

# How many encounters does it take to catch all shiny Pokemon?

The core challenge of this simulation is a famous statistical puzzle known as the **Coupon Collector's Problem**. The problem asks: "On average, how many attempts are needed to collect a complete set of unique items?" The key finding, which this simulation clearly demonstrates, is that the process is not linear. While the first few unique items (or shiny Pokémon) are found relatively quickly, the time and number of encounters required to find the *last few* missing items increase exponentially. This is because you are far more likely to get duplicates of what you already have, leading to a long and difficult "end game" to complete the collection. The curve on the "Sum of Unique Shinies Over Encounters" chart is a perfect visualization of this statistical phenomenon in action.

## Experience Type

All

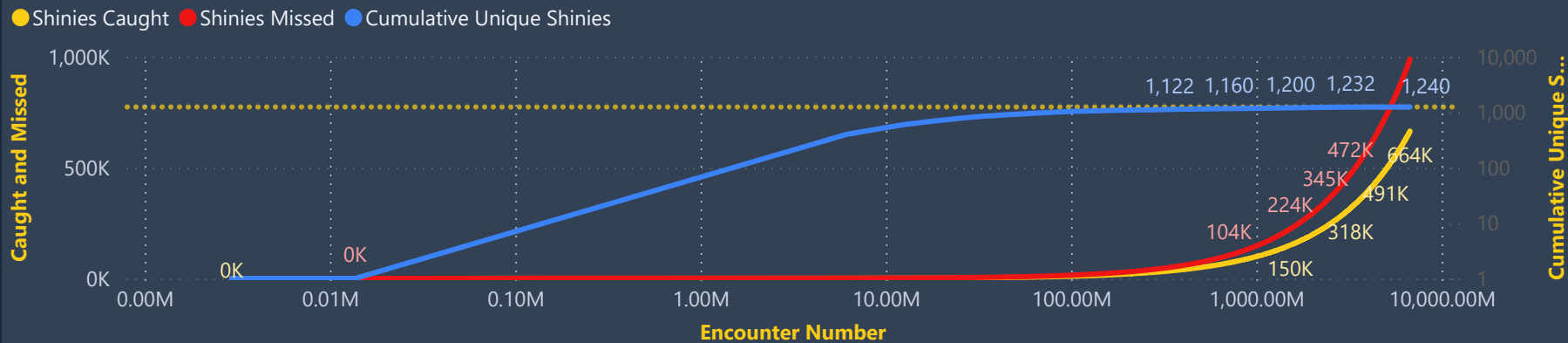
## Catch Rate (bins)

All

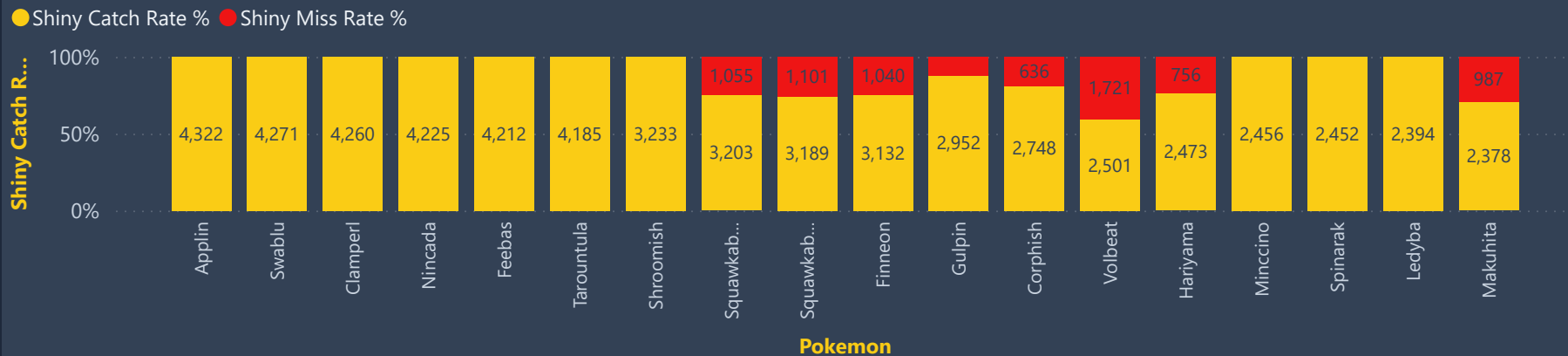
## Pokemon

All

### Sum of Unique Shinies Over Encounters



### Total Shinies Caught, Total Shinies Missed, by Pokemon



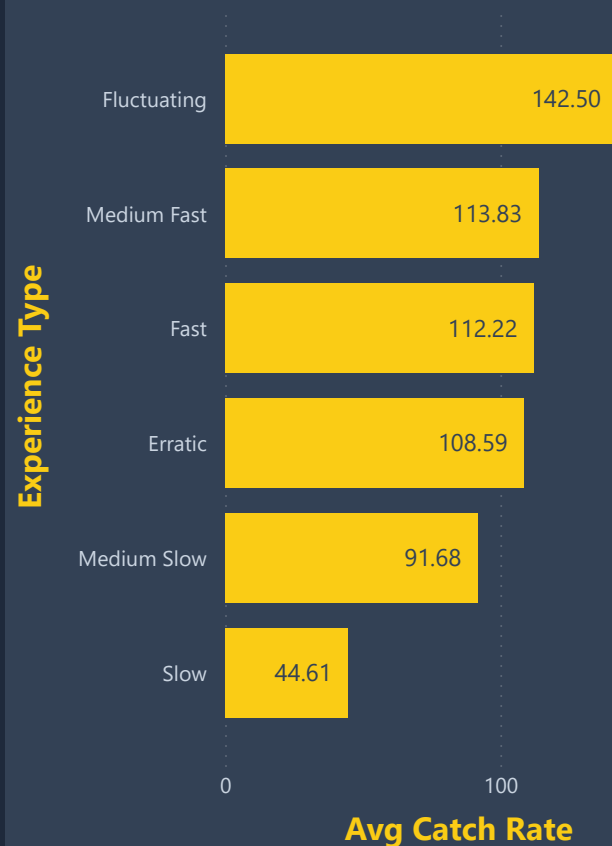
## Summary

6,759,893,113	1,240
Encounters to Final Shiny	Unique Shinies Caught
93,332,754.23	93,355,580
Normal Catches Per Hour	Encounters Per Hour
664,018	6,758,240,289
Shinies Caught	Total Normal Catches
988,798	5,451,526.70
Total Shinies Missed	Avg Enc. Per Unique Shiny
4,089.92	1,652,816
Avg Enc Per Shiny	Total Shiny Encounters
0.0245%	40.17%
Shiny Rate	Shiny Catch Rate
Cradily	Arceus-Fairy
Most Common Shiny	Most Stubborn Shiny
Shinx	72.4
First Shiny	Sim Duration Hours
9,170.23	13,767,361
Shinies Caught Per Hour	Encounter at Halfway Point
5.99	3.50
Hours Spent on Final Shi...	Avg Minutes Per Unique Shi...
8.85	63.56
Minutes for First Half	Minutes for Second Half

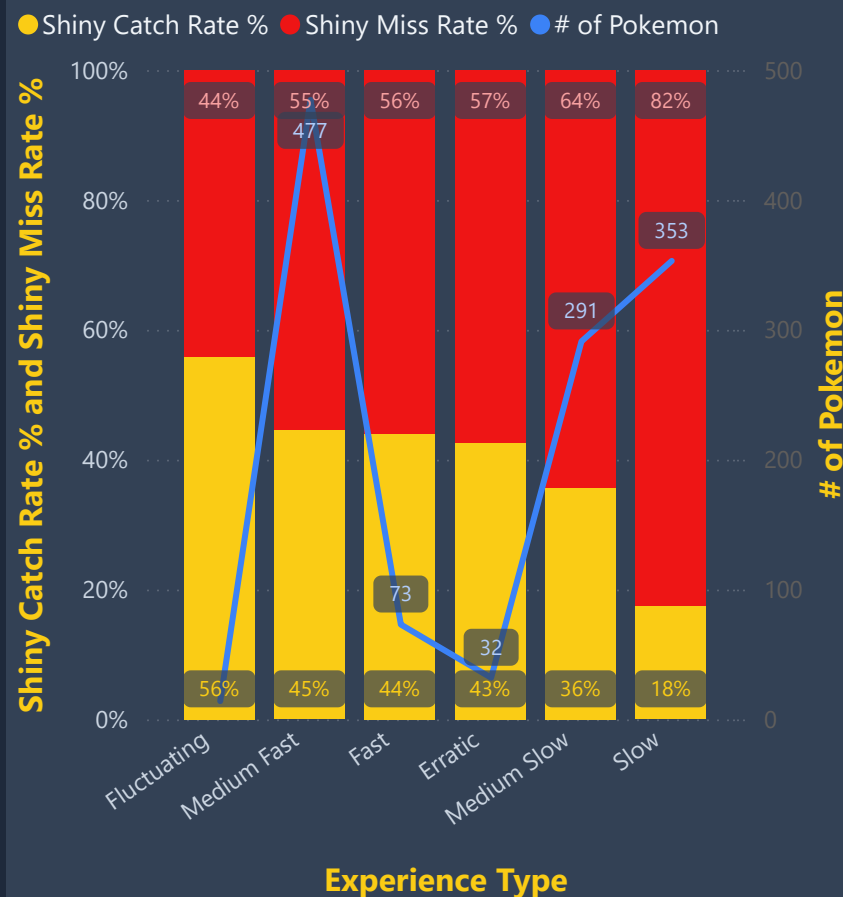
# How did Experience Type Affect the Simulation?

- **Experience Type as Rarity:** The simulation successfully used "Experience Type" to model rarity. Pokémon with "Slow" or "Medium Slow" types had significantly lower spawn rates, proving the weighted encounter system worked as designed.
- **Catch Rate Disparity:** The large gap between missed and caught shinies, especially in the "Erratic" group, clearly indicates that some Pokémon are inherently harder to catch than others, regardless of how often they are encountered.
- **Visualizing Variance:** The scatter plot effectively visualizes the simulation's probabilities. The wide vertical spread within the more common groups ("Erratic" and "Fluctuating") is a direct result of their higher encounter frequency, which generates more data points and reveals a greater range of outcomes.

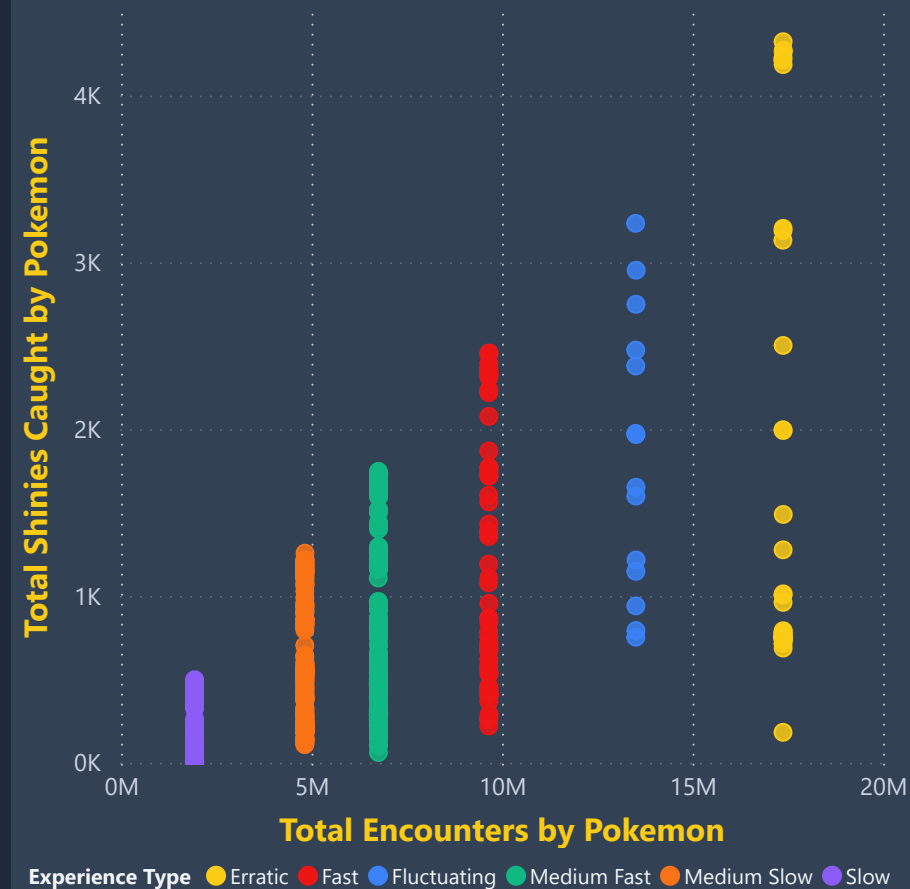
## Avg Catch Rate and Shiny Catch Rate by Experience Type



## Total Shinies Caught by Exp Type



## Shinies Caught by Exp Type and Encounters



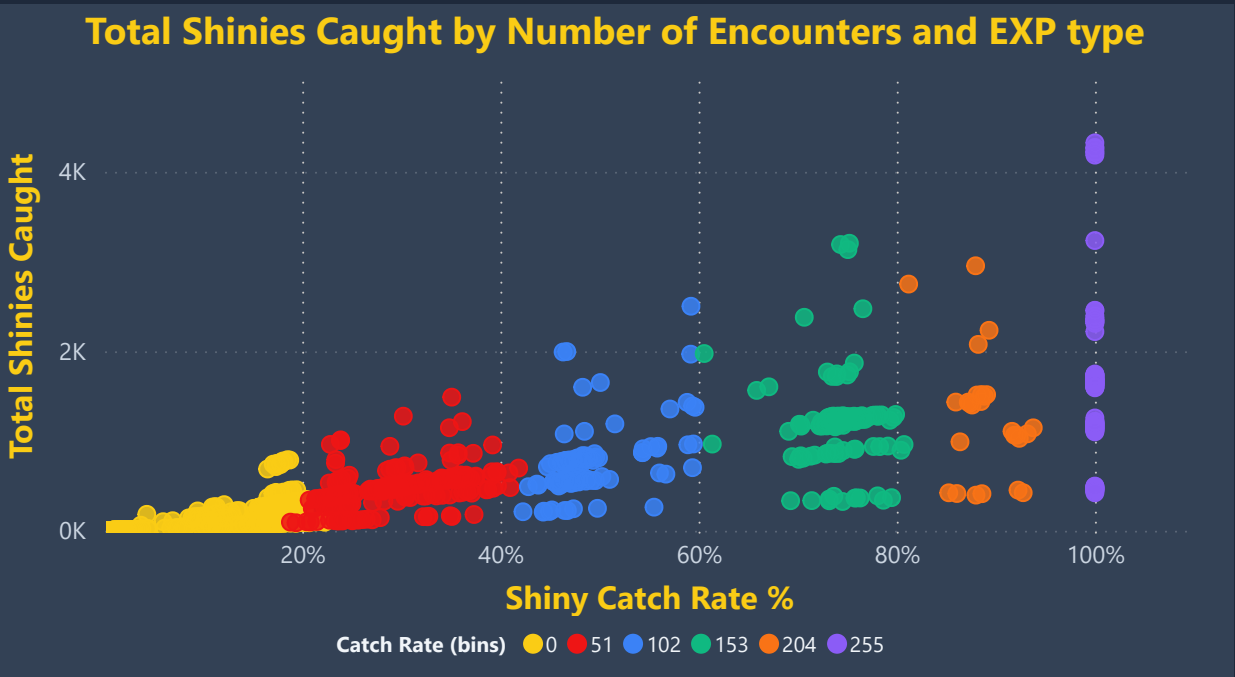
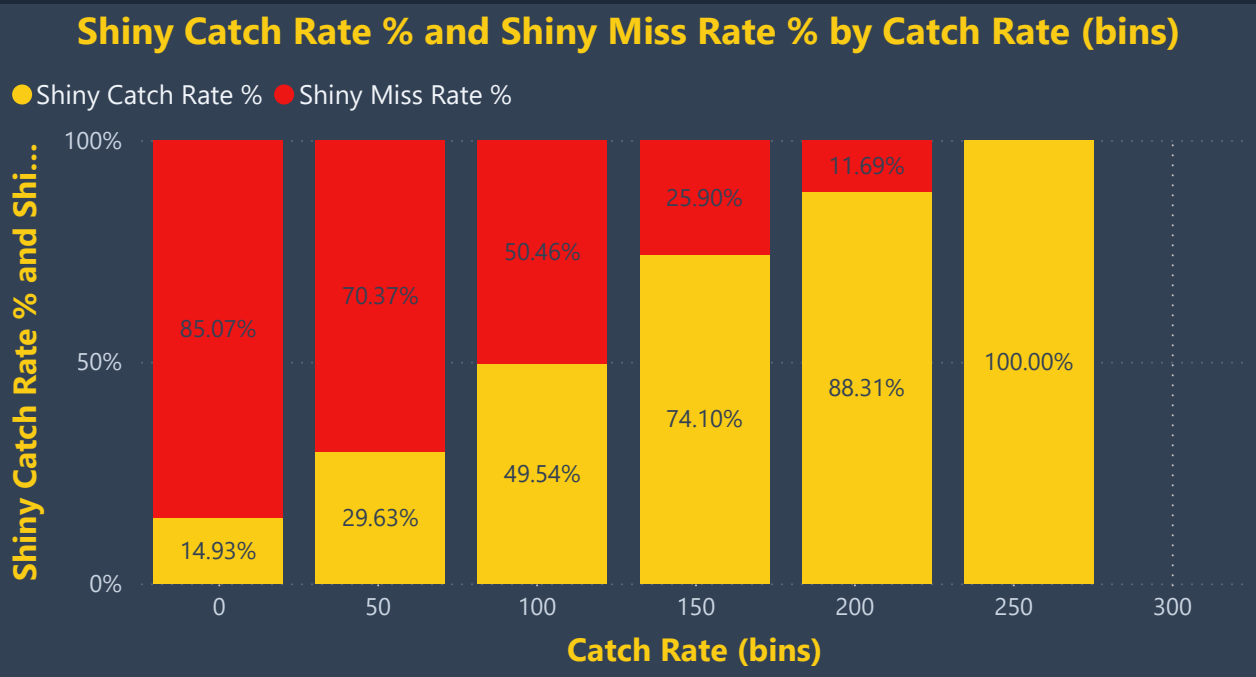
# How did Catch Rate Affect the Simulation?

Catch Rate (bins)	Experience Type	Pokemon Catch Rate	Sim Catch Rate	Total Shinies Caught	Total Shinies Missed
153	Erratic	189.75	74.10%	170,060	59,442
255	Erratic	255.00	100.00%	165,897	
51	Erratic	74.79	29.63%	115,339	273,868
0	Erratic	32.47	14.93%	100,036	570,107
102	Erratic	125.39	49.54%	79,512	80,989
204	Fast	226.92	88.31%	33,174	4,392
Total	Erratic	89.02	40.17%	664,018	988,798

**Catch Rate Is a Critical Factor:** This simulation proves that a Pokémon's base catch rate is a major factor in the difficulty of a shiny hunt. The "Shiny Catch Rate %" chart clearly shows a direct correlation: as the base catch rate goes up, the chances of a shiny getting away plummet. For Pokémon with the highest catch rates (255), a shiny encounter was a guaranteed catch every time.

**Finding is Only Half the Battle:** The data reveals that simply encountering a shiny is not enough. Pokémon like **Zangoose** and **Yanma**, despite being found over 100 times, had simulated catch rates below 30%. This highlights the frustrating reality that for many species, the real challenge begins *after* the shiny has already appeared.

**Data Validation:** The scatter plot successfully visualizes the direct impact of the catch rate. It shows that while shiny encounters happened across all rarity and catch rate levels, the actual successful catches (the individual points) are heavily influenced by this crucial stat, validating the simulation's catch-and-flee mechanic.



# Fun Stats for Nerds

https://joshualown.org



Erratic Experience Type	Applin Most Caught	4,322 Total Shinies Caught	17,378,220 Total Encounters by Pok...
Fast Experience Type	Minccino Most Caught	2,456 Total Shinies Caught	9,660,481 Total Encounters by Pok...
Fluctuating Experience Type	Shroomish Most Caught	3,233 Total Shinies Caught	13,508,218 Total Encounters by Pok...

Medium Fast Experience Type	Grubbin Most Caught	1,746 Total Shinies Caught	6,755,761 Total Encounters
Medium Slow Experience Type	Pidove Most Caught	1,256 Total Shinies Caught	4,830,591 Total Encounters
Slow Experience Type	Necrozma Most Caught	497 Total Shinies Caught	1,933,354 Total Encounters by Pok...

Best Shiny Catch Rate			
Applin			
17,378,220 Total Encounters	4,322 Total Shinies Caught	(Blank) Total Shinies Missed	100.00% Shiny Catch Rate %

Worst Shiny Catch Rate			
Arceus-Fairy			
1,931,256 Total Encounters	1 Total Shinies Caught	0.20% Shiny Catch Rate %	494 Total Shinies Missed

Most Encountered			
Rampardos			
17,385,425 Total Encounters	17,381,158 Total Normal Catches	741 Total Shinies Caught	17% Shiny Catch Rate %

Least Encountered			
Carvanha			
1,926,165 Total Encounters	1,925,700 Total Normal Catches	412 Total Shinies Caught	89% Shiny Catch Rate %

Stats Table														
Experience Type	First Experience Type	Total Shinies Caught	Avg Catch Rate	Total Shinies Missed	Total Encounters	Total Shiny Encounters	Shiny Catch Rate %	Shiny Miss Rate %	Encounter Rank	Avg Encounters Per Shiny	Encounters for First Shiny	Shiny Rate	Total Normal Catches	Count of Pokemon
+ Fluctuating	Fluctuating	25,820	142.50	20,444	6,759,718,759	46,264	55.81%	44.19%	1	146,111.85	7,519,091	0.0007%	189,155,352	14
+ Medium Fast	Medium Fast	352,519	113.83	436,926	6,759,887,668	789,445	44.65%	55.35%	1	8,562.84	201,860,265	0.0117%	3,222,743,089	477
+ Fast	Fast	75,966	112.22	96,364	6,759,865,720	172,330	44.08%	55.92%	1	39,226.29	90,657,324	0.0025%	704,596,523	73
+ Erratic	Erratic	57,913	108.59	77,684	6,759,873,260	135,597	42.71%	57.29%	1	49,852.68	91,485,201	0.0020%	555,956,855	32
+ Medium Slow	Medium Slow	122,648	91.68	220,146	6,759,887,223	342,794	35.78%	64.22%	1	19,719.97	236,779,000	0.0051%	1,404,363,767	291
+ Slow	Slow	29,152	44.61	137,234	6,759,893,113	166,386	17.52%	82.48%	1	40,627.78	6,759,893,113	0.0025%	681,424,703	353
Total	Erratic	664,018	89.02	988,798	6,759,893,113	1,652,816	40.17%	59.83%	1	4,089.92	6,759,893,113	0.0245%	6,758,240,289	1240

Pokemon



Stats

Necrozma-...	97	113	157
Pokemon	HP	Attack	Sp Attack
109	127	13'09"	771.60
Defense	Sp Def	Height	Weight

It survives by absorbing light. After a long time spent slumbering underground, impurities accumulated within it, causing its body to darken.

Pokemon

Necrozma-Dawn Wings

1.930M

Total Encounters by Pokemon

Slow

Selected Experience Type

493

Total Shinies Caught

6.81

Shinies Caught Per Hour

493

Total Shiny Encounters

(Blank)

Total Shinies Missed

1.930M

Total Normal Catches

100%	(Blank)
Shiny Catch Rate %	Shiny Miss Rate %
0.0000%	255.00
Shiny Rate	Avg Catch Rate

13.683M

Avg Encounters Per Shiny

Thank you from the bottom of my heart for checking out my work. This was a learning experience for me, and one I poured some true passion into.

I learned a great deal about Python, Power BI, and Data Analytics in general. It was a fantastic journey, and I'm happy to share these results with anyone who would appreciate and learn from them.

GitHub Repo: <https://github.com/rela82me/shiny-encounter-simulation>



Check out the GitHub repo for more info about the simulation and visit <https://joshualown.org> for more experiments like this!

## Improvements

- **Catch Rate change**
  - Have it attempt multiple times to increase the catch rate chance.
  - Stop trying to catch the normals to increase speed.
- **Calculation Methods**
  - Calculate as a whole without simulation and test against simulation.
- **Performance Improvements**
  - Dumping shiny log into a separate logfile instead of keeping it in memory.
  - Using fixed sized arrays to store the results
  - Starting a new simulation / limiting simulation for testing.
- **Improved Data Source**
  - Cleaned up to be only single encounters.
  - Find spawn rate, and catch rate data to better align with true pokemon stats.
  - Include more interesting data points like type
- Better PokeDex
  - Implement better Base Stats and stats display (separate)
- Stats for Nerds
  - Include more interesting metrics like stats by type utilizing more base stats/metrics.
- Simulate by Game?
- Simulate IV's ?