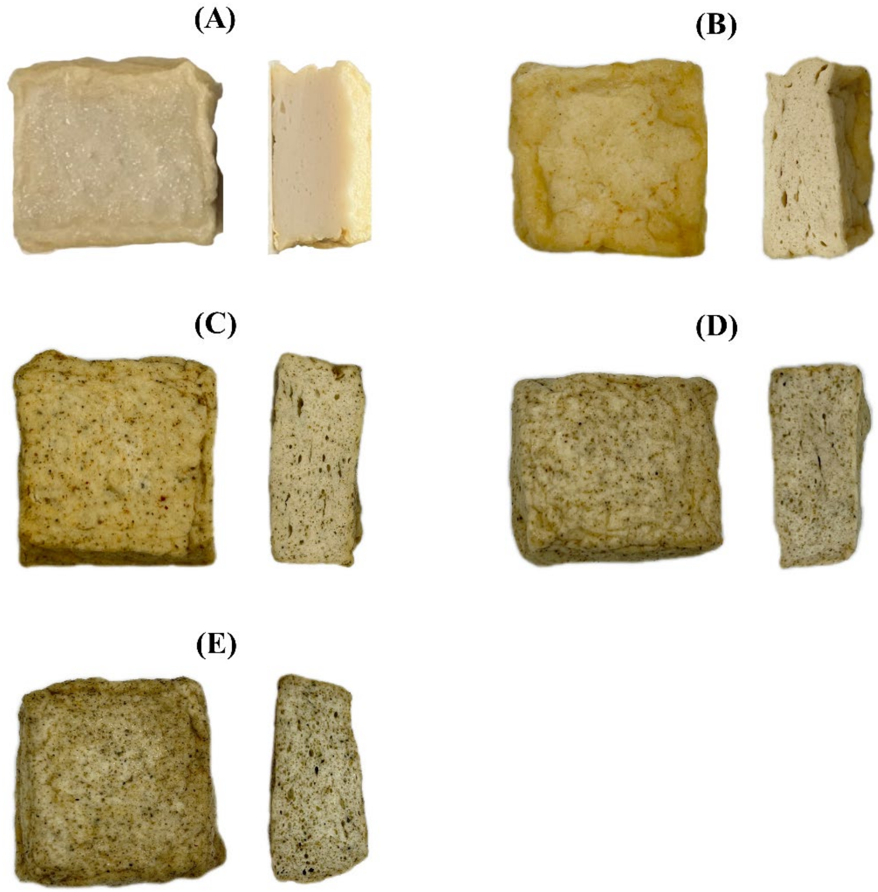

Fig. S1. Overall appearances and cutting profiles of surimi-based fishcake and plant-based fishcake analogues. (A): surimi-based fishcake (SFC); (B): PP + NO (10:0); (C): PP + NO (9:1); (D): PP + NO (8:2); (E): PP + NO (7:3). PP + NO (10:0), (9:1), (8:2) and (7:3) represent the ratio of pea protein isolate and *Nannochloropsis oceanica* in plant-based fishcake analogues, respectively.

Table S1

The proximate compositions of pea protein isolate and *Nannochloropsis* used in our study.

Constituents	Pea protein isolate	*Nannochloropsis oceanica*
Protein	78.4%	63.6%
Moisture	7.4%	9.4%
Carbohydrate	10.1%	13.6%
Fat	0.2%	0.1%
Ash	3.9%	13.3%

Table S2

Concentration of ingredients used in plant-based fishcake analogues at different *Nannochloropsis* addition.

Category	**Ingredients (%)**	**PP + NO (10:0)**	**PP + NO (9:1)**	**PP + NO (8:2)**	**PP + NO (7:3)**
Enzyme	Microbial transglutaminase (Activa® TG-SR-MH, 25−57 U/g)	0.10	0.10	0.10	0.10
Seasoning	Salt	1.60	1.60	1.60	1.60
	Monosodium glutamate	0.32	0.32	0.32	0.32
	Sugar	0.20	0.20	0.20	0.20
	White pepper	0.12	0.12	0.12	0.12
Oil	Sunflower oil	12.50	12.50	12.50	12.50
Filler	Dextrose monohydrate	0.81	0.81	0.81	0.81
Protein	Pea protein isolate	10.00	9.00	8.00	7.00
Microalgae	*Nannochloropsis oceanica*	0.00	1.00	2.00	3.00
Thickener	Methylcellulose	2.40	2.40	2.40	2.40
	Gellan Gum	1.00	1.00	1.00	1.00
Water	Cold water with ice	70.95	70.95	70.95	70.95
Total			**100%**		

Table S3

The compositions of simulated salivary fluid (SSF), simulated gastric fluid (SGF) and simulated intestinal fluid (SIF).

Constituents	SSF (mmol/L)[a]	SGF (mmol/L)[a]	SIF (mmol/L)[a]
KCl	18.88	8.63	8.50
KH_2PO_4	4.63	1.13	1.00
$NaHCO_3$	17.00	31.25	106.25
NaCl	-	59.00	48.00
$MgCl_2(H_2O)_6$	0.19	0.12	0.41
$(NH_4)_2CO_3$	0.08	0.63	-

[a] All the stock concentrations were 1.25× of the final concentrations.

Table S4

Metabolites identified in surimi-based fishcake and plant-based fishcake analogues at different *Nannochloropsis* addition after *in vitro* digestion.

No.	Metabolites	Assignments	δ^1 H (ppm) and multiplicity[a]	δ^{13} C (ppm)
	Essential amino acids			
1	Isoleucine	αCH, βCH, γCH$_2$, γ'CH$_3$, δCH$_3$	**3.66** (d), **1.96** (m), **1.46** (m), **1.04** (d), **0.92** (t)	**62.25**, **39.10**, **28.12**, **17.77**, **14.00**
2	Leucine	αCH, βCH$_2$, γCH, δCH$_3$, δ'CH$_3$	**3.76** (m), **1.70** (m), **1.71** (m), **0.97** (t), **0.92** (t)	**54.59**, **39.96**, **26.40**, **22.01**, **23.02**
3	Valine	αCH, βCH, γCH$_3$, γ'CH$_3$	**3.57** (d), **2.31** (m), 1.03 (d), **0.98** (d)	**63.85**, **31.67**, 19.37, **20.70**
4	Lysine	αCH, βCH$_2$, γCH$_2$, δCH$_2$, εCH$_2$	**3.76** (t), **1.82** (m), **1.49** (m), **1.72** (m), **3.02** (t)	**57.48**, **32.60**, **24.20**, **30.60**, **39.70**
5	Threonine	αCH, βCH, γCH$_3$	**3.57** (d), **4.24** (m), **1.32** (d)	**63.70**, **68.00**, **22.31**
6	Phenylalanine	C$_1$H, C$_2$H$_2$, C$_4$H, C$_5$H, C$_6$H	**3.96** (dd), **3.29** (dd), **7.33** (q), **7.43** (t), **7.37** (m)	**59.78**, **36.31**, **129.30**, **129.05**, **128.70**
7	Methionine	αCH, βCH$_2$, γCH$_2$, S-CH$_3$	**3.84** (dd), **2.18** (m), 2.63 (t), **2.08** (m)	**56.27**, **32.18**, 31.57, **17.54**
8	Tryptophan	C$_7$H, C$_6$H, C$_2$H, C$_9$H, C$_8$H, αCH, βCH$_2$	**7.72** (m), **7.52** (d), **7.30** (d), **7.26** (m), **7.19** (m), **4.01** (t), **3.48** (t), **3.29** (q)	**118.50**, **112.10**, **129.08**, **122.04**, **119.39**, **56.14**, **26.50**, **26.50**
9	Histidine	αCH, βCH$_2$, NCHC, NCHN	**4.26** (dd), **3.20**, **3.25** (dd), **7.17** (d), **8.00** (d)	**57.28**, **28.53**, **119.20**, **138.10**
	Non-essential amino acids			
10	Alanine	αCH, βCH$_3$	**3.73** (m), **1.32** (m)	**53.45**, **19.80**
11	Tyrosine	C$_1$H, C$_2$H$_2$, C$_4$H, C$_5$H	**3.90** (dd), **3.03** (dd), **7.19** (m), **6.90** (m)	**59.95**, **39.27**, **130.60**, **116.00**
12	Glycine	αCH$_2$	**3.56** (s)	**41.40**
13	Glutamine	αCH, βCH$_2$, γCH$_2$	**3.76** (t), **2.11** (m), **2.41** (m)	**54.72**, **29.89**, **33.95**
14	Aspartic acid	αCH, βCH$_2$	**3.80** (dd), **2.68** (m), **2.80** (dd)	**54.30**, **37.40**, **36.20**
15	Asparagine	αCH, βCH$_2$	**3.86** (t), **2.84** (d)	**53.7**, **35.9**
16	Arginine	αCH, βCH$_2$, γCH$_2$, δCH$_2$	**3.76** (t), **1.91** (m), **1.68** (m), **3.25** (t)	**54.34**, **30.48**, **26.19**, **40.56**
17	Proline	C$_1$H$_2$, C$_2$H$_2$, C$_3$H$_2$, C$_4$H	**3.27** (d), **1.99** (m), **2.33** (m), **4.13** (dd)	**47.36**, **26.90**, **31.50**, **64.90**
18	γ-aminobutyric acid	αCH$_2$, βCH$_2$, γCH$_2$	**2.25** (t), **1.92** (q), **3.01** (t)	**36.63**, **27.38**, **39.31**
19	Serine	βCH$_2$, αCH	**4.02** (q), **3.83** (dd)	**63.20**, **59.70**
20	Glutamic acid	αCH, βCH$_2$, γCH$_2$	**3.78** (dd), **2.08** (m), **2.35** (m)	**58.40**, **29.80**, **34.30**
	Fatty acids			

21	Linoleic acid (C18:2 ω-6)	C_1H_2, C_2H_2, C_3H_2, C_4H_2-C_6H_2, $C_{14}H_2$, C_7H_2, $C_{13}H_2$, C_8H, $C_{12}H$, C_9H, $C_{11}H$, $C_{10}H_2$, $C_{15}H_2$, $C_{16}H_2$, $C_{17}H_3$	**2.34** (t), **1.63** (m), **1.32** (m), **1.35** (m), **2.05** (m), **5.37** (m), **5.33** (m), **2.77** (t), **1.29** (m), **1.30** (m), **0.92**, **0.86** (t)	**34.01**, **24.70**, **29.14**, **29.41**, **27.25**, **130.05**, **128.05**, **25.65**, **31.58**, **22.54**, **14.06**
22	Linolenic acid (C18:3 ω-3)	C_1H_2, C_2H_2, C_3H_2-C_6H_2, C_7H_2, C_8H, C_9H, $C_{11}H$, $C_{10}H_2$, $C_{12}H$, $C_{13}H_2$, $C_{14}H$, $C_{15}H$, $C_{16}H_2$, $C_{17}H_3$	**2.34** (t), **1.61** (q), **1.31** (m), **2.05** (m), **5.35** (m), **5.30** (m), **2.75** (m), **5.34** (m), **2.78** (m), **5.31** (m), **5.39** (m), **2.08** (m), **0.93** (t)	**33.39**, **24.38**, **29.61**, **27.51**, **129.70**, **127.82**, **25.40**, **129.13**, **25.30**, **127.82**, **129.78**, **20.66**, **14.65**
23	Oleic acid (C18:1 ω-9)	C_1H_2, C_2H_2, C_3H_2-C_6H_2, $C_{11}H_2$, $C_{14}H_2$, C_7H_2, $C_{10}H_2$, C_8H, C_9H, $C_{12}H_2$, $C_{13}H_2$, $C_{15}H_2$, $C_{16}H_2$, $C_{17}H_3$	**2.35** (t), **1.64** (m), **1.33** (m), **2.02** (m), **5.34** (m), **1.27** (m), **1.25** (m), **1.29** (m), **0.89** (t)	**33.77**, **24.59**, **29.32**, **27.12**, **129.89**, **29.41**, **31.89**, **22.53**, **14.07**
24	Palmitic acid (C16:0)	C_2H_2, C_3H_2, C_4H_2, C_5H_2-$C_{13}H_2$, $C_{14}H_2$, $C_{15}H_2$, $C_{16}H_3$	**2.35** (t), **1.64** (m), **1.32** (m), **1.26** (m), **1.26** (m), **1.28** (m), **0.88** (t)	**33.49**, **24.42**, **29.22**, **29.53**, **31.73**, **22.73**, **14.55**
	Sugars			
25	α-D-Glucose	C_1H, C_2H, C_3H, C_4H, C_5H, C_6H_2	**5.24** (d), **3.49** (m), **3.70** (m), 3.39 (m), **3.81** (m), **3.76** (m)	**92.10**, **75.57**, **75.18**, 73.00, **75.15**, **63.78**
26	β-D-Glucose	C_1H, C_2H, C_3H, C_4H, C_5H, C_6H_2	**4.65** (d), **3.24** (m), **3.46** (m), **3.31** (m), 3.48 (m), **3.88** (m)	**95.64**, **74.38**, **76.32**, **73.40**, 78.68, **62.11**
27	Sucrose	$^{1}C_1H$, $^{1}C_2H$, $^{1}C_3H$, $^{1}C_4H$, $^{1}C_5H$, $^{1}C_6H_2$, $^{2}C_1H_2$, $^{2}C_2H$, $^{2}C_3H$, $^{2}C_4H$, $^{2}C_5H$, $^{2}C_6H_2$	**5.42** (d), **3.48** (t); **3.75** (dd); **3.42**; **3.56** (t); 3.83 (m); **3.59** (dd); **3.56** (dd); **4.21** (d); 4.04 (t); **3.89** (dd), 3.93 (m)	**92.05**, **75.80**; **75.30**; **75.75**; **71.10**; 75.16; **62.50**; **63.83**; **76.23**; 76.75; **81.20**, 63.09
28	α-D-Maltose	$^{1}C_1H$, $^{1}C_2H$, $^{1}C_3H$, $^{1}C_4H$, $^{1}C_5H$, $^{1}C_6H_2$, $^{2}C_1H$, $^{2}C_2H$, $^{2}C_3H$, $^{2}C_4H$, $^{2\alpha\beta}C_5H$, $^{2}C_6H_2$	**5.19** (d), **3.58** (m), 3.96 (t), **3.66** (t), 3.93 (m), **4.01** (m), 5.39 (dd), **3.58** (t), **3.67** (m), **3.43** (t), **3.71** (m), **3.81** (m)	**94.30**, **74.68**, 75.97, **78.62**, 72.69, **63.35**, 102.28, **74.68**, **75.36**, **71.84**, **75.36**, **63.0**
29	β-D-Fructose	C_1H_2, C_2H, C_3H, C_4H, C_6H_2	**3.69** (m), **3.98** (m), **3.87** (m), **3.77** (m), **3.53** (d)	**66.78**, **73.04**, **72.27**, **70.90**, **67.04**

[a]Multiplicity: s, singlet; d, doublet; t, triplet; q, quartet; dd, doublet of doublets; m, multiplet.
Note: Bold chemical shifts indicate an identified peak in the 2D spectra.

Table S5
Loading plot table derived from principal component analysis.

Metabolites	PC1	PC2
Ile	-0.03	-0.05
Leu	0.01	0.10
Val	-0.04	0.03
Lys	-0.01	0.01
Thr	0.01	0.05
Phe	-0.02	0.05
Met	-0.02	0.03
Trp	-0.00	0.01
His	-0.00	0.00
Ala	0.10	0.00
Tyr	-0.01	0.05
Gly	0.11	0.00
Gln	-0.03	-0.02
Asp	0.01	0.04
Asn	-0.01	0.05
Arg	0.02	0.08
Pro	-0.02	0.01
GABA	-0.05	0.05
Ser	-0.02	0.07
Glu	-0.03	0.09
Linoleic acid	0.04	0.07
Linolenic acid	-0.04	-0.04
Oleic acid	-0.07	-0.08
Palmitic acid	-0.08	-0.11
α-D-Glucose	0.08	0.00
β-D-Glucose	0.07	-0.02
Sucrose	0.12	-0.01
α-D-Maltose	-0.01	-0.00
β-D-Fructose	0.05	0.01