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At a glance

Total numbers of key measurements

	2018	2019
Recorders	115	85
Transects	118	87
Records	15,436	13,111
Butterflies	46,012	36,171

Top 5 species in 2019

Ringlet, Speckled Wood,

Painted Lady, Meadow Brown, Peacock



Irish Butterfly Monitoring Scheme 2019, the year of the painted lady!

2019 was the 12th year of the Irish Butterfly Monitoring Scheme and it marked another good year with 17% more butterflies recorded than in 2008. The painted lady was the stand out species of the year with a staggering 590% increase on 2008 numbers! As the Irish Butterfly Monitoring Scheme (IBMS) enters its 13th year, it's a good time to reflect on why the scheme is so important, and to highlight the requirements for the scheme to continue to continue to develop over the years ahead.



About the Irish Butterfly Monitoring Scheme

First things first, a short recap of the scheme for our existing recorders and some background information for our new recorders.

What is the IBMS? The IBMS is a citizen science scheme that tracks population and phenology (flight) trends in Irish butterflies, detecting the impacts of factors such as land use and climate change on the Irish butterfly population. It involves walking a fixed route (transect) on a weekly basis from 1st April to 31st September each year, when weather conditions are favourable. The number of the different butterfly species seen along different sections of each transect are recorded. These recordings are the basic data upon which the analysis is based.

What type of analysis is completed within the scheme? Two separate analyses are undertaken to determine the change (if any) in butterfly populations. The first is a multi-species index which estimates the overall direction of change in

the butterfly population, as a whole, using Irelands most common resident butterflies (15 species). A trend line is estimated from the multi-species index which summarises the overall direction of the population change since the commencement of the recording scheme (ie., 2008). The second type of analysis is the estimation of a trend that tracks the status of the individual species of butterflies. This analysis includes migratory species of butterflies to Ireland and not just native or common species like in the multi-species analysis. The multispecies index and the individual species trends are estimated using international best practice methods developed by Statistics Netherlands (TRends and Indices for Monitoring data, TRIM, Pannoeck & van Strein, 2005; Multi-Species Indicators, MSI, Soldaat et al., 2017).



Multi-species analysis

2019 was another good year for the scheme with populations up by 17% compared to our baseline year of 2008 (Figure 1); this was slightly lower than the 2018 figure (+29%) but any increase in population size is positive. The 17% increase was estimated using the multispecies index of the 15 most common butterfly species that fit the criteria to be included in the analysis, and although there has been a strong increase in the numbers of butterflies in the last 2 years, the peaks and troughs of the population since 2008 (Figure 1; circle markers) means that the overall estimated trend shows a rate of change in our butterfly populations of -1.3 ± 0.92 % (± 95% confidence interval surrounding the estimate) per year. In good news however, there has been a strong increase (+10%) in the rate of change since 2015; this strong upward trend is largely due to 2018 and 2019 being particularly good years for butterflies,

making up for poor butterfly numbers in the preceding years.

For a species to be included in the multi-species index it must be recorded in at least 25 sites, with 70% or more of it's flight period per year and with a minimum of 7 years across sites. Table 1 (page 5) lists the species that are included in the multi-species analysis.

The multi-species index is a useful index to show overall tends in population changes of common butterflies of the wider countryside. However, it does not generate sufficiently reliable data to track how the populations of our more localised or specialised butterfly species are changing. This is because there is currently not enough data being recorded for these species. In order to capture adequate information on these species additional speciesspecific schemes (like the Marsh Fritillary Monitoring Scheme) would need to be in place.



Multispecies Index of butterfly population change 2008-2019

Figure 1 The multi-species index derived from the amalgamation of the population trends of 15 common species of butterflies from 2008 to 2019. The dark orange line is the smoothed trend line, and the circle markers represent the multispecies index per year. Error bars (on markers) and the shaded area surrounding the trend line are the 95% confidence intervals.

Figure 2 is a heatmap showing the percentage of total butterfly populations recorded per week for the monitoring scheme period from 2008 to 2019. The values in the heatmap were generated from the multi-species analysis and therefore control for differences in the number of transects walked per year and the number of walks conducted per transect.

The horizontal **Total** bar (below graph) represents the percentage of butterflies recorded per year since the scheme began; 2010 stands out as the best year with 13.19% of butterflies being recorded in that year. The

worst year on record was 2016 where only 5.79% of butterflies recorded since 2008 were recorded in that year.

The vertical **Total** bar on the right sums up the percentage per week, e.g. the 1st peak of butterfly counts typically occurs in the end of May which falls in weeks 8 to 10 of the scheme (3.37% of all butterflies within a year are recorded in week 9), with the main peak usually occurring in mid July which falls in weeks 15 to 17 (24% of butterflies recorded within these three weeks) of the scheme.

Figure 2 Normalised % of total butterflies recorded 2008-2019

			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Total
	April	1	0.03	0.01	0.00	0.06	0.04	0.00	0.05	0.04	0.01	0.03	0.01	0.03	0.32
		2	0.02	0.02	0.03	0.15	0.05	0.00	0.11	0.16	0.01	0.05	0.02	0.04	0.66
		3	0.04	0.10	0.07	0.42	0.06	0.02	0.23	0.16	0.03	0.08	0.07	0.24	1.50
		4	0.07	0.13	0.13	0.58	0.06	0.03	0.27	0.24	0.03	0.07	0.06	0.22	1.89
		5	0.18	0.15	0.17	0.39	0.13	0.05	0.22	0.11	0.04	0.29	0.12	0.23	2.09
	May	6	0.28	0.26	0.36	0.16	0.12	0.06	0.18	0.09	0.12	0.37	0.20	0.20	2.41
X		7	0.38	0.08	0.37	0.17	0.06	0.11	0.39	0.21	0.20	0.17	0.29	0.26	2.70
ee		8	0.26	0.19	0.65	0.15	0.27	0.16	0.23	0.11	0.16	0.26	0.36	0.24	3.03
3		9	0.32	0.41	0.43	0.17	0.28	0.24	0.32	0.14	0.27	0.24	0.39	0.14	3.37
e	June	10	0.31	0.25	0.37	0.18	0.24	0.41	0.24	0.12	0.21	0.08	0.39	0.14	2.95
E L		11	0.14	0.29	0.41	0.20	0.18	0.13	0.32	0.24	0.12	0.09	0.16	0.08	2.37
g sche		12	0.13	0.29	0.59	0.20	0.13	0.17	0.43	0.22	0.13	0.30	0.27	0.15	3.01
		13	0.22	0.54	0.92	0.32	0.19	0.23	0.46	0.27	0.21	0.34	0.62	0.32	4.63
	July	14	0.32	0.60	0.84	0.69	0.34	0.42	0.52	0.64	0.31	0.51	0.88	0.73	6.81
. ⊆ .		15	0.50	0.63	0.88	0.77	0.24	0.93	0.52	0.50	0.39	0.56	1.12	0.86	7.91
õ		16	0.64	0.62	0.75	0.28	0.47	1.27	0.63	0.64	0.63	0.60	0.77	0.65	7.95
Ę		17	0.88	0.37	0.92	0.61	0.61	1.02	0.84	0.42	0.38	0.51	0.82	0.72	8.10
ō	•	18	0.66	0.43	0.65	0.53	0.40	0.81	0.72	0.37	0.42	0.33	0.75	0.73	6.81
Σ	August	19	0.49	0.48	0.99	0.49	0.62	0.75	0.61	0.31	0.39	0.38	0.49	0.60	6.60
		20	0.49	0.42	0.84	0.54	0.50	0.53	0.49	0.44	0.47	0.31	0.35	0.49	5.8/
		21	0.41	0.44	0.70	0.52	0.33	0.49	0.33	0.40	0.48	0.20	0.33	0.43	5.07
	Combound	22	0.37	0.25	0.85	0.31	0.28	0.49	0.25	0.36	0.30	0.29	0.42	0.39	4.57
	September	23	0.30	0.27	0.52	0.15	0.38	0.43	0.36	0.23	0.18	0.17	0.25	0.26	3.50
		24	0.15	0.40	0.35	0.15	0.19	0.27	0.28	0.21	0.18	0.11	0.12	0.28	2.69
		25	0.12	0.22	0.20	0.08	0.15	0.20	0.23	0.17	0.07	0.10	0.07	0.23	1.90
		20	0.08	0.17	0.11	0.10	0.08	0.10	0.10	0.14	0.05	0.00	0.08	0.08	1.20
		Total	7.75	8.04	13.19	8.39	6.39	9.38	9.40	6.95	5.79	6.53	9.43	8.76	100.00

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2019 got off to a great start with an early above average peak in week 3 (Figure 3; green line). This was likely due to the above average temperatures experienced in mid April (Met Eireann^{*} quoted the highest maximum temperature recorded in April in 44 years). However, after this, there was a reduction in the percentage of butterflies recorded when compared to 2018. There was a below average dip in butterfly numbers from weeks 9 to 11 (i.e., end of May/early June); which likely coincided with the 'below average' temperatures and 'above average rainfall for most' as cited by Met Eireann^{**}. The highest peak of 2019 occurred in week 15 (beginning of July) which was expected and was in-line with previous years.



Peacock populations continue to show a strong increase in Ireland



Phenology of Butterflies from April to September

Figure 3 Phenology (flight curves) of butterflies across monitoring scheme week. This was part of the multispecies index which contained an amalgamation of records from 15 of the most common resident species

https://www.met.ie/climate-statement-for-april-2019



^{**&}lt;u>https://cli.fusio.net/cli/bulletin/data/2019/06/sum_062019.pdf</u>

Table 1 Irish Butterfly population trends 2008 to 2019

Species	Change 2008-2019	Statistical confidence, sites per year	Included in multi- species index?		
Peacock	Strong increase	99%, >50 sites	Yes		
Brimstone	(> +5% p.a.)	95%, 10 - 24 sites	No		
Silver-washed Fritillary		95%, 25 - 50 sites	Yes		
Dingy Skipper	Noderate increase $(< +5\% \text{ p a })$	95%, 10 - 24 sites	No		
Holly Blue	(< 1370 p.a.)	95%, 25 - 50 sites	Yes		
Orange-tip		95%, > 50 sites	Yes		
Ringlet		95%, > 50 sites	Yes		
Small Tortoiseshell	Stable (±5% p.a.)	95%, > 50 sites	Yes		
Speckled Wood		95%, > 50 sites	Yes		
Small White		95%, > 50 sites	Yes		
Green-veined White		99%, >50 sites	Yes		
Large White	Moderate decline	95%, >50 sites	Yes		
Meadow Brown	(< 5% p.a.)	95%, >50 sites	Yes		
Small Copper	Strong Decline	95%, 25 - 50 sites	Yes		
Small Heath	(> -5% p.a.)	99%, 25 - 50 sites	Yes		
Common Blue		95% <i>,</i> > 50	Yes		
Dark Green Fritillary		95%, 10 - 24	No		
Grayling	Uncertain	95%, 10 - 24	No		
Wall Brown		95%, 10 - 24	No		
Wood White		95%, 25 - 50	Yes		
Brown Hairstreak			No		
Comma			No		
Essex Skipper			No		
Gatekeeper			No		
Green Hairstreak			No		
Large Heath	Unknown	<15 sites	No		
Marsh Fritillary			No		
Pearl-bordered Fritillary			No		
Purple Hairstreak			No		
Small Blue			No		
Small Skipper			No		
Clouded Yellow*	Unknown	<15 sites	No		
Painted Lady*	Strong increase (> +5% p.a.)	99%, 25 - 50	No		
Red Admiral*	Moderate increase (< +5% p.a.)	99%, > 50%	No		

* Migrant species; changes in numbers recorded in Ireland largely dependent on conditions external to Ireland



Individual species analysis

When the population trends of the individual species were examined, it was a story of winners and losers, and 2019 will go down as the year of the Painted Lady. The well reported influx of these migratory butterflies was captured by the Irish Butterfly Monitoring Scheme and results showed a population increase of 590% on 2008 records (Figure 4a). The Painted Lady is not included in the multi-species trend because it is a migratory species, and it's population impacts are mainly driven by factors outside of Ireland. Another migratory species, the Red Admiral, shared a similar story with an increase of 75% on 2008 figures (Figure 4b); the Red Admiral was also not included in the multi-species analysis because of it's migratory status.

The three other species that fared well in 2019 were the Peacock (+250% on 2008 figures), the Silver-washed





 a migra-Unfortunately, five species showed a decrease in 2019 when compared to 2008; the strongest declines were identified in the Small Heath (-77%) and Small Copper (-49%), with the Small Copper moving from a moderate decline in 2018 to a strong decline in 2019. The Meadow Brown and the Large White also experienced moderate declines in 2019. Of particular note was the Green-veined White which experienced a sharp decline in populations between 2008 and 2019 (-36%).
Figure 4a The estimated population index (blue markers) and population trend (red line) of the Painted Lady since 2008

Fritillary (+57%) and the Holly Blue (+34%) (Figure 5). When

compared with records from 2018, Peacock populations

continued to show a strong increase, whereas the Silver-

washed Fritillary continued to increase, but at a slower

rate than in previous years. Holly Blue also showed a mod-

erate increase in 2019. The populations of five of our com-

moner species (Orange-tip, Ringlet, Small Tortoiseshell,

Small White and Speckled Wood) remained stable in 2019.



Figure 4b The estimated population index and population trend of the Red Admiral since 2008





Figure 5 Population trends of individual butterfly species









Brimstone Gonepteryx rhamni Ave. sites per year in monitoring scheme: 10-24 Change 2008-2019: +191% Generations per year: 2 Overwinters as: Adult

Conservation status (2010): Least Concern

Common Blue *Polyommatus icarus* Ave. sites per year in monitoring scheme: >50

Change 2008-2019: Uncertain, too variable

Generations per year: 2

Overwinters as: Larva

Conservation status (2010): Least Concern

Dark Green Fritillary Argynnis aglaja

Ave. sites per year in monitoring scheme: 10-24

Change 2008-2019: Uncertain, too variable

Generations per year: 1

Overwinters as: Larva

Conservation status (2010): Vulnerable

Dingy Skipper Erynnis tages

Ave. sites per year in monitoring scheme: 10-24

Change 2008-2019: +25%

Generations per year: 1

Overwinters as: Larva

Conservation status (2010): Near Threatened













Grayling Hipparchia semele

Ave. sites per year in monitoring scheme: 10-24

Change 2008-2019: Uncertain, too variable

Generations per year: 1

Overwinters as: Larvae

Conservation status (2010): Near Threatened





1200

1000

008 000 Oonut

600 400

200

0

2008

2010

2012

2014

Time point

2016

2018

Green-veined White Pieris napi

Ave. sites per year in monitoring scheme: >50

Change 2008-2019: -36%

Generations per year: 2

Overwinters as: Pupa

Conservation status (2010): Least Concern

Holly Blue *Celastrina argiolus* Ave. sites per year in monitoring scheme: 25-50

Change 2008-2019: +34%

Generations per year: 2

Overwinters as: Pupa

Conservation status (2010): Least Concern

2500 2000 1500 1000 500 0 2008 2010 2012 2014 2016 2018 Time point

Large White Pieris brassicae Ave. sites per year in monitoring scheme: >50 Change 2008-2019: -23% Generations per year: 2 Overwinters as: Pupa Conservation status (2010): Least

Concern











Meadow Brown *Maniola jurtina* Ave. sites per year in monitoring scheme: >50 Change 2008-2019: -20% Generations per year: 1 Overwinters as: Larva Conservation status (2010): Least Concern



6000

4000 000

2000

0

2008

2010

2012

2014

Time point

2016

2018

Orange-tip Anthocharis cardamines Ave. sites per year in monitoring scheme: >50 Change 2008-2019: Stable Generations per year: 1 Overwinters as: Pupa

Conservation status (2010): Least Concern

Peacock Aglais io

Ave. sites per year in monitoring scheme: >50

Change 2008-2019: +250%

Generations per year: 2

Overwinters as: Adult

Conservation status (2010): Least Concern

15000 -10000 -5000 -2008 2010 2012 2014 2016 2018 Time point

Ringlet Aphantopus hyperantus Ave. sites per year in monitoring scheme: >50 Change 2008-2019: Stable Generations per year: 2 Overwinters as: Larva Conservation status (2010): Least

Concern













600 - 500



Ave. sites per year in monitoring scheme: 25-50

Change 2008-2019: +57%

Generations per year: 1

Overwinters as: Egg

Conservation status (2010): Least Concern

Small Copper Lycaena phlaeas

Ave. sites per year in monitoring scheme: 25-50

Change 2008-2019: -49%

Generations per year: 2

Overwinters as: Larva

Conservation status (2010): Least Concern

Small Heath *Coenonympha pamphilus* Ave. sites per year in monitoring scheme: 25-50 Change 2008-2019: -77% Generations per year: 2 Overwinters as: Larva Conservation status (2010): Near

Threatened

Small Tortoiseshell *Aglais urticae* Ave. sites per year in monitoring scheme: >50

Change 2008-2019: Stable

Generations per year: 2

Overwinters as: Adult

Conservation status (2010): Least Concern

















Small White Pieris rapae

Ave. sites per year in monitoring scheme: >50

Change 2008-2019: Stable

Generations per year: 2

Overwinters as: Pupa

Conservation status (2010): Least Concern









Speckled Wood *Pararge aegeria* Ave. sites per year in monitoring scheme: >50 Change 2008-2019: Stable Generations per year: 2-3

Conservation status (2010): Least Concern

Overwinters as: Larva/pupa

Wall Brown *Lasiommata megera* Ave. sites per year in monitoring

scheme: 10-24

Change 2008-2019: Uncertain, too variable

Generations per year: 2

Overwinters as: Larva

Conservation status (2010): Endangered

Wood White agg. Leptidea spp.

Ave. sites per year in monitoring scheme: 25-50

Change 2008-2019: Uncertain, too variable

Generations per year: 1

Overwinters as: Pupa

Conservation status (2010): *L. sinapis*, Near Threatened; *L. juvernica*, Least







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Ensuring continued success of the IBMS

As stated previously, for a species to be included in the multi-species analysis it needs to fulfil certain criteria. There is a similar criterion for the addition of data into analyses from each of the transects. Data from each transect can only be included in the multi-species analysis if that transect has been visited for at least 7 years since the commencement of the recoding scheme (i.e., 2008), and has been visited at least 10 times each year. Where some weeks are missed, it is possible to calculate estimated counts using the previous and subsequent counts, but the fewer missed counts the greater the accuracy of the data.

Unfortunately, 2019 saw a significant decrease in the number of transects walked, falling from 118 in 2018 to 87 in 2019. This reduced number of transects still allows

statistically significant population trends to be produced, but it does mean that the remaining transects become increasingly important to maintain as each year progresses, to ensure there is adequate data to analyse population trends. Currently, records from 159 transects (from 2008 to 2019) are not included in the multi-species analysis because the transect does not meet the criteria for inclusion. Of the 159 transects, 6% were not included because they were visited less than 10 times per year and 94% were not included because they were visited for less than 7 years since 2008. Ensuring transects are walked as much as possible, for as many years as possible, will allow us to reap the biggest benefits from that data we are collecting year on year.

In other news

Farewell

Dr Tomás Murray who led the work on the Irish Butterfly Monitoring Scheme for the last five years, left the Data Centre late last year to follow a new career path. Tomás has done tremendous work in developing the monitoring scheme and undertaking very high quality analysis of these data. His contribution will have a long lasting impact as Tomás has also developed a detailed road map for the further development of the monitoring scheme over the years ahead. We thank him sincerely for the great work that he did to build the evidence base on how butterflies populations are changing in the Irish countryside.

Five visit monitoring scheme

In parallel to the Irish Butterfly Monitoring Scheme the National Biodiversity Data Centre also operates a Five Visit Monitoring Scheme. In 2019, volunteers walked 88 Five Visit Monitoring Scheme transect. These results of these walks will be incorporated into the Butterfly Atlas 2021 project

As always we would like to express our thanks to all of our



A big thank you!

A group of IBMS volunteers in the Burren, 2019

recorders (Table 2). Without giving your time and expertise so generously we would not we would not be able to complete such in-depth analysis of butterfly populations in Ireland and we really appreciate your efforts each year.

If you would like to reference this document:

Judge, M and Lysaght, L. (2020) '2019, the year of the Painted Lady', The Irish Butterfly Monitoring Scheme Newsletter, Issue 13.



Irish Butterfly Monitoring Scheme recorders in 2019

Recorder	Site Name	Recorder	Site Name
Áine Fenner	LD01	Kate Lavender	CE12
Alberto Villarejo	KE10	Kevin Deering	S01
Angela Dakin	D08	Lee Donohoe	MH03
Anthony Pickering	M004	Lesley Whiteside	WH02, WH07, WH09
Barry O' Sullivan	C60	Mairi-Elena Crook	DL07
Bryony Williams	M006	Malcolm Taylor	D18
Caren Carruthers	OY03	Margaret O'Keeffe	G14
Caroline Stanley	G36	Mary Foley	WX09, WX10
Christopher J Wilson			
(In memorandum)	WX01	Mary Howard	CE05
Clare Heardman	C13	Mary Niblett	W13
Clare McIntyre	C37	Michael O'Connell	G30
Colin Hamilton	C38	Mireille McCall	KE13, KE14
Coole Park	G15	Naomi Mitten	CN04
Damaris Lysaght	C29	Nuala Mahon	C33
Denis Cullen	W03	Oisin Duffy	DL10
Dermot McNelis	DL06	Orla Murphy	C41
Donna Smith	CE04	Padraig Keirns	G29
Eamonn Twomey	CE16, CE17, CE18	Pat Bell	KE06
Eddie Gilligan	KE04	Patrick Fahy	MO10
Eileen Maguire	G22	Patrick Sheridan	KE09
Eileen McGrath	T15	Philomena Cahill	WX24
Emma Stewart-Liberty	CE01	Rachel Vaughan	T16
Emmet Fahy	WX22	Ralph Sheppard	DL03
Enda Flynn	LH04	Richard McCafferty	DL02
Frank Smyth	D07	Rob Wheeldon	LM01
Gillian Stewart	WW07, WW10	Rodney Daunt	C03
Grainne Reidy	G01	Ryner Weinreich	C23
Irene Deisler	DL05	Sean Forde	KY08, KY09, KY10
Janet Whelehan	WX23	Simone Schmaler	G37
Jesmond Harding	KE01, MH04	Siobhan Hardiman	RN09
John Cullen	WX13, WX20	Stephen Lester	CE10
John Hardiman	LK09	Sue White	D13
John Kehoe	WX16	Tadhg Corcora	KE02
John Lovatt	D01	Tim Butter	C48, C50
Jon Freestone	M008	Tomás Murray	W18
Justin Ivory	WW13, WW14, WW15	Tony Miller	C16
Karina Dingerkus	M009		

