# 2017 Billygoat - Fork Leg Analysis

*"Thanks to Rick for the excellent course. It was great having both of the sometime-traditions of the Billygoat, skip and fork, and both were especially well implemented. The course posed multiple varied and tempting skip opportunities from start to finish. And **the fork offered a pair of interesting and quite different choices, maybe the best Billygoat fork ever**."*

Stephen Tarry, running his 39th Billygoat!
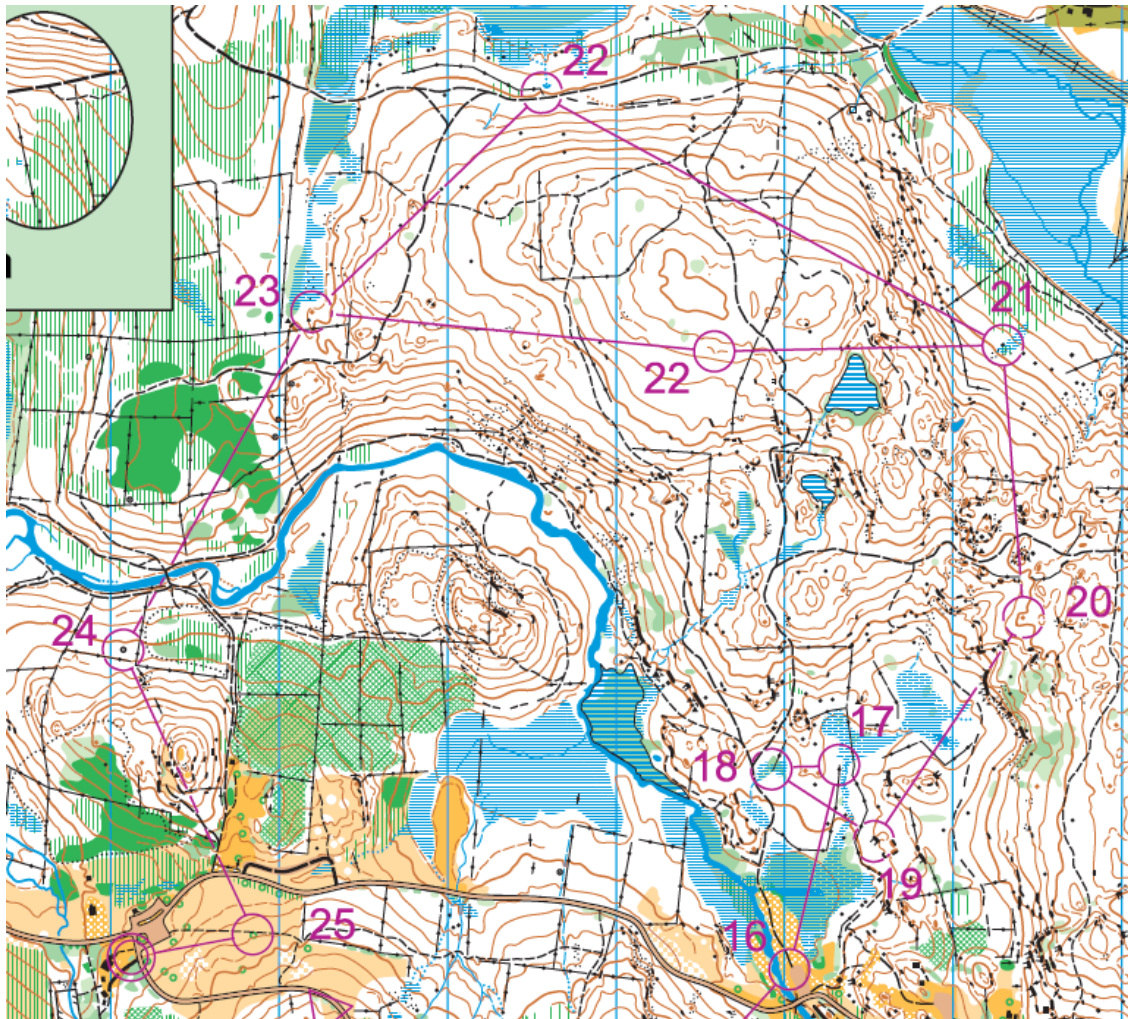
The Billygoat tradition of a fork leg presented an interesting choice of running 1.0km straight through hilly terrain or 1.5km of very easy navigation on a mostly flat, large trail. The fork came towards the end of the race when most participants had already been running for 1.5-2.0 hours. The fork leg control was #22, so the fork leg route times are calculated from leaving control #21 until punching control #23.

2017 Billygoat			Forked Leg Route Choice	
Participants	#	%	Straight	Trail
Male	68 *81%*		29 *43%*	39 *57%*
Female	16 *19%*		3 *19%*	13 *81%*
Total	84 *100%*		32 *38%*	52 *62%*

Top 10 Runners

Surname	First name	Pl	Total Race Time	Route Choice	Leg Times (min:sec)			
					21-23	Rank	23-F	21-F
Laughlin	Jordan	1	87:16:00	Straight	7:54	2	6:47	14:41
Hawkins	William	2	87:34:00	Trail	7:53	1	7:18	15:11
Barbone	Giacomo	3	87:47:00	Trail	7:58	3	7:29	15:27
Graham	Robert	4	92:07:00	Trail	8:02	4	7:34	15:36
Walker Jr.	Ken	5	92:53:00	Trail	8:06	5	7:23	15:29
Torrance	Jon	6	92:56:00	Trail	8:46	10	7:37	16:23
Riley	Wyatt	7	93:42:00	Straight	8:17	6	7:51	16:08
Young	Alan	7	93:42:00	Straight	8:22	7	7:49	16:11
Denzler	Patrick	9	95:31:00	Straight	8:45	8	8:41	17:26
Olsen	Niels	10	97:33:00	Trail	8:45	8	8:34	17:19
			Fastest times					
			Trail route		7:53			
			Straight route		7:54			
			Average times	#				
			Top 10	10	8:16		7:42	15:59
			Trail route	6	8:15		7:39	15:54
			Straight route	4	8:19		7:47	16:06
			Difference (sec)		*0:04*		*0:07*	*0:12*
					0.9%		*1.7%*	*1.3%*

The top two finishers, Jordan Laughlin and Will Hawkins ran opposite fork routes and had the fastest times of 7:54 and 7:53 for the Straight and the Trail route, respectively. Among the top ten runners, six chose the Trail route and four the Straight route, and the two routes were essentially equal in time. The Trail route runners gained on average a very narrow 4 seconds advantage from #21 to #23, and an additional 8 seconds advantage from #23 to the Finish line.

Insight #1: At Ward Pound Ridge, top US male orienteers can run up to 50% longer distance on a flat, large trail compared with running straight through hilly, open terrain.

The overall fork leg analysis for all runners were done by measuring the time from control #20 to control #23, as the split times at #21 were not registered for most runners. We adjusted the data for runners who we know had time losses on control #21.

All Runners	Leg Times (min:sec)			All Female	Leg Times (min:sec)		
	20-23	23-F	20-F		20-23	23-F	20-F
Avg. total	18:39:32	12:16:16	30:55:48	Avg. total	18:06:23	11:56:18	30:02:42
Avg. Straight	17:18:10	11:08:02	28:26:12	Avg. Straight	16:40:00	11:35:00	28:15:00
Avg. Trail	19:22:39	12:50:29	32:13:08	Avg. Trail	18:22:05	12:00:11	30:22:16

Top Ten				Top 5 Female			
Avg. total	11:10:30	7:42:18	18:52:48	Avg. total	15:44:10	10:05:50	25:50:00
Avg. Straight	11:22:15	7:47:00	19:09:15	Avg. Straight	-	-	-
Avg. Trail	11:02:40	7:39:10	18:41:50	Avg. Trail	15:44:10	10:05:50	25:50:00

Place 11-21 (Note: 8 of 11 ran Straight)				Remaining Female			
Avg. total	13:00:06	8:55:36	21:55:42	Avg. total	20:16:08	13:09:37	33:25:45
Avg. Straight	12:41:45	8:58:45	21:40:30	Avg. Straight	16:40:00	11:35:00	28:15:00
Avg. Trail	14:13:30	8:43:00	22:56:30	Avg. Trail	21:28:10	13:41:10	35:09:20

Second Quartile			
Avg. total	16:01:57	10:13:51	26:15:47
Avg. Straight	15:37:24	10:04:12	25:41:36
Avg. Trail	16:10:43	10:17:17	26:28:00

Bottom Half			
Avg. total	21:54:13	14:01:30	35:55:43
Avg. Straight	19:51:35	13:03:40	32:55:15
Avg. Trail	22:43:16	14:12:42	36:55:57

The original hypothesis when analyzing the data was that the Trail option was preferable for most runners for a couple of different reasons, including much easier navigation, no slowdown by the big hill early on the leg, plus the ability to save some energy for the final legs. Well, the data tells a different story:

For all runners, the Straight route was on average about 12% faster than going around on the Trail. We can speculate that at this stage in the race, after 1.5-2.0 hours of running, the pace may have slowed down to a point where the difference between walking up a steep hill and running/walking around on the Trail was not significant enough to compensate for the 50% extra distance on the Trail. Also, the difference in navigational challenge on the two routes may not be significant at a slower pace.

The top 5 women chose the Trail route. For all women, the Straight route was on average faster than the Trail route, but the sample size was tiny with only three women running the Straight route.

Insight #2: Towards the end of a long-distance race when running paces slow down, the 'middle of the pack' runners may emphasize minimizing distance when evaluating route choices in open terrain.

As a side commentary, under shorter, more normal race conditions, it is likely that the Trail route would have been faster for 'middle of the pack' runners, given that the two route choices were equal for top male runners who are relatively faster in the terrain than other runners.