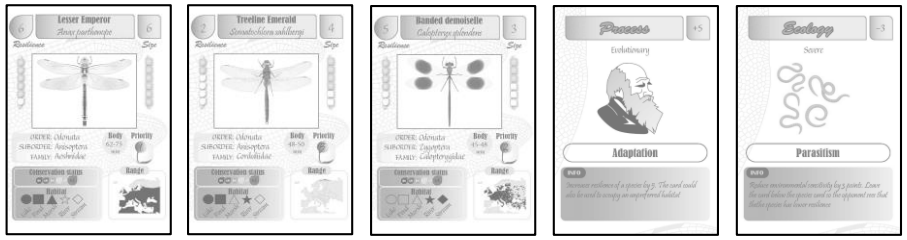
Gameplay

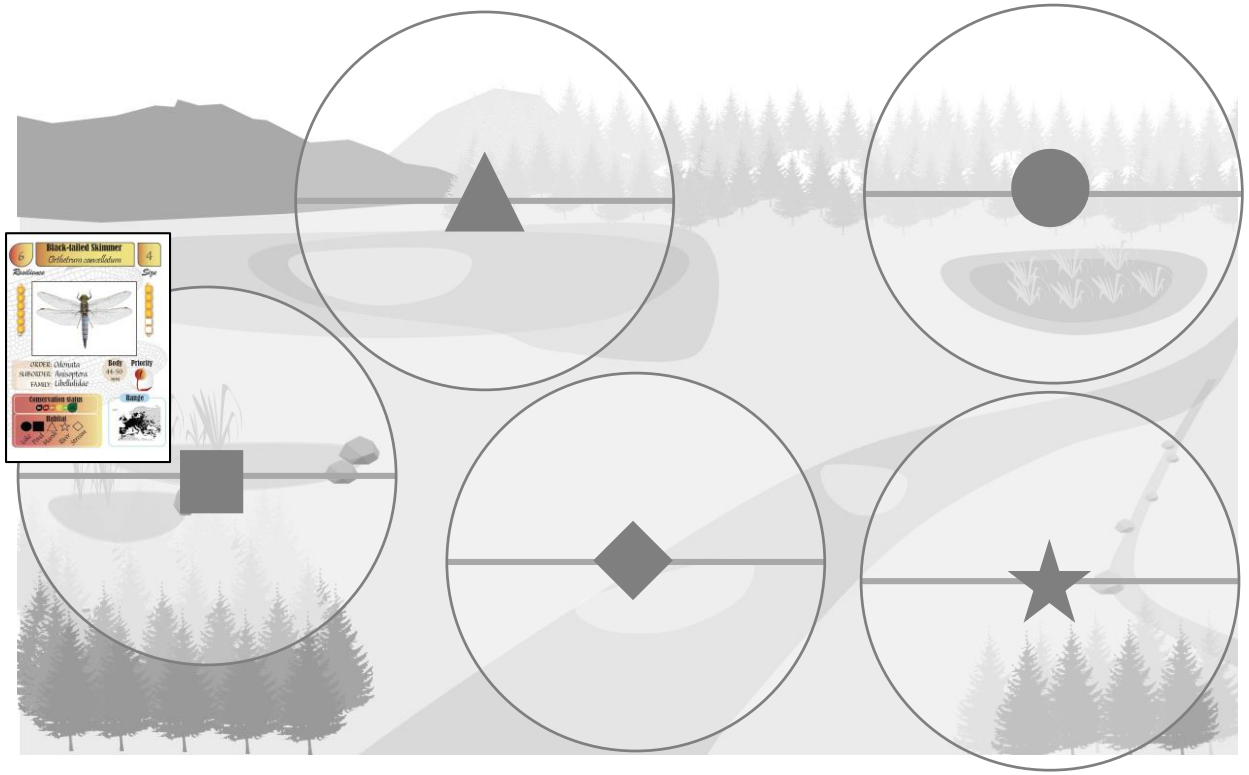
1. Player 1 plays one card (or could pass)
   - Here, Player 1 placed a dragonfly (Black-tailed Skimmer) in the square habitat



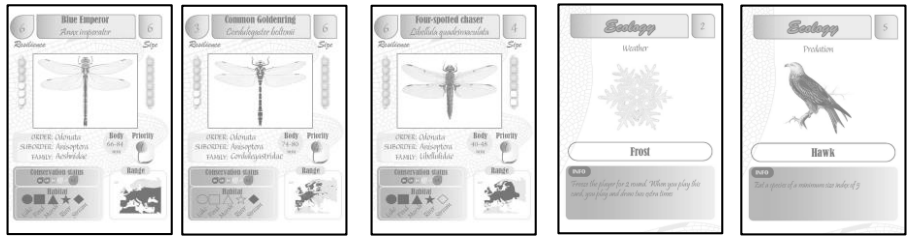
Habitat occupied	Disturbances solved	Conservation priority
0	0 0 0 (+2 +4 +6)	0

Player 1

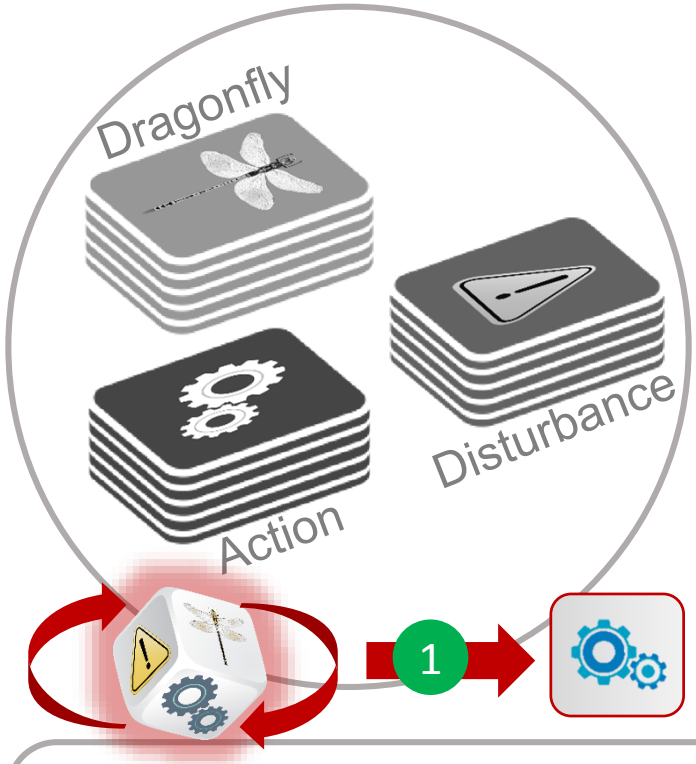




Player 2



Habitat occupied	Disturbances solved	Conservation priority
1	0 0 0 (+2 +4 +6)	1

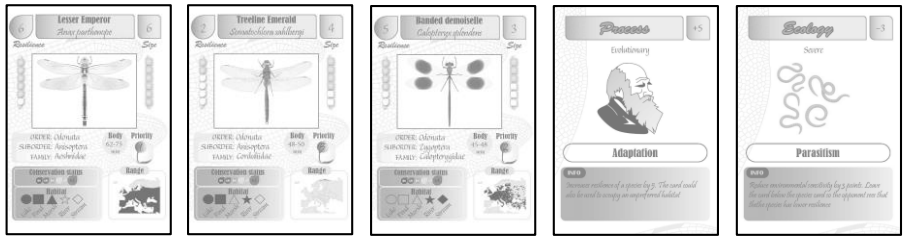


Gameplay

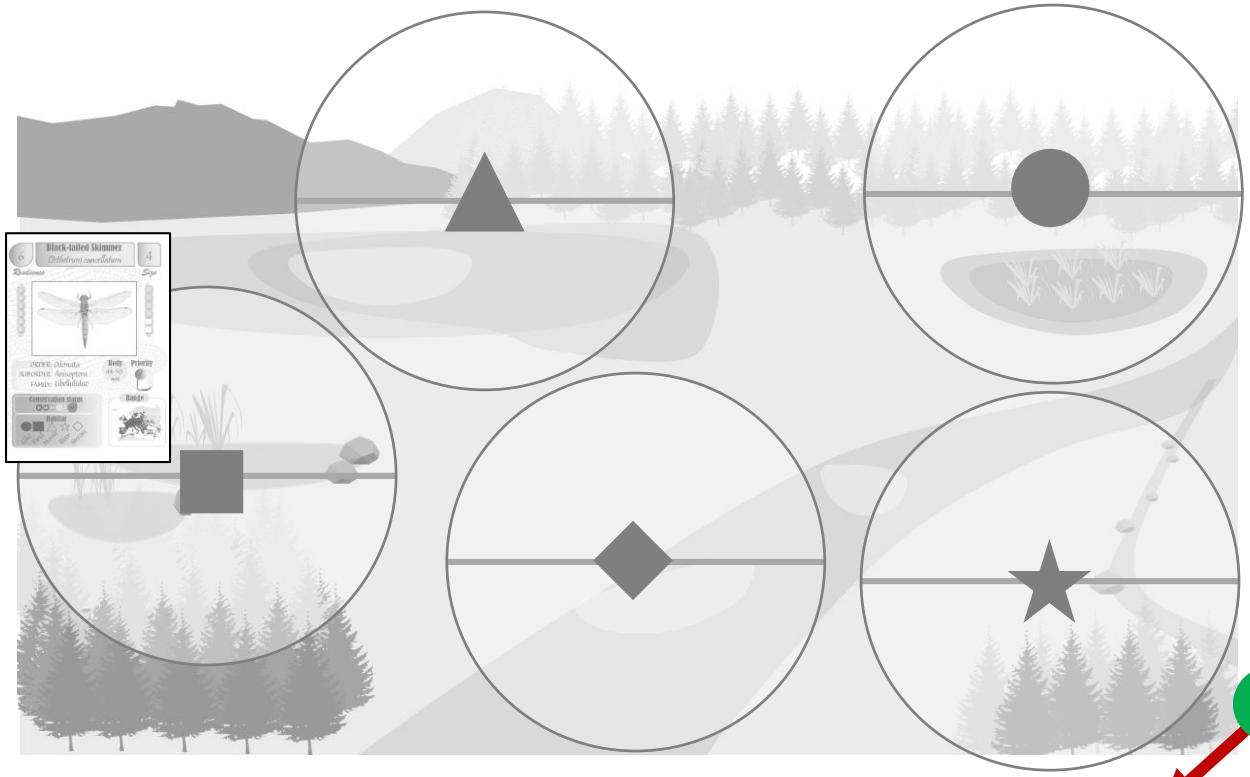
1. Same as Player 1, Player 2 rolls a die first.
   - Here, Player 2 has to draw an action card.

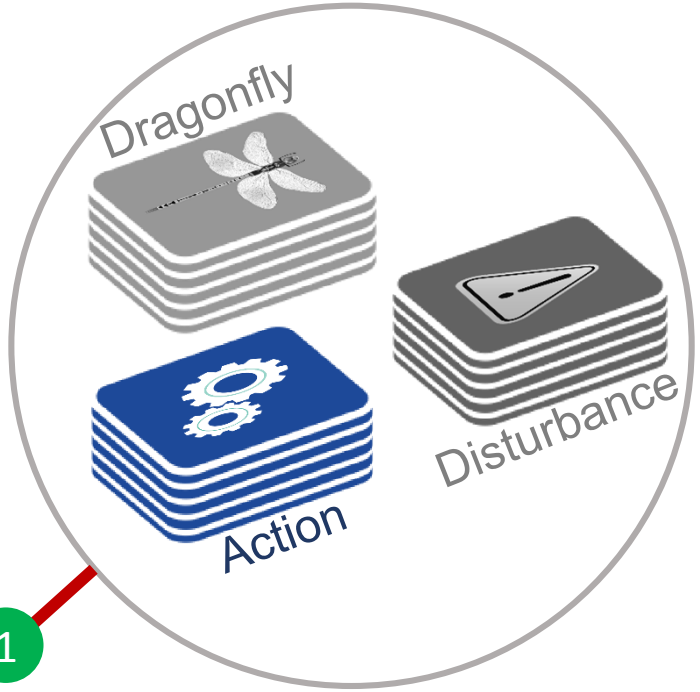
Habitat occupied	Disturbances solved	Conservation priority
0	0 0 0 (+2 +4 +6)	0

Player 1



Habitat occupied	Disturbances solved	Conservation priority
1	+2 +4 +6 → 0 0 0	1



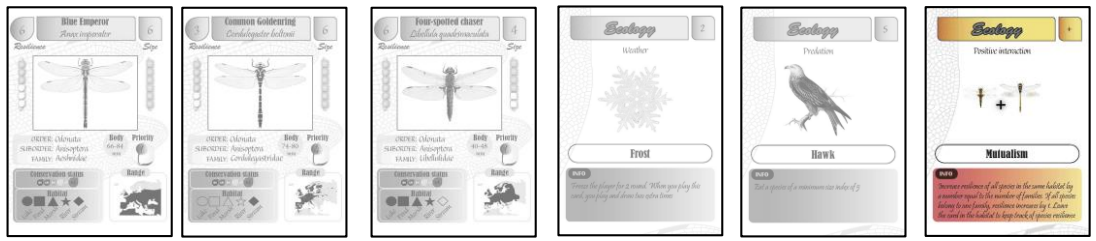


Gameplay

1. Player 2 draws one action card
   - Player 2 received a mutualism card

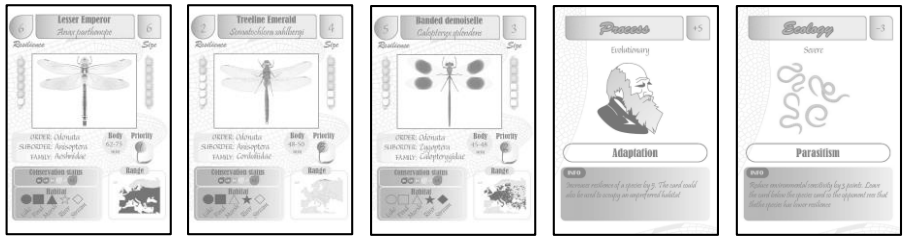
1

Player 2

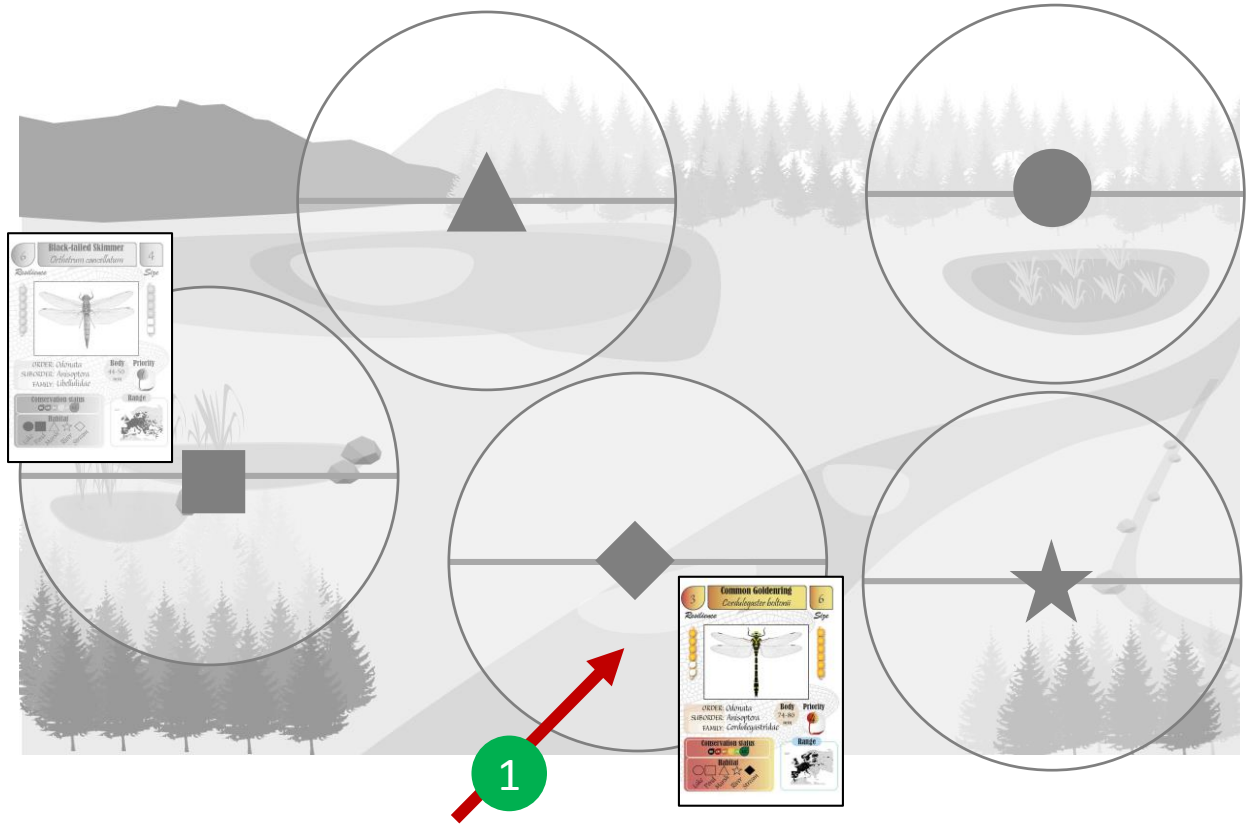


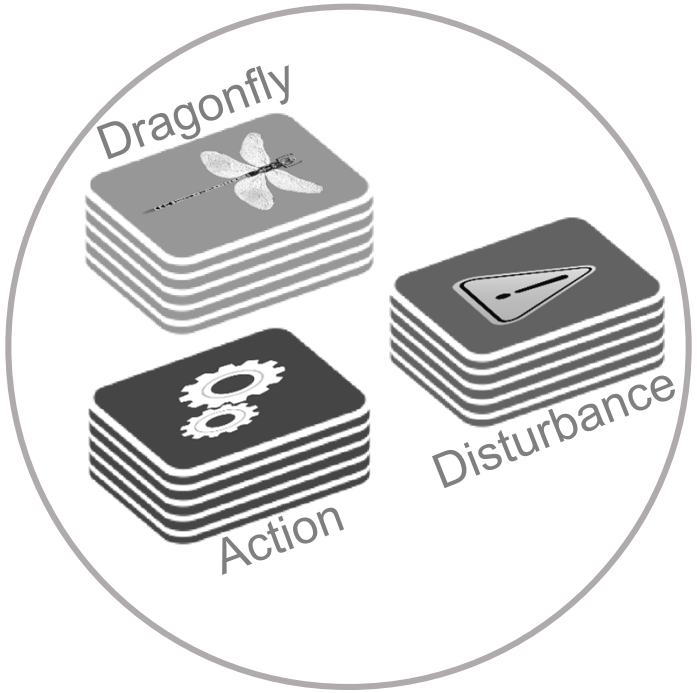
Habitat occupied	Disturbances solved	Conservation priority
0	+2 +4 +6 → 0 0 0	0

Player 1



Habitat occupied	Disturbances solved	Conservation priority
1	+2 +4 +6 → 0 0 0	1

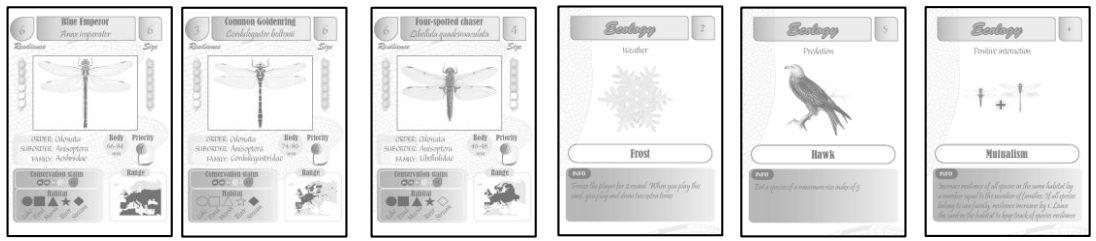




Gameplay

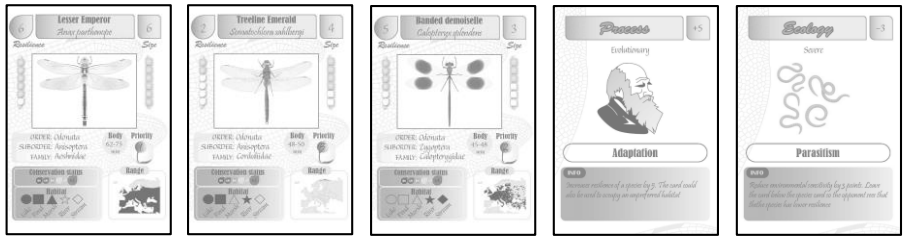
1 Player 2 plays one card Here, Player 2 placed a dragonfly (Common Goldenring) in the diamond habitat

Player 2

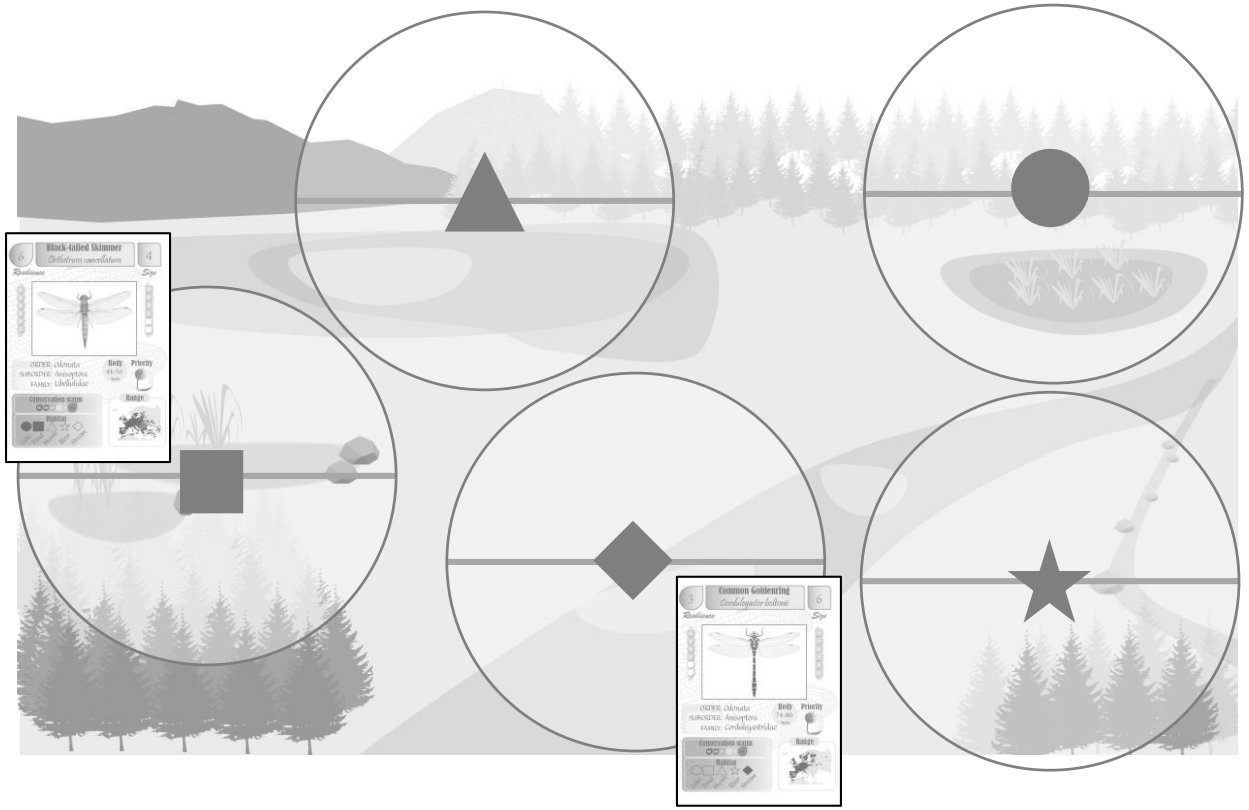


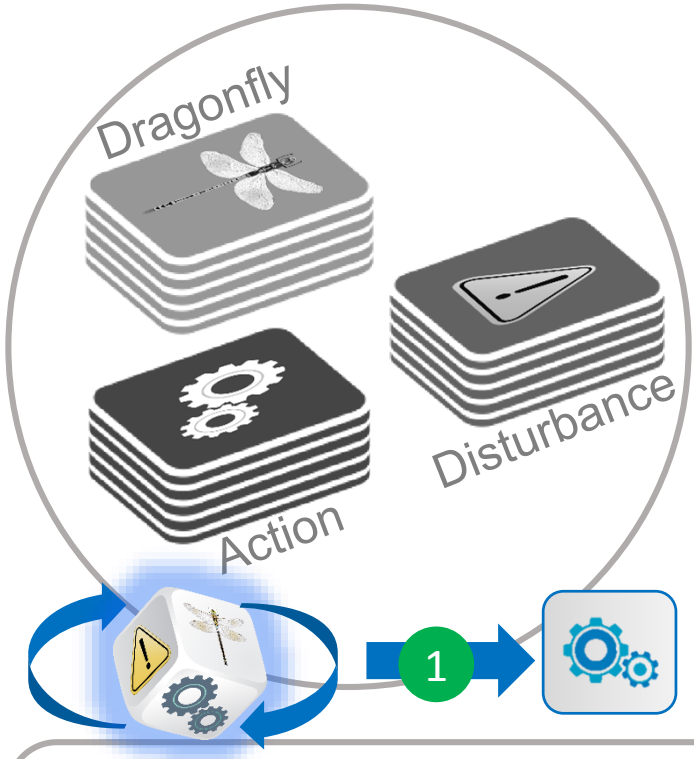
Habitat occupied	Disturbances solved	Conservation priority
1	+2 +4 +6 → 0 0 0	4

Player 1



Habitat occupied	Disturbances solved	Conservation priority
1	+2 +4 +6 → 0 0 0	1

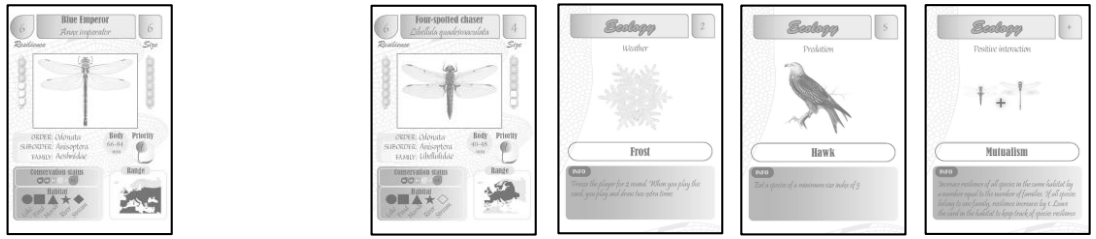




Gameplay

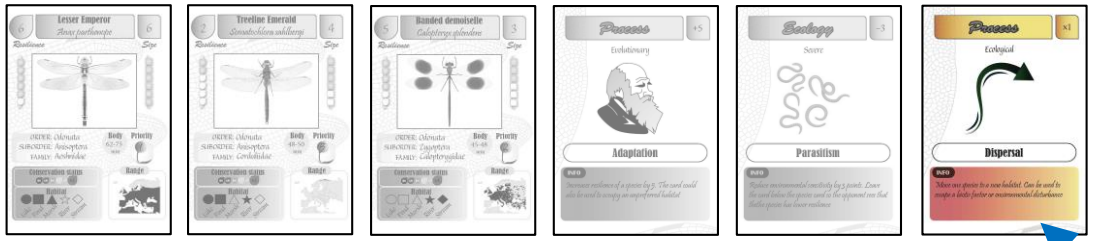
1. Player 1 tosses the die and obtains an action card

Player 2

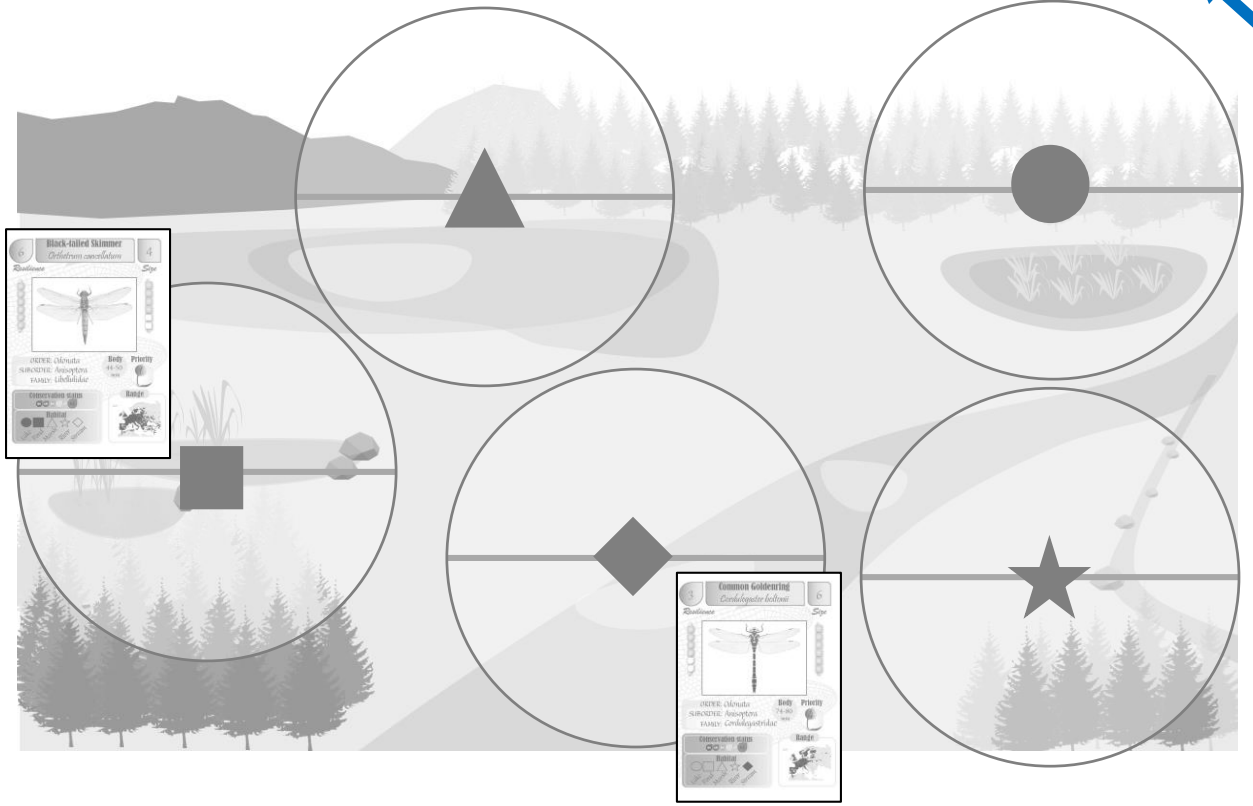


Habitat occupied	Disturbances solved	Conservation priority
1	+2 +4 +6 → 0 0 0	4

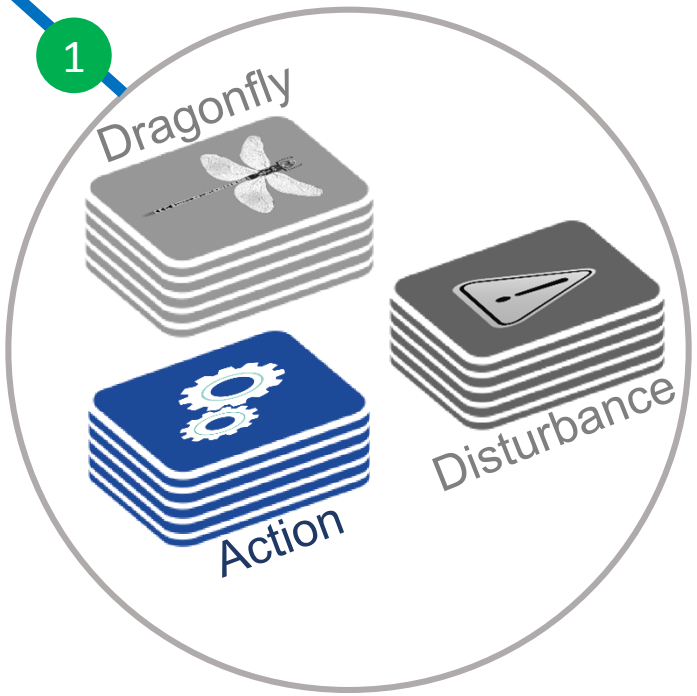
Player 1



Habitat occupied	Disturbances solved	Conservation priority
1	0 0 0 (+2 +4 +6)	1



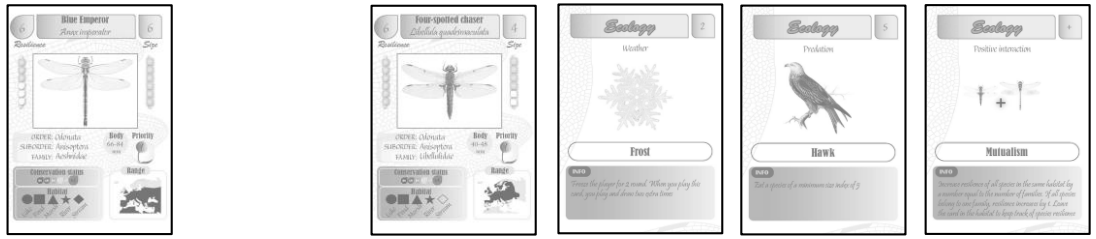
1



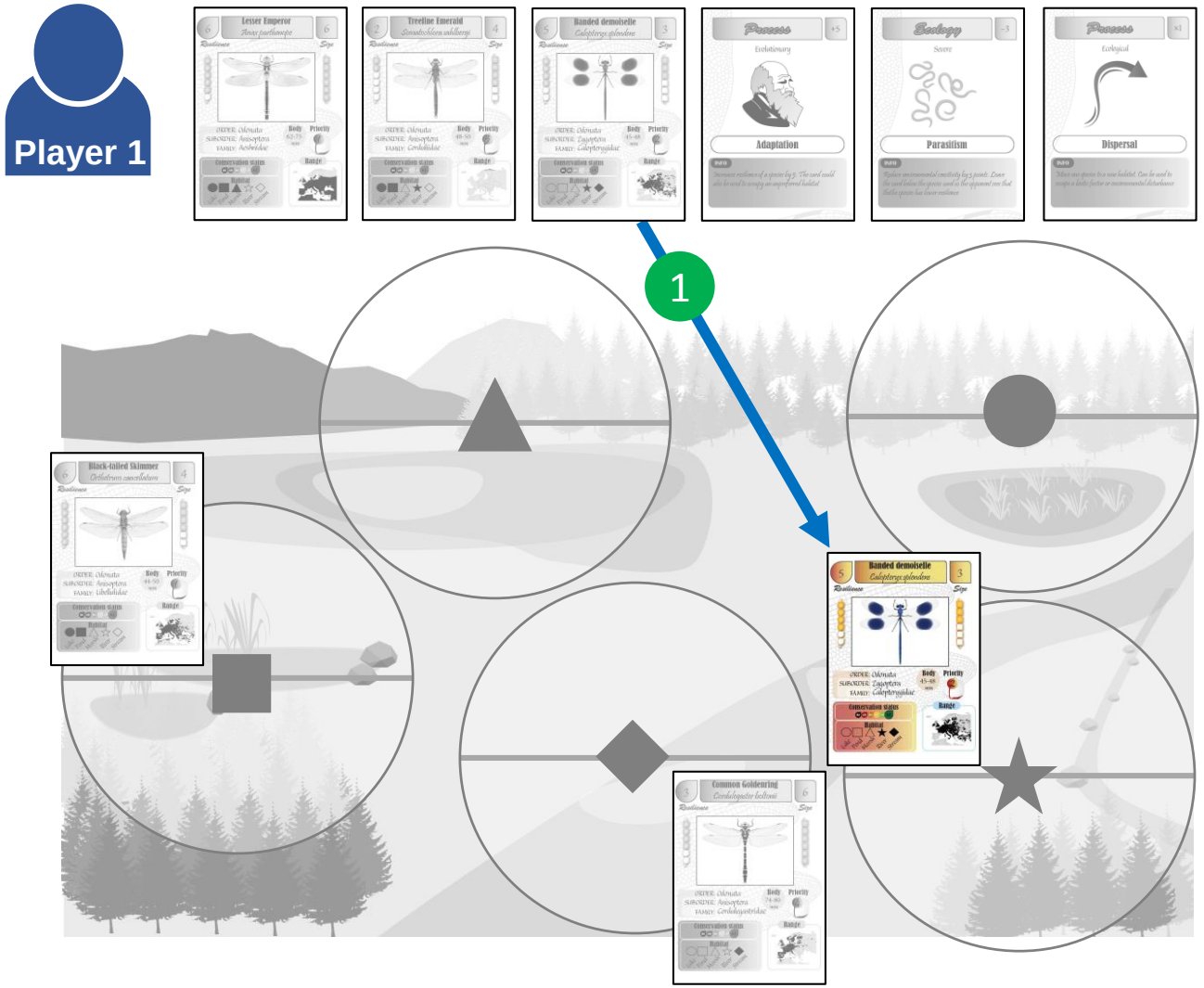
Gameplay

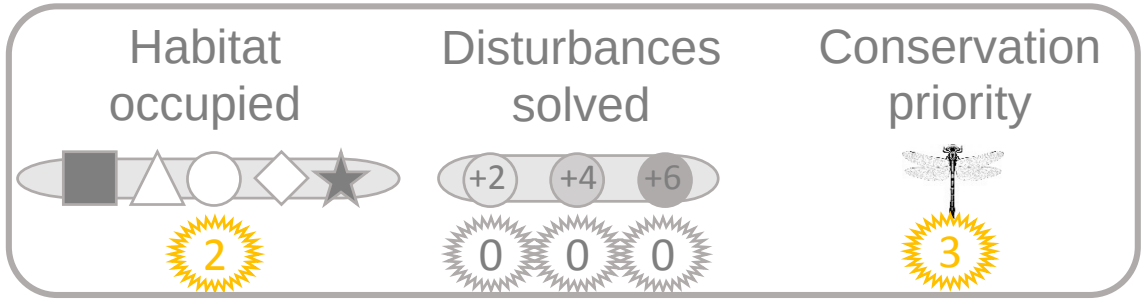
1 Player 1 draws an action card (dispersal)

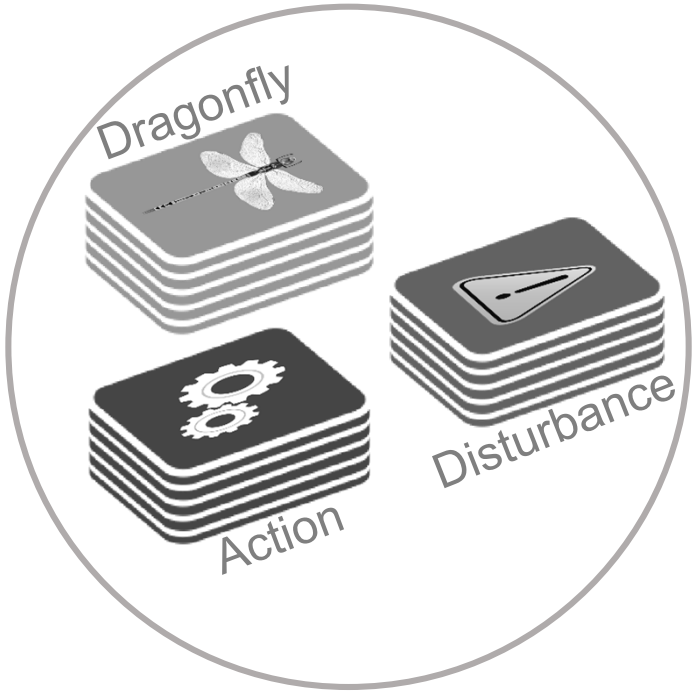
Player 2



Habitat occupied	Disturbances solved	Conservation priority
1	0 0 0 (+2 +4 +6)	4

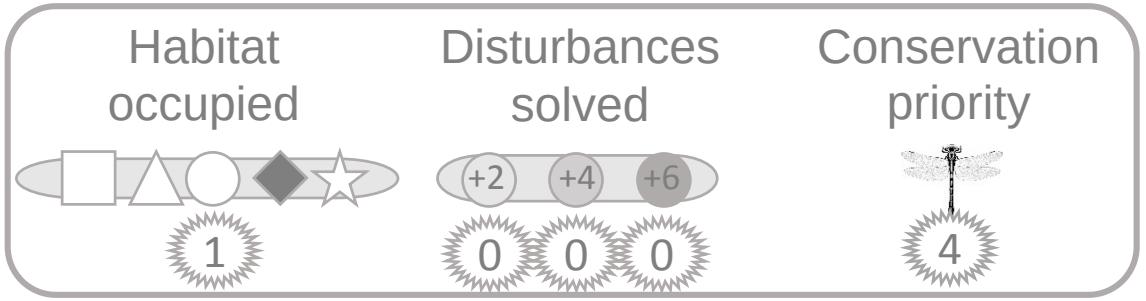




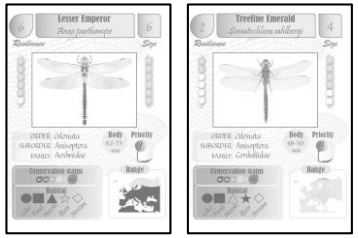


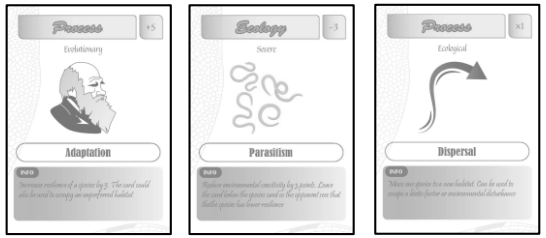
Gameplay

1 Player 1 places a dragonfly card (banded demoiselle) in the star habitat

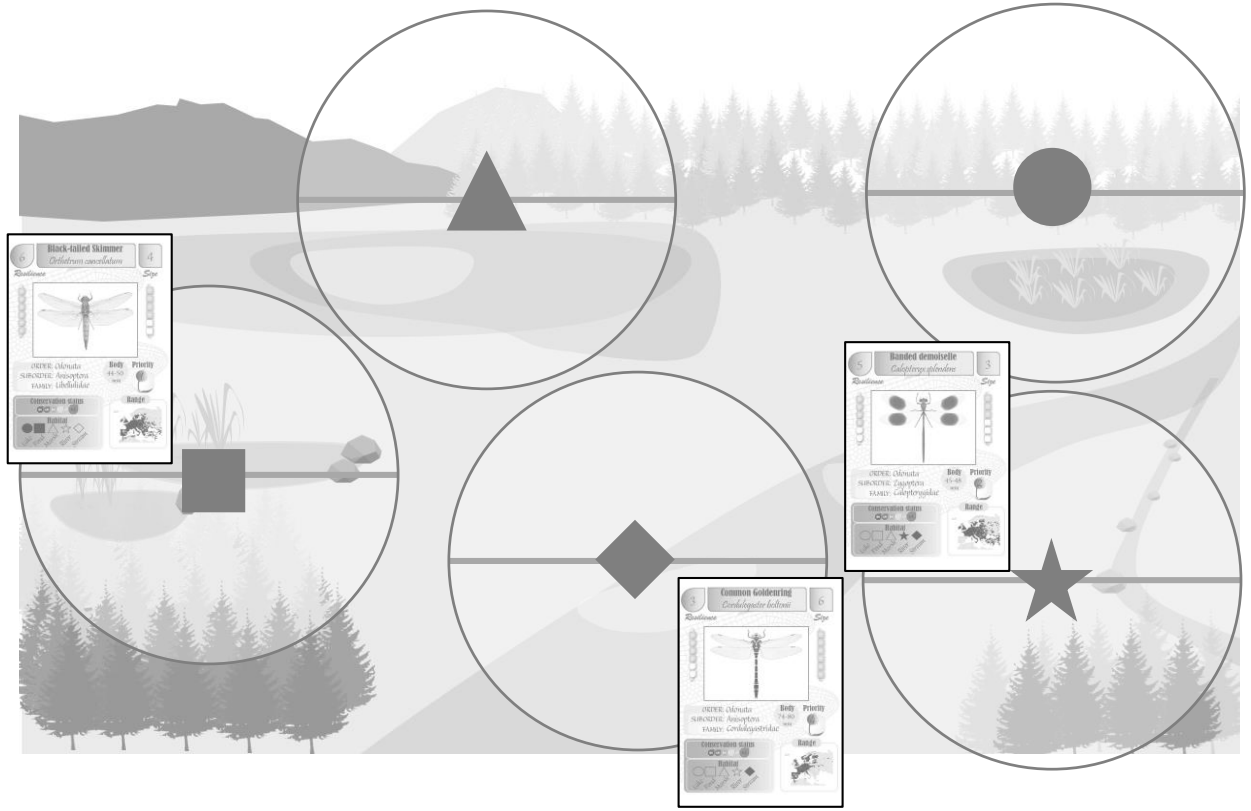


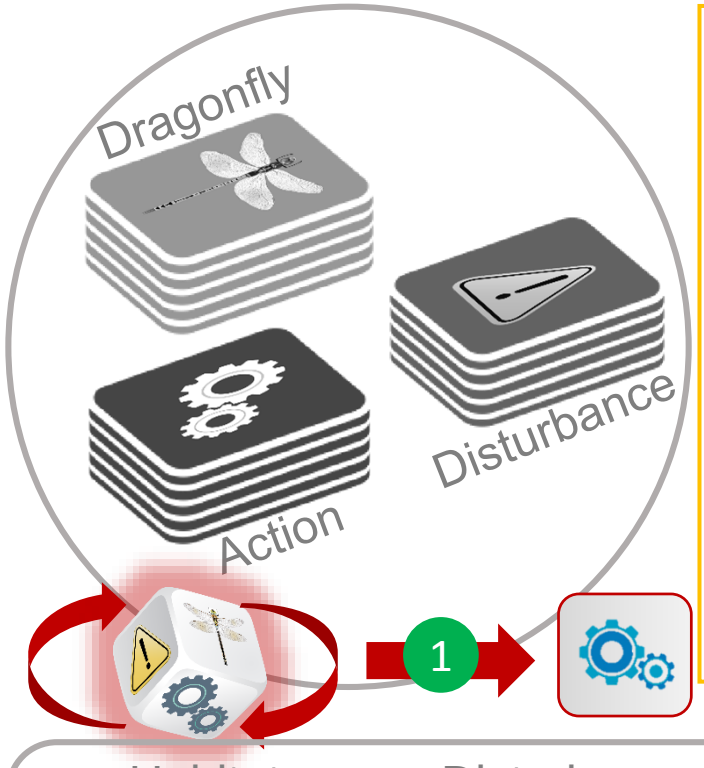
Player 1





Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 0 0	3



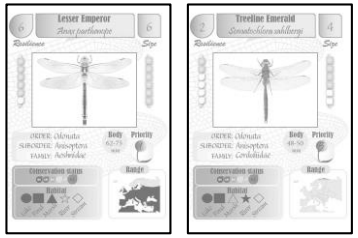


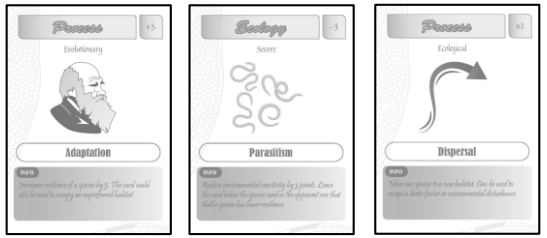
Gameplay

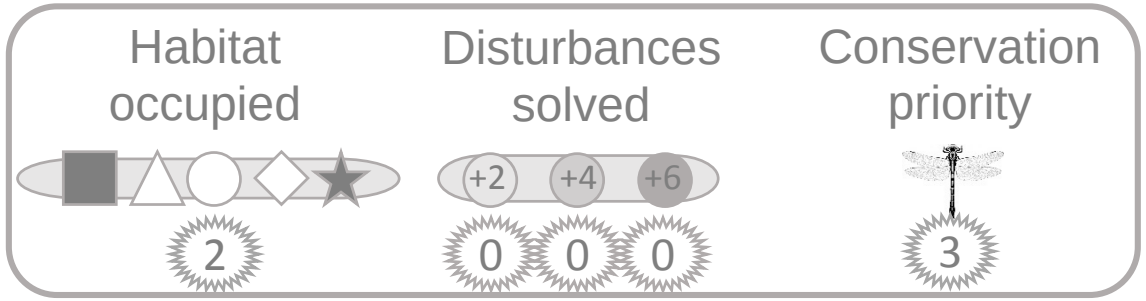
1. Player 2 rolls the dice and obtain action card

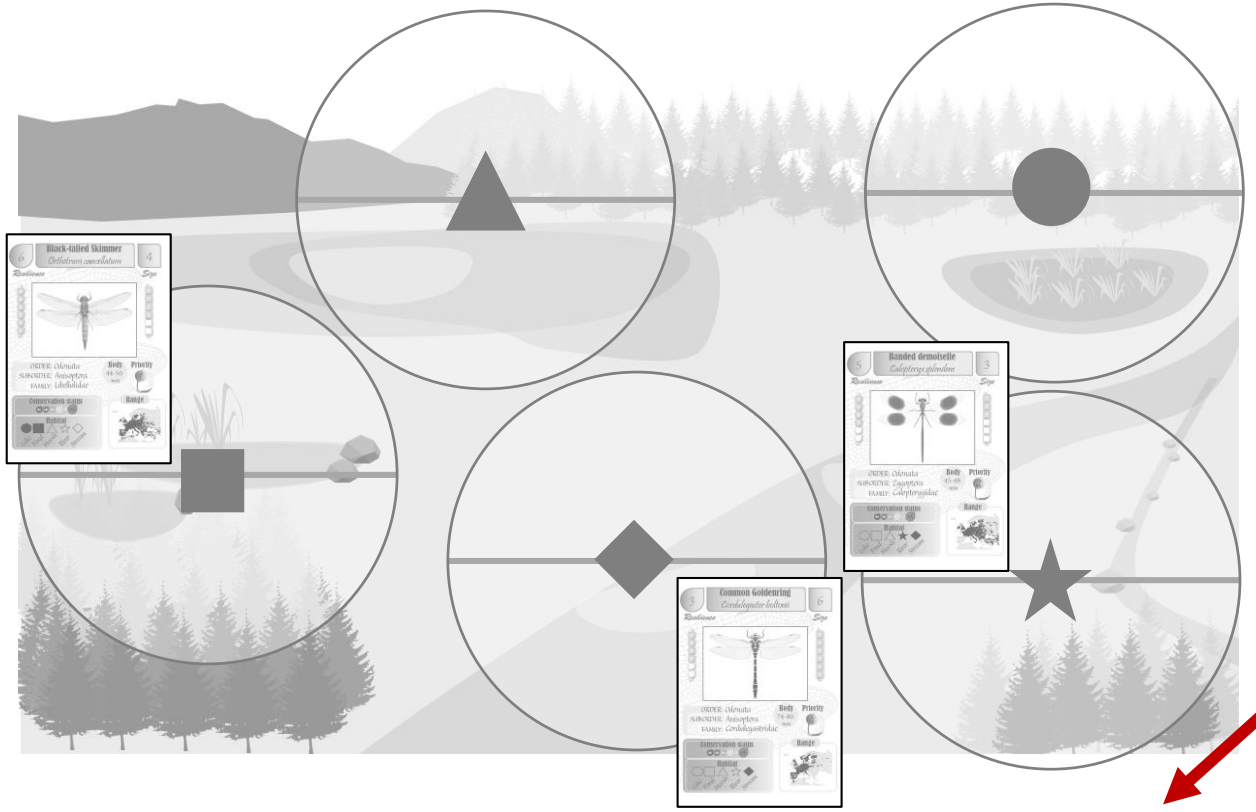
Player 2

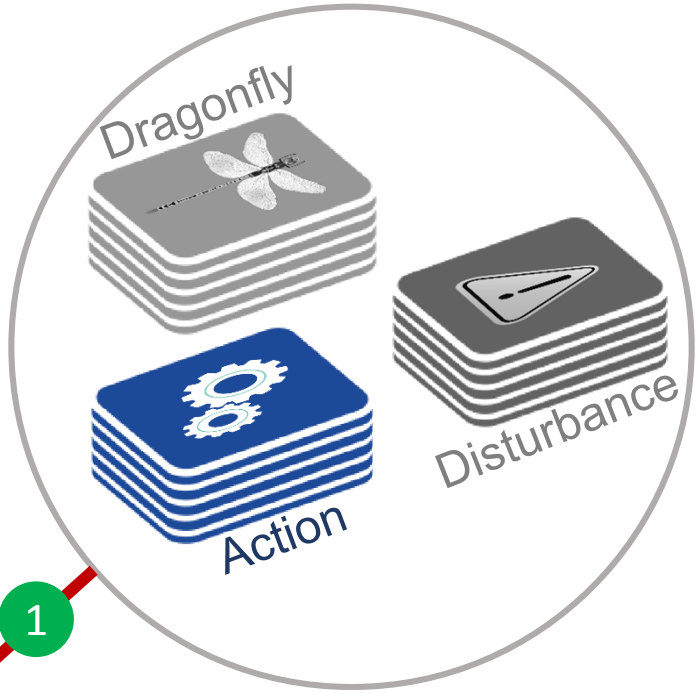
Habitat occupied	Disturbances solved	Conservation priority
1	+2 +4 +6 → 0 0 0	4







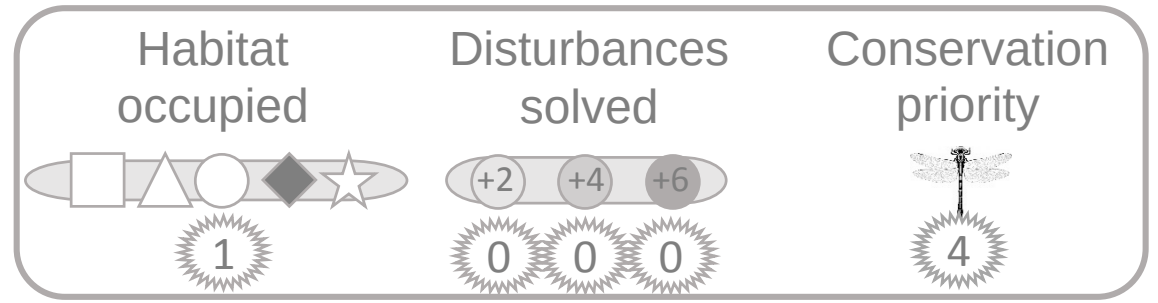




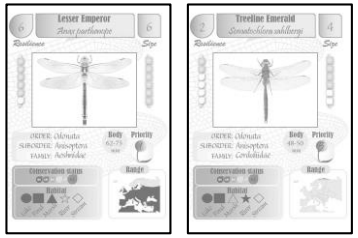
Gameplay

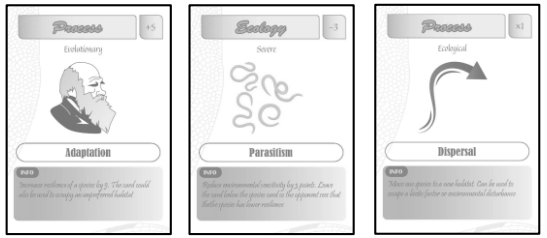
1 Player 2 obtains a conservation card (WWF)

1

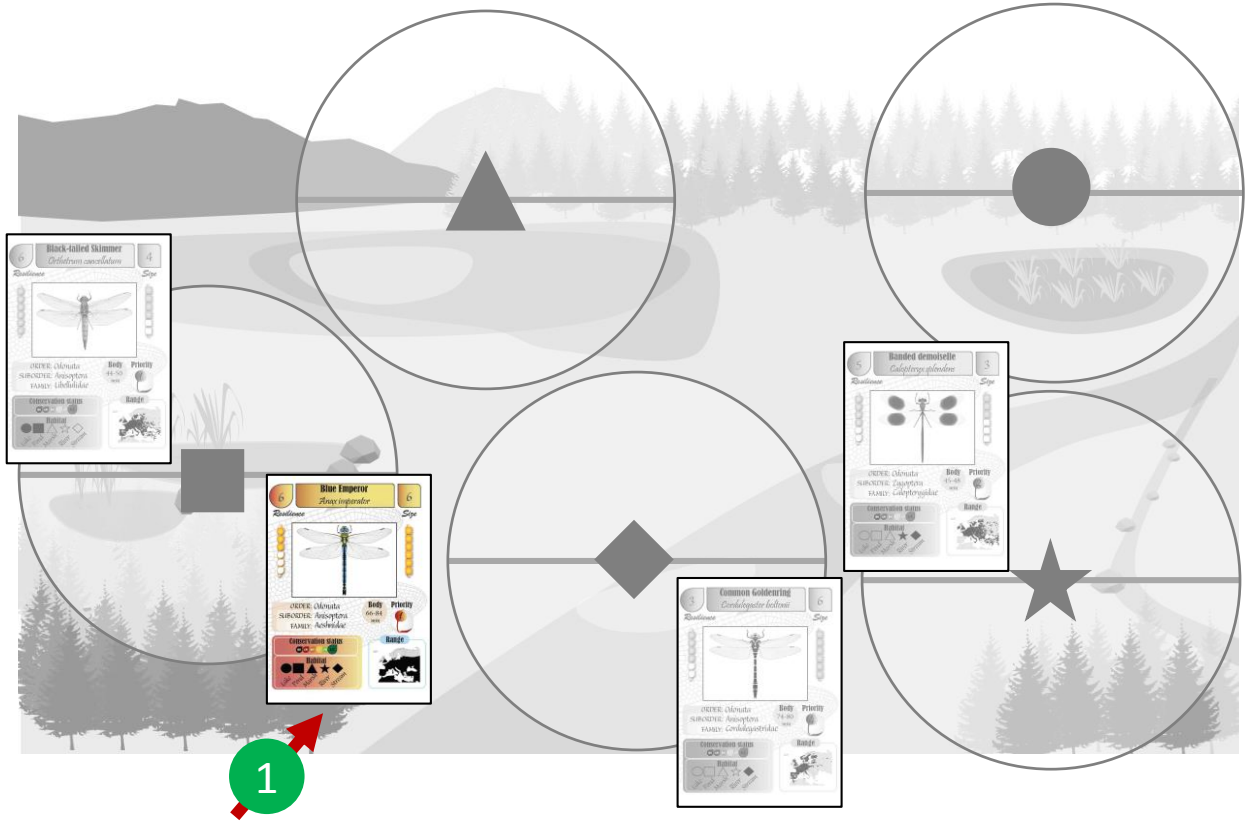


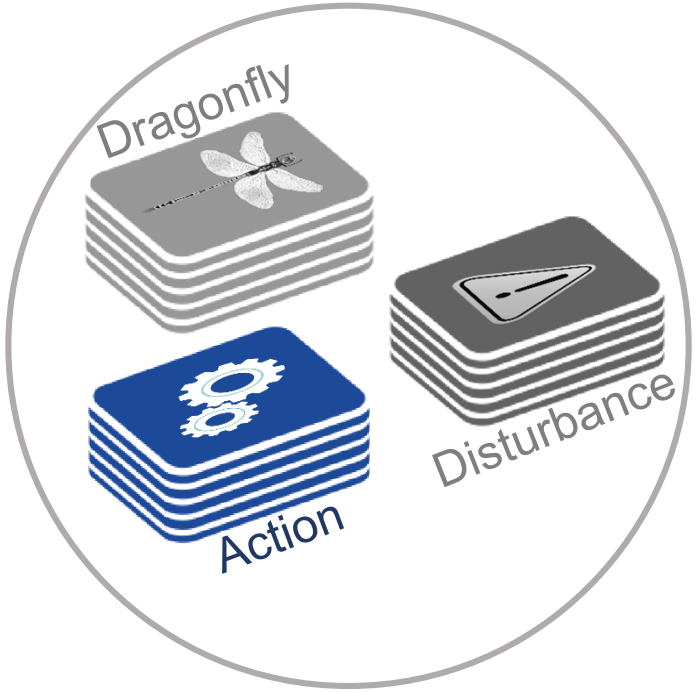
Player 1





Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 0 0 0	3



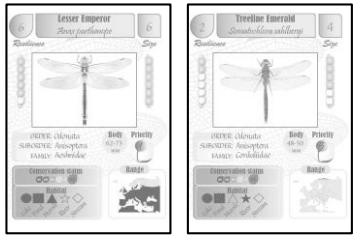


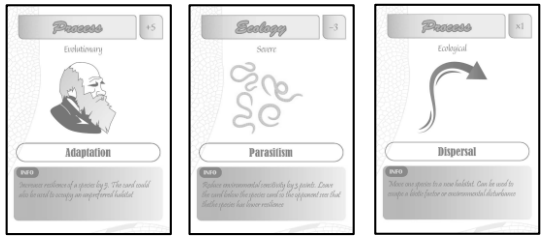
Gameplay

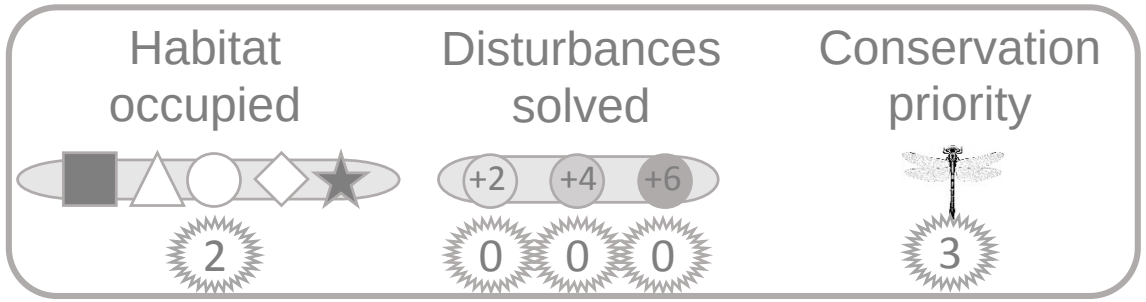
1. Player 2 places a dragonfly card (Blue Emperor) in the square habitat

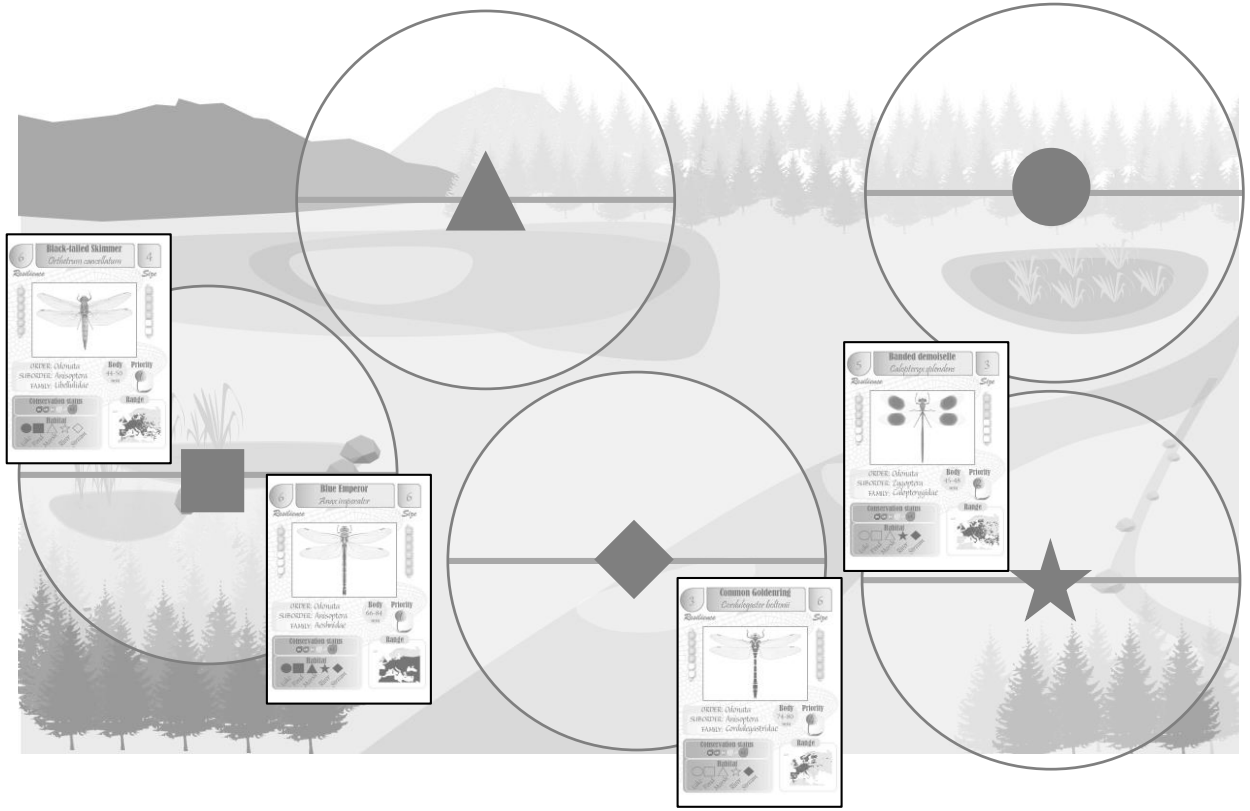
Player 2

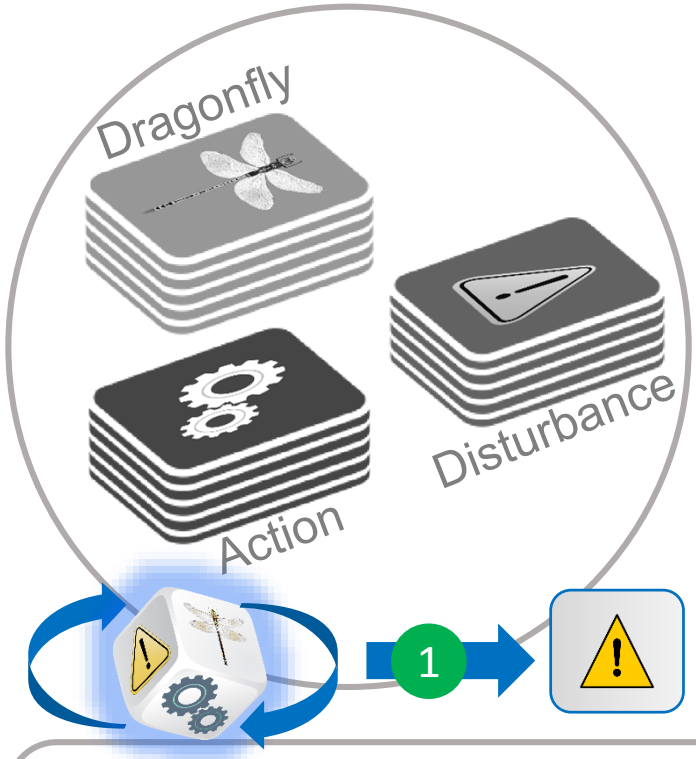
Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 0 0 0	5





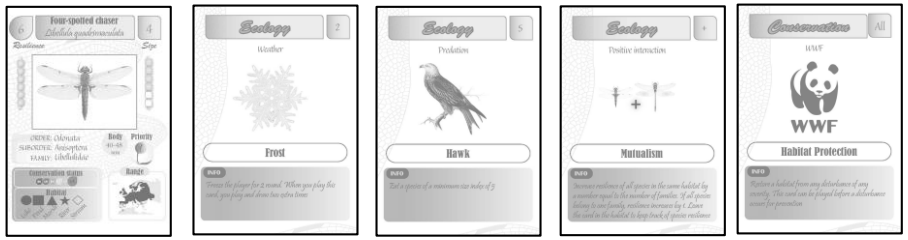


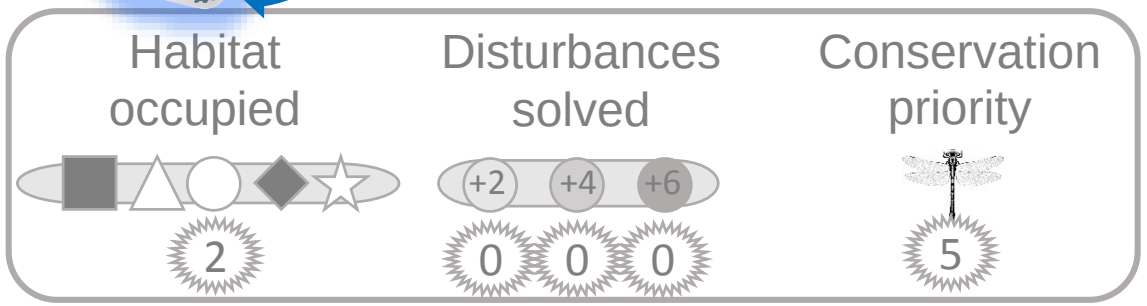


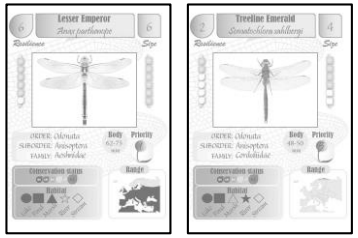


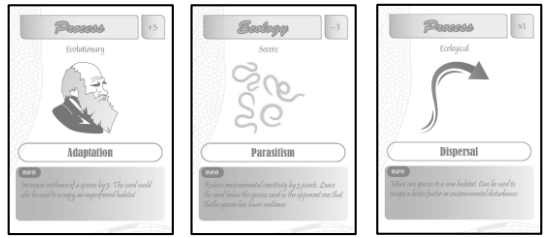
Gameplay

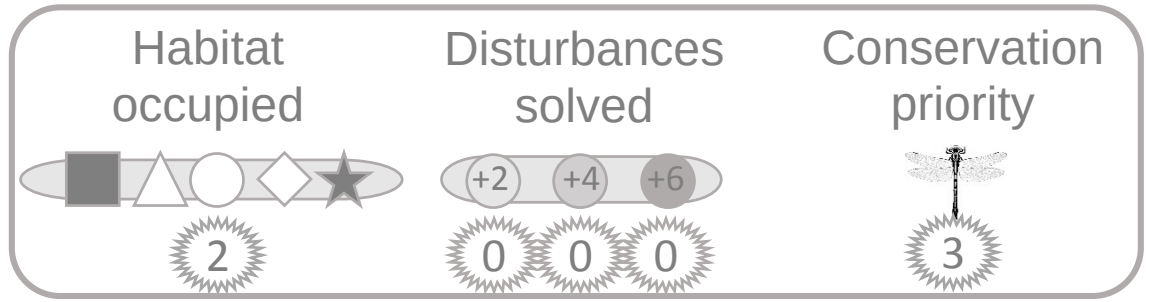
1. Player 1 rolls the dice and obtain the disturbance card

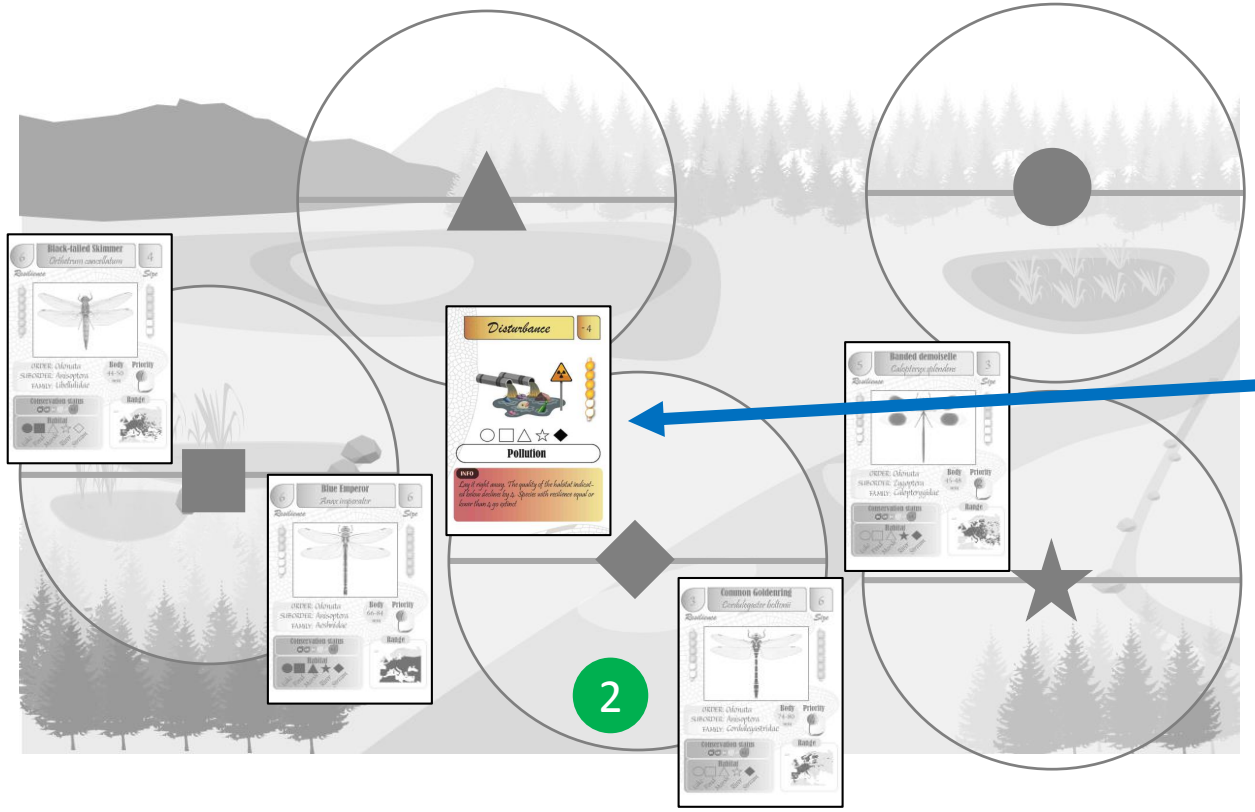


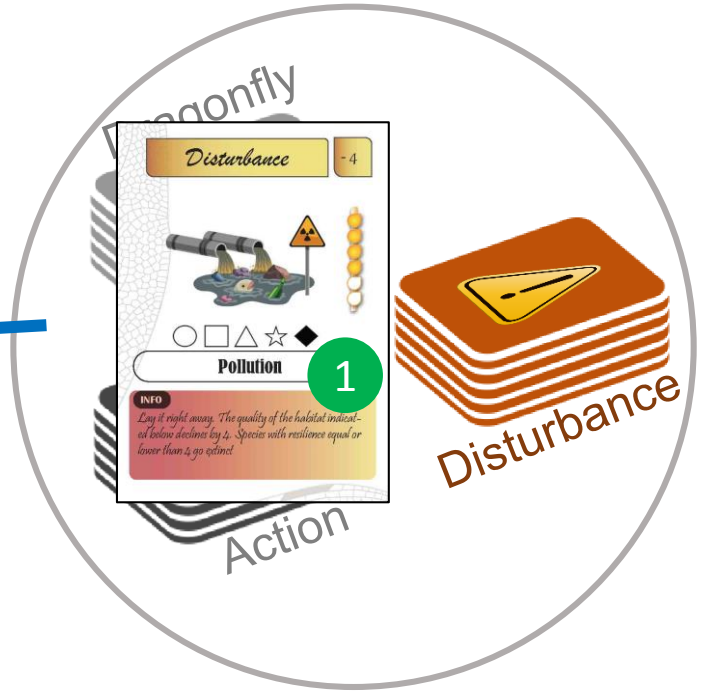






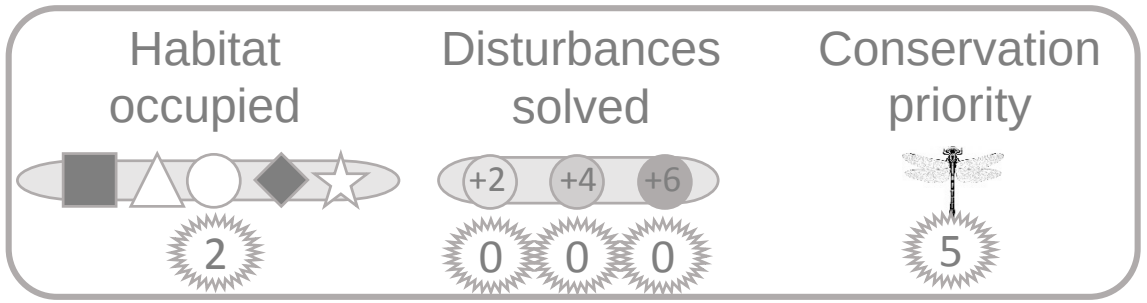


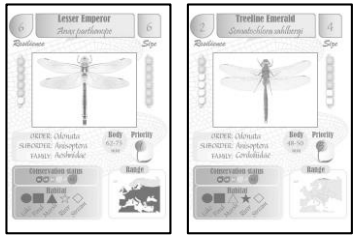


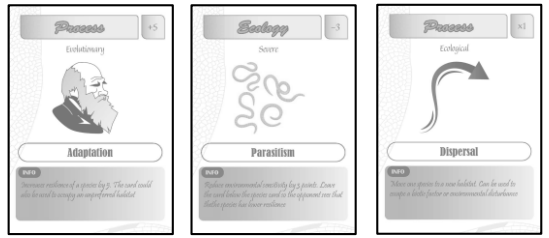


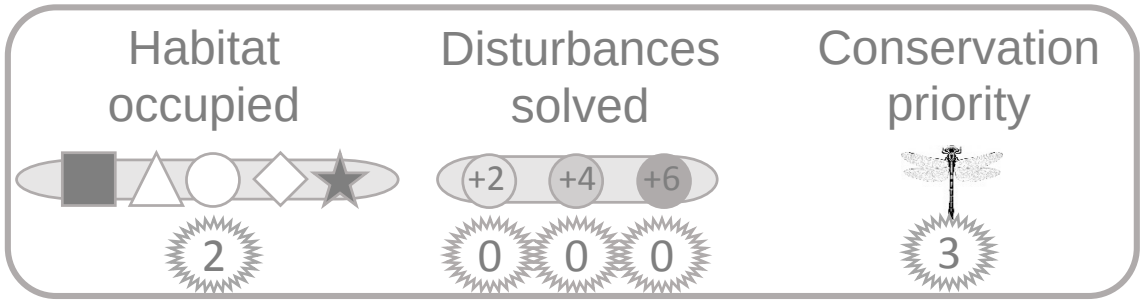
Gameplay

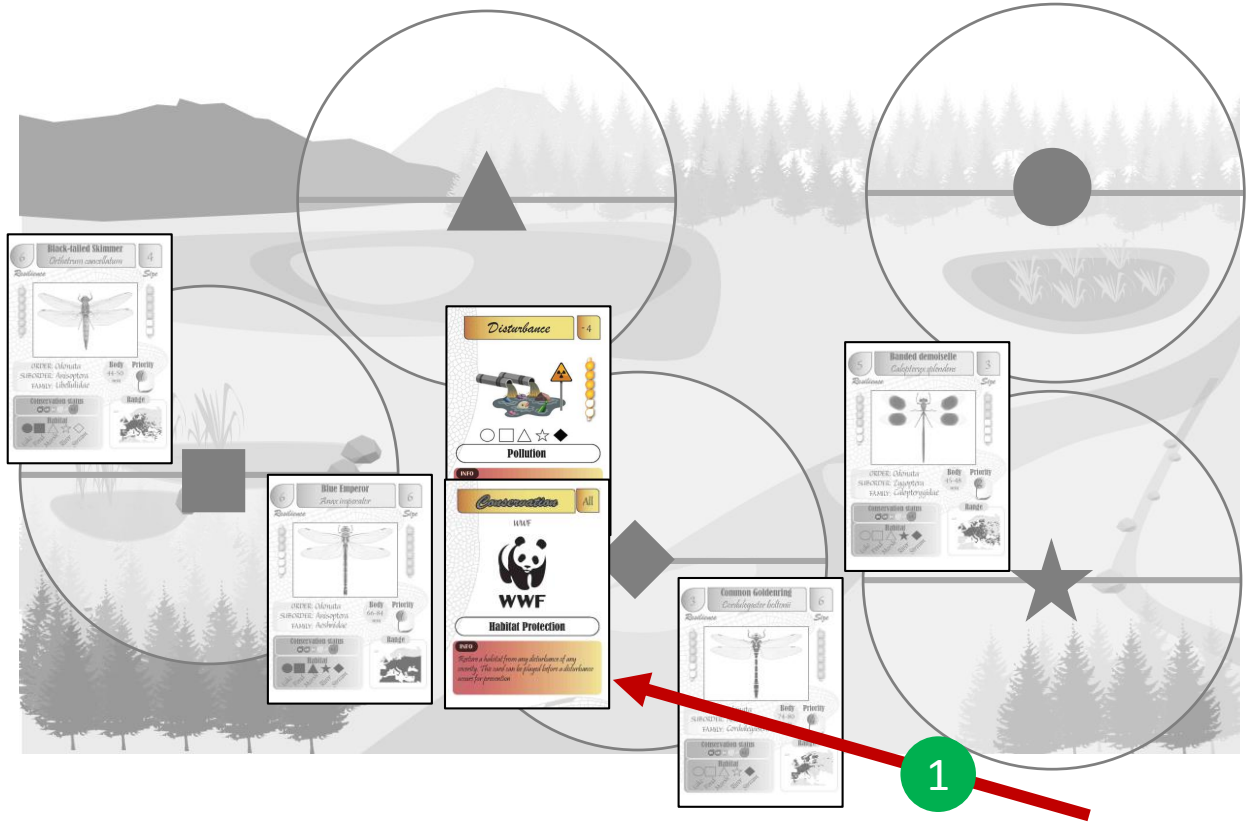
1. The disturbance card is Pollution (quite severe) for the diamand habitat
   - Note that the disturbance card is not played by Player 1 as it could affect either players.
2. Here, the dragonfly in the diamand habitat (Common Goldenring) has a resilience of 3, but the disturbance has a severity of 4 which kills the species(+3-4 = -1).
   - Thus, if severity ≥ resilience, the species dies

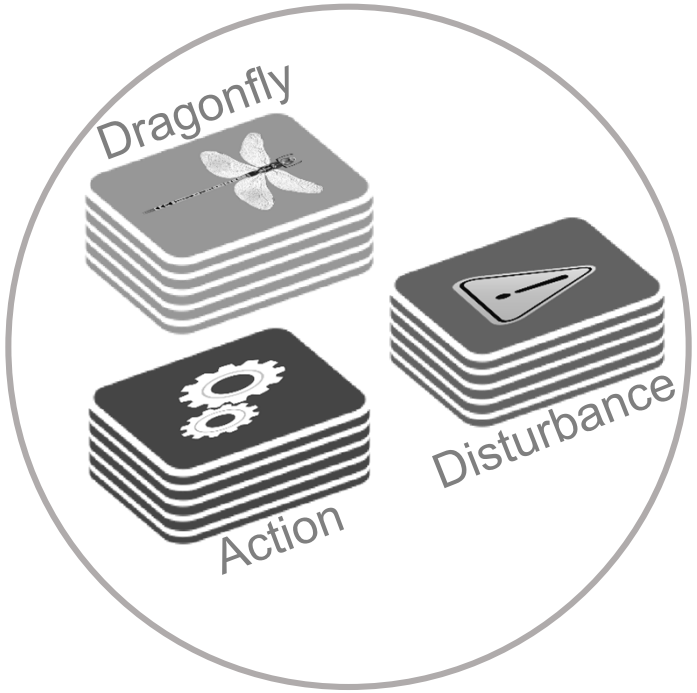






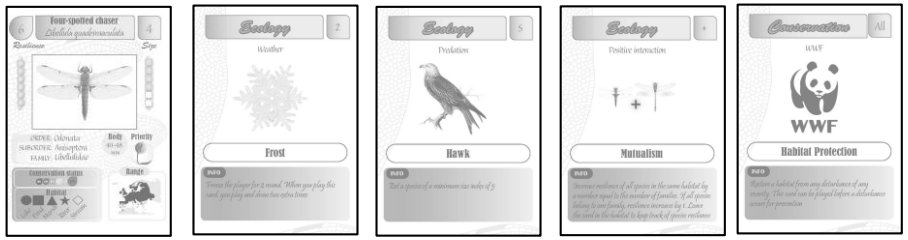


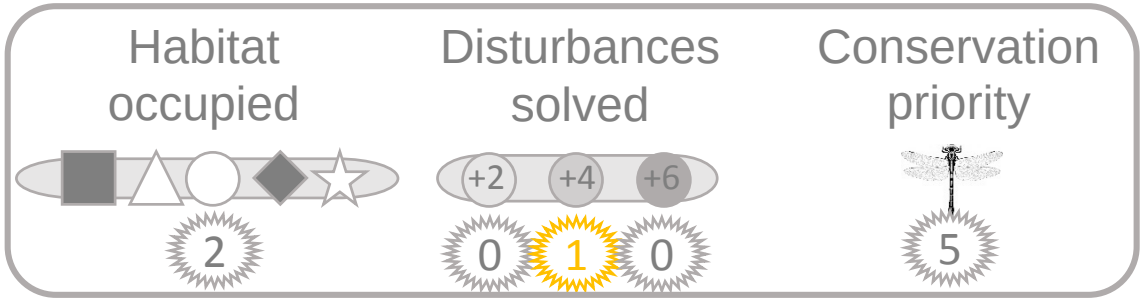


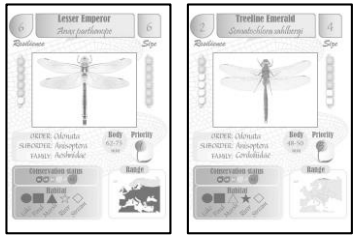


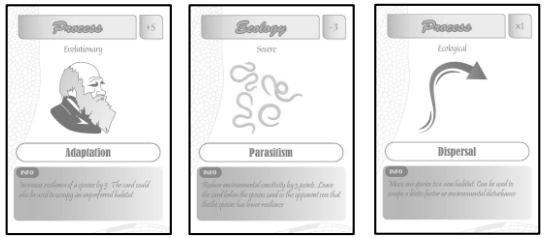
Gameplay

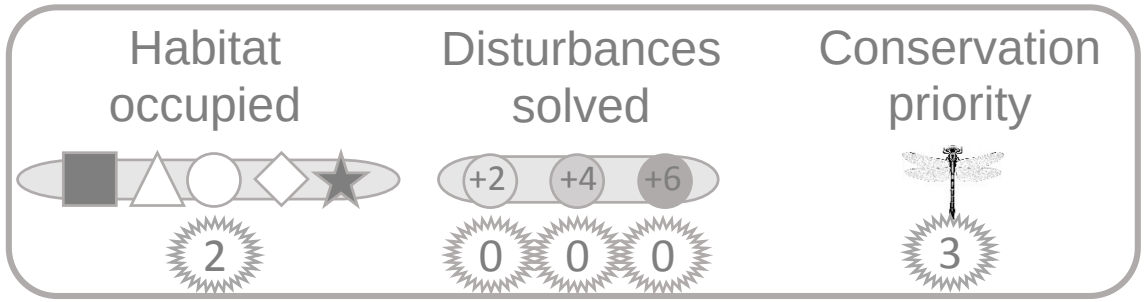
1. To save the dragonfly in the diamand habitat, Player 2 uses a conservation card which removes the disturbance from the habitat

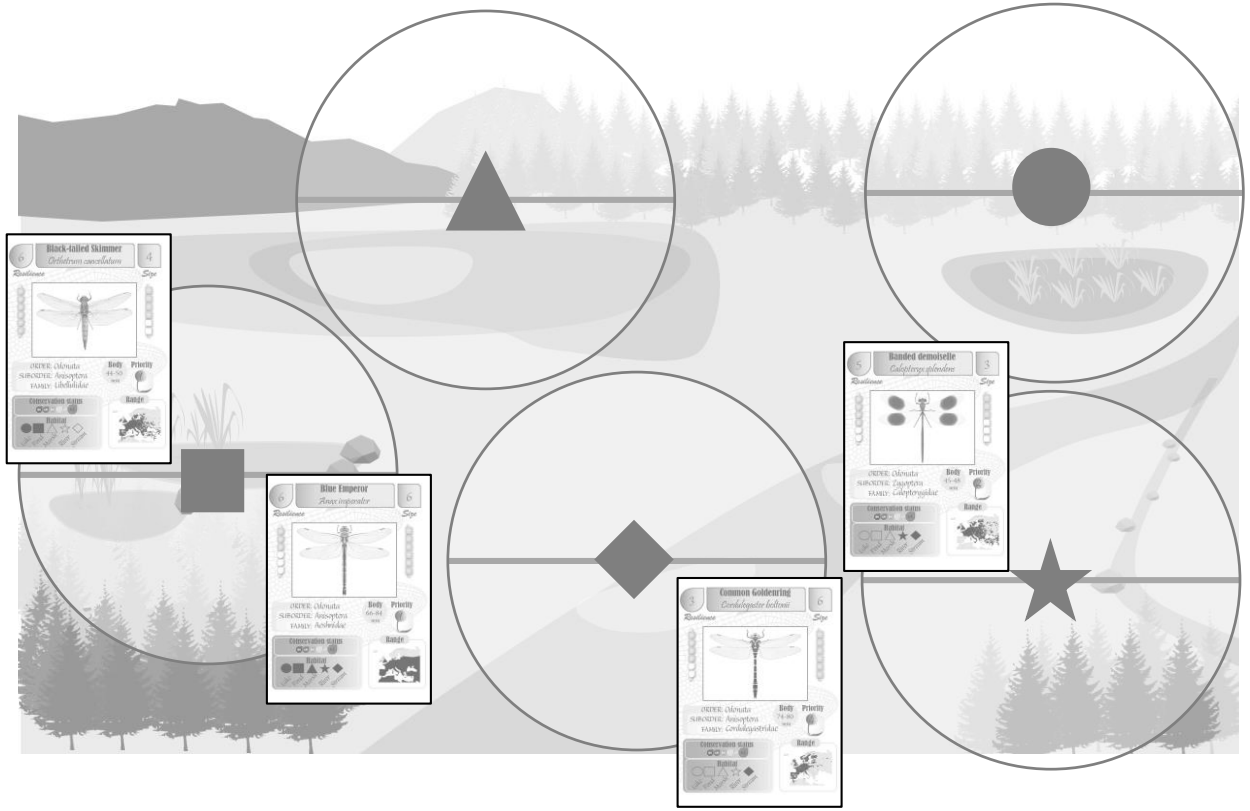


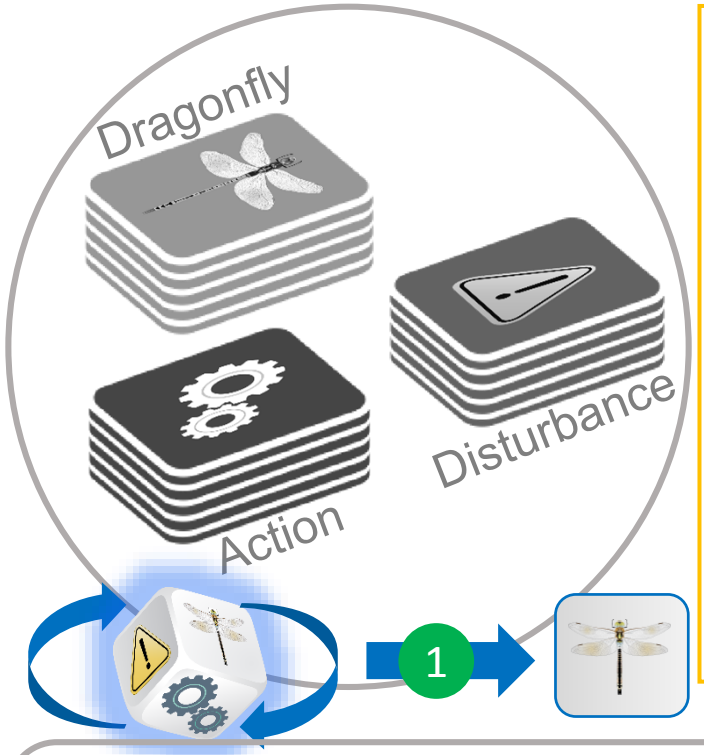






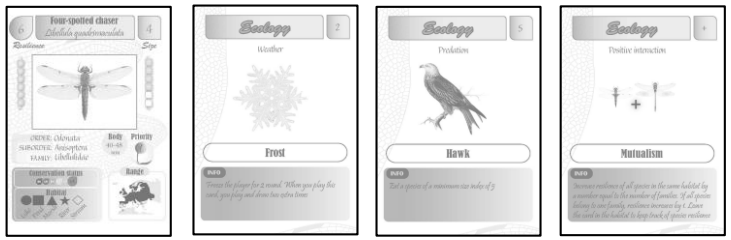


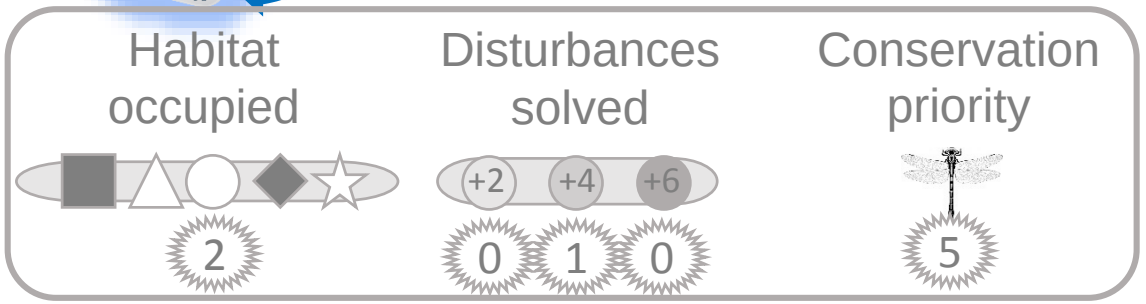




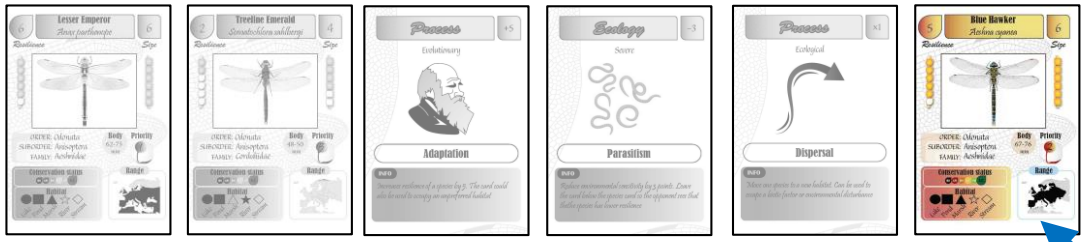
Gameplay

1. Player 1 rolls the dice and obtain a dragonfly logo

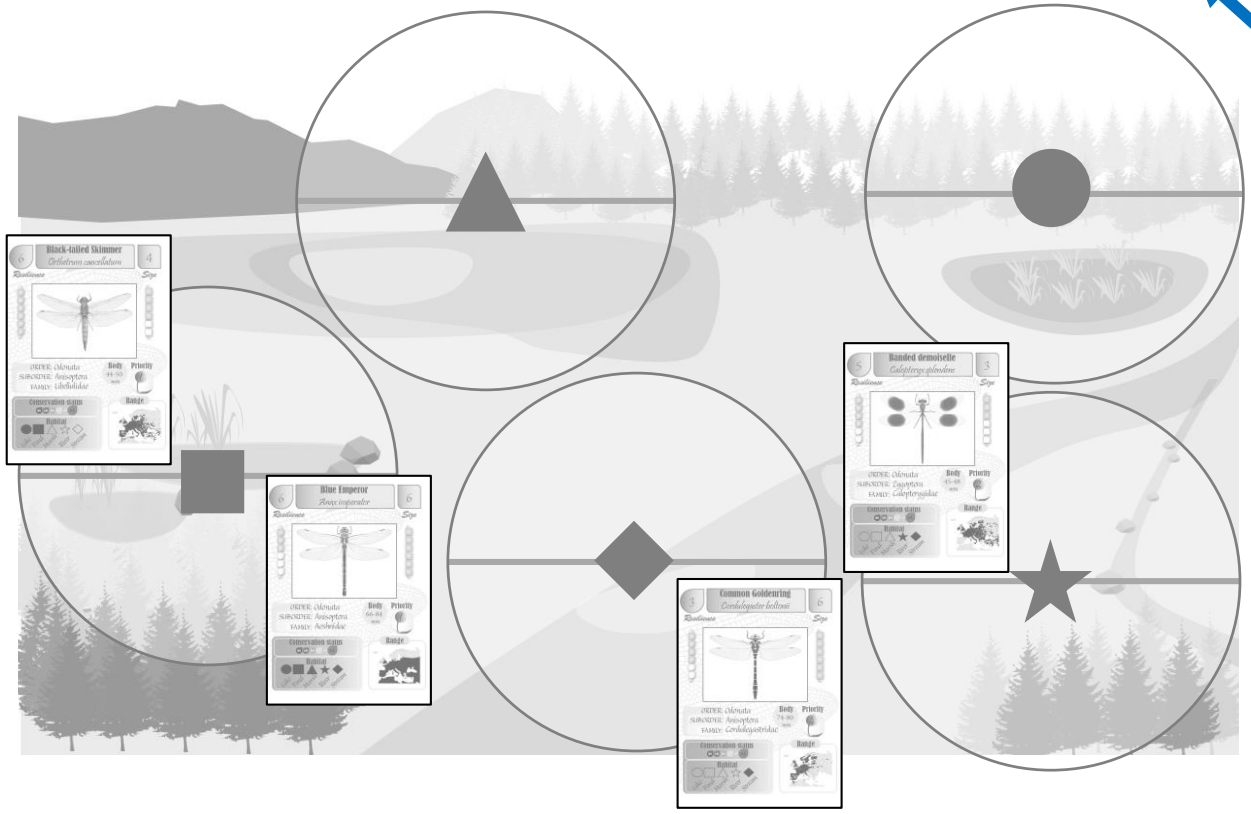




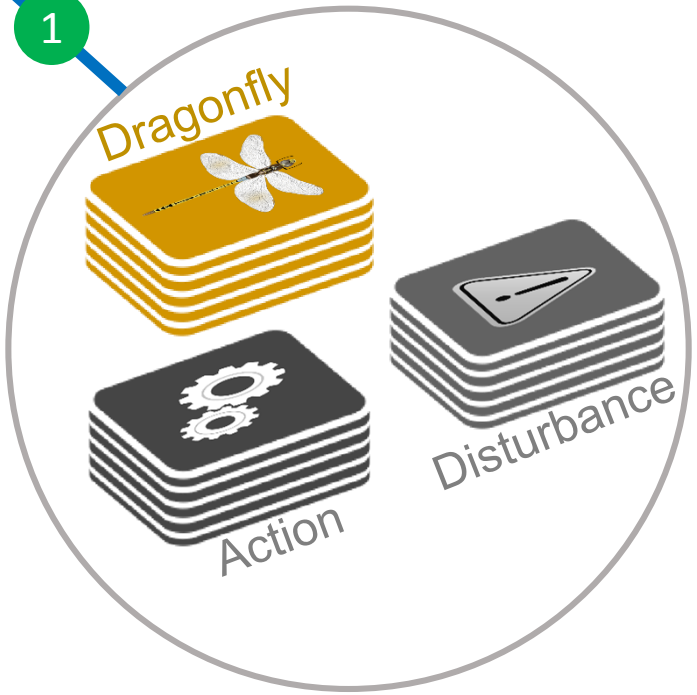
Player 1



Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 0 0	3



1

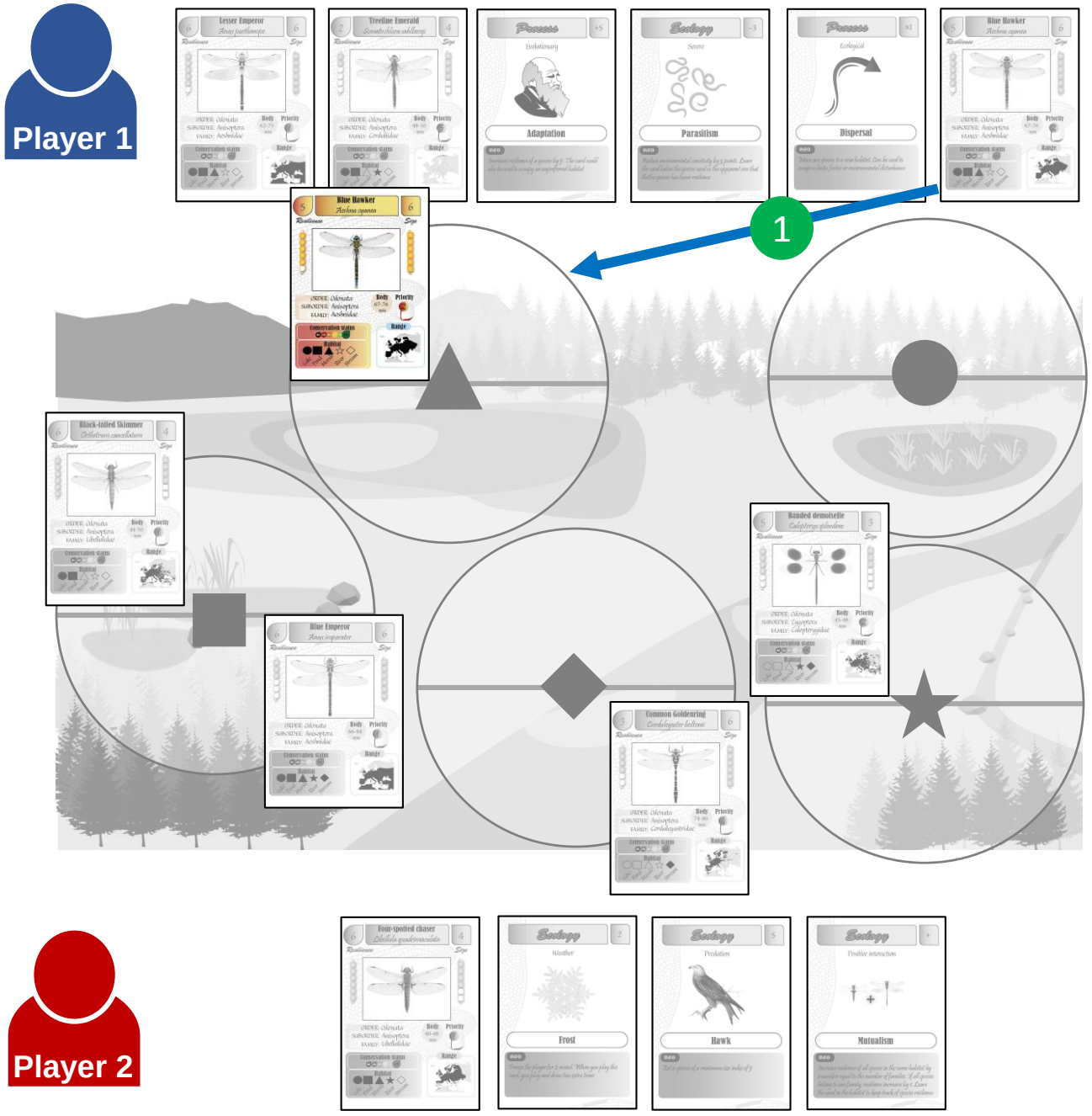


Gameplay

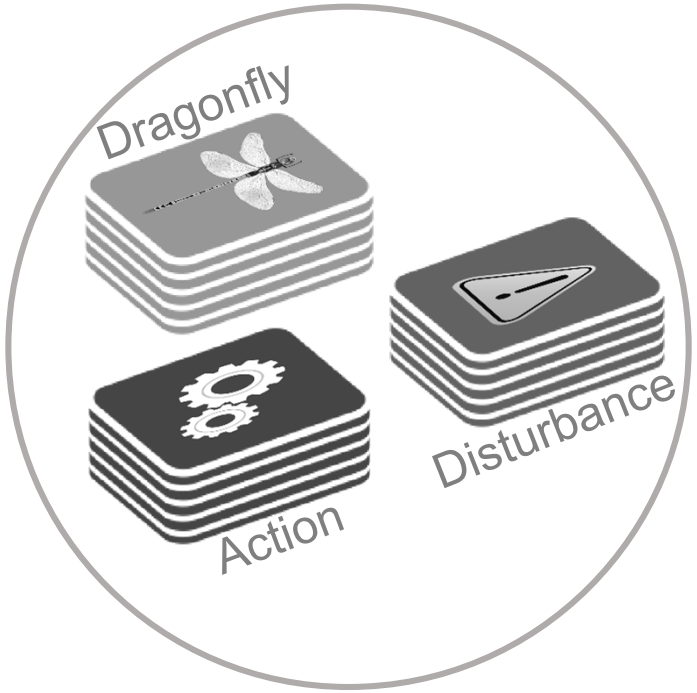
1. Player 1 draws a dragonfly card and obtains the Blue Hawker

Player 2

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	5



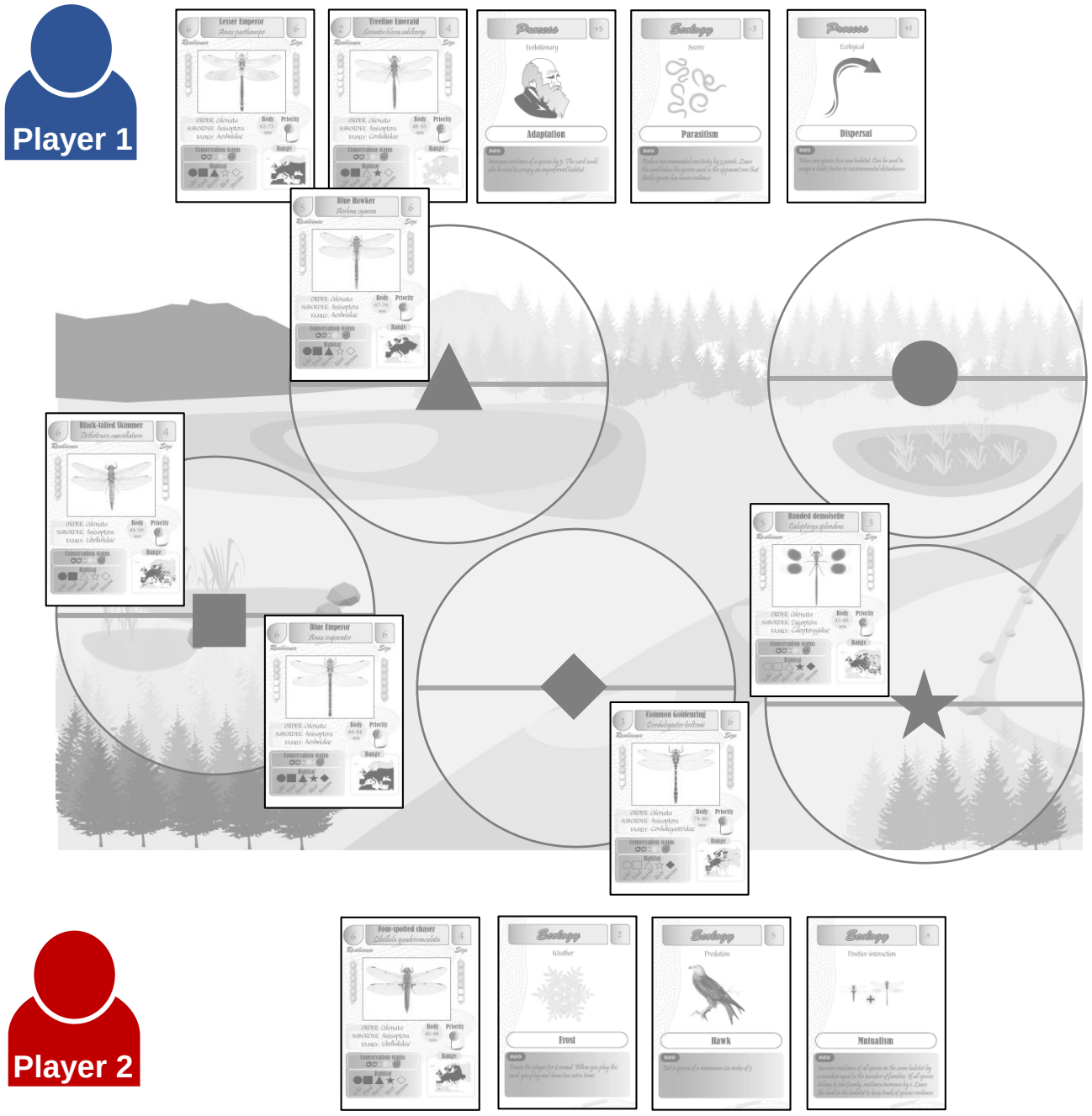
Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6 0 0 0	5



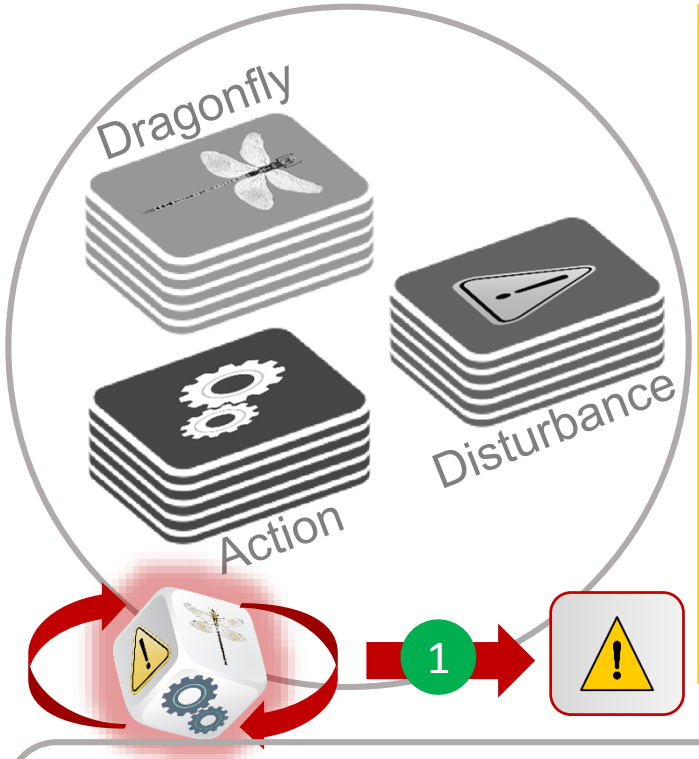
Gameplay

1. Player 1 places the Blue Hawker in the triangle habitat

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 0 1 0	5



Habitat occupied	Disturbances solved	Conservation priority
3	0 0 0 (+2 +4 +6)	5



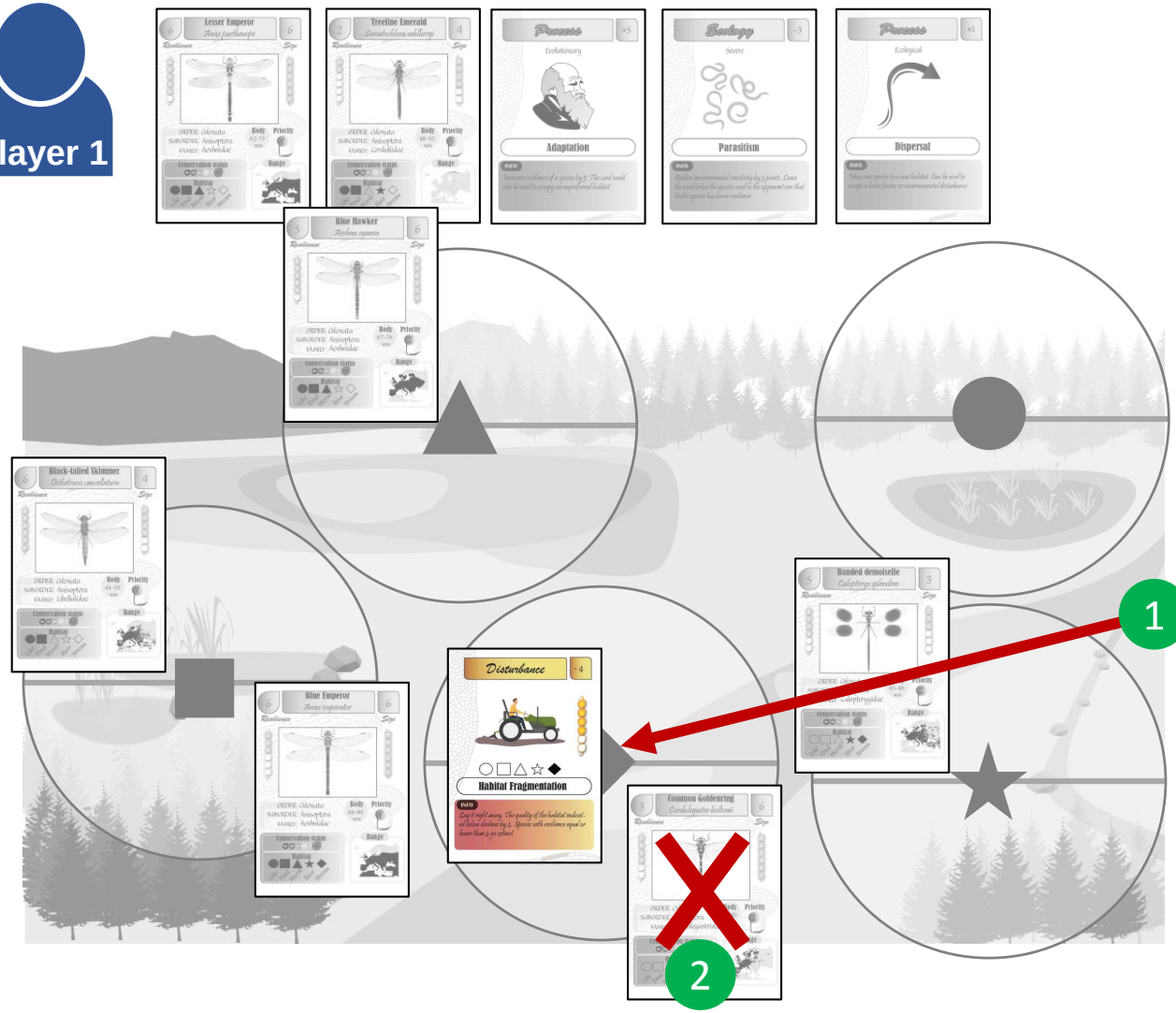
Gameplay

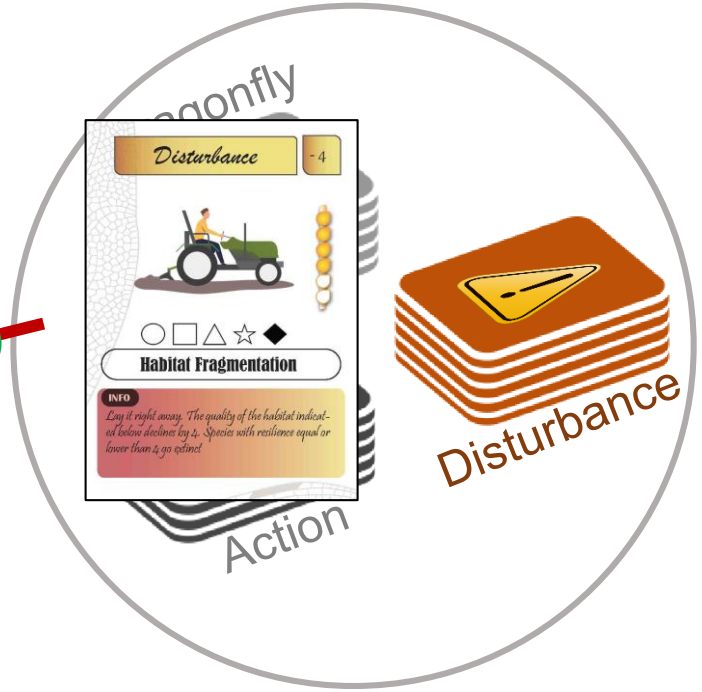
1. Player 2 rolls the dice and obtain the disturbance logo

Habitat occupied	Disturbances solved	Conservation priority
2	0 1 0 (+2 +4 +6)	5

Player 1

Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6 → 0 0 0	5



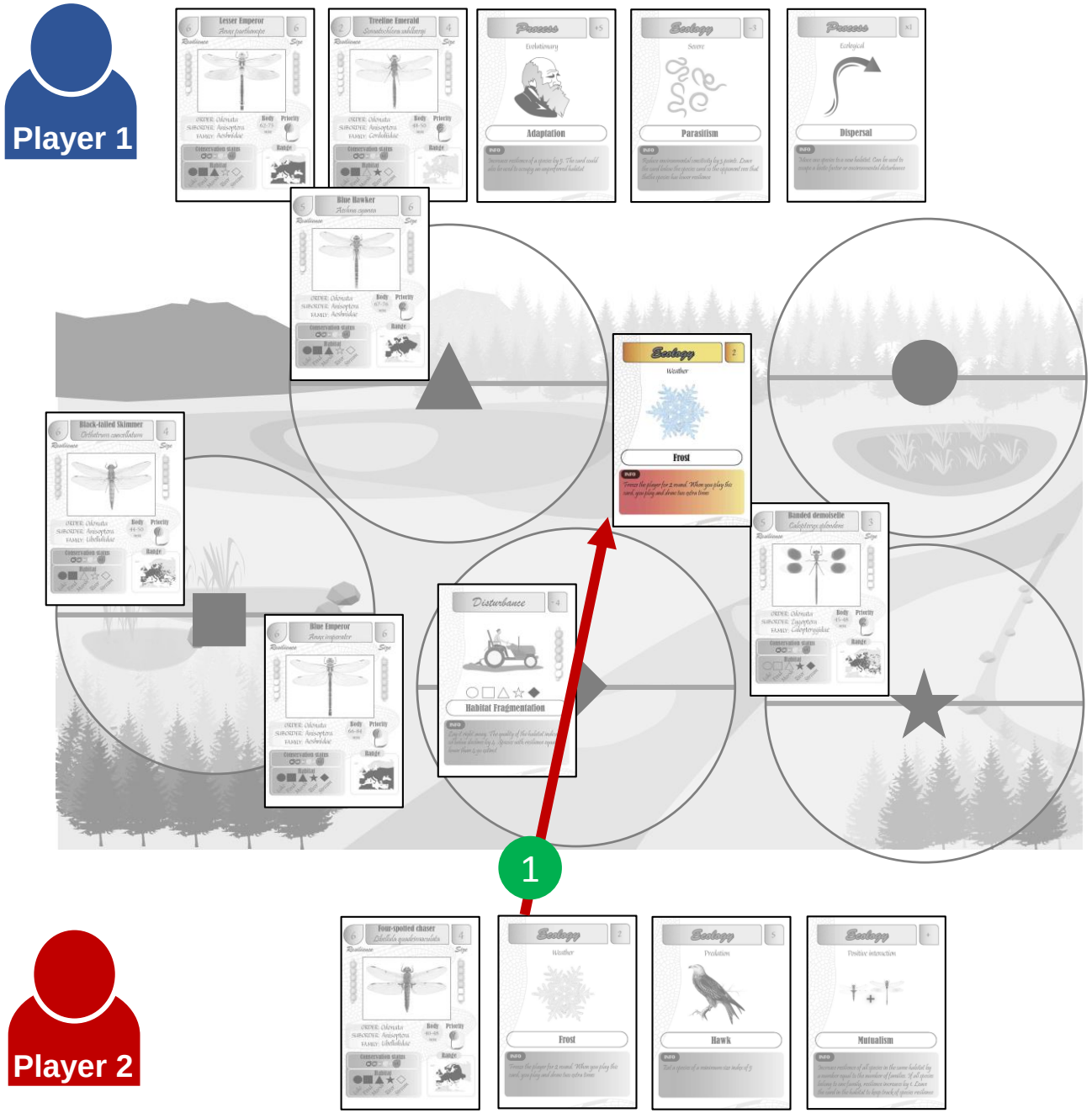


Gameplay

1. Player 2 obtains Habitat fragmentation card (quite strong) for the diamand card
2. This disturbance level (Severity=4) is beyond the Resilience of the Common Goldenring (Resilience=3), thus the dragonfly will die

Player 2

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	1



Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6	5
	0 0 0	

Dragonfly

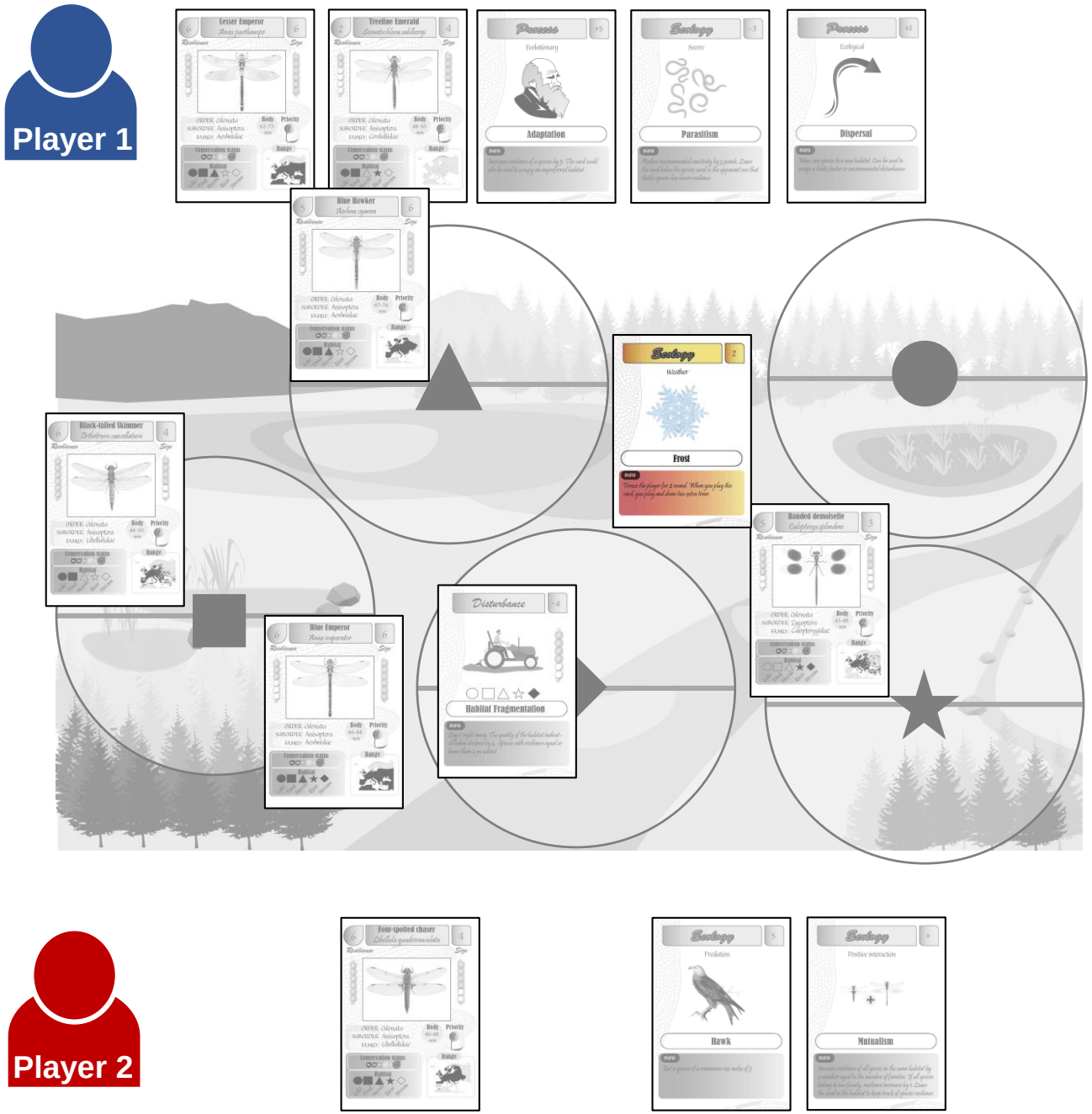
Disturbance

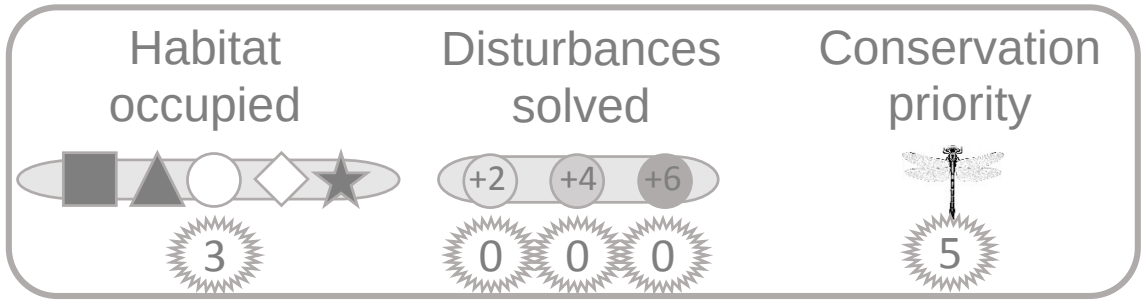
Action

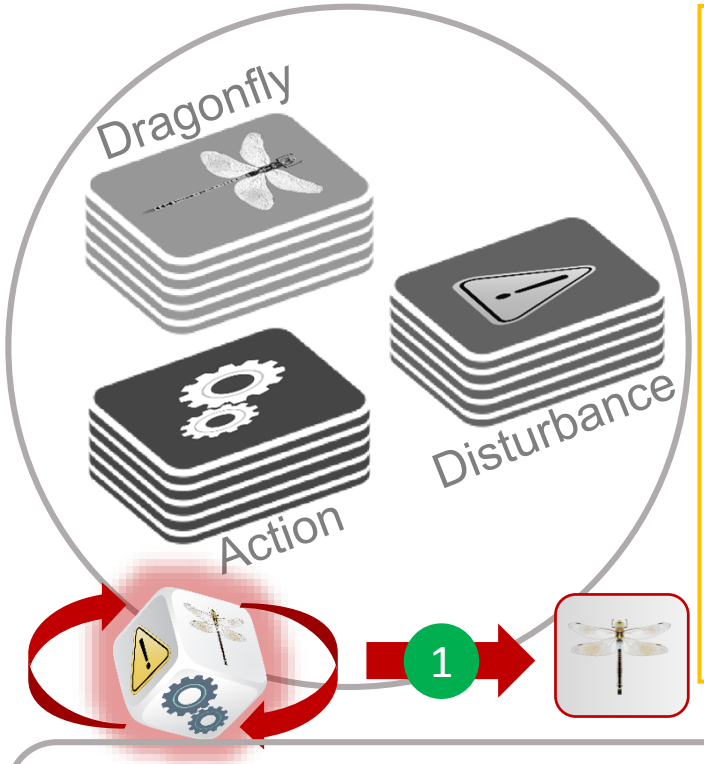
Gameplay

1. Player 2 plays the Frost card which freeze Player 1 from playing for two rounds

Habitat occupied	Disturbances solved	Conservation priority
1	+2 +4 +6	1
	0 1 0	

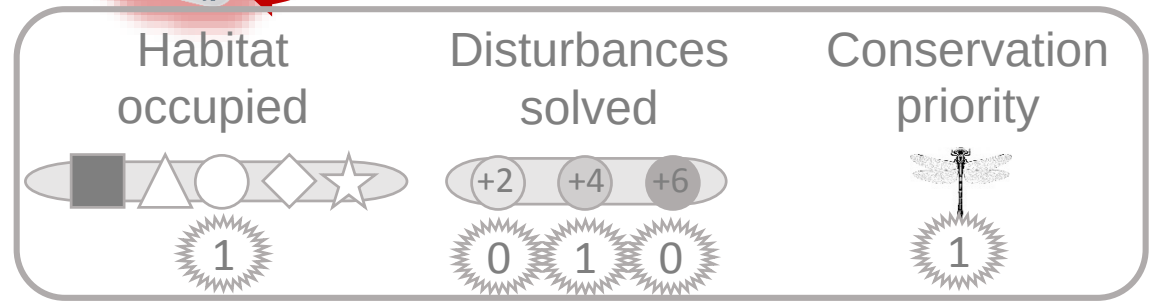


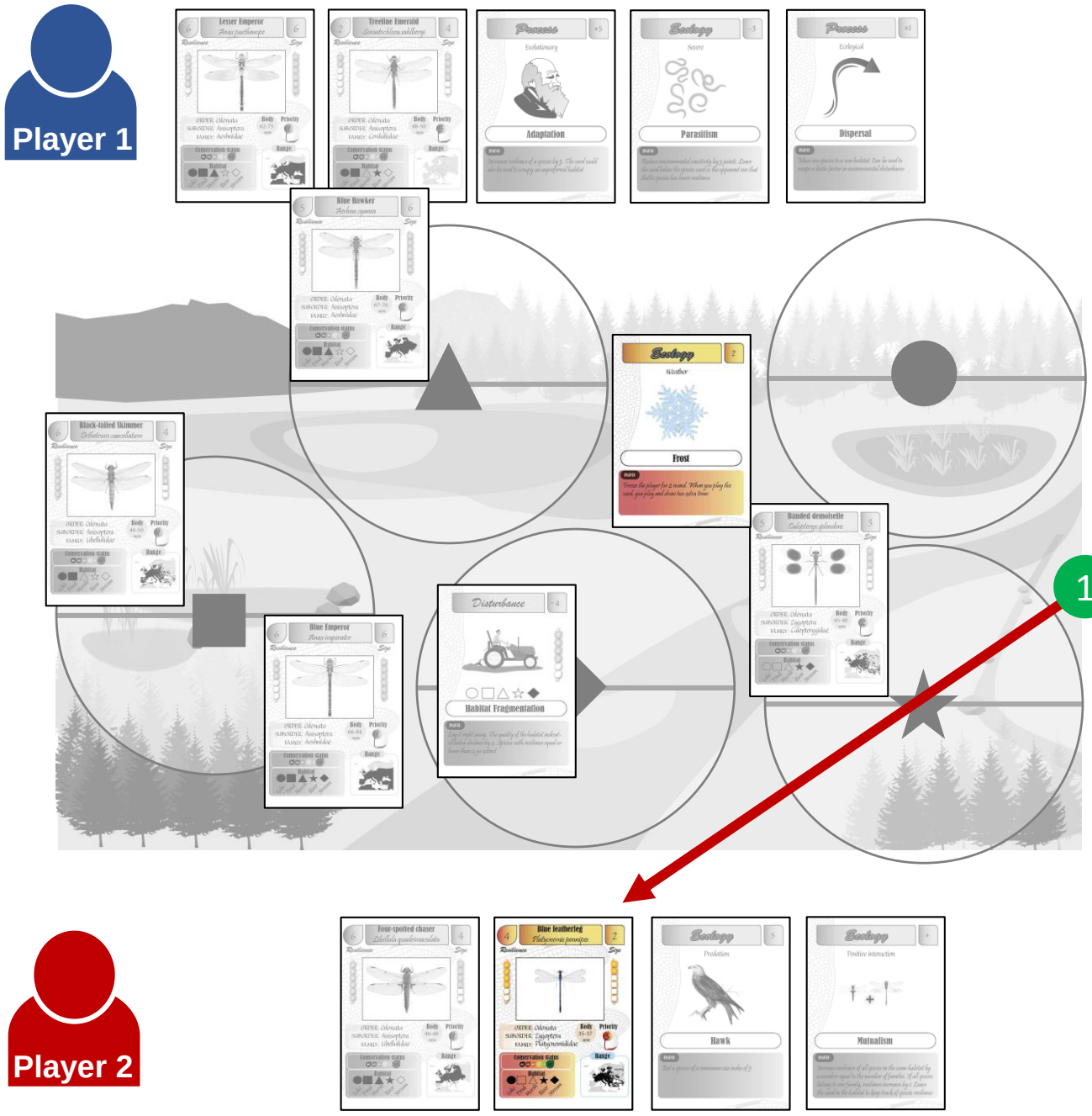




Gameplay

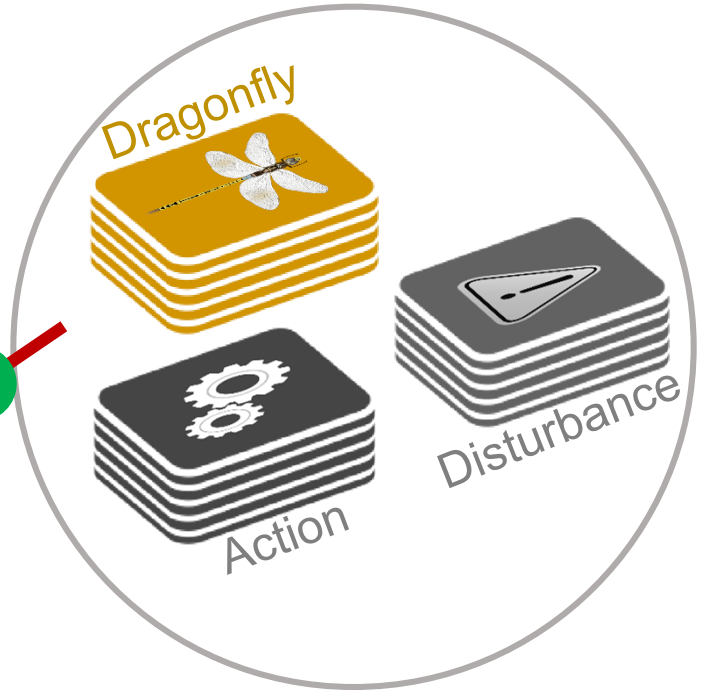
1. Player 2 rolls the dice and obtain the dragonfly logo





Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6 → 0 0 0	5

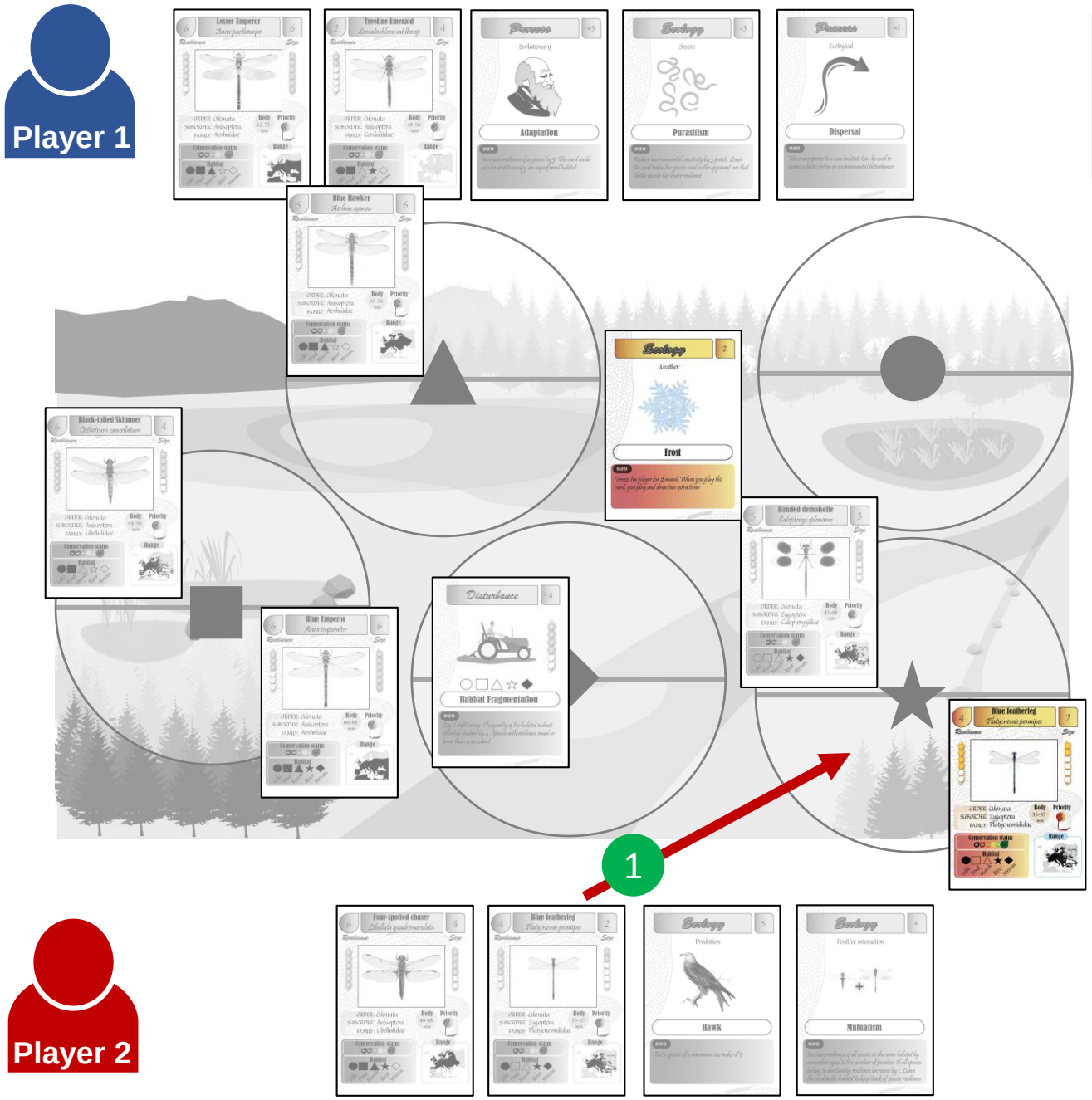
1



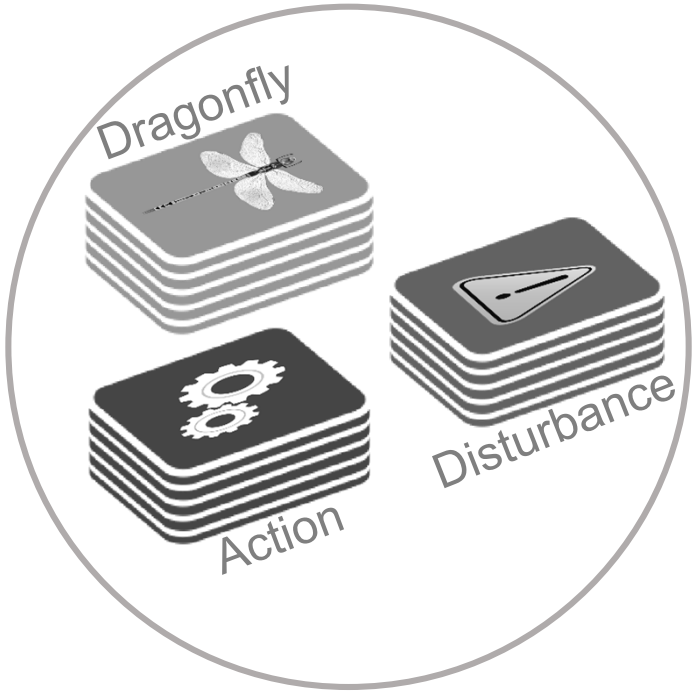
Gameplay

1. Player 2 draws a dragonfly card and receives the ‘Blue Featherleg’

Habitat occupied	Disturbances solved	Conservation priority
1	+2 +4 +6 → 0 1 0	1



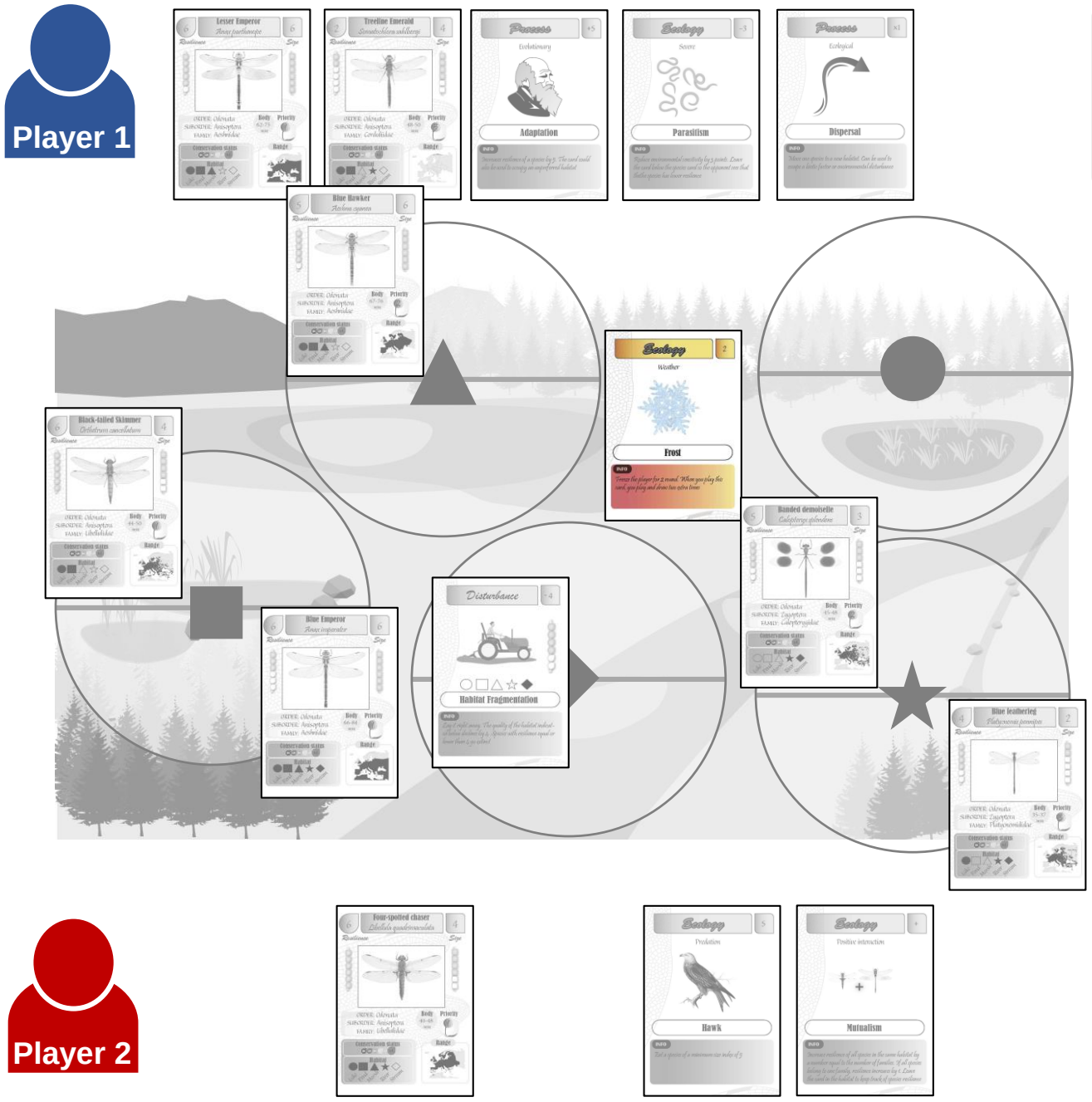
Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6 → 0 0 0	5



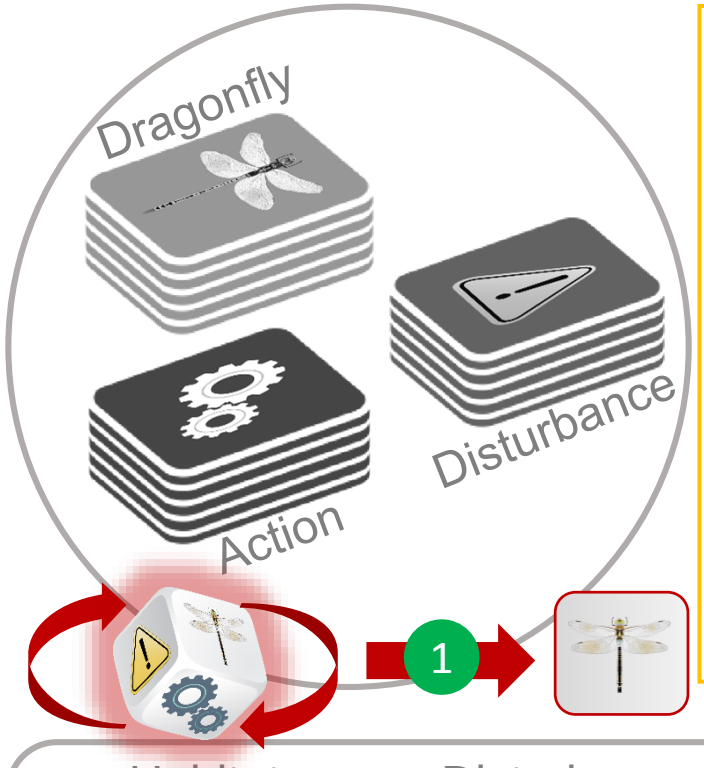
Gameplay

1. Player 2 places the dragonfly card (Blue Featherleg) in the star habitat

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	4



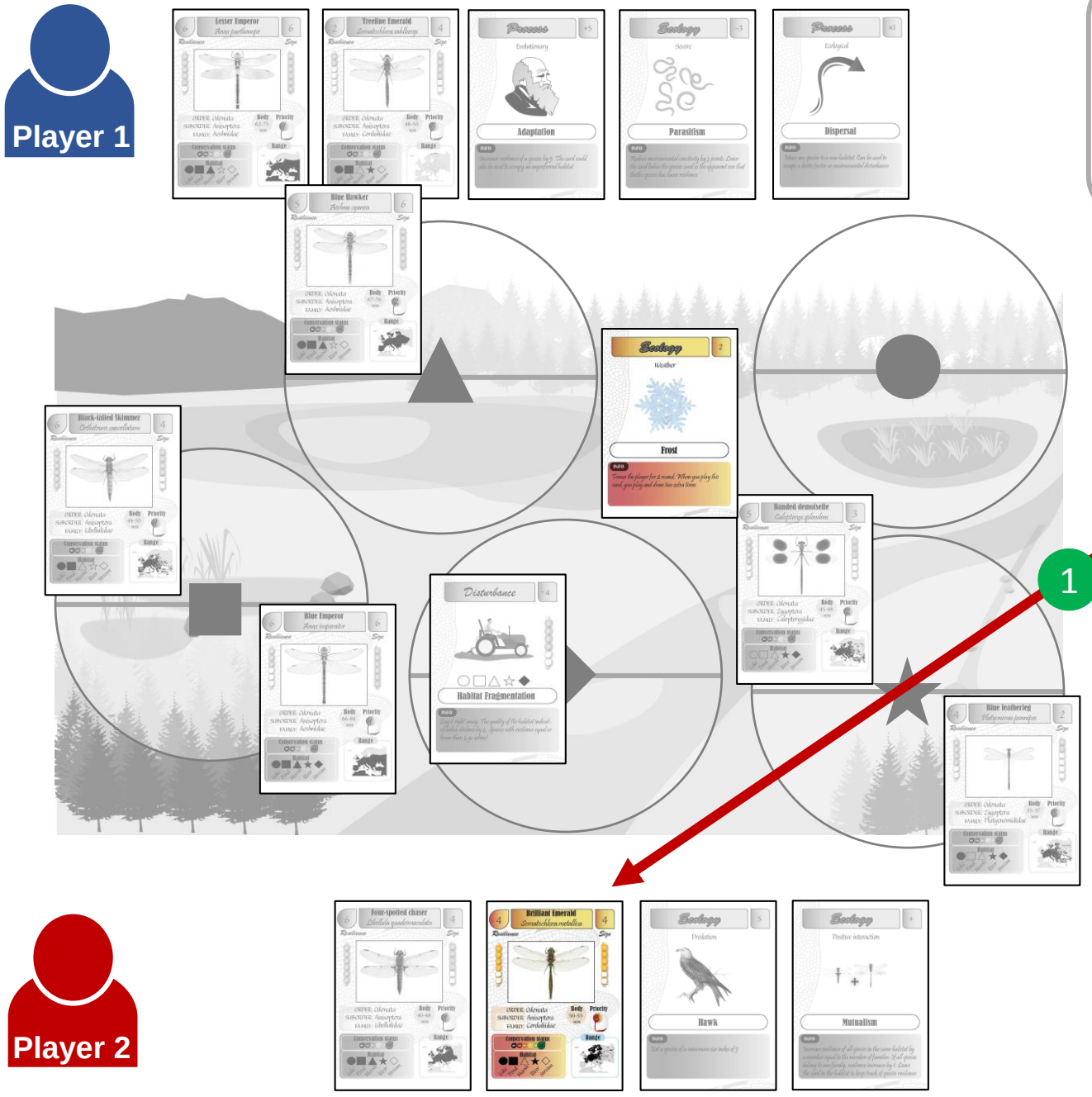
Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6 → 0 0 0	5



Gameplay

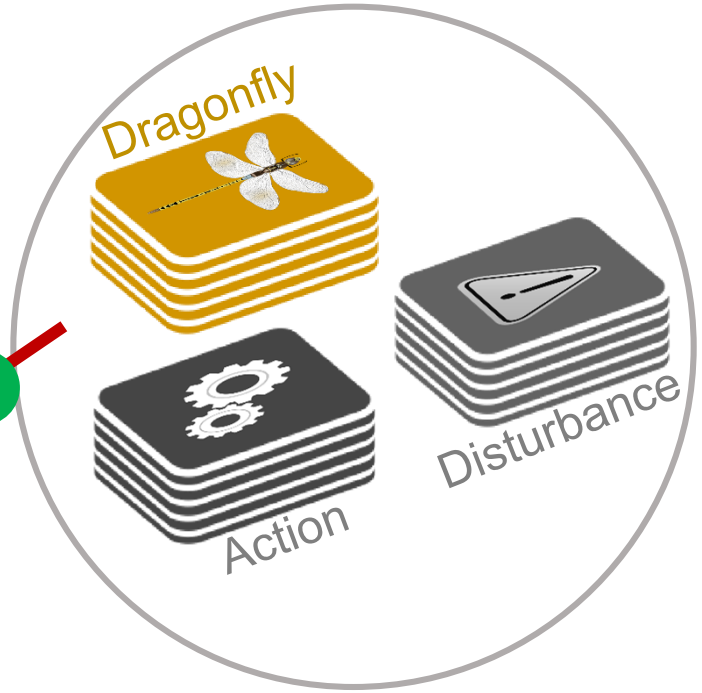
1. As player 1 is still frozen, Player two tosses the die again and receives the dragonfly logo

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	4



Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6 → 0 0 0	5

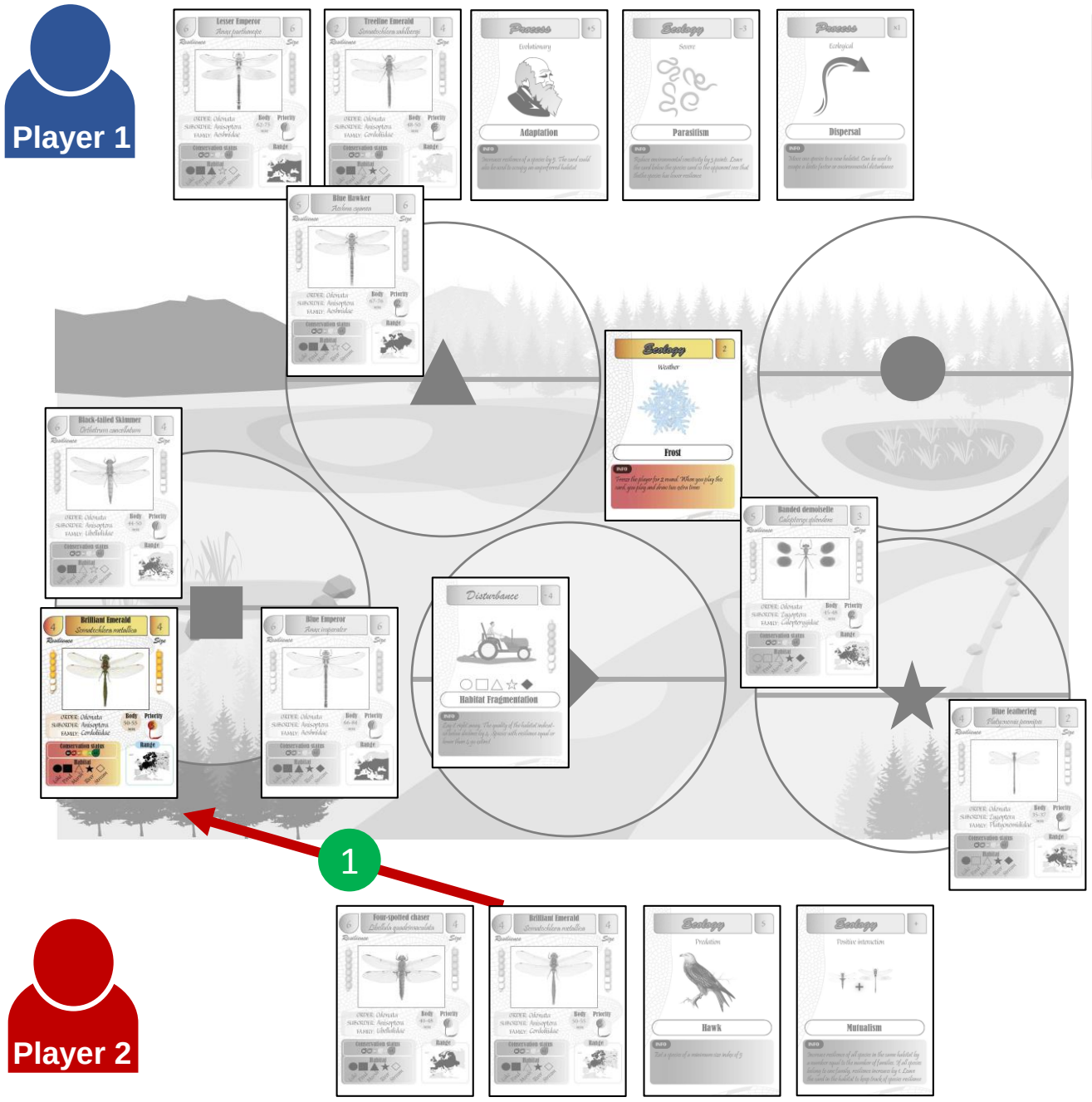
1



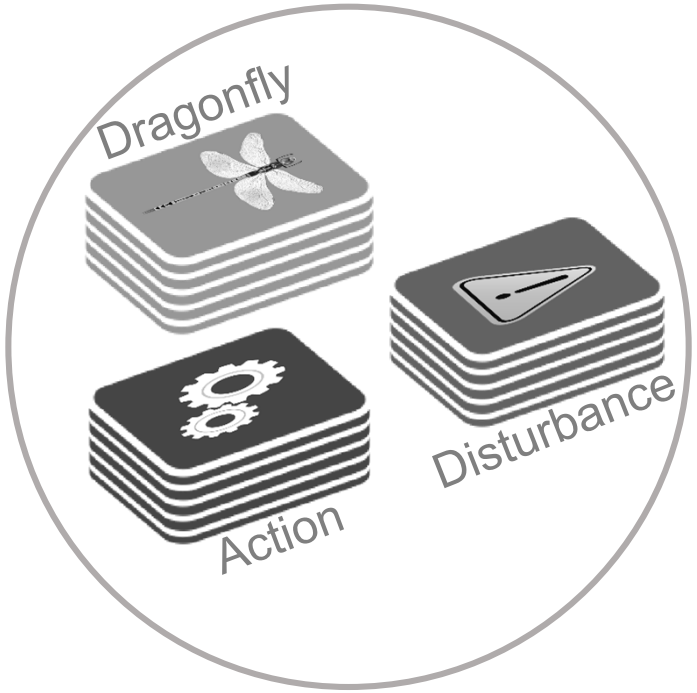
Gameplay

1. Player 2 draws a dragonfly card and obtains the ‘Brilliant Emerald’

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	4



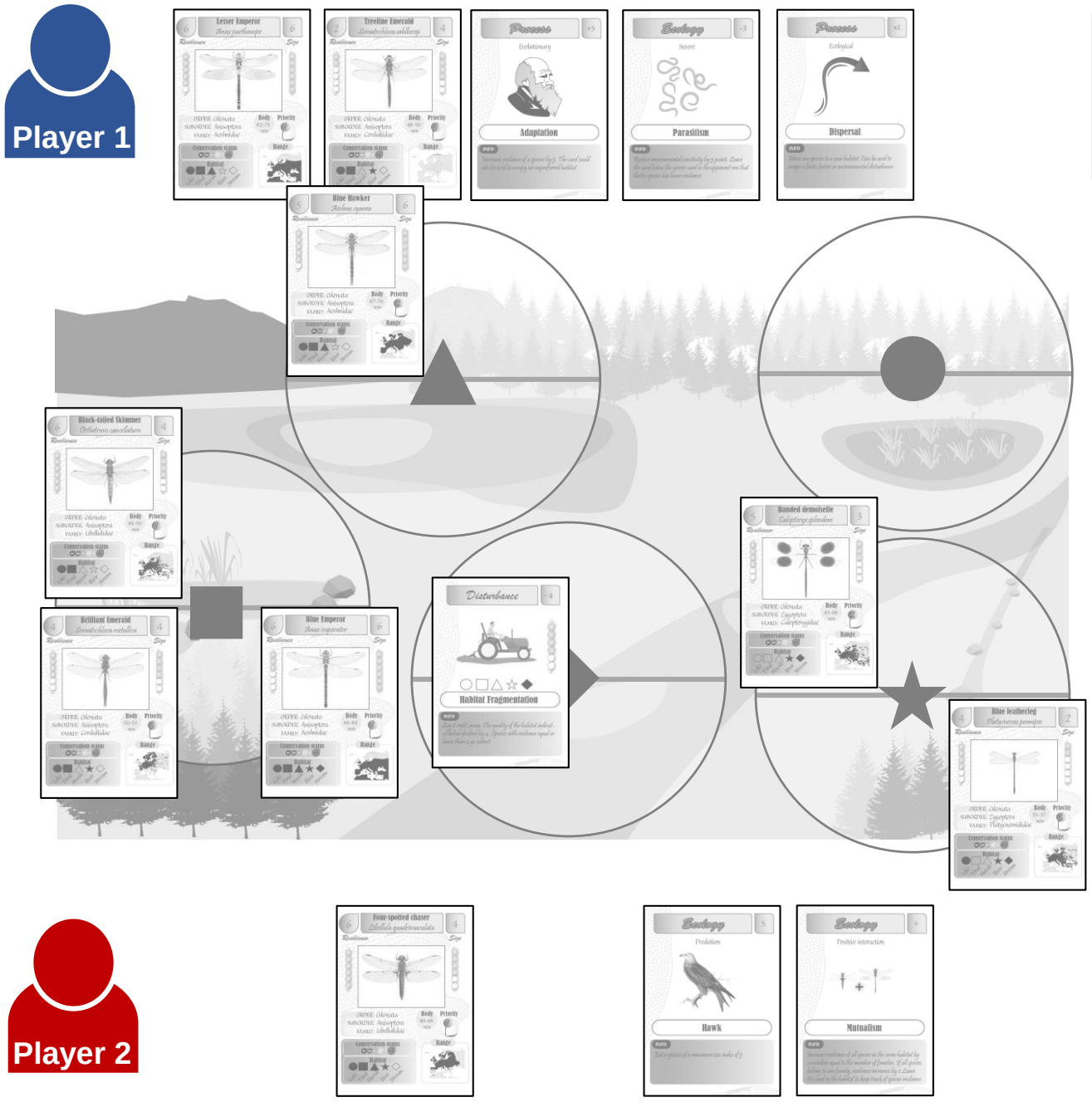
Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6 → 0 0 0	5

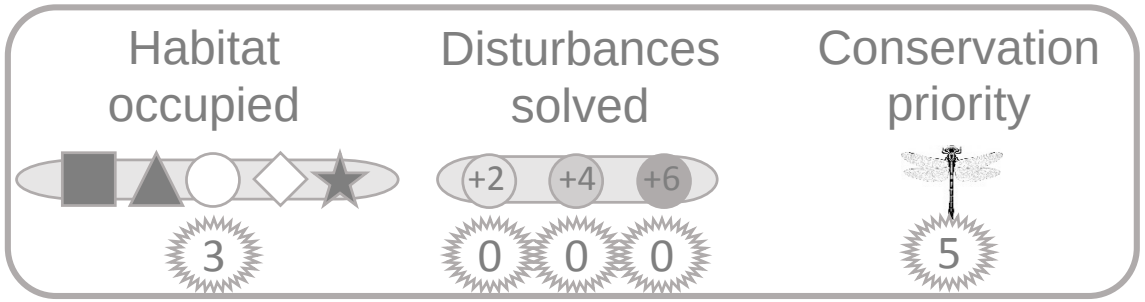


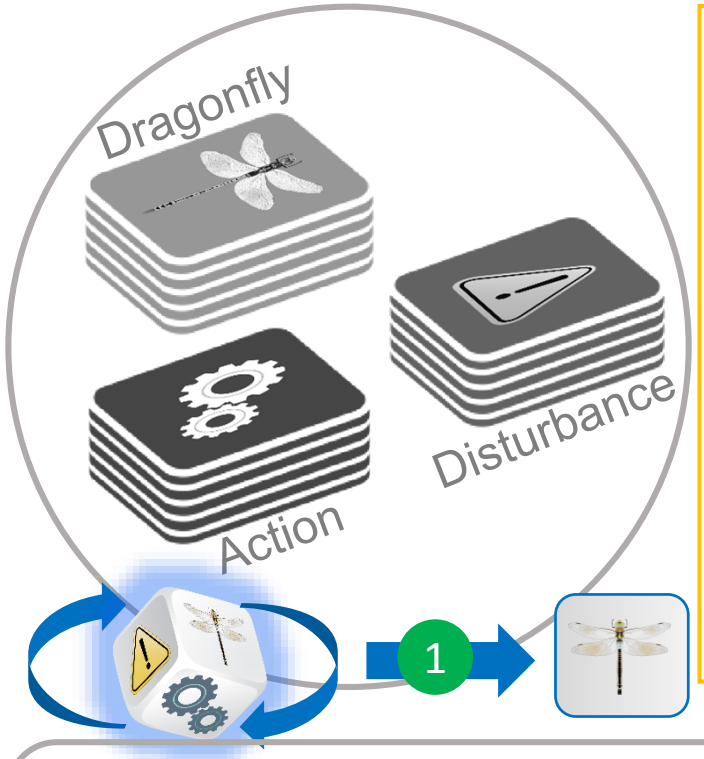
Gameplay

1. Player 2 places the Brilliant Emerald in the square habitat

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	7

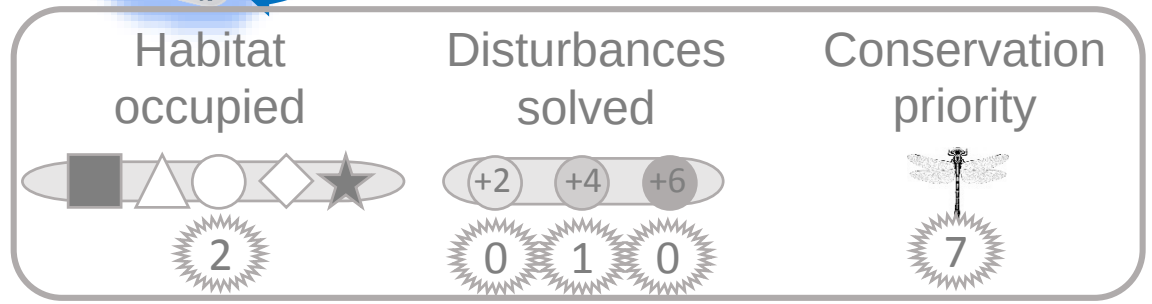


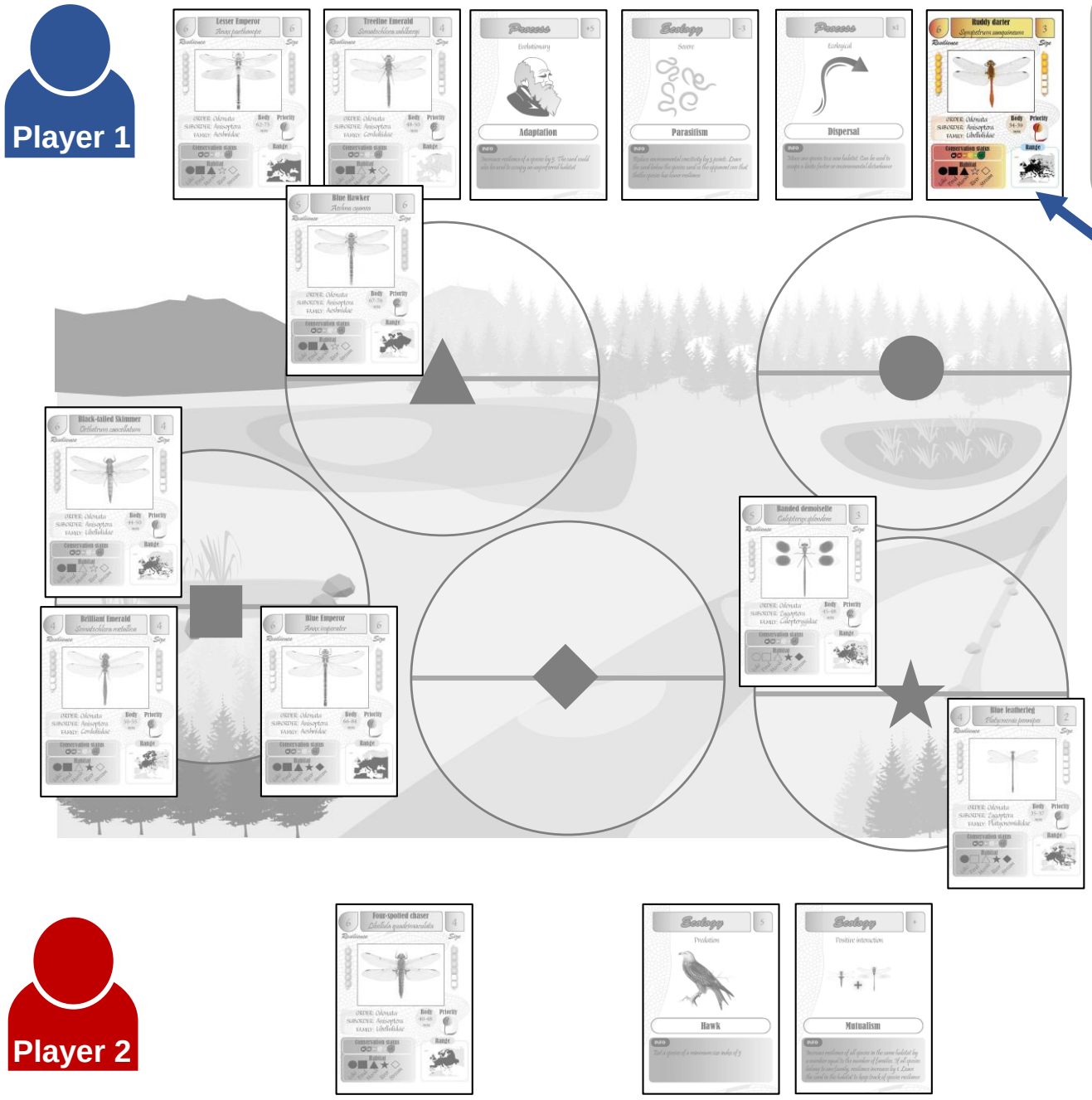


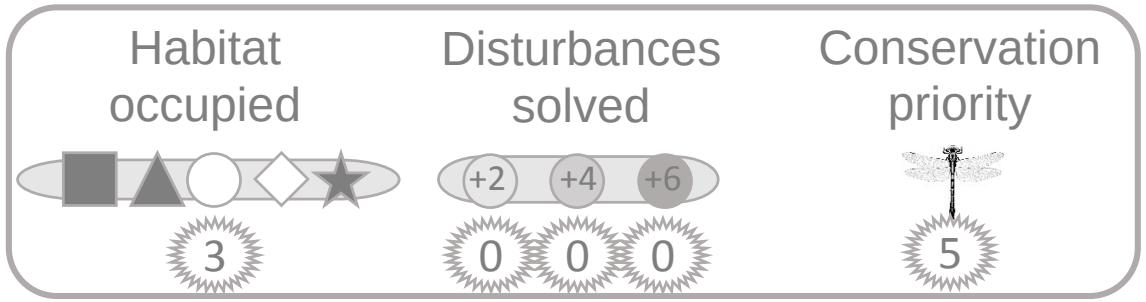


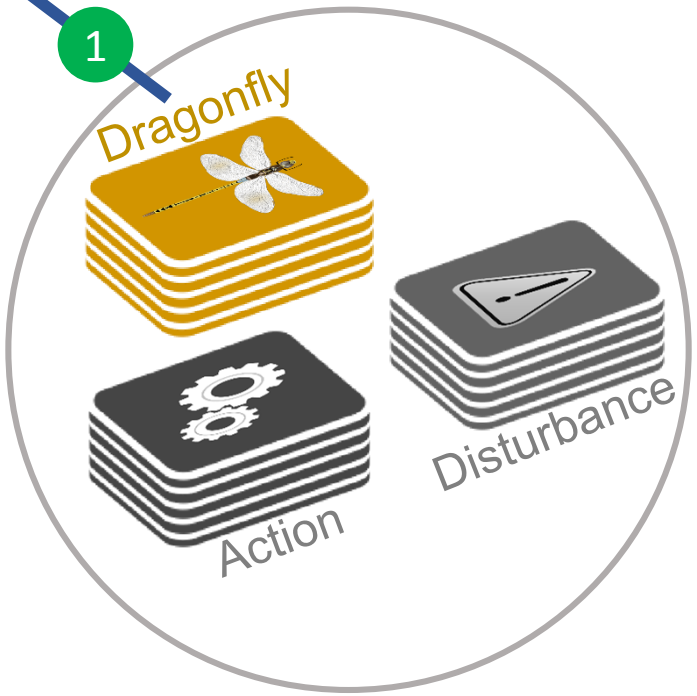
Gameplay

1. Player 1 rolls the dice and obtain the dragonfly logo



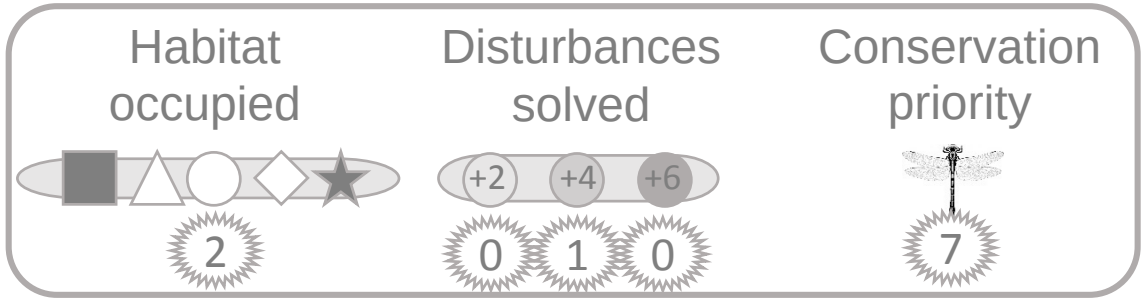


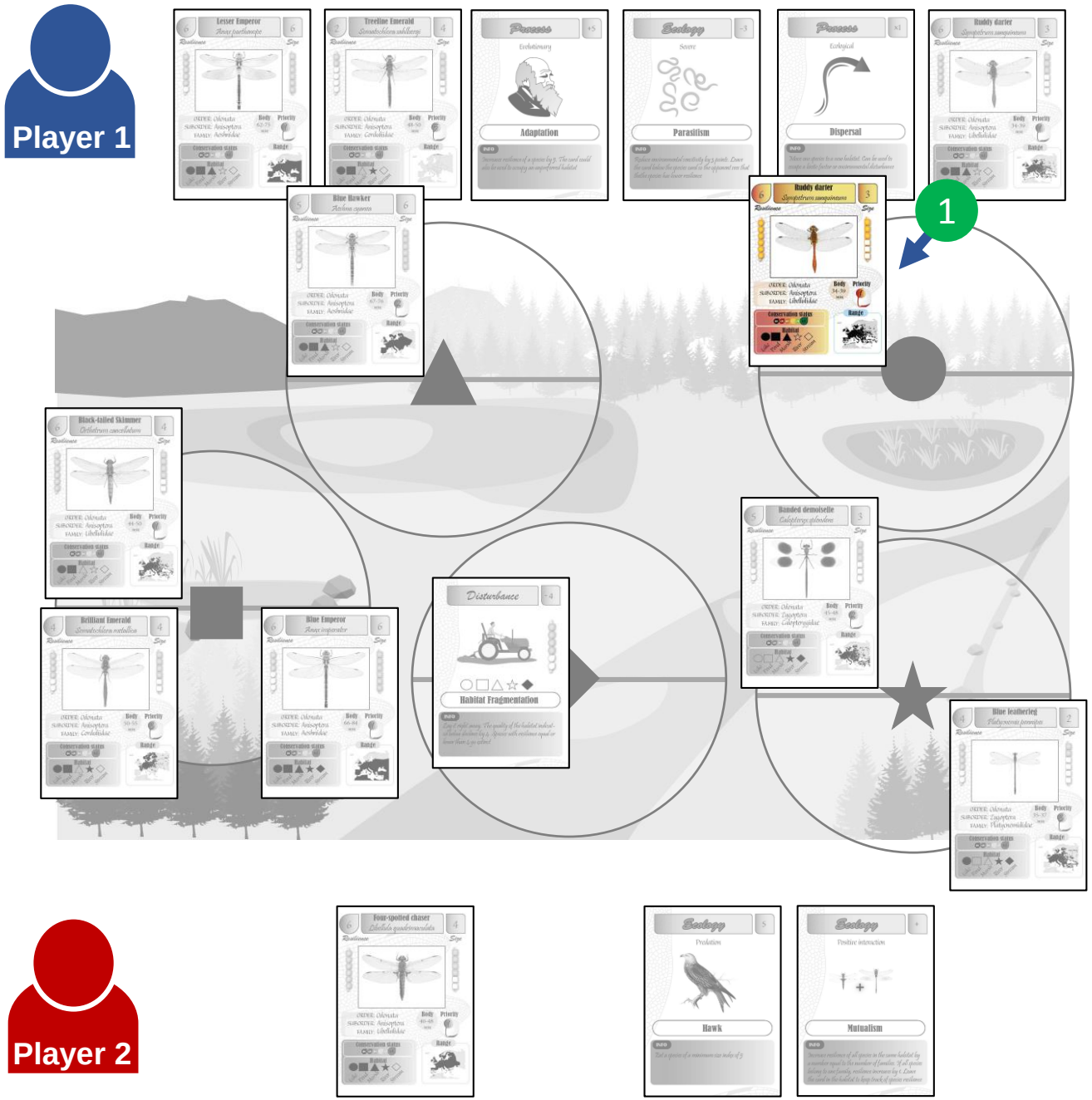




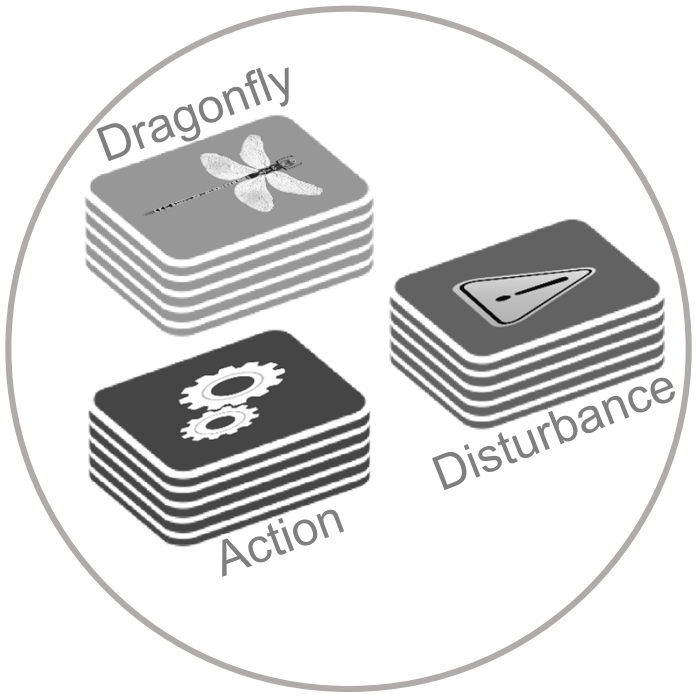
Gameplay

1 Player 1 draws a dragonfly card and obtains the Ruddy darter





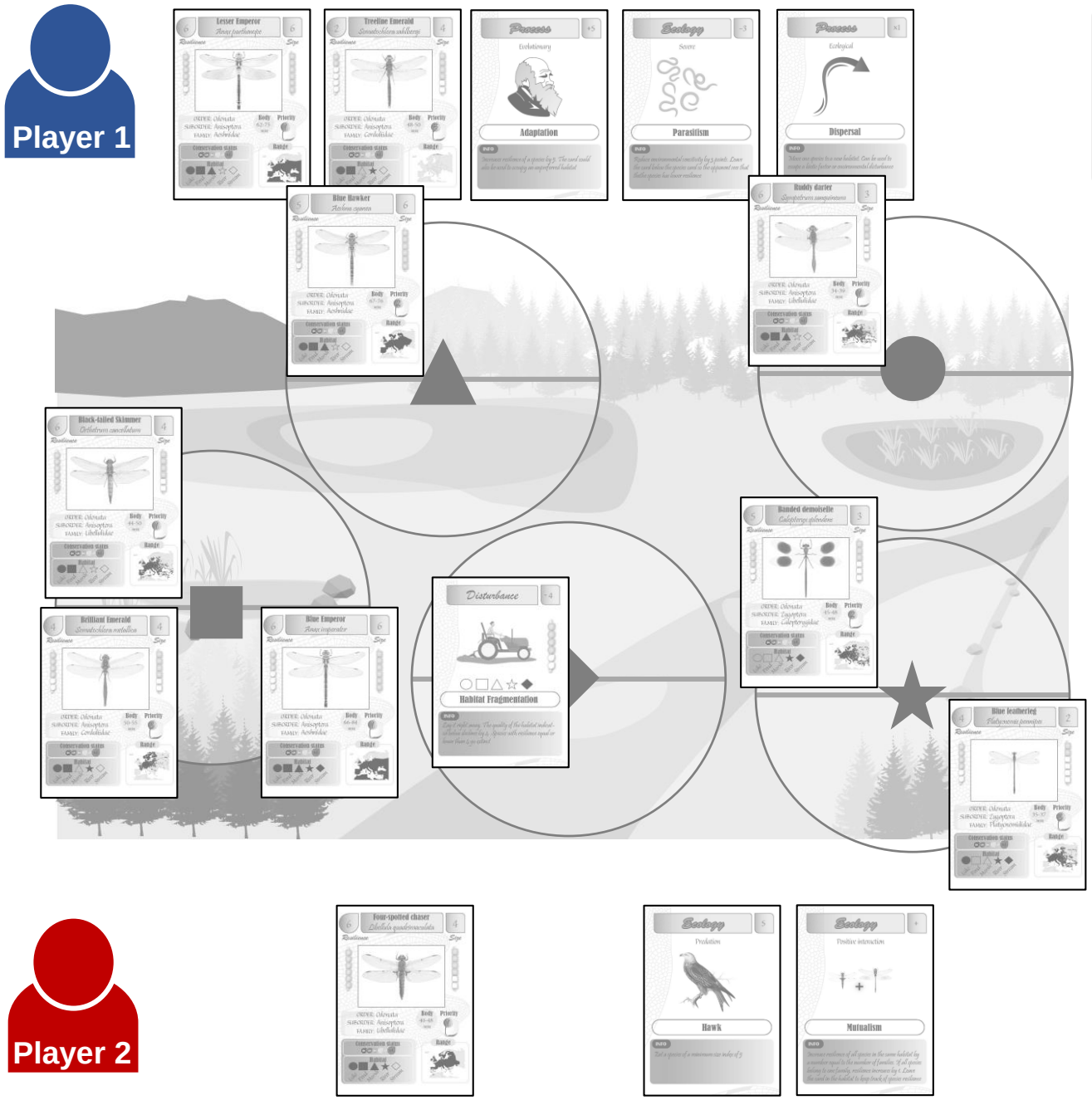
Habitat occupied	Disturbances solved	Conservation priority
4	+2 +4 +6 0 0 0	6



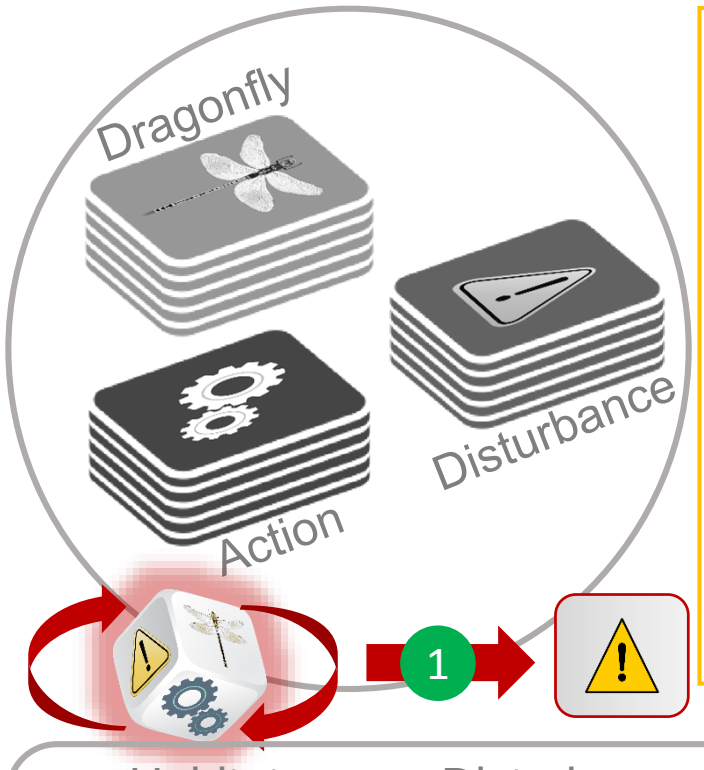
Gameplay

1. Player 1 places a dragonfly card (Ruddy darter) in the circle habitat

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 0 1 0	7



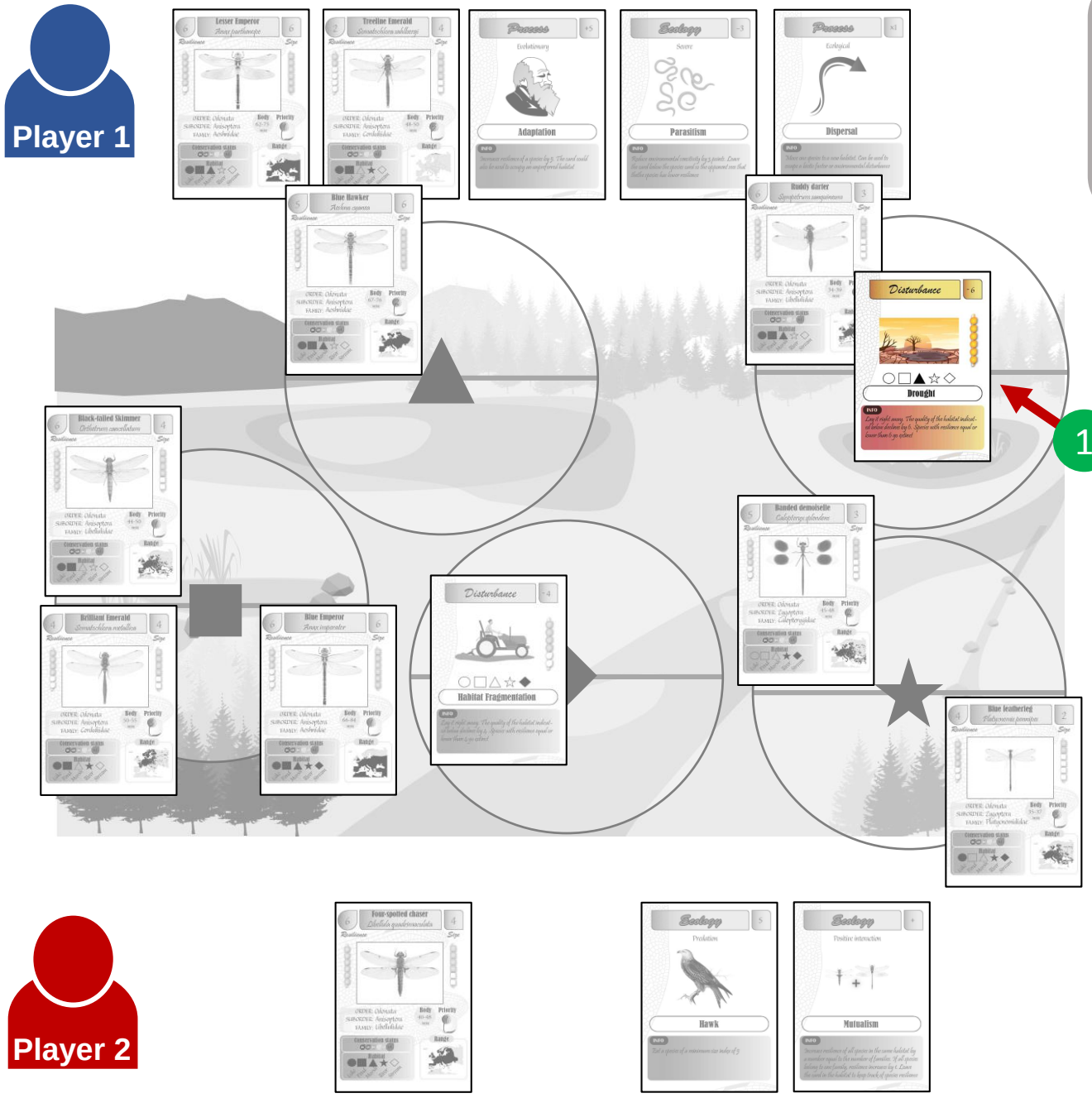
Habitat occupied	Disturbances solved	Conservation priority
4	+2 +4 +6 → 0 0 0	6



Gameplay

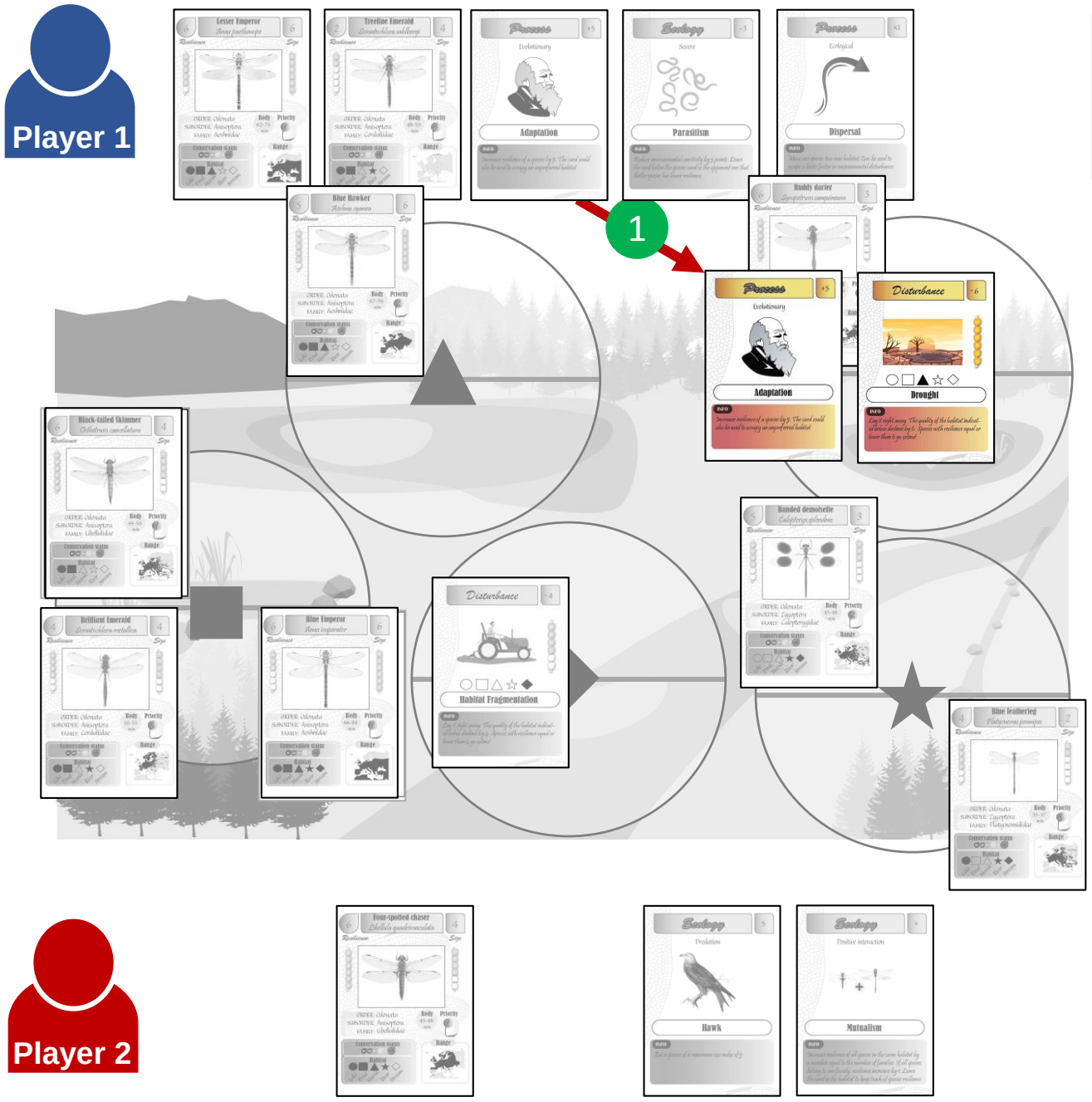
1. Player 2 rolls the dice and obtain the disturbance card

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	7

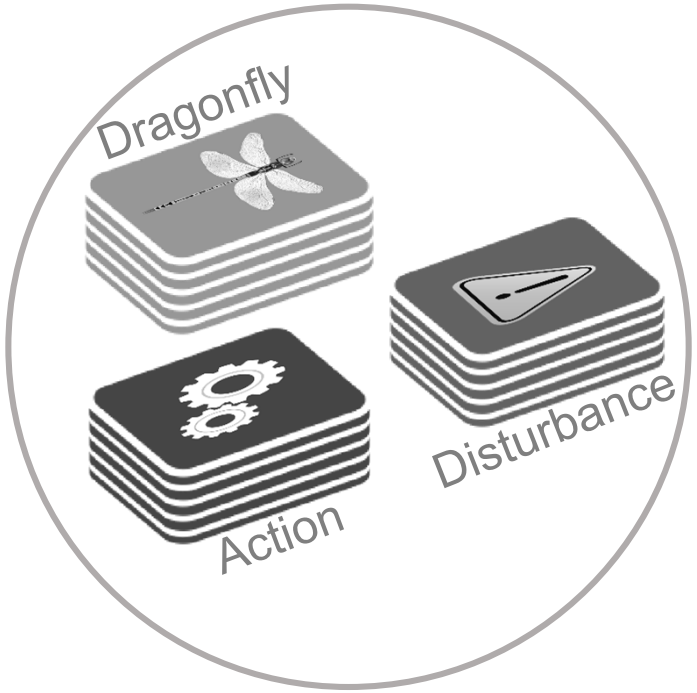


Gameplay

1. The disturbance is Drought (severe) for the circle habitat which should kill any dragonfly in the habitat



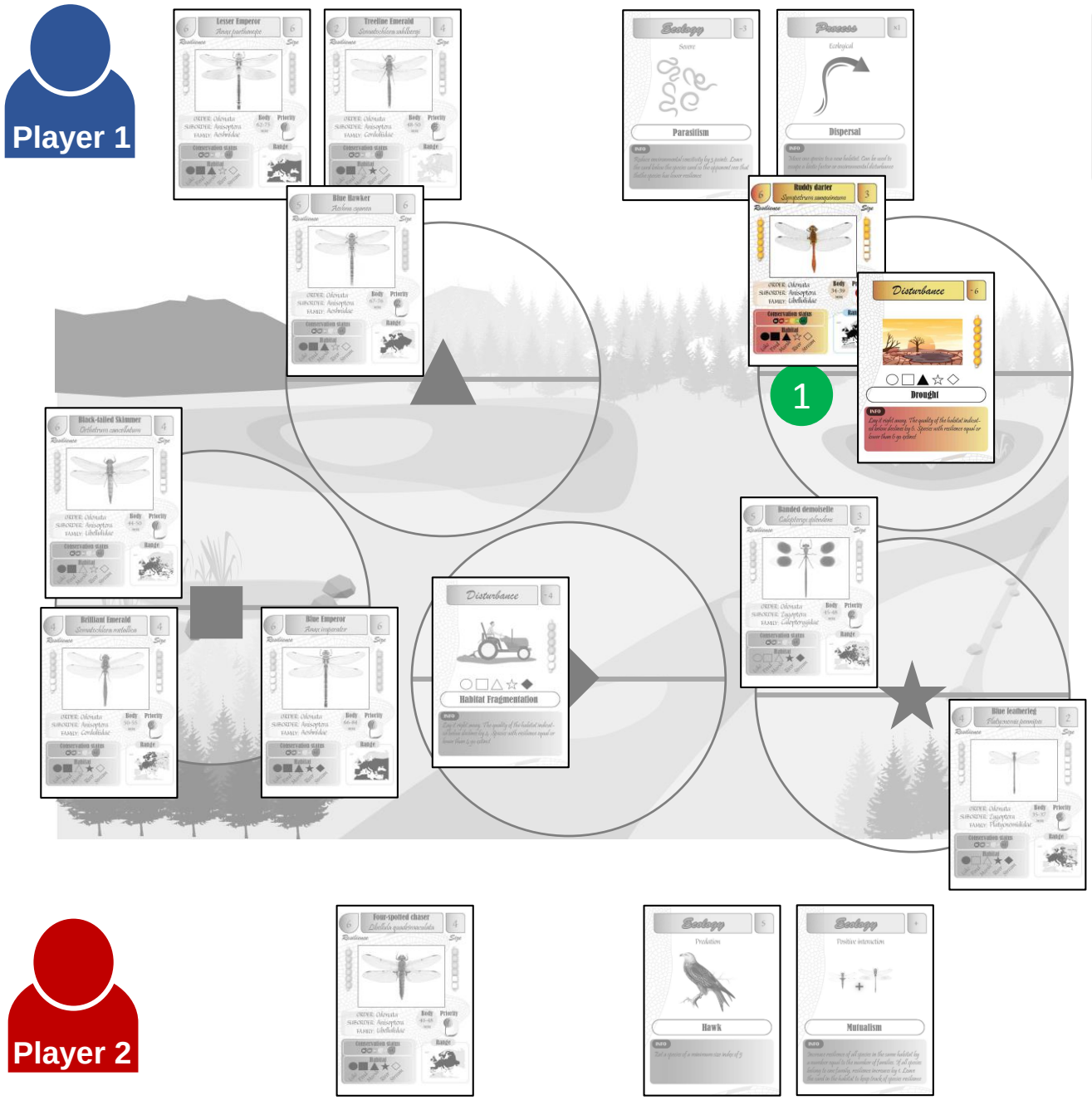
Habitat occupied	Disturbances solved	Conservation priority
4	+2 +4 +6 0 0 0	6



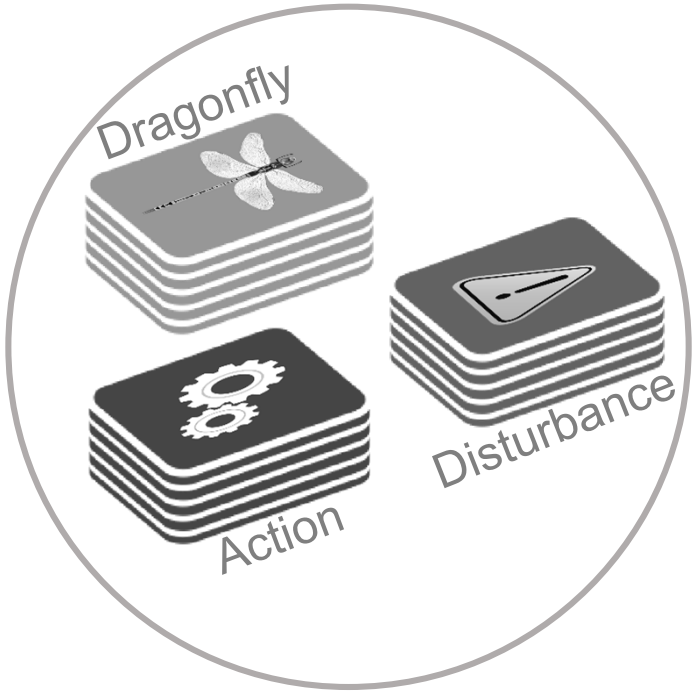
Gameplay

1. Player 1 defends the dragonfly by using ‘Adaptation card’ which allows the species to obtain an extra 5 resilience points.

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 0 1 0	7



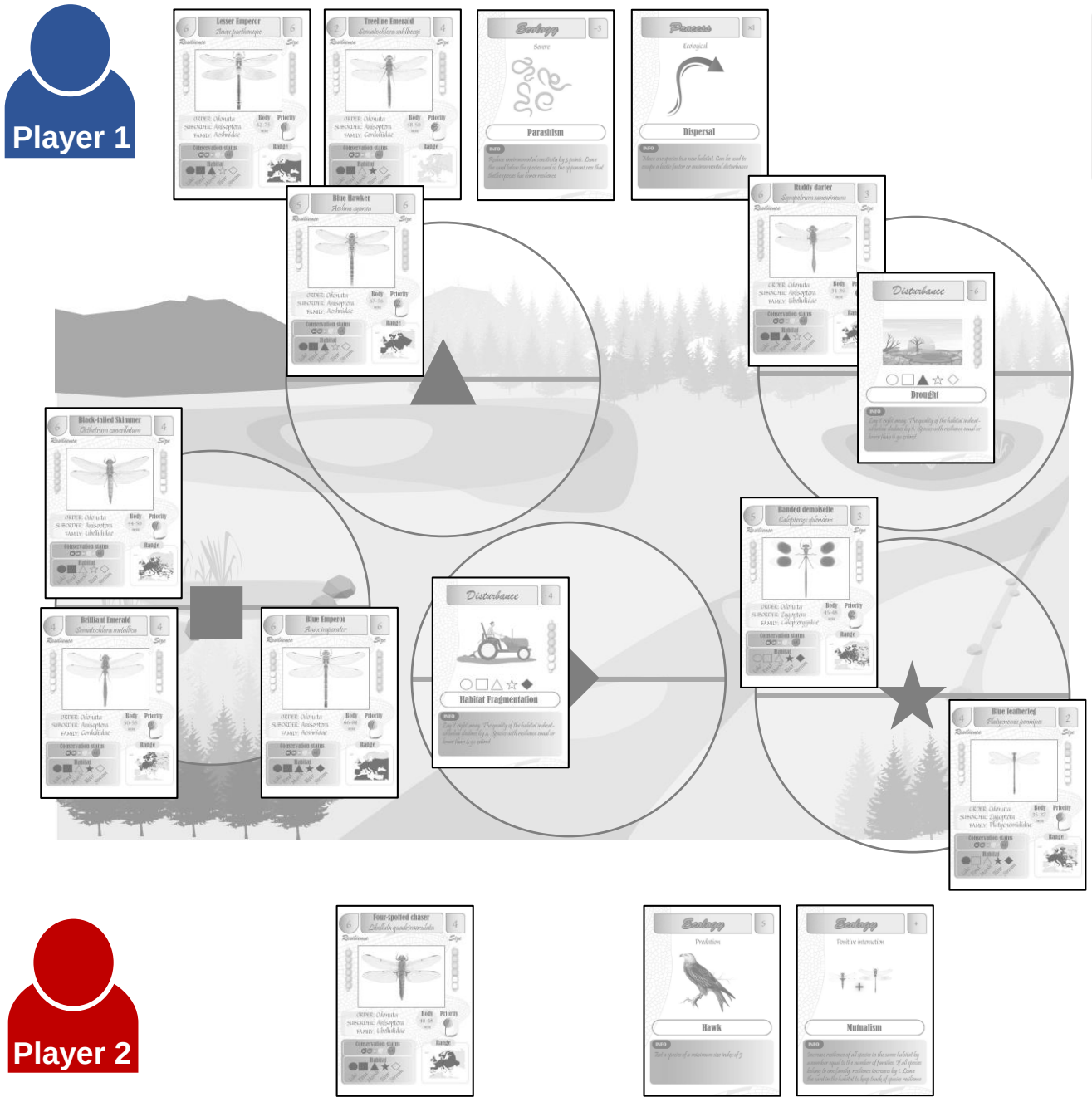
Habitat occupied	Disturbances solved	Conservation priority
4	+2 +4 +6 → 0 0 0	6

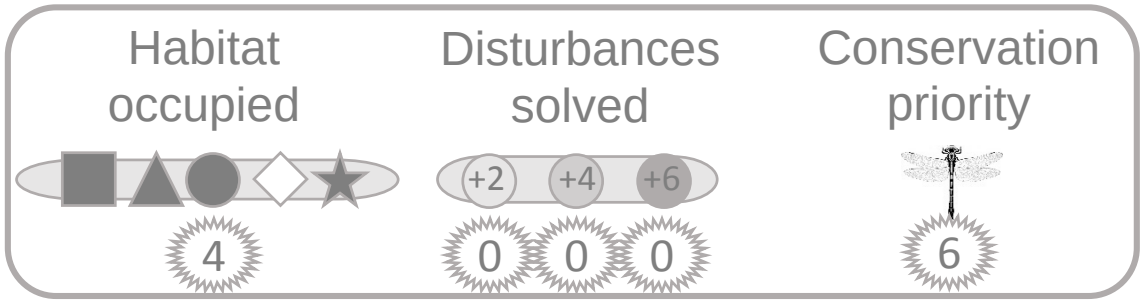


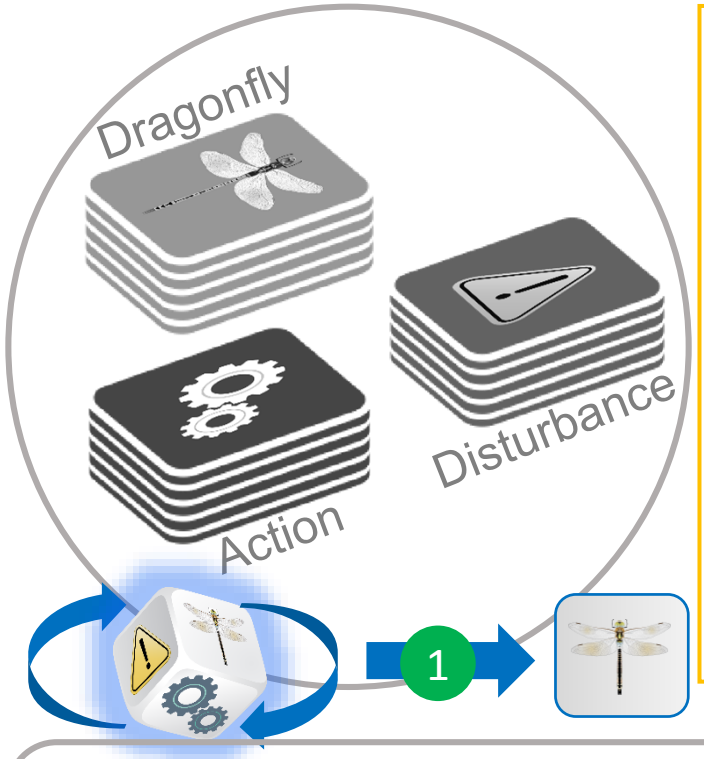
Gameplay

1. So, the Ruddy darter survives, but the disturbance still persists in the habitat

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	7

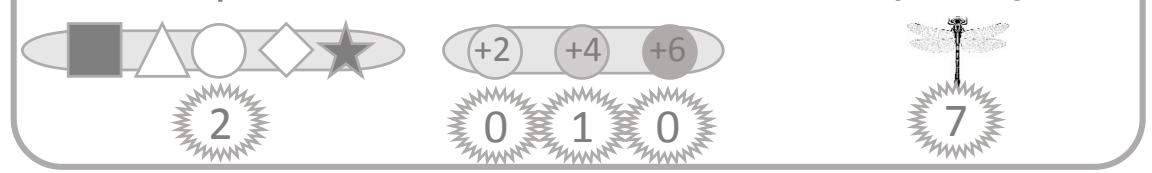


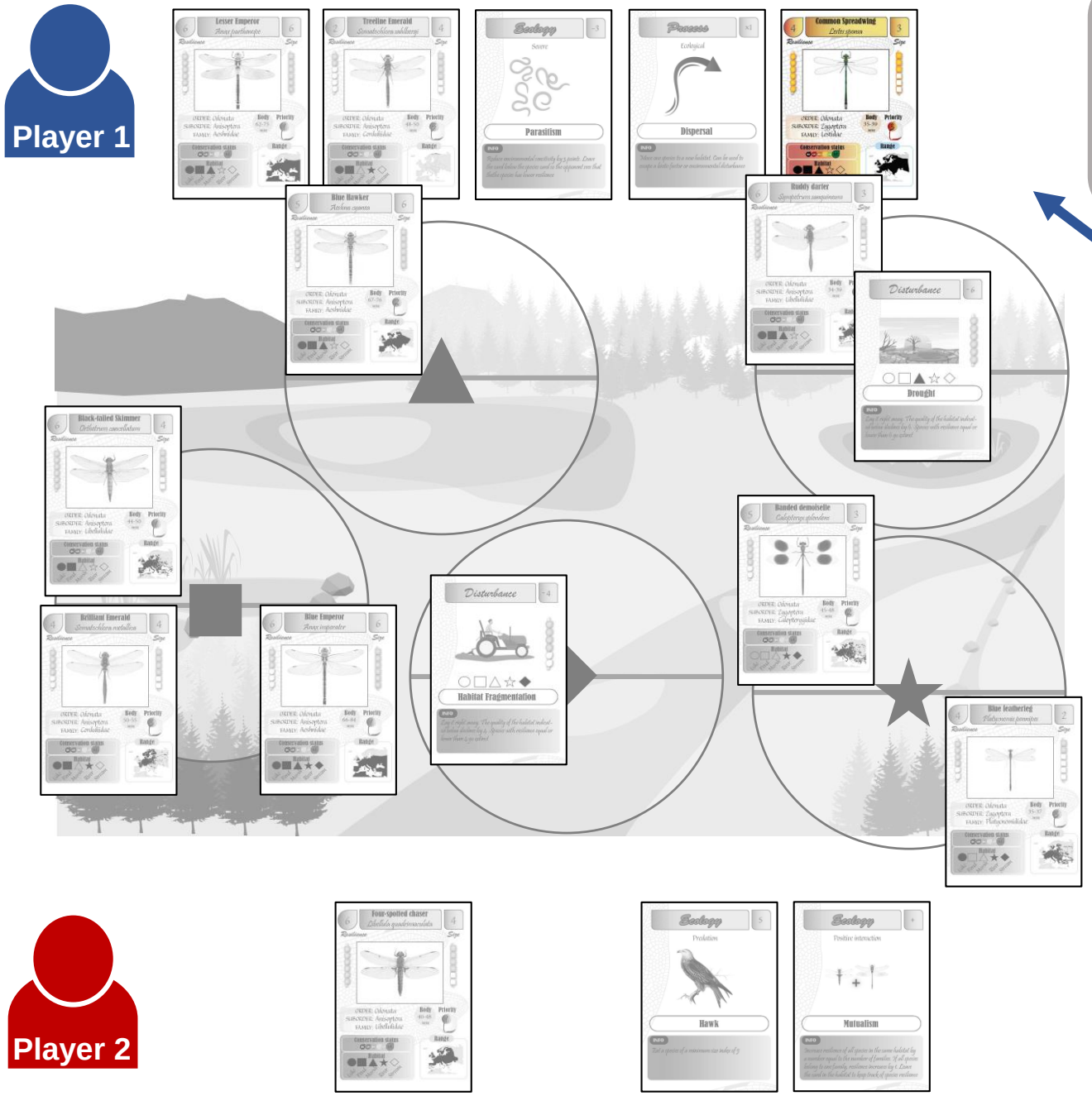




Gameplay

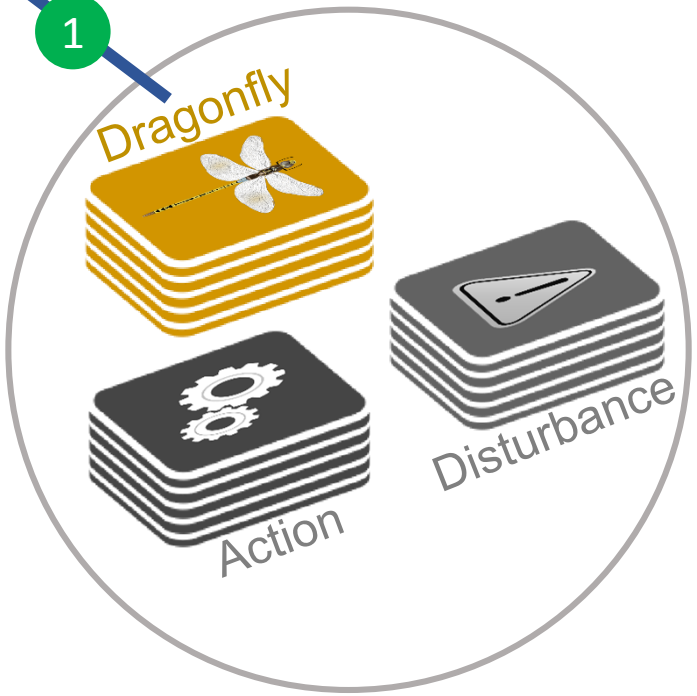
1. Player 1 rolls the dice and obtain the dragonfly logo





Habitat occupied	Disturbances solved	Conservation priority
4	0 0 0 (+2 +4 +6)	6

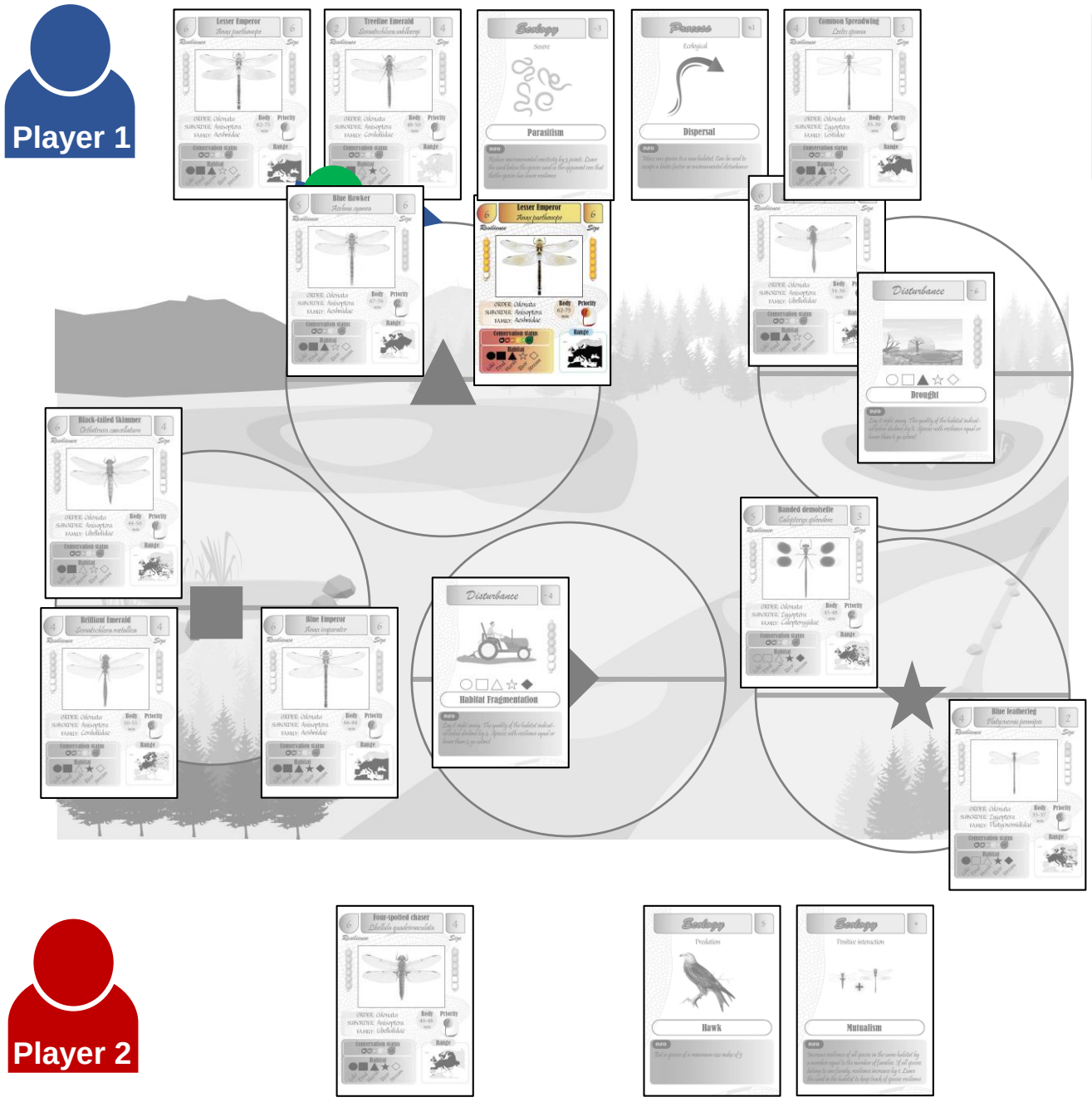
1



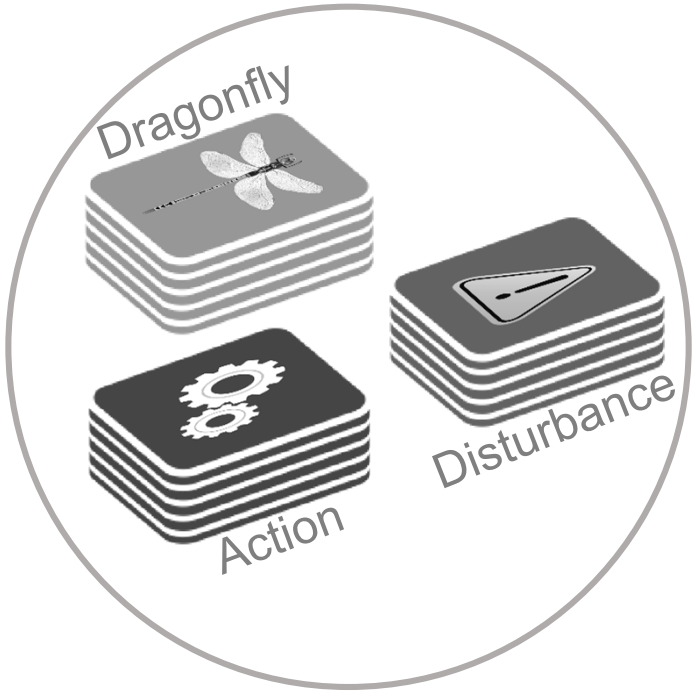
Gameplay

1. Player 1 draws a dragonfly card a obtains the ‘Common Spreadwing’

Habitat occupied	Disturbances solved	Conservation priority
2	0 1 0 (+2 +4 +6)	7



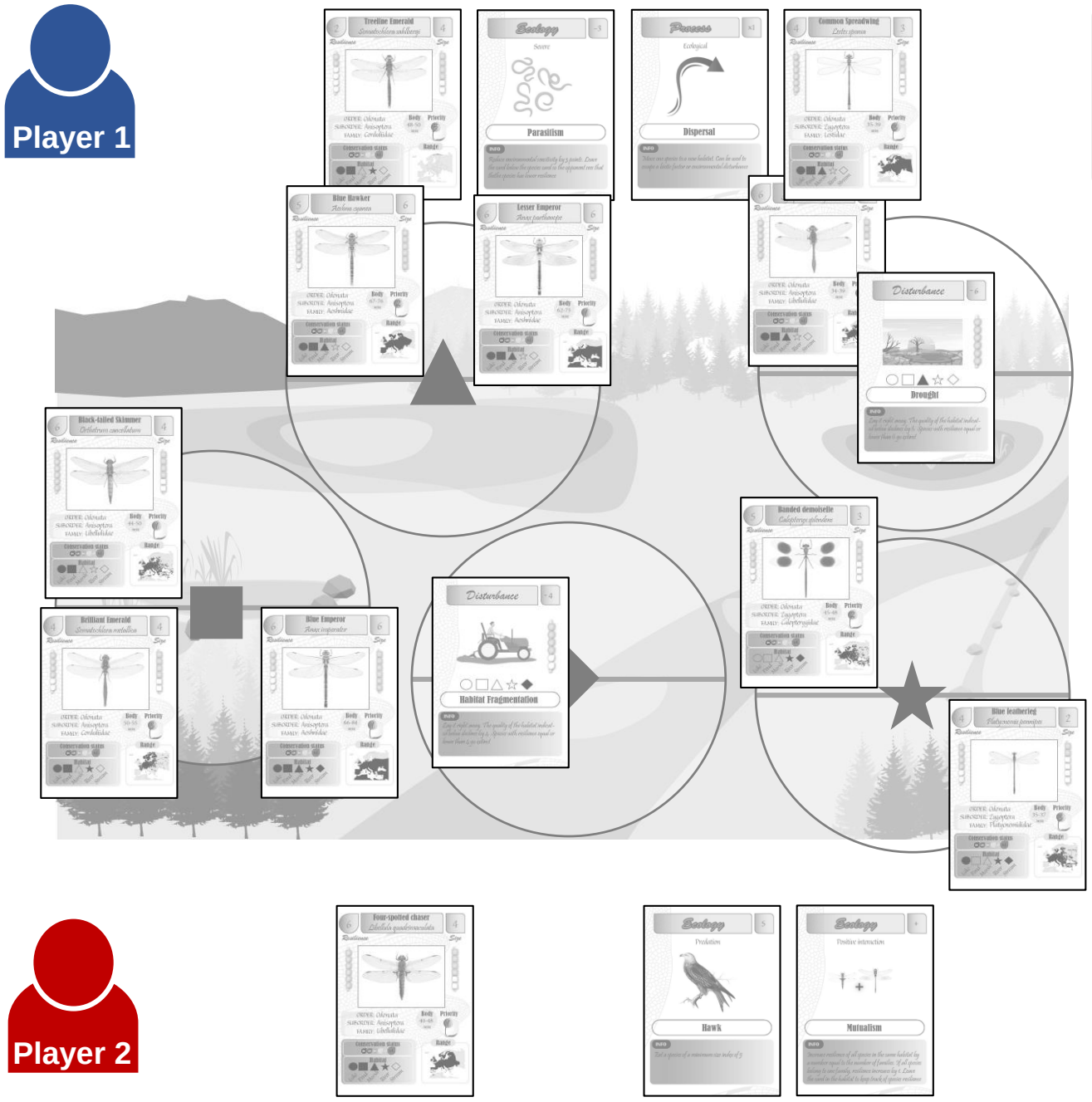
Habitat occupied	Disturbances solved	Conservation priority
4	+2 +4 +6 0 0 0	7

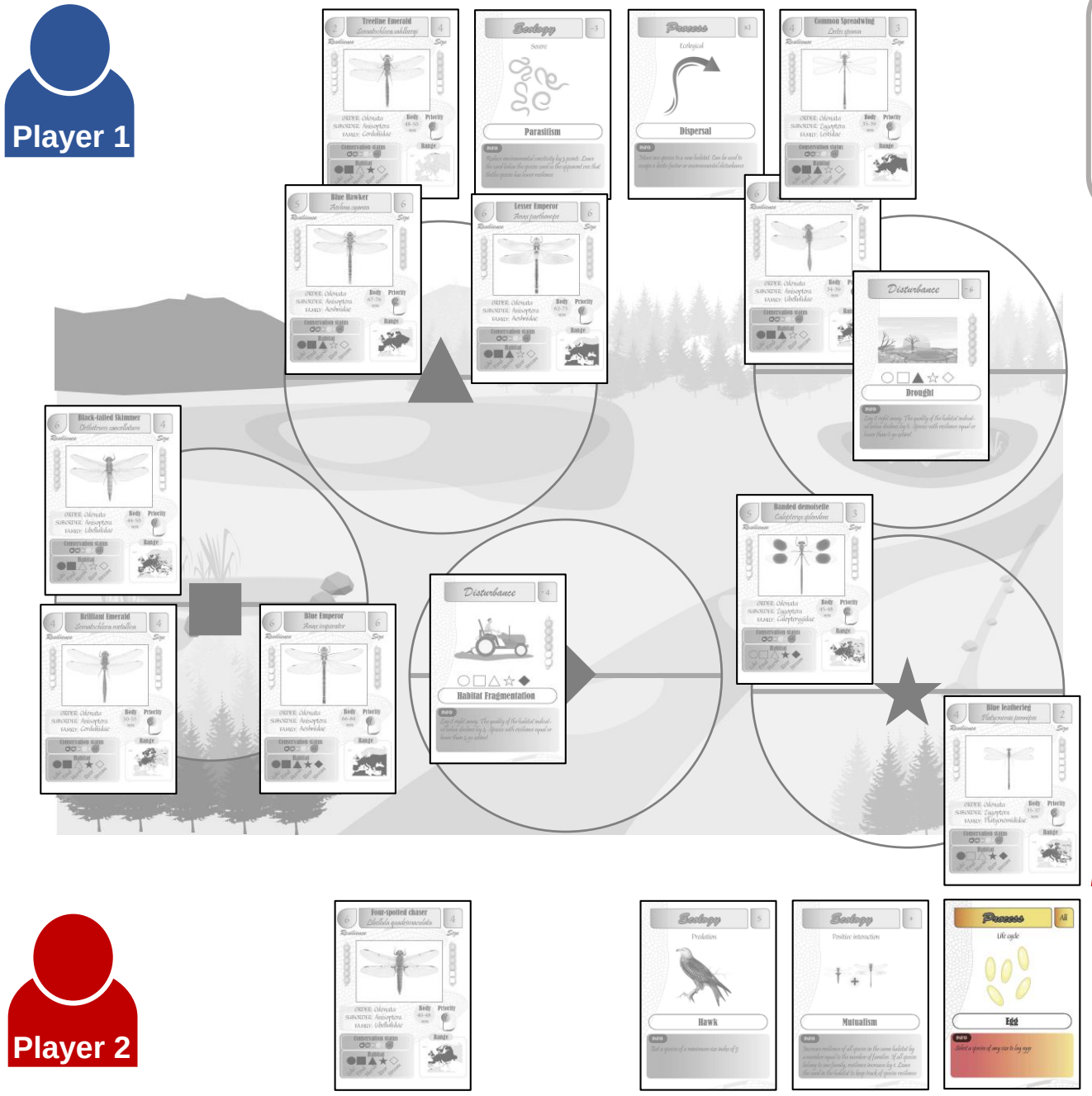


Gameplay

1. Player 1 places a dragonfly card (Lesser Emperor) in the triangle habitat

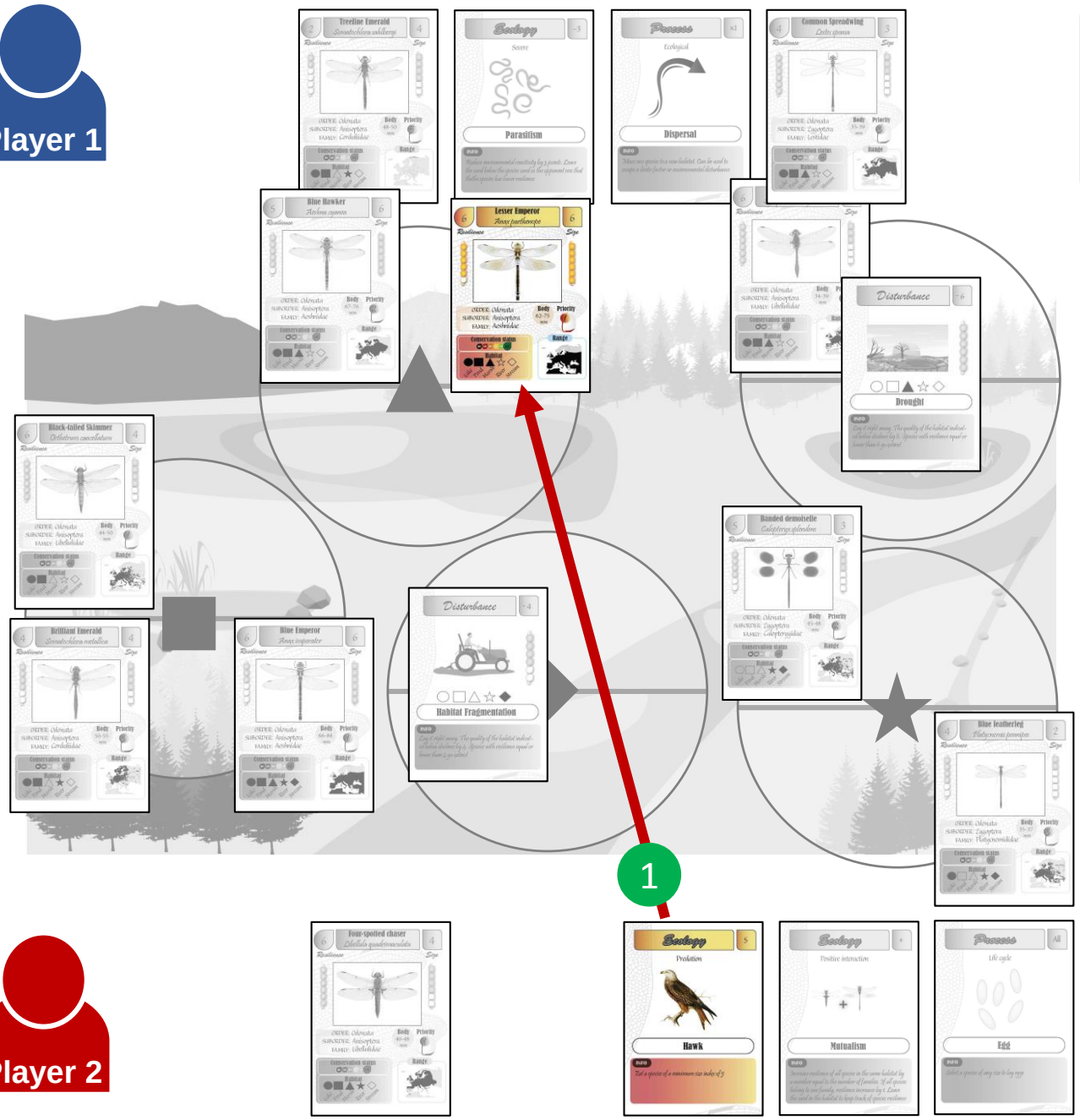
Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 0 1 0	7


Player 1
Habitat occupied
Disturbances solved
Conservation priority
4
+2
+4
+6
0
0
0
7
Gameplay
1
Player 2 rolls the dice and obtain the action logo
Dragonfly
Disturbance
Action
1
Habitat occupied
Disturbances solved
Conservation priority
2
+2
+4
+6
0
1
0
7
Player 2

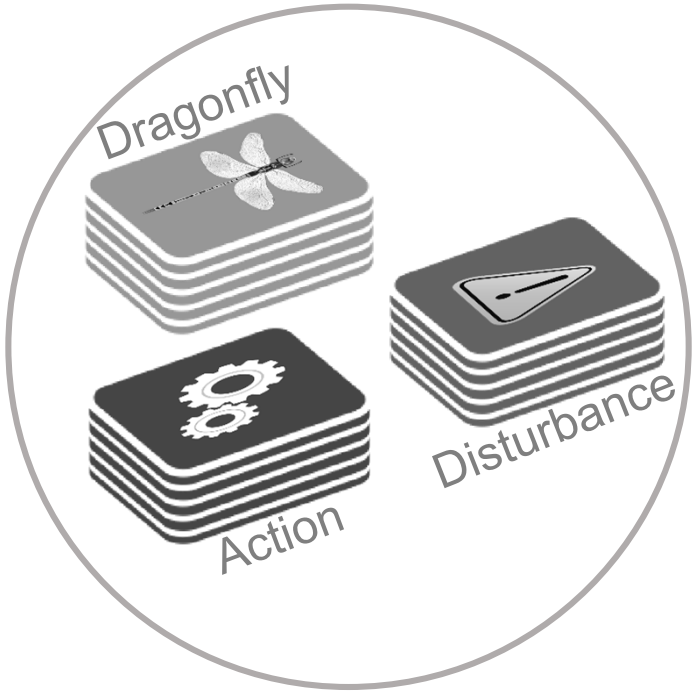


Gameplay

1. Player 2 draws an action card and receives an ‘Egg’



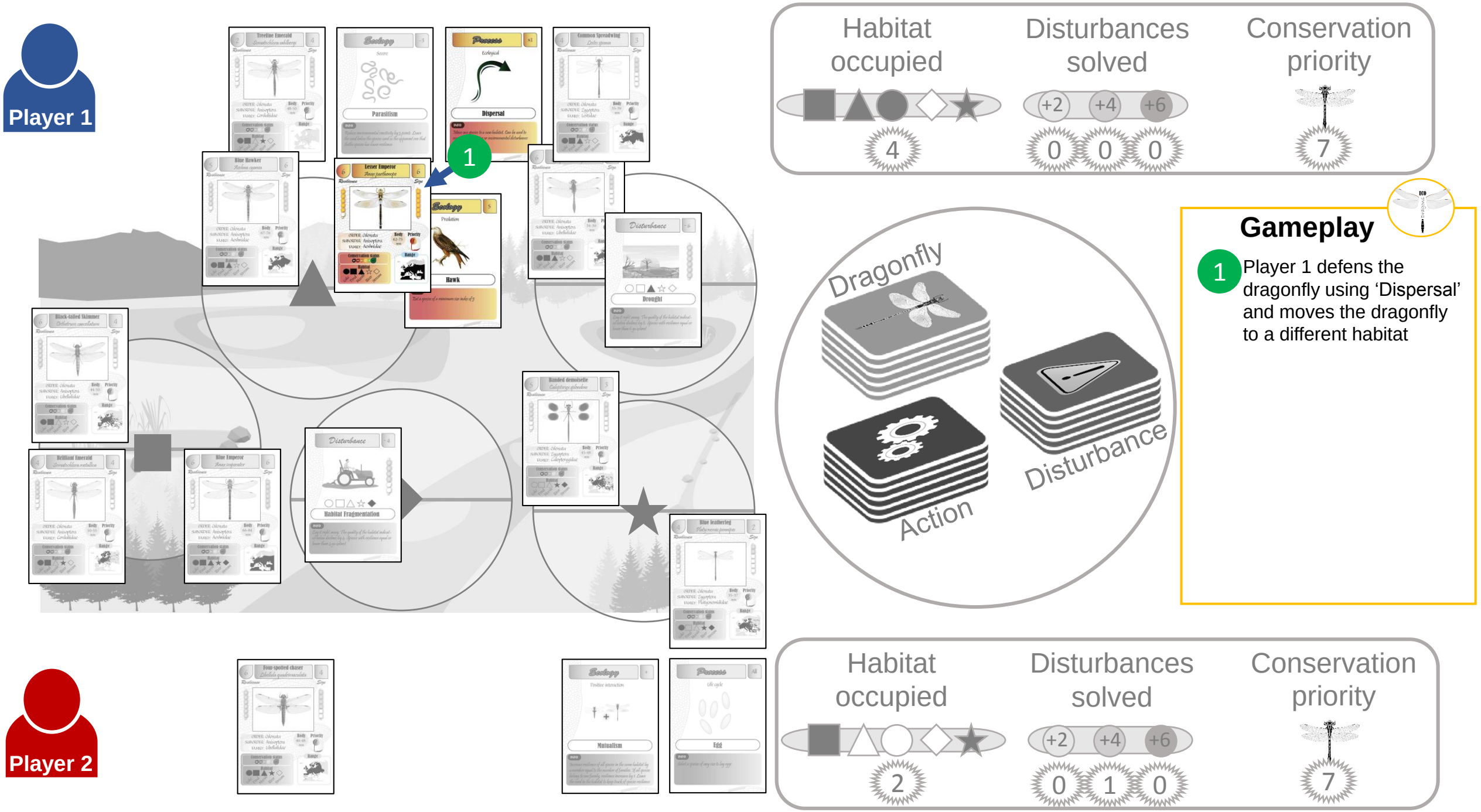
Habitat occupied	Disturbances solved	Conservation priority
4	+2 +4 +6 0 0 0	7

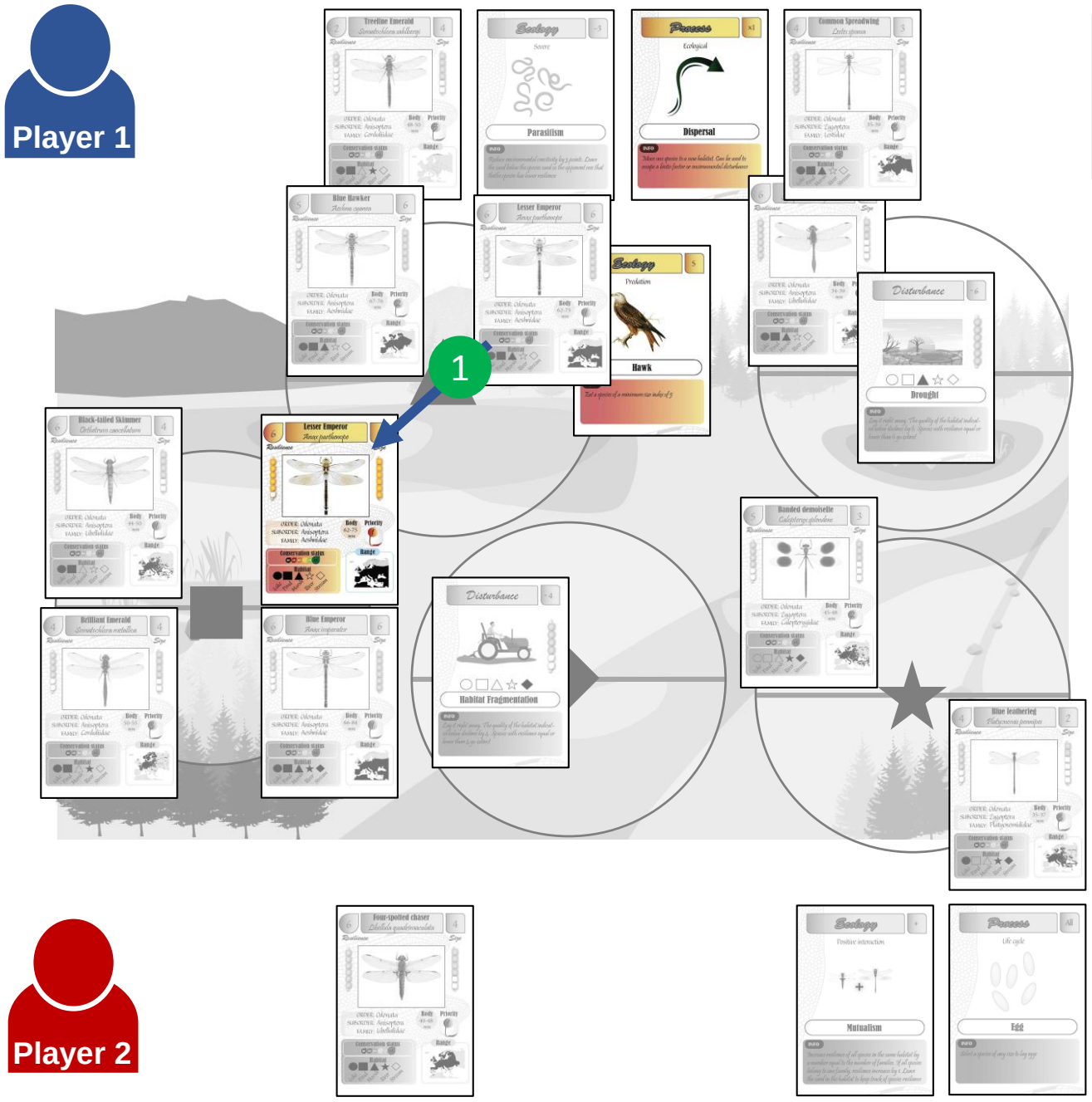


Gameplay

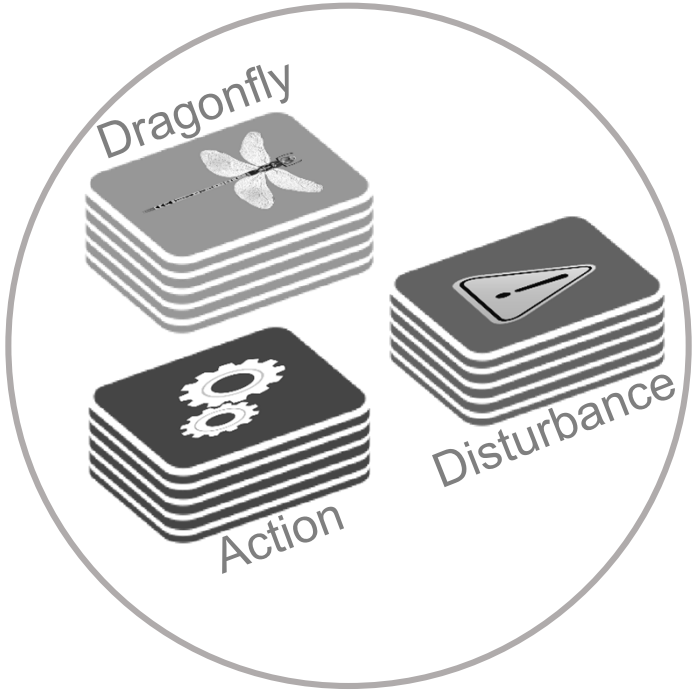
1. Player 2 attempt to use predation (Hawk) on the Lesser Emperor in the triangle habitat.

Habitat occupied	Disturbances solved	Conservation priority
3	+2 +4 +6 0 1 0	7


Player 1
Player 2
Habitat occupied
Disturbances solved
Conservation priority
4
+2
+4
+6
0
0
0
7
Dragonfly
Action
Disturbance
Gameplay
1
Player 1 defens the dragonfly using 'Dispersal' and moves the dragonfly to a different habitat
Habitat occupied
Disturbances solved
Conservation priority
2
+2
+4
+6
0
1
0
7



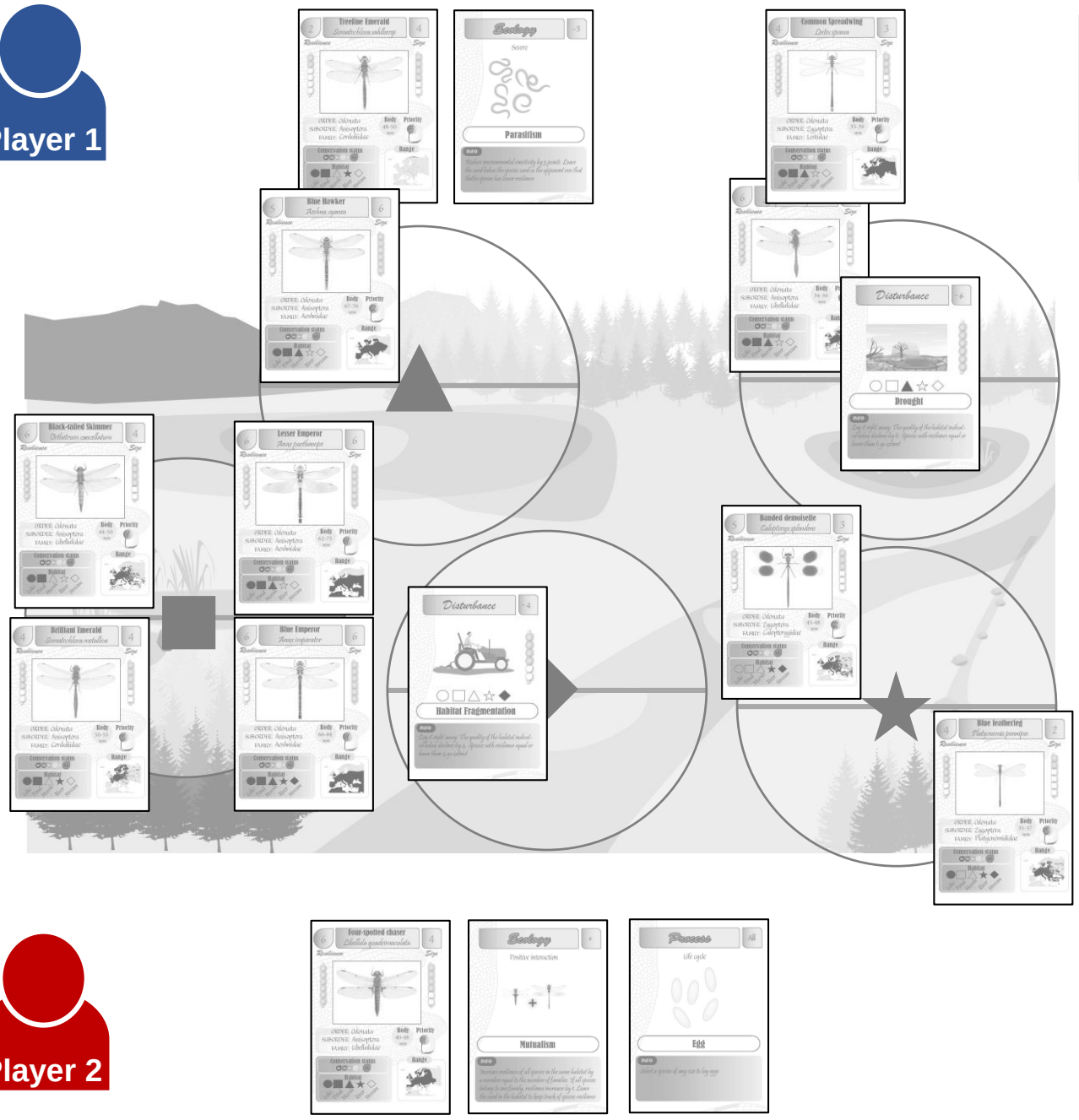
Habitat occupied	Disturbances solved	Conservation priority
4	+2 +4 +6 → 0 0 0	7



Gameplay

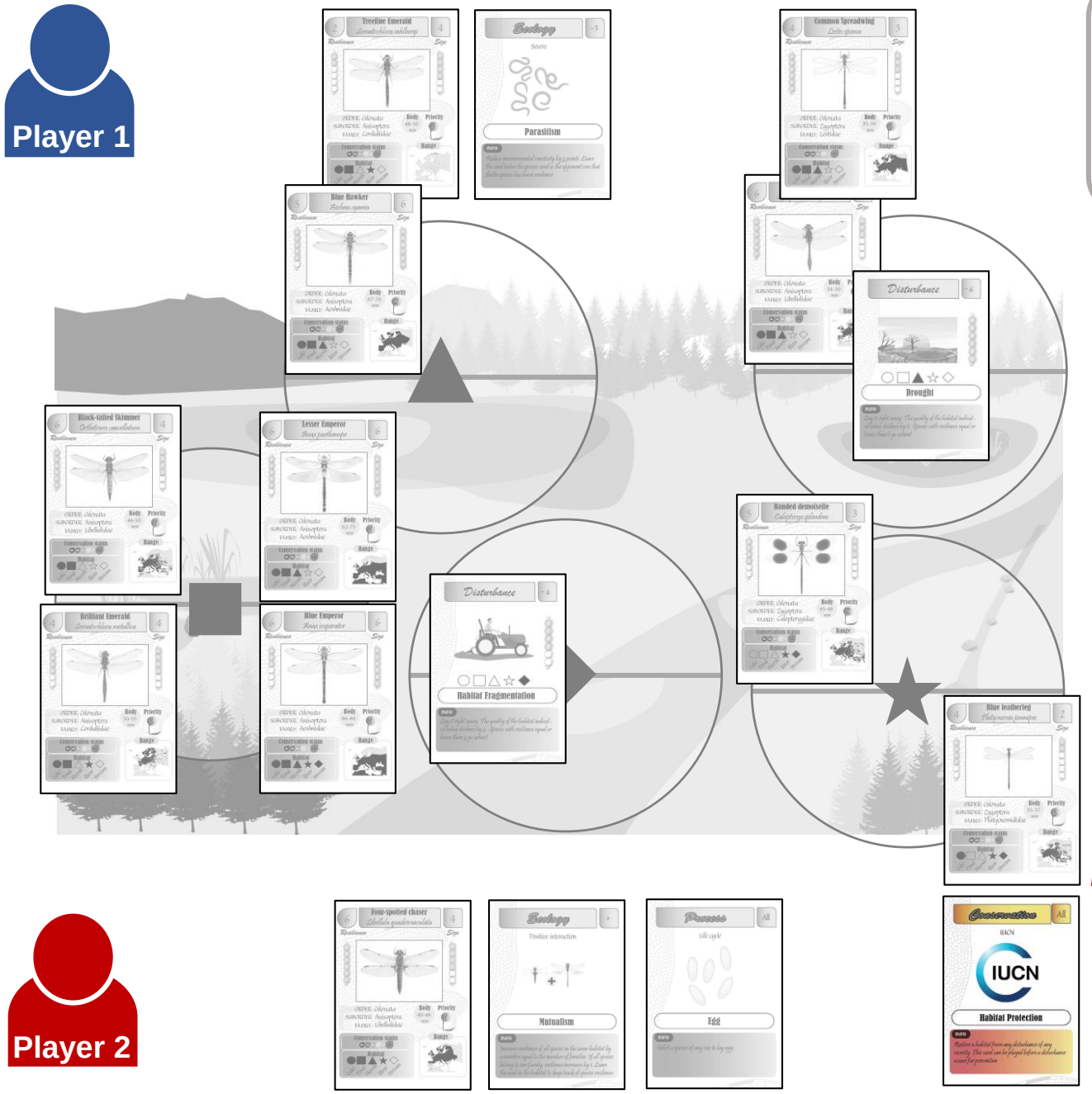
1. Player 1 moves the Lesser Emperor to the square habitat

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 → 0 1 0	7



Gameplay

1. Player 2 rolls the dice and obtain the action logo



Habitat occupied	Disturbances solved	Conservation priority
4	0 0 0 (+2 +4 +6)	7

Dragonfly

Disturbance

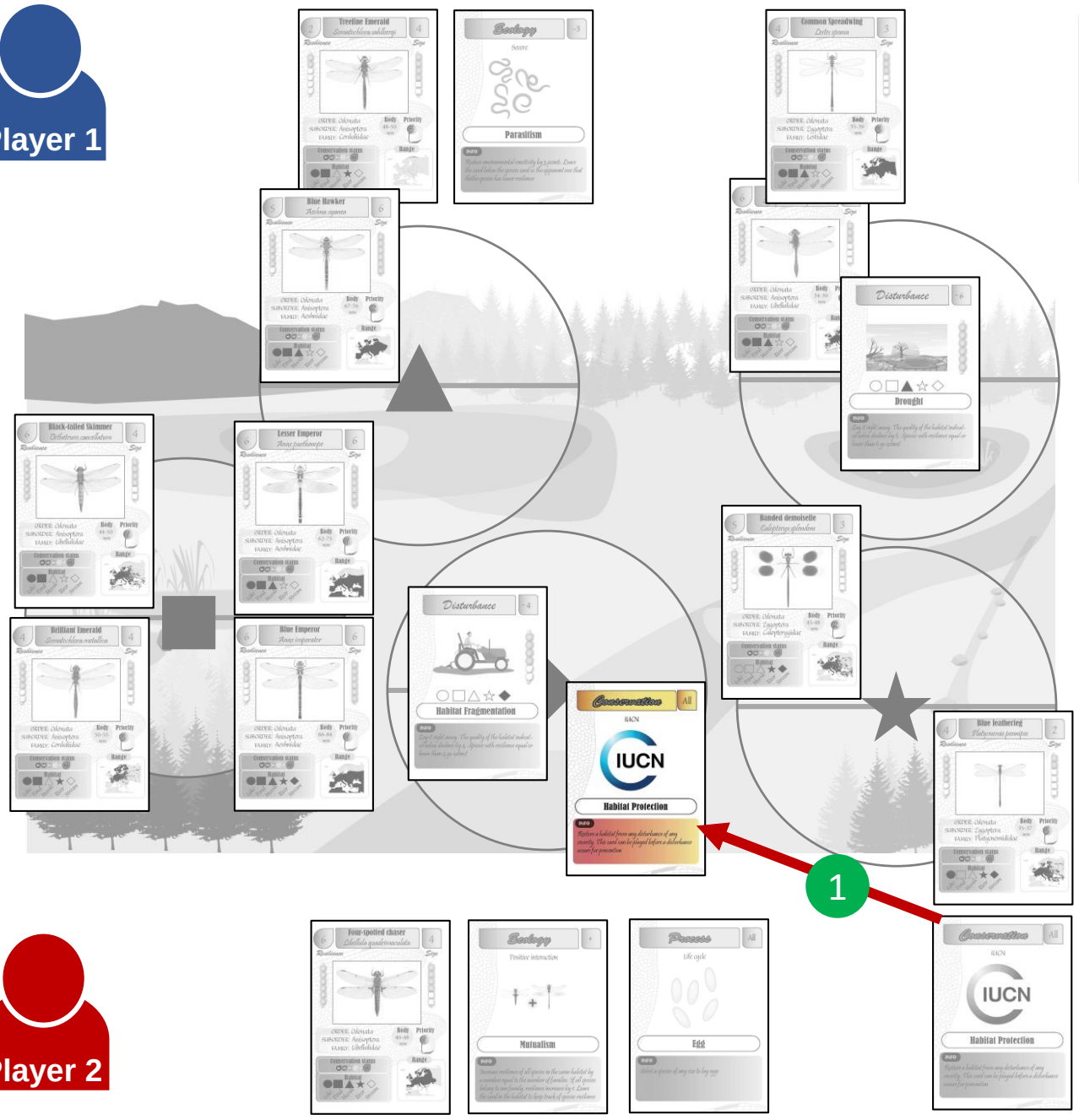
Action

1

Gameplay

1. Player 2 draws an action card and receives a conservation card (IUCN)

Habitat occupied	Disturbances solved	Conservation priority
2	0 1 0 (+2 +4 +6)	7



Habitat occupied	Disturbances solved	Conservation priority
4	0 0 0 (+2 +4 +6)	7

Dragonfly

Disturbance

Action

Gameplay

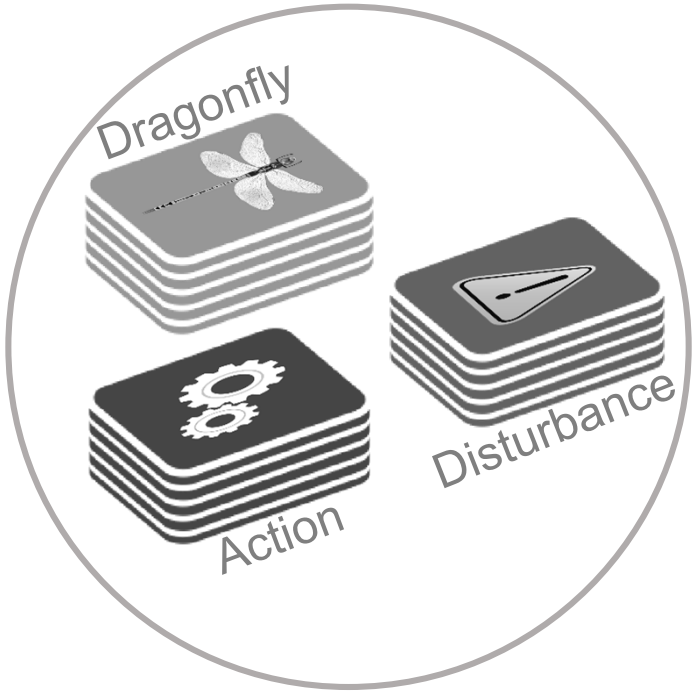
1. Player 2 uses the Conservation card to solve the environmental disturbance (Habitat fragmentation) in the diamand habitat

Habitat occupied	Disturbances solved	Conservation priority
2	0 2 0 (+2 +4 +6)	7

Player 1

Player 2

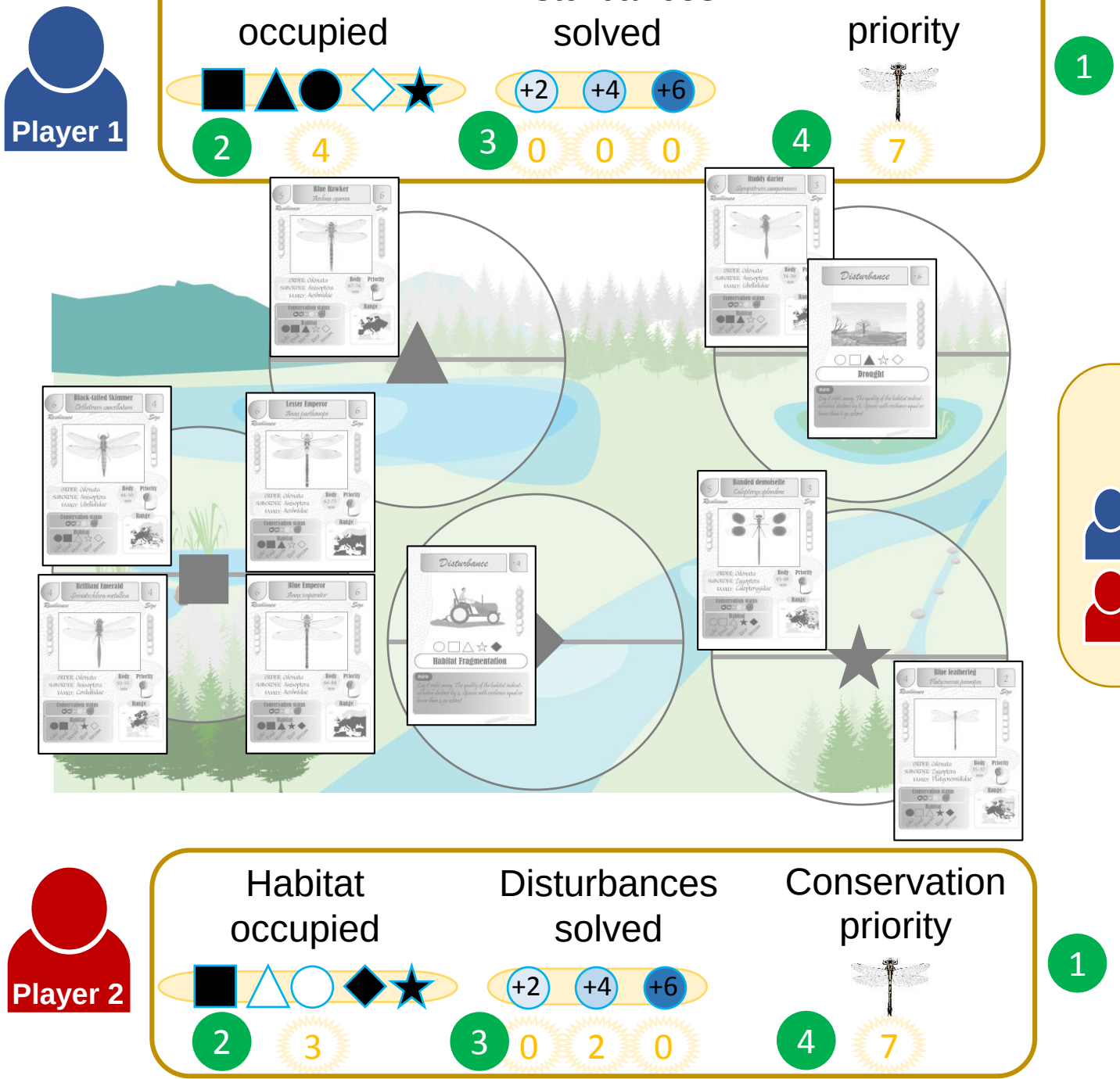
Habitat occupied	Disturbances solved	Conservation priority
4	+2 +4 +6 0 0 0	7



Gameplay

1. As the game is long, we stop it here to understand how scoring is calculated at the end of the game

Habitat occupied	Disturbances solved	Conservation priority
2	+2 +4 +6 0 2 0	7



Final score

Habitat + Disturbance + Priority

40 + 0 + 7 = 47

30 + 8 + 7 = 45

5

Gameplay

1. At the end of the game, the three scores (habitat, disturbances solved, conservation priority) are used to calculate the final score.
2. Each occupied habitat counts as 10
3. The total number of points for environmental disturbances depends on the number of disturbances and the level of severity of the disturbance (2 for mild, 4 for strong, and 6 for severe).
4. The conservation priority score is the sum of the priority indices of all species occupying a habitat at the end of the game
5. In the current game, Player 1 won with 47 points